US00D554111S

(12) **United States Design Patent** (10) **Patent No.: US D554,111 S**
Su et al. (45) **Date of Patent: ** Oct. 30, 2007**

(54) **MULTI-BAND ANTENNA**

(75) Inventors: **Wen-Fong Su**, Tu-Cheng (TW); **Yao-Shien Huang**, Tu-Cheng (TW); **Chen-Ta Hung**, Tu-Cheng (TW)

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

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

(21) Appl. No.: **29/271,654**

(22) Filed: **Jan. 24, 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 R–705, 343/871–908, 795, 840, 711–713, 819, 846; 455/90.2, 90.3, 91, 128, 269, 344, 347, 562.1
See application file for complete search history.

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D535,290	S *	1/2007	Su et al.	D14/230

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Primary Examiner—Louis S. Zarfas
Assistant Examiner—John Windmuller
(74) *Attorney, Agent, or Firm*—Wei Te Chung

(57) **CLAIM**

The ornamental design for a multi-band antenna, as shown.

DESCRIPTION

FIG. **1** is a front, top and right side perspective view of a multi-band antenna showing our new design;

FIG. **2** is a front elevational view thereof;

FIG. **3** is a rear elevational view thereof;

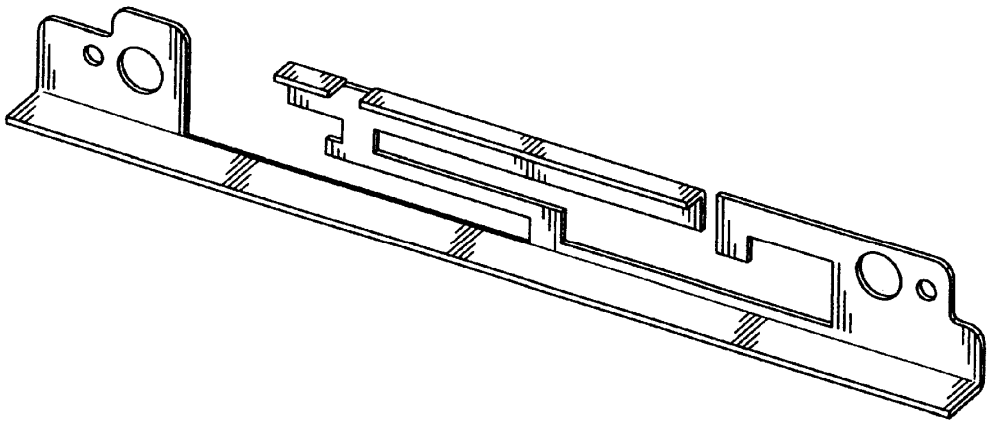
FIG. **4** is a left side elevational view thereof;

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, 6 Drawing Sheets



US007292190B2

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

(10) **Patent No.: US 7,292,190 B2**
(45) **Date of Patent: Nov. 6, 2007**

(54) **UWB PRINTED ANTENNA**

(75) Inventors: **Jia-Lin Teng**, Tu-Cheng (TW); **Chia-Hao Mei**, Tu-Cheng (TW)

(73) Assignee: **Hon Hai Precision Industry Co., Ltd.**, Tu-Cheng, 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 28 days.

(21) Appl. No.: **11/321,163**

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

(65) **Prior Publication Data**

US 2006/0145929 A1 Jul. 6, 2006

(30) **Foreign Application Priority Data**

Jan. 6, 2005 (CN) 2005 2 0053547

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

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

(58) **Field of Classification Search** ..... 343/700 MS, 343/850, 853, 820
See application file for complete search history.

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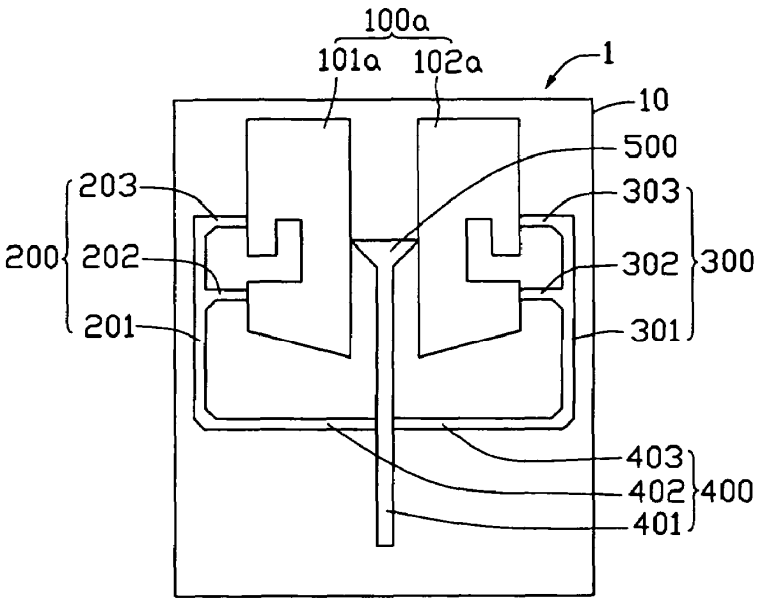
Primary Examiner—Hoang V. Nguyen
(74) *Attorney, Agent, or Firm*—Morris Manning Martin LLP; Tim Tingkang Xia, Esq.

(57) **ABSTRACT**

A UWB printed antenna (**1**) printed on a substrate (**10**) includes a body (**100***a*) for radiating and receiving electromagnetic signals, a signal feeding part (**400**) for inputting electromagnetic signals to or outputting electromagnetic signals from the body (**100***a*), a first feeding part (**200**), a second feeding part (**300**), and a third feeding part (**500**). The first, second and third feeding parts are electronically connected to the signal feeding part for feeding electromagnetic signals to the body. A first body part (**201**), a first feeding end (**202**) and a second feeding end (**203**) of the first feeding part collectively form an "F" shape. A second body part (**301**), a third feeding end (**302**) and a fourth feeding end (**303**) of the second feeding part collectively form an inverted "F" shape. The third feeding part, a first radiating end (**101***a*) and a second radiating end (**102***a*) collectively form an "H" shape.

16 Claims, 19 Drawing Sheets



US007292193B2

(12) **United States Patent**
Jang

(10) **Patent No.: US 7,292,193 B2**
(45) **Date of Patent: Nov. 6, 2007**

(54) **METHOD FOR TUNING ANTENNA MODULE IN PORTABLE WIRELESS TERMINAL AND BUILT-IN ANTENNA MODULE USING THE SAME**

(75) Inventor: **Chang-Won Jang**, Suwon-si (KR)

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

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

(21) Appl. No.: **11/248,036**

(22) Filed: **Oct. 12, 2005**

(65) **Prior Publication Data**

US 2006/0139218 A1 Jun. 29, 2006

(30) **Foreign Application Priority Data**

Dec. 24, 2004 (KR) 10-2004-0112163

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

(52) **U.S. Cl.** **343/702**; 343/767; 343/846

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

(56) **References Cited**

U.S. PATENT DOCUMENTS

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2003/0160728 A1 * 8/2003 Fukushima et al. 343/702

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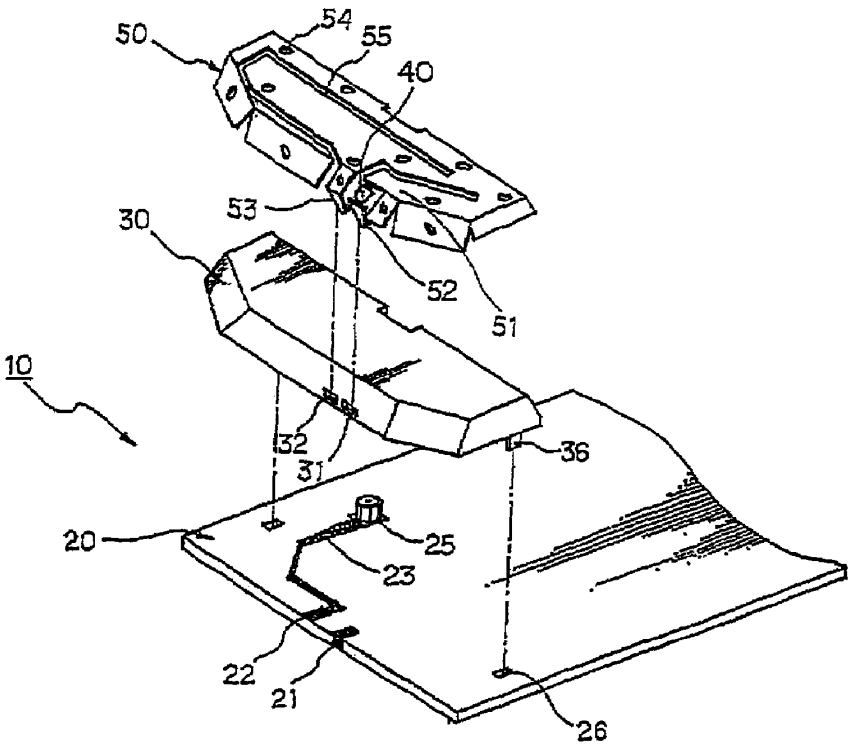
Primary Examiner—Hoang V. Nguyen
(74) *Attorney, Agent, or Firm*—The Farrell Law Firm

(57) **ABSTRACT**

Disclosed is a method for tuning an antenna module in a portable wireless terminal and built-in antenna module using the same. According to the method and built-in antenna module, the built-in antenna module is provided with a plate type radiator defining a slot with a predetermined width to form a pattern. The plate type radiator is provided with downwardly protruded feed and ground pins that are spaced apart, and at least one passive element having a predetermined value is connected to the radiator to optimally tune the antenna module. Therefore, various frequency response properties of the built-in antenna module can be attained by altering such a passive element as a variable design parameter without changing the radiator. Also, this construction can take the place of a matching circuit in a signal line, such that radiation performance can be increased without insertion loss.

