US007656353B2

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

(10) **Patent No.: US 7,656,353 B2**
(45) **Date of Patent: Feb. 2, 2010**

(54) **MOBILE WIRELESS COMMUNICATIONS DEVICE COMPRISING A SATELLITE POSITIONING SYSTEM ANTENNA WITH ACTIVE AND PASSIVE ELEMENTS AND RELATED METHODS**

(75) Inventors: **Yihong Qi**, St. Agatha (CA); **Adrian Cooke**, Kitchener (CA); **Ying Tong Man**, Waterloo (CA); **Perry Jarmuszewski**, Waterloo (CA)

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

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 529 days.

(21) Appl. No.: **11/288,896**

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

(65) **Prior Publication Data**

US 2007/0120745 A1 May 31, 2007

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

(52) **U.S. Cl.** **343/702**; 343/833; 455/575.7

(58) **Field of Classification Search** 343/702, 343/825, 828, 833, 841, 834; 455/575.7
See application file for complete search history.

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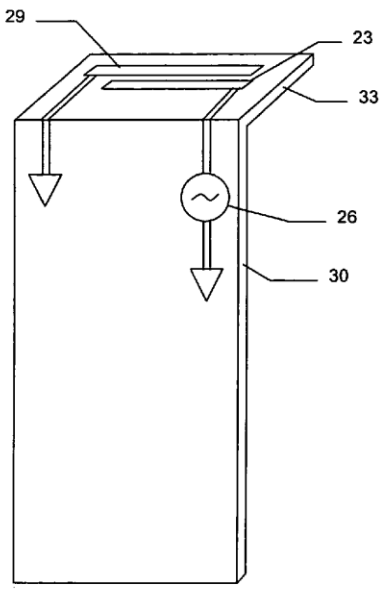
Primary Examiner—Michael C Wimer
(74) *Attorney, Agent, or Firm*—Allen, Dyer, Doppelt, Milbrath & Gilchrist, P.A.

(57) **ABSTRACT**

A mobile wireless communications device may include a portable housing, at least one wireless transceiver carried by the portable housing, and a satellite positioning signal receiver carried by the portable housing. Moreover, a satellite positioning antenna may be carried by the portable housing. The satellite positioning antenna may include an active element connected to the satellite positioning signal receiver, and a passive element connected to a voltage reference and positioned in spaced apart relation from the active element and operatively coupled thereto for directing a beam pattern thereof.

21 Claims, 6 Drawing Sheets



US007656354B2

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

(10) **Patent No.: US 7,656,354 B2**
(45) **Date of Patent: Feb. 2, 2010**

(54) **ANTENNA APPARATUS FOR PORTABLE TERMINAL**

(75) Inventors: **Jung-Ho Park**, 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 339 days.

(21) Appl. No.: **11/453,580**

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

(65) **Prior Publication Data**

US 2006/0284773 A1 Dec. 21, 2006

(30) **Foreign Application Priority Data**

Jun. 15, 2005 (KR) 10-2005-0051511

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

(52) **U.S. Cl.** ..... **343/702**; 343/700 MS; 343/762; 343/795

(58) **Field of Classification Search** ..... 343/700 MS, 343/702, 873, 795, 813, 815, 821, 753, 762, 343/779, 785
See application file for complete search history.

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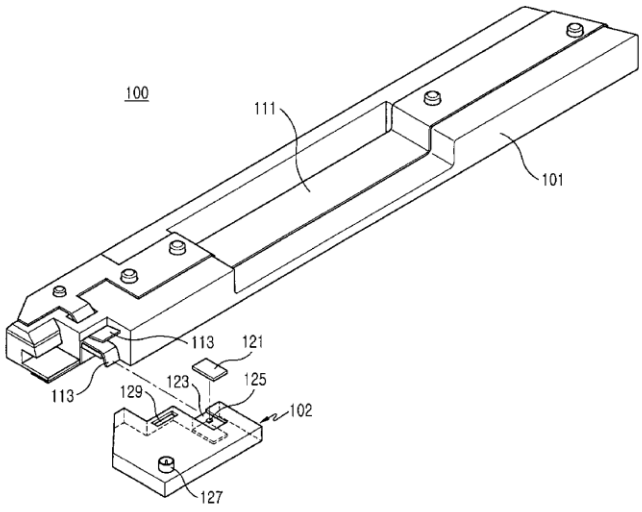
Primary Examiner—Douglas W Owens
Assistant Examiner—Chuc D Tran
(74) *Attorney, Agent, or Firm*—The Farrell Law Firm, LLP

(57) **ABSTRACT**

Disclosed is an antenna apparatus for a portable terminal which includes radiation elements received in a housing of the portable terminal; contact arms formed on the radiation elements; and feeding pads disposed on both surfaces of a printed circuit board, wherein the contact arms are in contact with the feeding pads. The contact arms respectively come in contact with each feeding pad. The pair of feeding pads is attached to the printed circuit board while the contact arms are provided on the radiation elements so as to come in contact with the each feeding pad, so that the antenna apparatus may satisfy operation criteria of wide and multi bands. In addition, the radiation elements are formed as a pair, one of which satisfies the operation criteria of double and triple bands and the other of which has resonance frequency of other bands, so that the operation criteria of the multi bands can be effectively achieved.

11 Claims, 5 Drawing Sheets



US007659852B2

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

(10) **Patent No.: US 7,659,852 B2**
(45) **Date of Patent: Feb. 9, 2010**

(54) **MULTI-BAND ANTENNA WITH LOW-PROFILE**

(75) Inventors: **Chen-Ta Hung**, Tu-Cheng (TW); **Shu-Yean Wang**, Tu-Cheng (TW); **Lung-Sheng Tai**, Tu-Cheng (TW)

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

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

(21) Appl. No.: **11/599,644**

(22) Filed: **Nov. 14, 2006**

(65) **Prior Publication Data**

US 2007/0109199 A1 May 17, 2007

(30) **Foreign Application Priority Data**

Nov. 14, 2005 (TW) ..... 94139851 A

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

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

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