8 Claims, 11 Drawing Sheets



US007292194B2

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

(10) **Patent No.: US 7,292,194 B2**
(45) **Date of Patent: Nov. 6, 2007**

(54) **INVERTED-F ANTENNA AND METHOD OF MODULATING IMPEDANCE OF THE SAME**

(75) Inventors: **Lung-Sheng Tai**, Tu-Cheng (TW); **Po-Kang Ku**, Tu-Cheng (TW); **Shu-Yean Wang**, Tu-Cheng (TW)

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

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

(21) Appl. No.: **11/487,867**

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

(65) **Prior Publication Data**

US 2007/0075902 A1 Apr. 5, 2007

(30) **Foreign Application Priority Data**

Jul. 15, 2005 (TW) ..... 94124101 A

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

(52) **U.S. Cl.** **343/702**; 343/860; 343/846

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

(56) **References Cited**

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2005/0073462	A1 *	4/2005	Lin et al.	343/702

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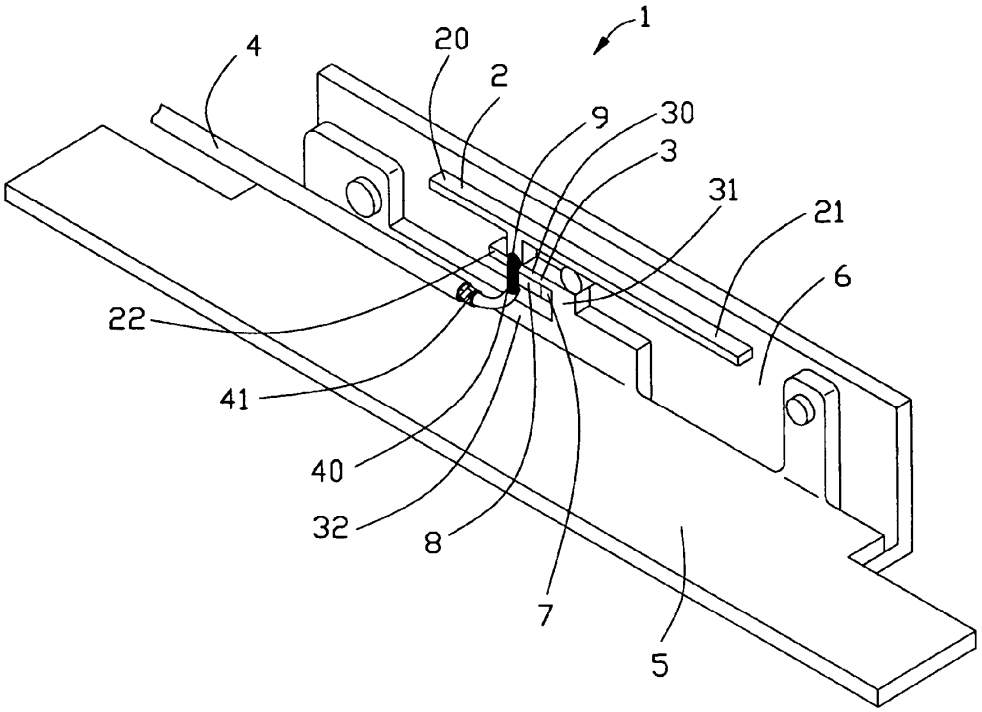
Primary Examiner—Hoang V. Nguyen
(74) *Attorney, Agent, or Firm*—Wei Te Chung

(57) **ABSTRACT**

An inverted-F antenna (**1**) used in a portable electrical device formed in a metal patch and includes a radiating element (**2**), a grounding element (**5**), and an impedance matching element (**3**) with an impedance matching space (**8**). The impedance matching element (**3**) connects the radiating element (**2**) and the grounding element (**5**). A metal foil (**7**) locates in the impedance matching space and connects to the impedance matching element (**3**) for modulating impedance matching of the inverted-F antenna. A feeding line (**4**) includes an inner conductor (**40**) soldered with the impedance element (**3**) and a braiding layer (**41**) soldered with the grounding element (**5**).

20 Claims, 3 Drawing Sheets



US007292196B2

(12) **United States Patent**
Waterhouse

(10) **Patent No.: US 7,292,196 B2**
(45) **Date of Patent: Nov. 6, 2007**

(54) **SYSTEM AND APPARATUS FOR A WIDEBAND OMNI-DIRECTIONAL ANTENNA**

(75) Inventor: **Rodney B. Waterhouse**, Columbia, MD (US)

(73) Assignee: **Pharad, LLC**, Baltimore, MD (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.: **11/212,722**

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

(65) **Prior Publication Data**

US 2007/0046556 A1 Mar. 1, 2007

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

(52) **U.S. Cl.** **343/770**; 343/767; 343/771

(58) **Field of Classification Search** 343/767, 343/770, 771
See application file for complete search history.

(56) **References Cited**

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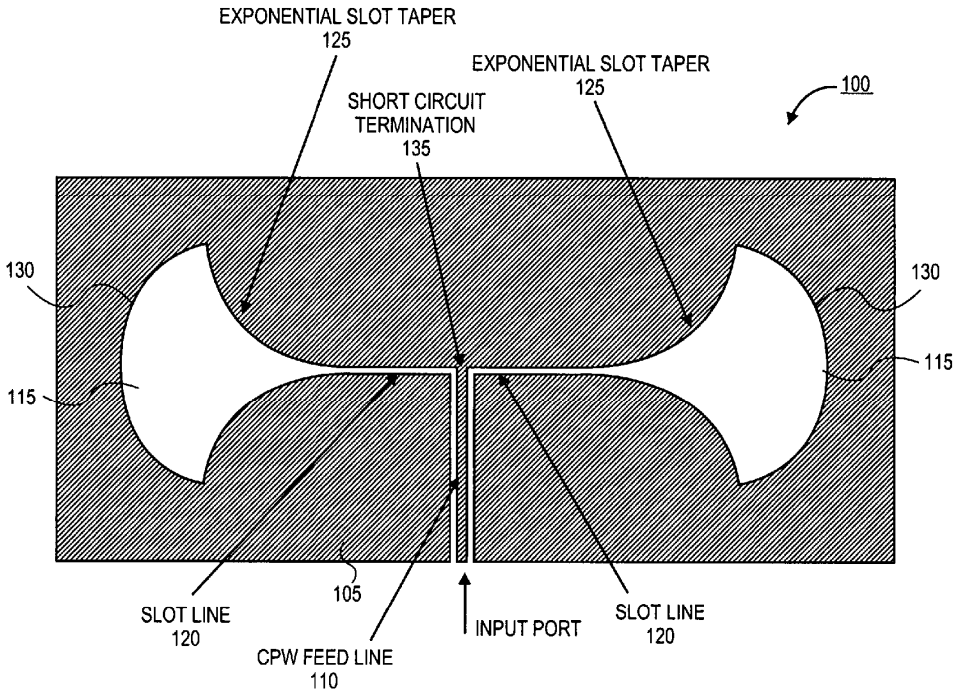
Primary Examiner—Tan Ho
(74) *Attorney, Agent, or Firm*—MH2 Technology Law Group, LLP

(57) **ABSTRACT**

Embodiments generally relate to an antenna. The antenna includes at least two slot radiators, where each slot radiator has an input port and a profile that has been defined to optimize the return loss bandwidth of the antenna. The antenna also includes a transmission line and a circuit configured to connect the transmission line and the at least two slot radiators at the respective input ports. The circuit is also configured to match the impedance of the at least two slot radiators and the co-planar waveguide.

20 Claims, 7 Drawing Sheets



US007292200B2

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

(10) **Patent No.: US 7,292,200 B2**
(45) **Date of Patent: Nov. 6, 2007**

(54) **PARASITICALLY COUPLED FOLDED DIPOLE MULTI-BAND ANTENNA**

(75) Inventors: **Jerry C. Posluszny**, LaGrange Park, IL (US); **Randy C. Posluszny**, Lyons, IL (US)

(73) Assignee: **Mobile Mark, Inc.**, Schiller Park, 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.: **11/218,755**

(22) Filed: **Sep. 2, 2005**

(65) **Prior Publication Data**

US 2006/0061515 A1 Mar. 23, 2006

Related U.S. Application Data

(60) Provisional application No. 60/612,321, filed on Sep. 23, 2004.

(51) **Int. Cl.**
H01Q 9/26 (2006.01)

(52) **U.S. Cl.** ..... **343/803**; 343/745; 343/700 MS

(58) **Field of Classification Search** ..... 343/795, 343/793, 702, 700 MS, 803
See application file for complete search history.

(56) **References Cited**

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2006/0220869 A1 * 10/2006 Kodukula et al. 340/572.7

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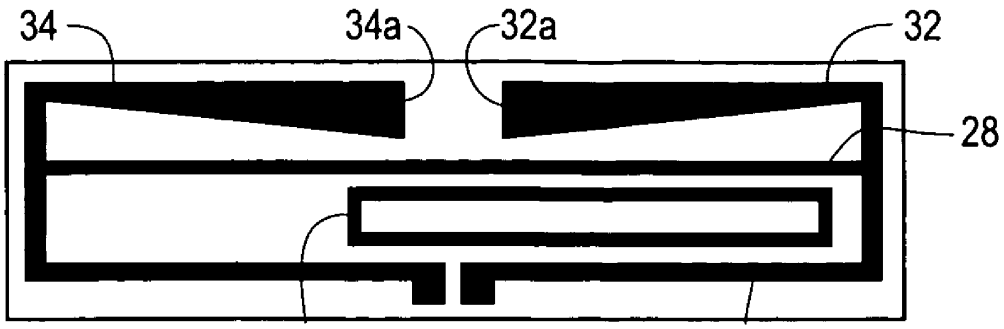
Primary Examiner—Hoanganh Le
(74) *Attorney, Agent, or Firm*—George H. Gerstman; Seyfarth Shaw LLP

(57) **ABSTRACT**

An antenna is provided which includes a primary folded dipole element and a feed for the primary folded dipole element. The primary folded dipole element is operable to resonate at a first frequency range. A parasitic dipole element is located within the primary folded dipole element and is spaced therefrom. The parasitic dipole element is operable to resonate at a frequency range that is higher than the first frequency range. Additional parasitic dipole elements may be located within the primary folded dipole element and spaced therefrom to resonate at different frequency ranges.

5 Claims, 1 Drawing Sheet



US007292203B2

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

(10) **Patent No.: US 7,292,203 B2**
(45) **Date of Patent: Nov. 6, 2007**

(54) **HELIX ANTENNA**

(75) Inventors: **John Stanley Craggs**, Kenthurst (AU); **Christopher Boyce Meulman**, North Turramurra (AU)

(73) Assignee: **Thiss Technologies Pte Ltd.**, Singapore (SG)

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

(21) Appl. No.: **10/517,499**

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

(86) PCT No.: **PCT/AU03/00690**

§ 371 (c)(1),
(2), (4) Date: **Jul. 26, 2005**

(87) PCT Pub. No.: **WO03/107483**

PCT Pub. Date: **Dec. 24, 2003**

(65) **Prior Publication Data**

US 2006/0001591 A1 Jan. 5, 2006

(30) **Foreign Application Priority Data**

Jun. 12, 2002 (AU) PS2908
Apr. 30, 2003 (AU) 2003902112

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

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

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

(56) **References Cited**

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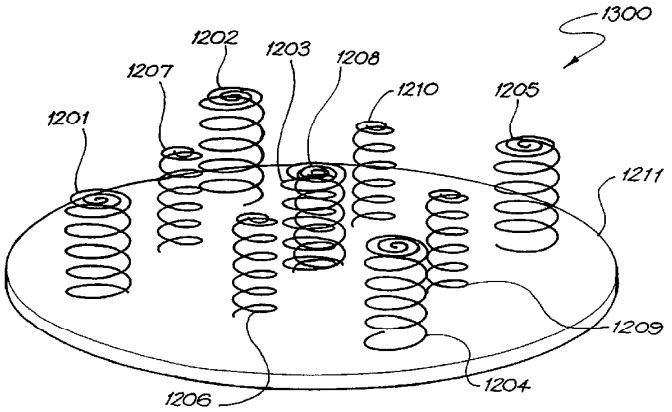
(Continued)

Primary Examiner—Michael C. Wimer
(74) *Attorney, Agent, or Firm*—Ladas & Parry LLP

(57) **ABSTRACT**

An antenna element is disclosed, having a ground plane (**106**), a helix (**104**) disposed above the ground plane (**106**), the helix (**104**) being connectable to a communications apparatus at a helix end (**214**) located near the ground plane (**106**), and a spiral (**102**) substantially centred on the axis (**100**) of the helix (**104**) the spiral (**102**) having an outer end thereof connected to the other helix end, said spiral (**102**) thereby terminating the antenna.

16 Claims, 14 Drawing Sheets



US007292204B1

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

(10) **Patent No.: US 7,292,204 B1**
(45) **Date of Patent: Nov. 6, 2007**

(54) **DIELECTRIC RESONATOR ANTENNA WITH A CAVED WELL**

(75) Inventors: **Tze-Hsuan Chang**, Taipei (TW); **Jean-Fu Kiang**, Taipei (TW)

(73) Assignee: **National Taiwan University**, Taipei (TW)

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

(21) Appl. No.: **11/551,711**

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

(51) **Int. Cl.**
H01Q 15/02 (2006.01)

(52) **U.S. Cl.** ..... **343/909**; 343/911 R; 343/846

(58) **Field of Classification Search** ..... 343/909 R
See application file for complete search history.

(56) **References Cited**

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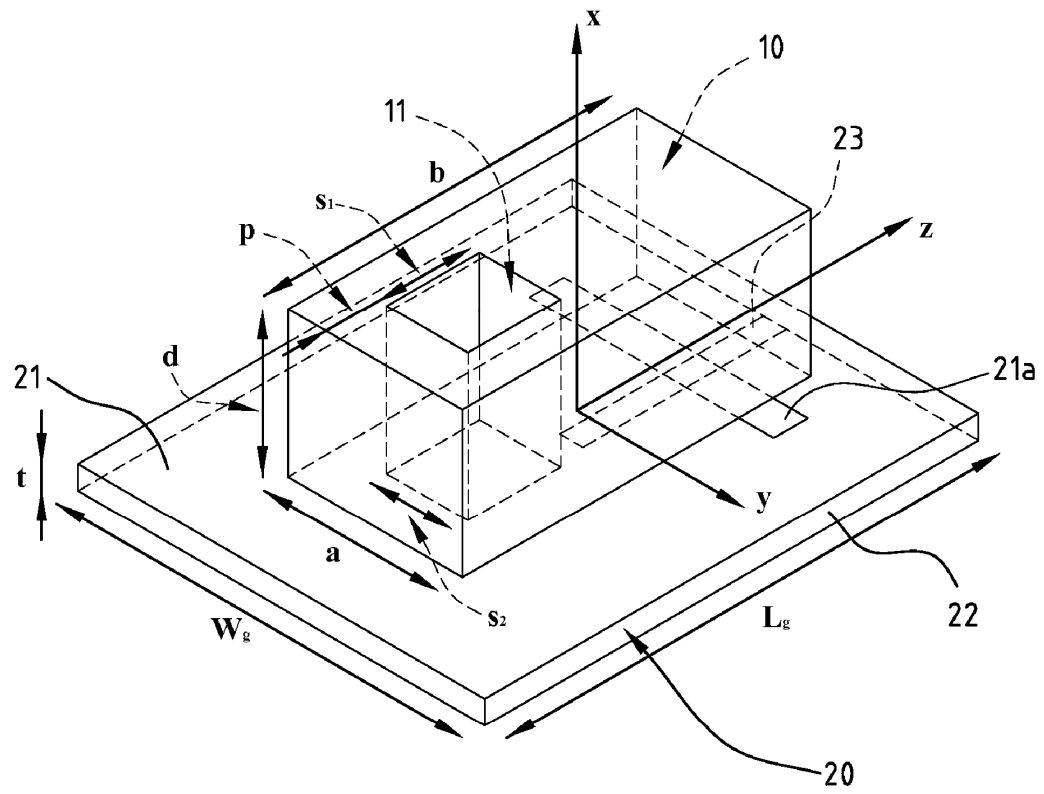
Primary Examiner—Trinh Vo Dinh

(57) **ABSTRACT**

A dielectric resonator antenna is a dielectric resonator mounted on a feed-in/feed-out component. The dielectric resonator is a rectangular parallelepiped made of a dielectric, and has a caved well passing through from the top surface to the bottom surface thereof. The feed-in/feed-out component includes a dielectric substrate, a ground metal layer and a strip metal layer coated on the top surface and the bottom surface, respectively, of the dielectric substrate. An etched part is provided on the ground metal layer. Wherein, the dielectric resonator with the caved well is mounted on the ground metal layer of the feed-in/feed-out component.

4 Claims, 6 Drawing Sheets



US00D554644S

(12) United States Design Patent

Ogasawara

(10) Patent No.: US D554,644 S
(45) Date of Patent: ** Nov. 6, 2007

(54) **COMPUTER ANTENNA**

(75) Inventor: **Shinichi Ogasawara**, Tokyo (JP)

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

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

(21) Appl. No.: **29/242,136**

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

(30) **Foreign Application Priority Data**

Jun. 24, 2005 (JP) D2005-018490

(51) **LOC (8) Cl.** **14-02**
(52) **U.S. Cl.** **D14/439**
(58) **Field of Classification Search** ..... 343/702, 343/900, 713, 878, 905, 906, 715, 749, 752, 343/895, 714, 806, 802, 823, 805, 872, 705, 343/708; D14/230–238, 242, 315–327, 432, D14/439; D18/1, 2, 7; 235/145 A, 145 R; 341/22, 23; 345/104, 156–7; 361/680–86
See application file for complete search history.

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Primary Examiner—M. H. Tung
Assistant Examiner—Susan Moon Lee
(74) *Attorney, Agent, or Firm*—Rader, Fishman & Grauer PLLC

(57) **CLAIM**

I claim the ornamental design for a computer antenna, as shown and described.

DESCRIPTION

FIG. **1** is a perspective view of a computer antenna showing my 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;

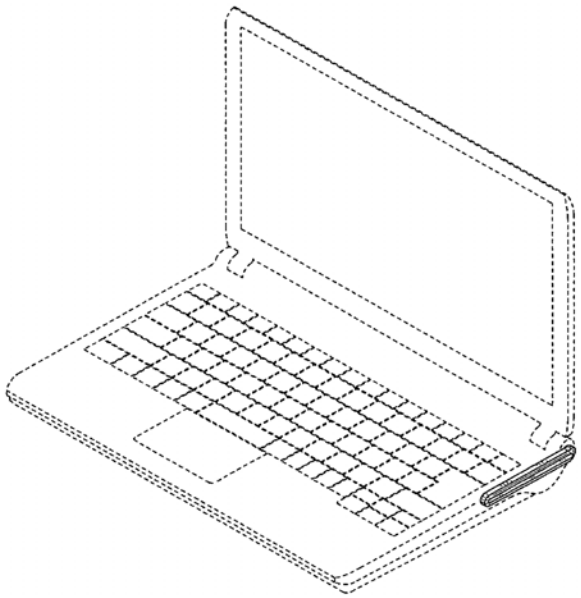
FIG. **5** is a right side elevational view thereof;

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

FIG. **7** is a bottom plan view thereof.

Portions of FIGS. **1**–**7** that are shown as broken lines are for illustrative purpose only and form no part of the claimed design.

1 Claim, 7 Drawing Sheets



US007295160B2

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

(10) **Patent No.: US 7,295,160 B2**
(45) **Date of Patent: Nov. 13, 2007**

(54) **MULTIBAND MICROWAVE ANTENNA**

(75) Inventors: **Thomas Purr**, München (DE); **Nora Brambilla**, Milan (IT); **Dragos-Nicolae Peligrad**, Aachen (DE)

(73) Assignee: **Koninklijke Philips Electronics N.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 0 days.

(21) Appl. No.: **10/506,379**

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

(86) PCT No.: **PCT/IB03/00746**

§ 371 (c)(1),
(2), (4) Date: **Sep. 2, 2004**

(87) PCT Pub. No.: **WO03/077365**

PCT Pub. Date: **Sep. 18, 2003**

(65) **Prior Publication Data**

US 2005/0093749 A1 May 5, 2005

(30) **Foreign Application Priority Data**

Mar. 8, 2002 (DE) 102 10 341

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

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

(58) **Field of Classification Search** ..... 343/700 MS, 343/702, 845, 846, 847, 848
See application file for complete search history.

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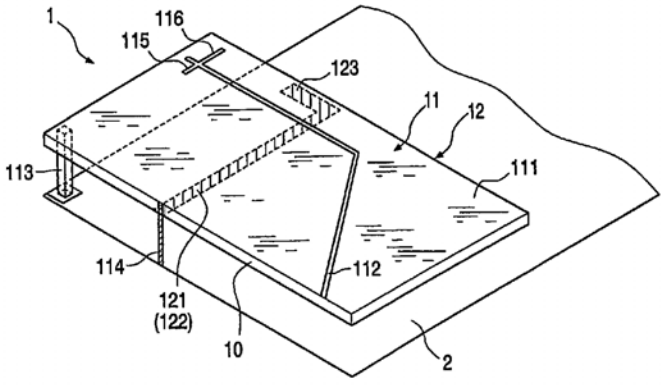
Primary Examiner—Hoanganh Le
Assistant Examiner—Huedung Mancuso
(74) *Attorney, Agent, or Firm*—Paul Im

(57) **ABSTRACT**

A multiband microwave antenna (**1**) is described, which antenna is intended particularly for surface mounting (SMD) on a printed circuit board (PCB) and has a substrate (**10**) having at least a first and a second metallization structure (**11**, **12**), wherein the first metallization structure (**11**) has at least a metal area (**111**) forming a resonator area and the second metallization structure (**12**) has at least a resonant printed conductor structure (**121**), thus enabling the antenna to combine the advantageous properties of a PIFA (planar inverted F-antenna) with those of a PWA (printed wire antenna).

8 Claims, 3 Drawing Sheets



US007295161B2

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

(10) **Patent No.: US 7,295,161 B2**
(45) **Date of Patent: Nov. 13, 2007**

(54) **APPARATUS AND METHODS FOR CONSTRUCTING ANTENNAS USING WIRE BONDS AS RADIATING ELEMENTS**

(75) Inventors: **Brian Paul Gaucher**, Brookfield, CT (US); **Duixian Liu**, Yorktown Heights, NY (US); **Ullrich Richard Rudolf Pfeiffer**, Carmel, NY (US); **Thomas Martin Zwick**, West Harrison, NY (US)

(73) Assignee: **International Business Machines Corporation**, Armonk, NY (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.: **10/912,959**

(22) Filed: **Aug. 6, 2004**

(65) **Prior Publication Data**

US 2006/0028378 A1 Feb. 9, 2006

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

(52) **U.S. Cl.** ..... **343/700 MS**; 343/872; 343/895; 340/572.7; 235/492

(58) **Field of Classification Search** ..... 343/700 MS, 343/872, 895, 866, 867; 340/572.7; 235/487, 235/492

See application file for complete search history.

(56) **References Cited**

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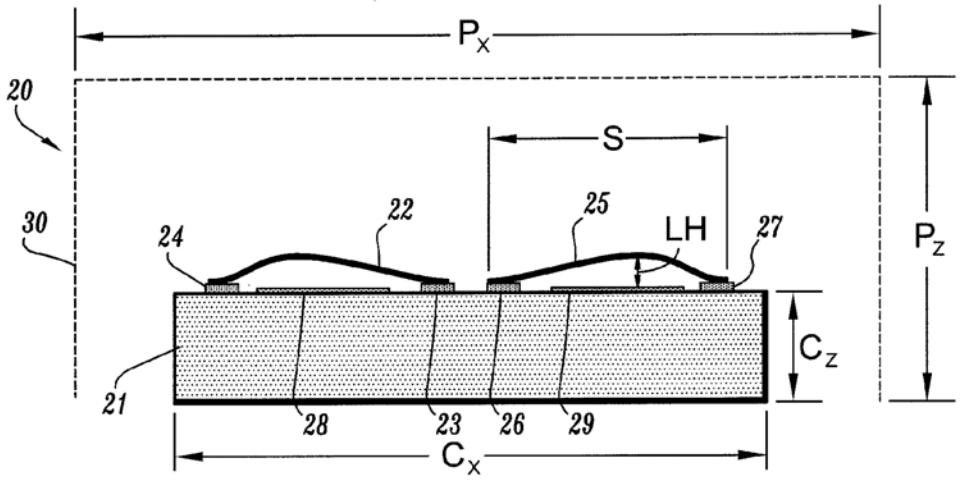
Primary Examiner—Tho Phan
(74) *Attorney, Agent, or Firm*—F. Chau & Associates, LLC; Frank V. DeRosa

(57) **ABSTRACT**

Antennas are provided which are constructed using one or more wires as radiating elements attached to a substrate or chip, wherein wire bonding methods can be used to attach and form loop profiles for the wires. The antennas can be integrally packaged with IC chips (e.g., IC transceivers, receivers, transmitters, etc.) to build integrated wireless or RF (radio frequency) communications systems.

28 Claims, 9 Drawing Sheets



US007295162B2

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

(10) **Patent No.: US 7,295,162 B2**
(45) **Date of Patent: Nov. 13, 2007**

(54) **DUAL-FREQUENCY DIRECTIONAL ANTENNA AND HIGH/LOW FREQUENCY RATIO ADJUSTING METHOD THEREOF**

(75) Inventors: **Wei-Jen Wang**, Miao-Li County (TW); **Jo-Wang Fu**, Miao-Li County (TW)

(73) Assignee: **Coretronic Corporation**, Miao-Li County (TW)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 7 days.

(21) Appl. No.: **11/436,224**

(22) Filed: **May 17, 2006**

(65) **Prior Publication Data**

US 2007/0013585 A1 Jan. 18, 2007

(30) **Foreign Application Priority Data**

Jul. 13, 2005 (TW) ..... 94123683 A

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

(52) **U.S. Cl.** ..... **343/700 MS**; 343/795; 343/893

(58) **Field of Classification Search** ..... 343/700 MS, 343/795, 893
See application file for complete search history.

(56) **References Cited**

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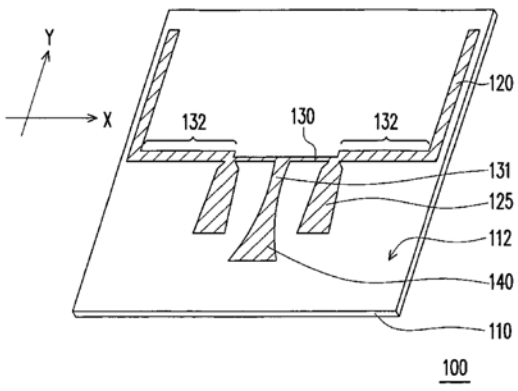
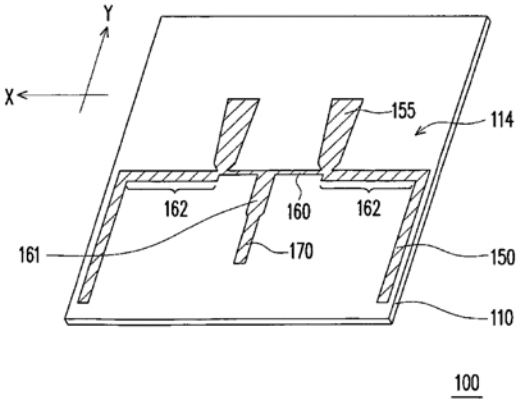
Primary Examiner—Douglas W. Owens
Assistant Examiner—Dieu Hien T Duong
(74) *Attorney, Agent, or Firm*—J.C. Patents

(57) **ABSTRACT**

A dual-frequency directional antenna includes a dielectric substrate, high frequency antenna elements, low frequency antenna elements, symmetrical micro-strip lines and baluns respectively disposed on a front surface and a rear surface of the dielectric substrate. Two ends of a symmetrical micro-strip line are respectively connected to two low frequency antenna elements. The high frequency antenna elements are disposed between two low frequency antenna elements and connected to a symmetric micro-strip line. Each balun is disposed between two high frequency antenna elements, one end of the balun is connected to a middle segment of a symmetrical micro-strip line and the other end is connected to an antenna feeding port. The dual-frequency directional antenna according to the present invention with thin and compact size has dual operating frequency bands property and is applicable for indoor environment.

20 Claims, 2 Drawing Sheets





US007295163B2

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

(10) **Patent No.: US 7,295,163 B2**
(45) **Date of Patent: *Nov. 13, 2007**

(54) **WIDE BAND ANTENNA**

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

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

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

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **11/475,218**

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

(65) **Prior Publication Data**

US 2007/0008225 A1 Jan. 11, 2007

Related U.S. Application Data

(63) Continuation of application No. 11/125,268, filed on May 10, 2005, now Pat. No. 7,123,195, which is a continuation of application No. 10/395,078, filed on Mar. 25, 2003, now Pat. No. 6,914,561.

(30) **Foreign Application Priority Data**

Apr. 9, 2002 (JP) 2002-106417

(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** ..... 343/787, 343/846, 895, 770, 795, 700 MS
See application file for complete search history.

(56) **References Cited**

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U.S. Appl. No. 11/475,218, filed Jun. 27, 2006, Kuroda, et al.

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Primary Examiner—Shih-Chao Chen
Assistant Examiner—Minh Dieu A
(74) *Attorney, Agent, or Firm*—Oblon, Spivak, McClelland, Maier & Neustadt, P.C.

(57) **ABSTRACT**

Disclosed is a wideband antenna having a reference conductor and radiation conductor, which are disposed so as to face one another. A substance whose relative permeability is in a range of about 1 though 8 in an operational radio frequency is interposed between the portions of the reference conductor and radiation conductor that face one another. A feed is operatively coupled to the radiation conductor and provides a radio frequency transmission signal thereto. The feed has a tapered shape, which progressively widens as the feed approaches the radiation conductor.

13 Claims, 18 Drawing Sheets

	CHARACTERISTIC OF MAGNETIC SUBSTANCE				DIMENSION OF ANTENNA		MATCHING CAPACITANCE [pF]
	εr	μr	σ [/Ωm]	tan σ [at 4GHz]	le [mm]	gf [mm]	
FIG.12: MAGNETIC SUBSTANCE	1.0	4.0	0.1	8.0e-7	15.0	5.0	Cs:0.4
FIG.13: MAGNETIC SUBSTANCE	1.0	4.0	1.0	8.0e-6	15.0	7.5	Cs:0.5
FIG.14: MAGNETIC SUBSTANCE	1.0	4.0	10.0	8.0e-5	15.0	7.5	Cs:1.5+Cp:0.5

US007295167B2

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

(10) **Patent No.: US 7,295,167 B2**
(45) **Date of Patent: *Nov. 13, 2007**

(54) **ANTENNA MODULE**

(75) Inventors: **Mehran Aminzadeh**, Braunschweig (DE); **Meinolf Schafmeister**, Hildesheim (DE); **Florian Scherbel**, Hildesheim (DE); **Keno Mennenga**, Braunschweig (DE)

(73) Assignee: **Receptec GmbH**, Hildesheim (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.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **11/753,539**

(22) Filed: **May 24, 2007**

(65) **Prior Publication Data**

US 2007/0210967 A1 Sep. 13, 2007

Related U.S. Application Data

(63) Continuation of application No. 11/494,533, filed on Jul. 28, 2006, which is a continuation of application No. 11/185,015, filed on Jul. 20, 2005, now abandoned.

(30) **Foreign Application Priority Data**

Jul. 20, 2004 (DE) 10 2004 035 064

(51) **Int. Cl.**
H01Q 1/32 (2006.01)
H01Q 1/38 (2006.01)

(52) **U.S. Cl.** ..... **343/713**; 343/700 MS; 343/846

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

See application file for complete search history.

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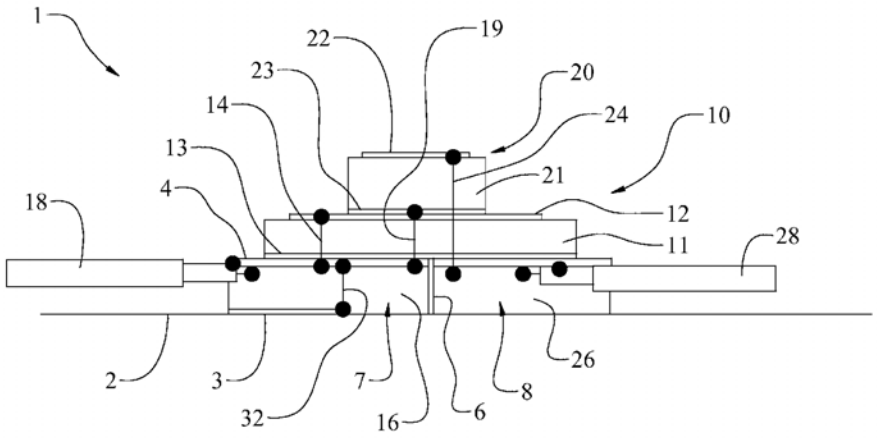
Primary Examiner—Tan Ho
(74) *Attorney, Agent, or Firm*—Harness, Dickey & Pierce, P.L.C.

(57) **ABSTRACT**

Exemplary embodiments are provided of antenna modules for frequencies in the GHz range and that may be mountable on a motor vehicle. In various exemplary embodiments, an antenna module generally includes upper and low patch-antennas on respective upper and lower substrates. Each patch-antenna includes λ/2-antenna structure provided on the upper surface of the respective upper or lower substrate for reception of satellite-transmitted frequencies in the GHz range. A metallization is also provided on or in contact with the lower surfaces of the upper and lower substrates. A lower antenna connector runs from the lower λ/2-antenna structure through the lower substrate. An upper antenna connector, separate from the lower antenna connector, runs from the upper antenna structure through the upper substrate and the lower patch-antenna.

20 Claims, 4 Drawing Sheets



US007295168B2

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

(10) **Patent No.: US 7,295,168 B2**
(45) **Date of Patent: Nov. 13, 2007**

(54) **ANTENNA COIL**

(75) Inventors: **Seiichiro Saegusa**, Yonezawa (JP); **Hitoki Nakaya**, Sakura (JP); **Takayuki Ochi**, Yonezawa (JP); **Shigeyoshi Seino**, Yonezawa (JP)

(73) Assignee: **Yonezawa Electric Wire Co., Ltd.**, Yonezawa (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.: **11/129,017**

(22) Filed: **May 13, 2005**

(65) **Prior Publication Data**

US 2005/0270249 A1 Dec. 8, 2005

(30) **Foreign Application Priority Data**

May 20, 2004 (JP) P2004-150356
Dec. 17, 2004 (JP) P2004-366117

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

(52) **U.S. Cl.** **343/788**; 343/866; 343/787

(58) **Field of Classification Search** 343/878, 343/866, 867; 29/600
See application file for complete search history.

(56) **References Cited**

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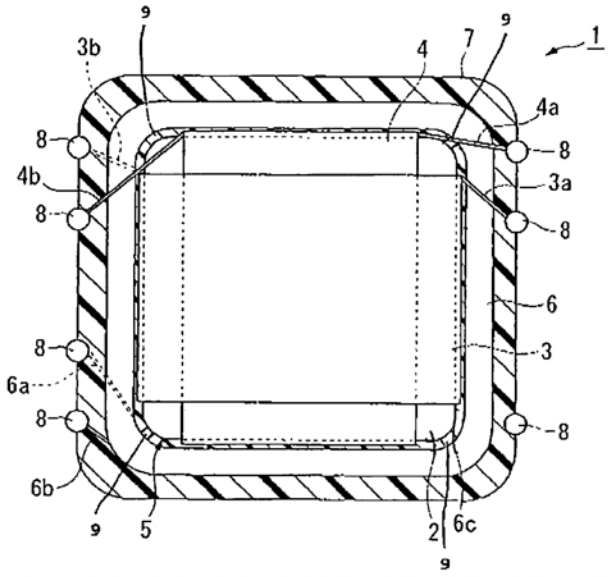
Primary Examiner—Trinh Vo Dinh
(74) *Attorney, Agent, or Firm*—Cohen Pontani Lieberman & Pavane LLP

(57) **ABSTRACT**

An antenna coil has a simple structure and a high sensitivity and can be thinner. The antenna coil includes an X Y coil unit having an X axis coil and a Y axis coil wound around a core, a Z axis coil wound around the X Y coil unit, and a resin portion insert molded around the X Y coil unit and the Z axis coil. In the antenna coil, the X axis coil, the Y axis coil, and the Z axis coil are arranged so that the three coils have an axis in a direction orthogonal to each other, and the X Y coil unit and the Z axis are integrated by the resin portion.

4 Claims, 6 Drawing Sheets



US007295169B2

(12) **United States Patent**
Motoyama

(10) **Patent No.: US 7,295,169 B2**
(45) **Date of Patent: Nov. 13, 2007**

(54) **ANTENNA PROBE HAVING ANTENNA PORTION, LOW NOISE CONVERTER WITH ANTENNA PROBE AND METHOD OF CONNECTING ANTENNA PROBE HAVING ANTENNA PORTION**

(75) Inventor: **Kohji Motoyama**, Osaka (JP)

(73) Assignee: **Sharp Kabushiki Kaisha**, Osaka (JP)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 21 days.

(21) Appl. No.: **11/335,530**

(22) Filed: **Jan. 20, 2006**

(65) **Prior Publication Data**

US 2006/0192722 A1 Aug. 31, 2006

(30) **Foreign Application Priority Data**

Feb. 25, 2005 (JP) 2005-051637

(51) **Int. Cl.**
H01Q 9/04 (2006.01)

(52) **U.S. Cl.** **343/790**; 343/772

(58) **Field of Classification Search** 343/786, 343/772, 840, 790

See application file for complete search history.

(56) **References Cited**

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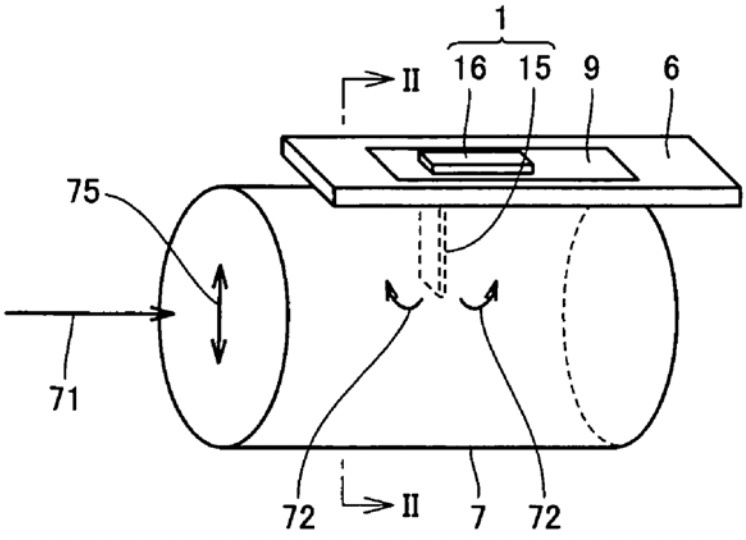
Primary Examiner—Tan Ho
(74) *Attorney, Agent, or Firm*—Nixon & Vanderhye P.C.

(57) **ABSTRACT**

An antenna probe includes an antenna portion having at least a part arranged inside a waveguide, and a connecting portion for connection with a micro-strip line, the connecting portion has a connecting surface to be connected to the micro-strip line, and the connecting surface is formed flat. The antenna portion is formed of a conductor, integral with the connecting portion with a first bent portion therebetween. The antenna probe is formed by bending a plate-shaped conductor.

19 Claims, 8 Drawing Sheets



US007295172B2

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

(10) **Patent No.: US 7,295,172 B2**
(45) **Date of Patent: Nov. 13, 2007**

(54) **ANTENNA UNIT**

(75) Inventors: **Junichi Noro**, Akita (JP); **Takao Kato**, Akita (JP)

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

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 8 days.

(21) Appl. No.: **11/318,409**

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

(65) **Prior Publication Data**

US 2006/0202903 A1 Sep. 14, 2006

(30) **Foreign Application Priority Data**

Mar. 10, 2005 (JP) 2005-067283

(51) **Int. Cl.**
H01Q 1/36 (2006.01)
H01Q 1/42 (2006.01)

(52) **U.S. Cl.** **343/895**; 343/872

(58) **Field of Classification Search** ..... 343/700 MS, 343/702, 972, 895, 872
See application file for complete search history.

(56) **References Cited**

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Related U.S. Appl. No. 11/318,411, filed Dec. 22, 2005; Inventor: J. Noro et al.
Related U.S. Appl. No. 11/318,407, filed Dec. 22, 2005; Inventor: J. Noro et al.

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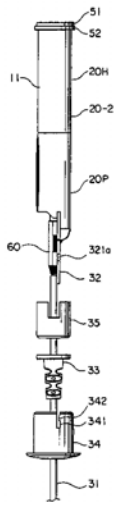
Primary Examiner—Shih-Chao Chen
(74) *Attorney, Agent, or Firm*—Frishauf, Holtz, Goodman & Chick, P.C.

(57) **ABSTRACT**

An antenna unit comprises a hollow cylindrical member obtained by forming a flexible insulating film member into a hollow cylinder. An antenna pattern composed of at least one conductor is formed at the hollow cylindrical member. The antenna unit further comprises a board mounted with a low-noise amplifier and a hollow cylindrical cover case covering the hollow cylindrical member and the board. In order to reduce the size in longitudinal direction, a part of the board is inserted into the inside of the hollow cylindrical member.

3 Claims, 12 Drawing Sheets



US00D555154S

(12) **United States Design Patent** (10) **Patent No.: US D555,154 S**
Lin et al. (45) **Date of Patent: ** Nov. 13, 2007**

(54) **MULTI-BAND ANTENNA**

(75) Inventors: **Ching Chi Lin**, Tu-Cheng (TW); **Jia Hung Su**, 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.: **29/274,647**

(22) Filed: **May 11, 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 R–705, 343/871–908, 795, 840, 711–713, 819, 846; 455/90.2, 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
D534,902 S	*	1/2007	Su et al.	D14/230
D534,903 S	*	1/2007	Hung et al.	D14/230
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Primary Examiner—Stella M. Reid
Assistant Examiner—John Windmuller
(74) *Attorney, Agent, or Firm*—Rosenberg, Klein & Lee

(57) **CLAIM**

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

DESCRIPTION

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

FIG. **2** is a front elevational view thereof;

FIG. **3** is a rear elevational view thereof;

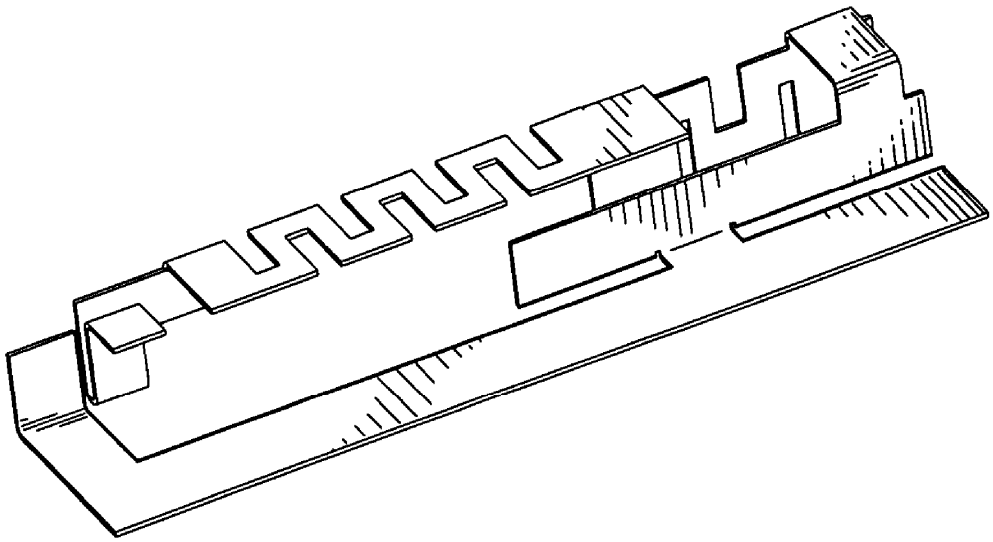
FIG. **4** is a left side elevational view thereof;

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



US00D555155S

(12) United States Design Patent

Su et al.

(10) Patent No.: US D555,155 S
(45) Date of Patent: ** Nov. 13, 2007

(54) **MULTI-BAND ANTENNA**

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

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

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

(21) Appl. No.: **29/274,689**

(22) Filed: **May 16, 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 R–705, 343/871–908, 795, 840, 711–713, 819, 846; 455/90.2, 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
D534,902 S * 1/2007 Su et al. D14/230
D534,903 S * 1/2007 Hung et al. D14/230
D535,290 S * 1/2007 Su et al. D14/230

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Primary Examiner—Stella M. Reid
Assistant Examiner—John Windmuller
(74) *Attorney, Agent, or Firm*—Rosenberg, Klein & Lee

(57) **CLAIM**

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

DESCRIPTION

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

FIG. **2** is a front elevational view thereof;

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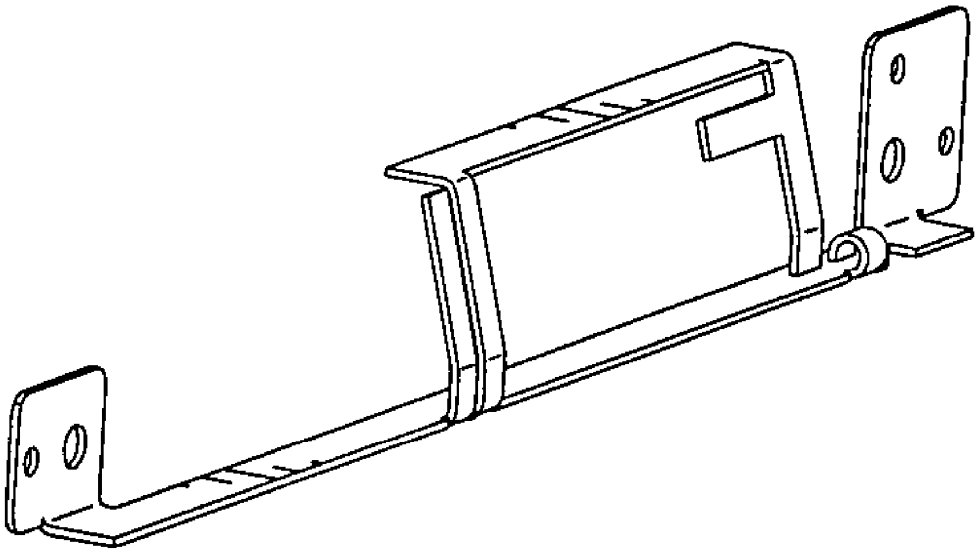
FIG. **4** is a left side elevational view thereof;

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



US007298331B2

(12) **United States Patent**
Oberly

(10) **Patent No.: US 7,298,331 B2**
(45) **Date of Patent: *Nov. 20, 2007**

(54) **METHOD FOR FORMING RADIO FREQUENCY ANTENNA**

(75) Inventor: **Robert R. Oberly**, Macungie, PA (US)

(73) Assignee: **RCD Technology, Inc.**, Quakertown, PA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 9 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **11/201,479**

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

(65) **Prior Publication Data**

US 2006/0028379 A1 Feb. 9, 2006

Related U.S. Application Data

(63) Continuation-in-part of application No. 10/925,229, filed on Aug. 24, 2004, now Pat. No. 7,268,740, which is a continuation-in-part of application No. 10/238,598, filed on Sep. 11, 2002, now Pat. No. 6,933,892, which is a continuation of application No. 09/524,505, filed on Mar. 13, 2000, now Pat. No. 6,476,775.

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

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

(58) **Field of Classification Search** ..... 343/700 MS, 343/741, 742, 895, 829, 846, 866, 867
See application file for complete search history.

(56) **References Cited**

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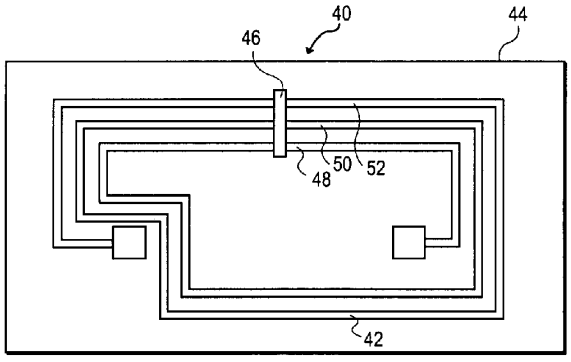
Primary Examiner—Tho Phan
(74) *Attorney, Agent, or Firm*—Fliesler Meyer LLP

(57) **ABSTRACT**

A metalized circuit suitable for application as a radio frequency antenna is produced by forming an antenna coil pattern on a flexible substrate. The antenna coil pattern is formed using a conductive ink which is patterned on the substrate. The conductive ink is cured and an electrical-short layer is formed across the coils of the conductive ink pattern. An insulating layer is formed over top of the electrical-short layer, a metal layer electroplated on top of the conductive layer, and then the electrical-short layer is removed. The use of the electrical-short layer during the electroplating allows for the voltage at the different points on the conductive ink layer to be relatively similar, so that a uniform electroplate layer is formed on top of the conductive ink layer. This results in a better quality radio frequency antenna at a reduced cost.

21 Claims, 7 Drawing Sheets



US007298233B2

(12) **United States Patent**
Zimmerman

(10) **Patent No.: US 7,298,233 B2**
(45) **Date of Patent: Nov. 20, 2007**

(54) **PANEL ANTENNA WITH VARIABLE PHASE SHIFTER**

(75) Inventor: **Martin Zimmerman**, Chicago, IL (US)

(73) Assignee: **Andrew Corporation**, Westchester, IL (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 351 days.

(21) Appl. No.: **10/711,919**

(22) Filed: **Oct. 13, 2004**

(65) **Prior Publication Data**

US 2006/0077098 A1 Apr. 13, 2006

(51) **Int. Cl.**
H01P 1/18 (2006.01)
H01Q 3/00 (2006.01)
H01Q 9/28 (2006.01)

(52) **U.S. Cl.** **333/161**; 342/372; 343/795

(58) **Field of Classification Search** 342/372; 333/161, 156, 118, 117, 159; 343/757, 853, 343/797, 795

See application file for complete search history.

(56) **References Cited**

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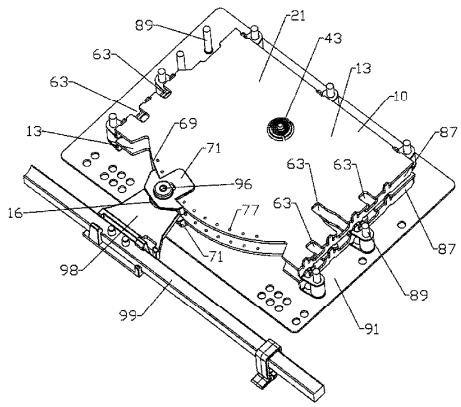
Primary Examiner—Thomas H. Tarcza
Assistant Examiner—Hien Ly
(74) *Attorney, Agent, or Firm*—Babcock IP, PLLC

(57) **ABSTRACT**

A panel antenna having a variable phase shifter module with at least one main-PCB having an input trace coupled to a wiper junction. An arcuate trace on the main-PCB extending between a first output trace and a second output trace, the arcuate trace having an arc center proximate the wiper junction. A wiper-PCB having a linking trace thereon; the wiper-PCB rotatably coupled to the main-PCB proximate the wiper junction with the linking trace facing the first main-PCB. Because the linking trace faces the main-PCB, the wiper-PCB may be formed from inexpensive and structurally resilient substrate material. The linking trace coupling the wiper junction with the arcuate trace. Multiple arcuate traces may be linked to further output traces to add additional outputs, each having variable phase shift between them, depending upon the position of the wiper-PCB. Multiple main-PCBs may be stacked upon each other and the wiper-PCBs of each controlled by a common linkage.

21 Claims, 11 Drawing Sheets



US007298334B2

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

(10) **Patent No.: US 7,298,334 B2**
(45) **Date of Patent: *Nov. 20, 2007**

(54) **MULTIFREQUENCY INVERTED-F ANTENNA**

(75) Inventors: **Chien-Hsing Fang**, Hsichih (TW); **Yuan-Li Chang**, Hsichih (TW); **Huey-Jen Lin**, Hsichih (TW)

(73) Assignee: **Wistron Neweb Corporation**, 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.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **11/482,253**

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

(65) **Prior Publication Data**

US 2006/0250309 A1 Nov. 9, 2006

Related U.S. Application Data

(63) Continuation of application No. 11/034,164, filed on Jan. 11, 2005, which is a continuation of application No. 10/394,370, filed on Mar. 20, 2003, now Pat. No. 6,861,986.

(30) **Foreign Application Priority Data**

Oct. 8, 2002 (TW) ..... 91123215 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, 343/702, 767, 829–830, 846
See application file for complete search history.

(56) **References Cited**

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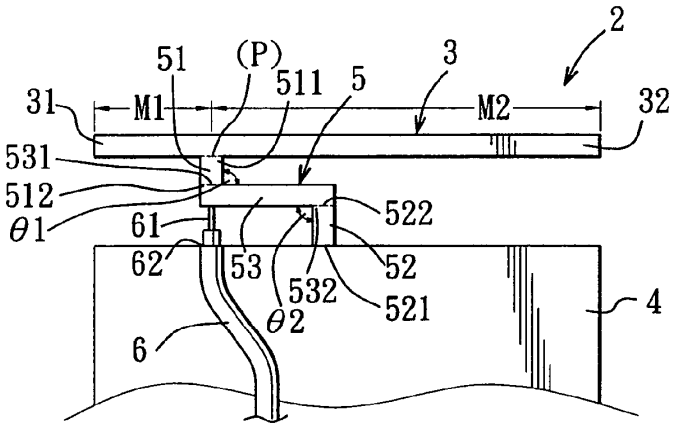
Primary Examiner—Huedung Mancuso
(74) *Attorney, Agent, or Firm*—Merchant & Gould P.C.

(57) **ABSTRACT**

A multifrequency inverted-F antenna includes a radiating element having opposite first and second ends, a grounding element spaced apart from the radiating element, and an interconnecting element extending between the radiating and grounding elements and including first, second, and third parts. The first part is connected to the radiating element at a feeding point between the first and second ends. The second part is offset from the first part in a longitudinal direction, and is connected to the grounding element. The third part interconnects the first and second parts. A feeding line is connected to the interconnecting element.

11 Claims, 4 Drawing Sheets



US007298336B2

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

(10) **Patent No.: US 7,298,336 B2**
(45) **Date of Patent: Nov. 20, 2007**

(54) **ANTENNA STRUCTURE FOR OPERATING MULTI-BAND SYSTEM**

(75) Inventors: **Yun-Ta Chen**, Taipei (TW); **Yen-Liang Kuo**, Taipei (TW)

(73) Assignee: **High Tech Computer Corp.**, Taoyuan (TW)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 113 days.

(21) Appl. No.: **11/186,989**

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

(65) **Prior Publication Data**

US 2006/0238424 A1 Oct. 26, 2006

(30) **Foreign Application Priority Data**

Apr. 25, 2005 (TW) ..... 94113161 A

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

(52) **U.S. Cl.** **343/702**; 343/873

(58) **Field of Classification Search** 343/702, 343/873

See application file for complete search history.

(56) **References Cited**

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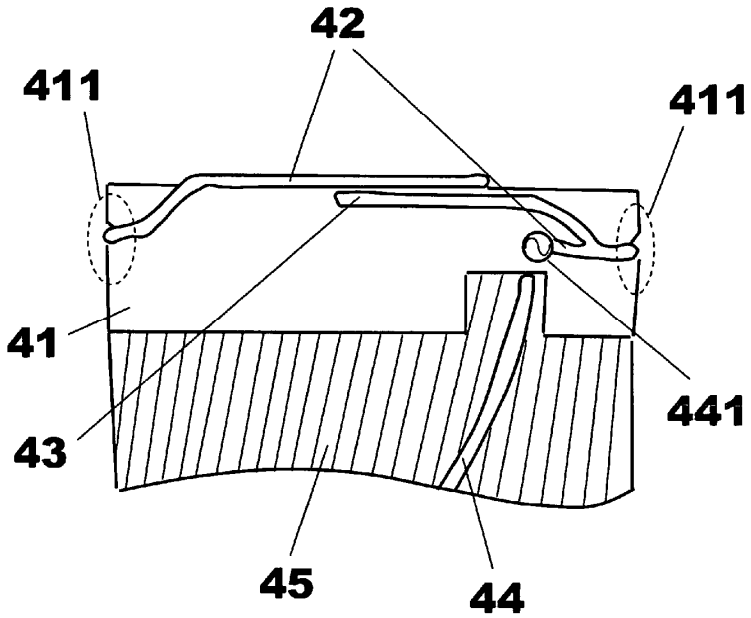
Primary Examiner—Tan Ho
(74) *Attorney, Agent, or Firm*—Rosenberg, Klein & Lee

(57) **ABSTRACT**

An antenna structure for operating multi-band system is disclosed. The antenna structure at least comprises a first radiation metal wire and a second radiation metal wire. These radiation metal wires send signal through the same feed point and provide a ground surface. The radiation metal wires are embedded into the circuit board having a hole. The design avoids the complexity of the antenna structure, reduces cost, and improves production capabilities. The length of the first radiation metal wire is bigger than the second radiation metal wire for using in a low frequency operating band and the second radiation metal wire is used in a high frequency operating band. These radiation metal wires can be fixed into the hole of the circuit board. The entwining of the radiation metal wires can bend according to a space provided by a case. Therefore, the antenna structure can be protected by the case without damages from outside forces.

20 Claims, 8 Drawing Sheets



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US007298337B2

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

(10) **Patent No.: US 7,298,337 B2**
(45) **Date of Patent: Nov. 20, 2007**

(54) **ANTENNA DEVICE FOR A MOBILE PHONE**

(75) Inventors: **Dong-Beom Seol**, Suwon-si (KR); **Jang-Hyun Nam**, Suwon-si (KR)

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

(*) 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.: **11/296,666**

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

(65) **Prior Publication Data**

US 2006/0132366 A1 Jun. 22, 2006

(30) **Foreign Application Priority Data**

Dec. 17, 2004 (KR) 10-2004-0107872

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

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

(58) **Field of Classification Search** ..... 343/702, 343/700 MS, 895, 906; 455/575.4
See application file for complete search history.

(56) **References Cited**

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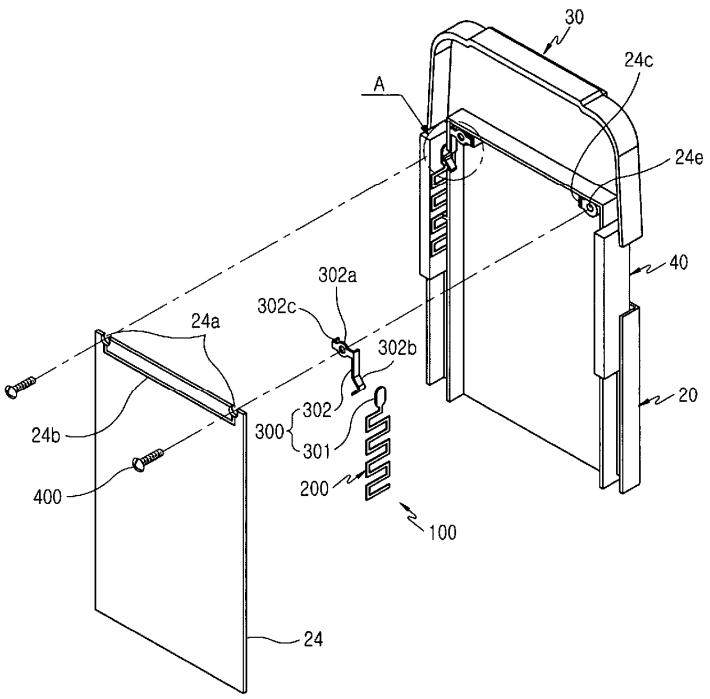
Primary Examiner—Hoang V. Nguyen
(74) *Attorney, Agent, or Firm*—The Farrell Law Firm

(57) **ABSTRACT**

Disclosed herein is an antenna device for a mobile phone having a body housing, a sliding housing for sliding up or down lengthwise along the body housing, a sliding module for connecting the sliding housing to the body housing in the manner that allows the sliding housing to slide up or down, and a main antenna device in the sliding housing. In the antenna device for the mobile phone, at least one sub-antenna device is installed lengthwise facing the sliding module and is electrically connected to or separated from the body housing, slidingly approaching or moving away from the body housing along with the sliding module, and at least one connection unit electrically connects the sub-antenna device to the body housing for signal transmission between the sub-antenna device and the body housing.

13 Claims, 9 Drawing Sheets



US007298338B2

(12) **United States Patent**
Vesterinen

(10) **Patent No.: US 7,298,338 B2**
(45) **Date of Patent: Nov. 20, 2007**

(54) **DOUBLE-LAYER ANTENNA STRUCTURE FOR HAND-HELD DEVICES**

(75) Inventor: **Jukka Vesterinen**, Jyväskylä (FI)

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

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

(21) Appl. No.: **11/377,770**

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

(65) **Prior Publication Data**

US 2006/0164310 A1 Jul. 27, 2006

Related U.S. Application Data

(62) Division of application No. 10/755,715, filed on Jan. 12, 2004, now Pat. No. 7,193,569.

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

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

(58) **Field of Classification Search** ..... 343/700 MS, 343/702, 703, 711, 829, 830
See application file for complete search history.

(56) **References Cited**

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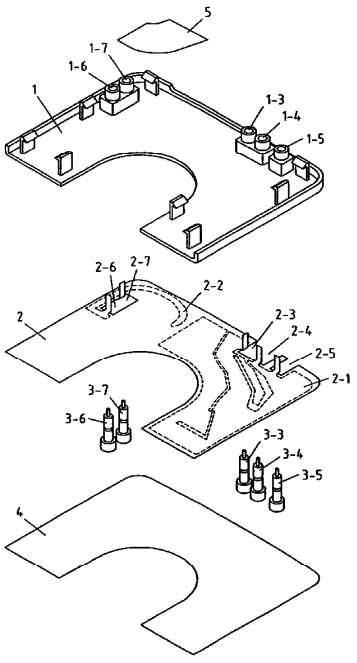
Primary Examiner—Huedung Mancuso

(57) **ABSTRACT**

The invention relates to a device, comprising an at least partially plane antenna carrier with a first side and a second side, at least one first Printed Wiring Board (PWB) being attached to said first side of said antenna carrier and having a first radiation structure formed on it, and at least one second PWB being attached to said second side of said antenna carrier. Said second PWB structure preferably represents a parasitic antenna element that improves the radiation pattern of an antenna that at least partially is represented by said first radiation structure. The invention further relates to a GPS-capable mobile phone, a method, a computer program and a radio system.

5 Claims, 4 Drawing Sheets



US007298339B1

(12) **United States Patent**
Ollikainen

(10) **Patent No.: US 7,298,339 B1**
(45) **Date of Patent: Nov. 20, 2007**

(54) **MULTIBAND MULTIMODE COMPACT ANTENNA SYSTEM**

(75) Inventor: **Jani Ollikainen**, Helsinki (FI)

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

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

(21) Appl. No.: **11/476,470**

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

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

(52) **U.S. Cl.** ..... **343/702**; 343/700 MS; 343/741

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

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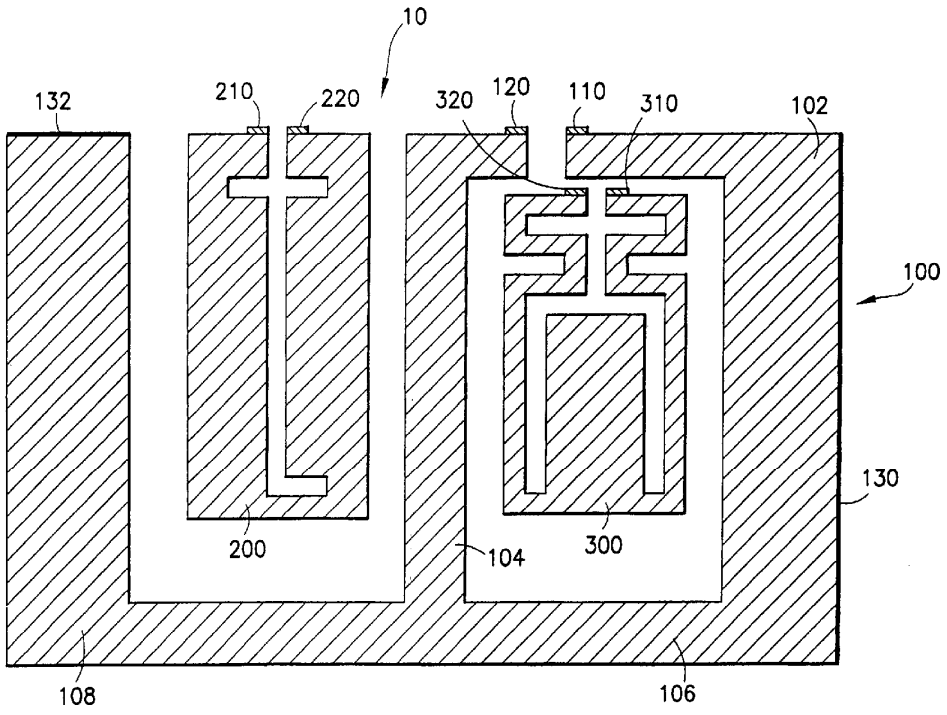
Primary Examiner—Tho Phan
(74) *Attorney, Agent, or Firm*—Ware, Fressola, Van Der Sluys & Adolphson, LLP

(57) **ABSTRACT**

An antenna system for use in a communications device, such as a mobile phone. The antenna system has a multiband GSM antenna operating at GSM850, GSM900, GSM 1800 and GSM 1900 that has a short-circuited section located between a separate UMTS antenna and a UMTS receive diversity antenna. As such, large electrical isolation between the two UMTS antennas can be achieved. The UMTS antennas can be short-circuited microstrip loop antennas, IFA, PIFA, ILA or PILA antennas. These antennas are well-isolated antennas instead of coupled antennas. As such, the diversity antenna is well isolated from the main antenna despite its close proximity to the main antenna. Well-isolated antennas have little mutual coupling and, therefore, are easier to design than coupled antennas, because isolated antennas can be tuned independently from each other.

29 Claims, 6 Drawing Sheets



US007298340B2

(12) **United States Patent**
Ohba

(10) **Patent No.: US 7,298,340 B2**
(45) **Date of Patent: Nov. 20, 2007**

(54) **ANTENNA DEVICE AND RADIO APPARATUS CAPABLE OF MULTIBAND OPERATION**

(75) Inventor: **Isao Ohba**, Tokyo (JP)

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

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

(21) Appl. No.: **11/499,558**

(22) Filed: **Aug. 4, 2006**

(65) **Prior Publication Data**

US 2007/0035458 A1 Feb. 15, 2007

(30) **Foreign Application Priority Data**

Aug. 9, 2005 (JP) 2005-230298

(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, 876
See application file for complete search history.

(56) **References Cited**

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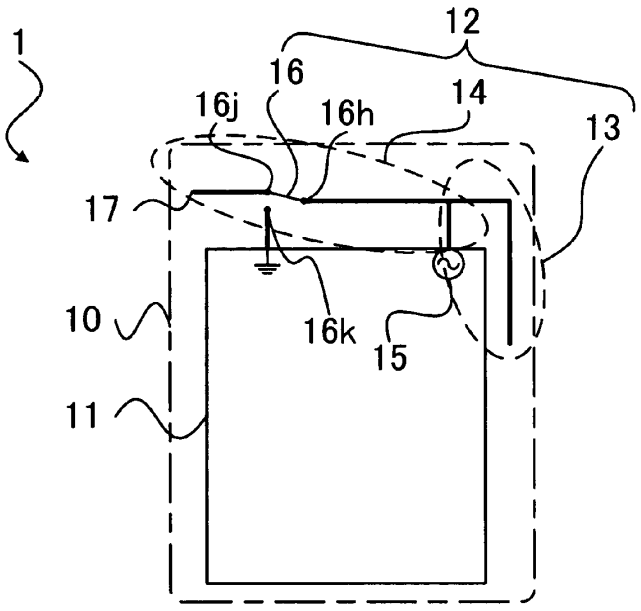
Primary Examiner—Hoang V. Nguyen
(74) *Attorney, Agent, or Firm*—Frishauf, Holtz, Goodman & Chick, P.C.

(57) **ABSTRACT**

An antenna device and a radio apparatus are provided. The antenna device is configured to be coupled to a feeding point of the radio apparatus. The antenna device has a first antenna element and a second antenna element. The first antenna element is configured to be an unbalanced-fed antenna fed at the feeding point to resonate at a first frequency. The second antenna element is configured to be a monopole antenna having an open end and to be fed at the feeding point. The first antenna element and the second antenna element have a common portion from the feeding point to a branching point. The second antenna element is configured to be ungrounded in a first state to resonate at a second frequency lower than the first frequency and to be grounded in a second state at a switch point between the branching point and the open end.

12 Claims, 12 Drawing Sheets



US007298346B2

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

(10) **Patent No.: US 7,298,346 B2**
(45) **Date of Patent: Nov. 20, 2007**

(54) **BROADBAND MONOPOLE ANTENNA**

(75) Inventors: **Wolfgang Heyde**, Herisau (CH); **Carsten Dieckmann**, St. Gallen (CH); **Cenk Koparan**, Urnäsch (CH); **Eugen Spirig**, Diepoldsau (CH)

(73) Assignee: **Huber + Suhner AG**, Herisau (CH)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 38 days.

(21) Appl. No.: **11/200,513**

(22) Filed: **Aug. 9, 2005**

(65) **Prior Publication Data**

US 2006/0055616 A1 Mar. 16, 2006

Related U.S. Application Data

(63) Continuation of application No. PCT/CH2003/000844, filed on Dec. 23, 2003.

(30) **Foreign Application Priority Data**

Feb. 14, 2003 (CH) 0228/03

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

(52) **U.S. Cl.** **343/828**; 343/825; 343/830

(58) **Field of Classification Search** 343/830, 343/829, 702, 846, 825, 828
See application file for complete search history.

(56) **References Cited**

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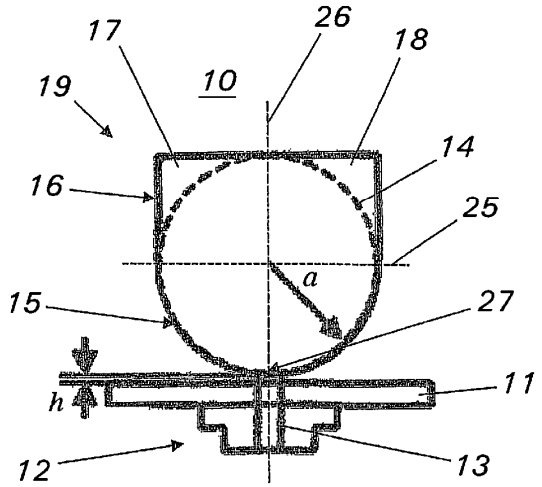
Primary Examiner—Tho Phan
(74) *Attorney, Agent, or Firm*—Burr & Brown

(57) **ABSTRACT**

A wideband monopole antenna including an emitter which is embodied in the form of a disc and vertically arranged at a predetermined spacing above an electrically conductive base plane. The disc-shaped emitter includes a modified section initially having a circular or elliptical disc form, with the modified section being limited by a border outline deviating from the circular or elliptical form.

11 Claims, 7 Drawing Sheets



US007301131B2

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

(10) **Patent No.: US 7,301,131 B2**
(45) **Date of Patent: Nov. 27, 2007**

(54) **MICROWAVE ABLATION INSTRUMENT WITH FLEXIBLE ANTENNA ASSEMBLY AND METHOD**

(75) Inventors: **Jules Gauthier**, Laval (CA); **Dany Berube**, Fremont, CA (US); **Hiep Nguyen**, Milpitas, CA (US)

(73) Assignee: **AFx, Inc.**, Santa Clara, CA (US)

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

(21) Appl. No.: **11/356,917**

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

(65) **Prior Publication Data**

US 2006/0138122 A1 Jun. 29, 2006

Related U.S. Application Data

(60) Division of application No. 10/219,598, filed on Aug. 14, 2002, now abandoned, which is a continuation of application No. 09/484,548, filed on Jan. 18, 2000, now Pat. No. 7,033,352.

(51) **Int. Cl.**
H05B 6/64 (2006.01)
A61N 1/00 (2006.01)

(52) **U.S. Cl.** **219/679**; 607/101

(58) **Field of Classification Search** 219/543, 219/538, 540, 542, 679; 338/307; 174/250; 607/101, 100, 102; *H05B 6/64; A61N 1/00*
See application file for complete search history.

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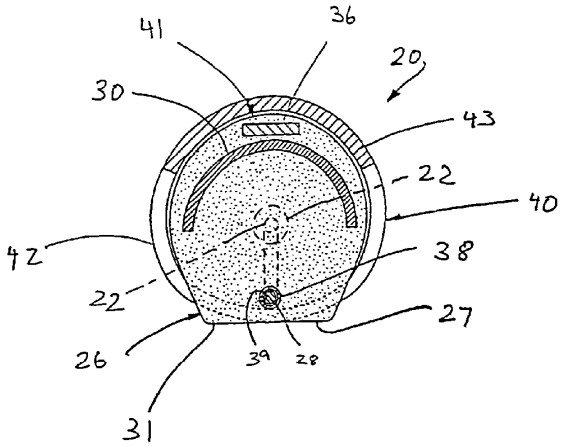
Primary Examiner—Daniel Robinson
(74) *Attorney, Agent, or Firm*—Fenwick & West LLP

(57) **ABSTRACT**

A flexible microwave antenna assembly for a surgical ablation instrument capable of conforming to a tissue surface for ablation thereof. The ablation instrument includes a transmission line having a proximal portion suitable for connection to an electromagnetic energy source. The antenna assembly includes a flexible antenna coupled to the transmission line for radially generating an electric field sufficiently strong to cause tissue ablation. A flexible shield device is coupled to the antenna to substantially shield a surrounding area of the antenna from the electric field radially generated therefrom while permitting a majority of the field to be directed generally in a predetermined direction. A flexible insulator is disposed between the shield device and the antenna which defines a window portion enabling the transmission of the directed electric field in the predetermined direction. The antenna, the shield device and the insulator are formed for selective manipulative bending thereof, as a unit, to one of a plurality of contact positions to generally conform the window portion to the biological tissue surface to be ablated.

3 Claims, 9 Drawing Sheets



US007301499B2

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

(10) **Patent No.: US 7,301,499 B2**
(45) **Date of Patent: Nov. 27, 2007**

(54) **BUILT-IN TYPE ANTENNA APPARATUS FOR PORTABLE TERMINAL**

(75) Inventors: **Yong-Joo Shin**, Yongin-si (KR); **Alexander Goudelev**, Suwon-si (KR); **Wan-Jin Choi**, Suwon-si (KR)

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

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 36 days.

(21) Appl. No.: **11/231,121**

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

(65) **Prior Publication Data**

US 2006/0244664 A1 Nov. 2, 2006

(30) **Foreign Application Priority Data**

Apr. 27, 2005 (KR) 10-2005-0035070

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

(52) **U.S. Cl.** ..... **343/700 MS**; 343/702; 343/767

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

(56) **References Cited**

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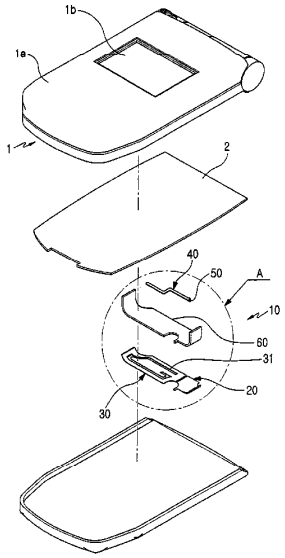
Primary Examiner—Shih-Chao Chen
(74) *Attorney, Agent, or Firm*—The Farrell Law Firm

(57) **ABSTRACT**

Disclosed is a built-in type antenna apparatus for a portable terminal which separates an antenna from a slot antenna and includes an additional sub-antenna. The built-in type antenna apparatus includes a first planar antenna having a shorting point and a feeding point; a second planar antenna provided at a position adjacent to the first planar antenna, the second planar antenna having a shorting point and providing at least one slot; and a sub-antenna electrically connected to the first planar antenna and electromagnetically coupled with the second planar antenna.

8 Claims, 8 Drawing Sheets



US007301502B2

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

(10) **Patent No.: US 7,301,502 B2**
(45) **Date of Patent: Nov. 27, 2007**

(54) **ANTENNA ARRANGEMENT FOR A CELLULAR COMMUNICATION TERMINAL**

(75) Inventors: **Ozden Sinasi**, Copenhagen (DK); **Dennis Sejersgaard-Jacobsen**, Brønshøj (DK)

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

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

(21) Appl. No.: **11/208,392**

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

(65) **Prior Publication Data**

US 2007/0040752 A1 Feb. 22, 2007

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

(52) **U.S. Cl.** **343/702**; 343/745; 343/846; 343/876

(58) **Field of Classification Search** ..... 343/700 MS, 343/702, 745, 749, 829, 833, 846, 876
See application file for complete search history.

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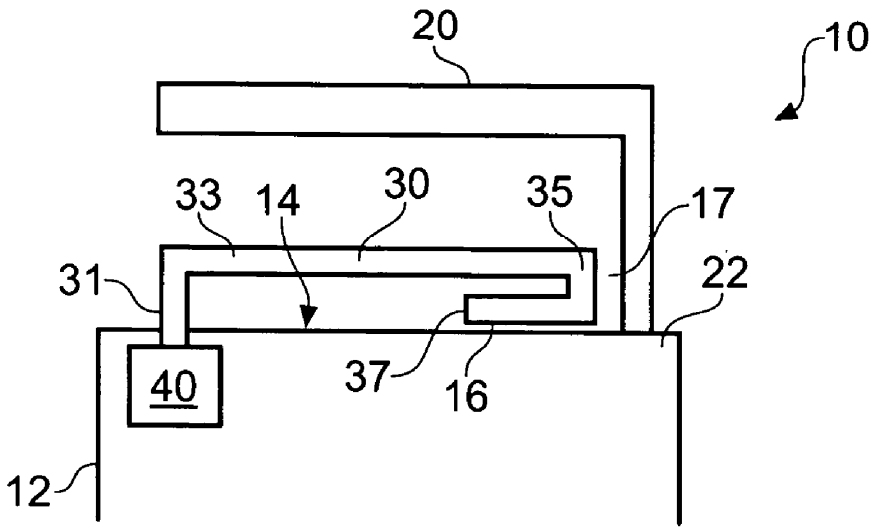
Primary Examiner—Tho Phan
(74) *Attorney, Agent, or Firm*—Harrington & Smith, PC

(57) **ABSTRACT**

An antenna arrangement operable to transmit/receive in a first communications band and a second communications band, including a ground plane; a first conductive element for transmitting/receiving; a second conductive element separate from the first conductive element and the ground plane and having a first portion proximal to, but separated from the first conductive element and a second portion proximal to, but separated from the ground plane; and a switch element for connecting/disconnecting the second conductive element to the ground plane, wherein, the first conductive element, when the switch element disconnects the second conductive element from the ground plane, is operable to transmit/receive in a first communications band and is inoperable to transmit/receive in a second communications band and the first conductive element, when the switch element disconnects the second conductive element from the ground plane, is operable to transmit/receive in the second communications band and inoperable to transmit/receive in the first communications band.

17 Claims, 2 Drawing Sheets



US007301503B1

(12) **United States Patent**
Rausch

(10) **Patent No.: US 7,301,503 B1**
(45) **Date of Patent: Nov. 27, 2007**

(54) **WIRELESS COMMUNICATION DEVICE WITH A PATCH ANTENNA SUPPORTING CROSS-POLARIZED ACTIVE ELEMENTS**

(75) Inventor: **Walter F. Rausch**, Shawnee, KS (US)

(73) Assignee: **Sprint Communications Company L.P.**, Overland Park, KS (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.: **11/464,901**

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

(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; 455/575
See application file for complete search history.

(56) **References Cited**

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Primary Examiner—Hoang V. Nguyen

(57) **ABSTRACT**

A wireless communication device comprises a first portion, a second portion, and an axis. The first portion comprises a patch antenna that includes an antenna plate and a ground plate that are separated by a dielectric. The antenna plate has orthogonal antenna elements that are configured to transmit and receive cross-polarized wireless signals. The second portion is configured to be handheld by a user. The axis is coupled to the first portion and the second portion. The axis allows the user to rotate the first portion and the second portion relative to one another to open and close the wireless communication device.

20 Claims, 4 Drawing Sheets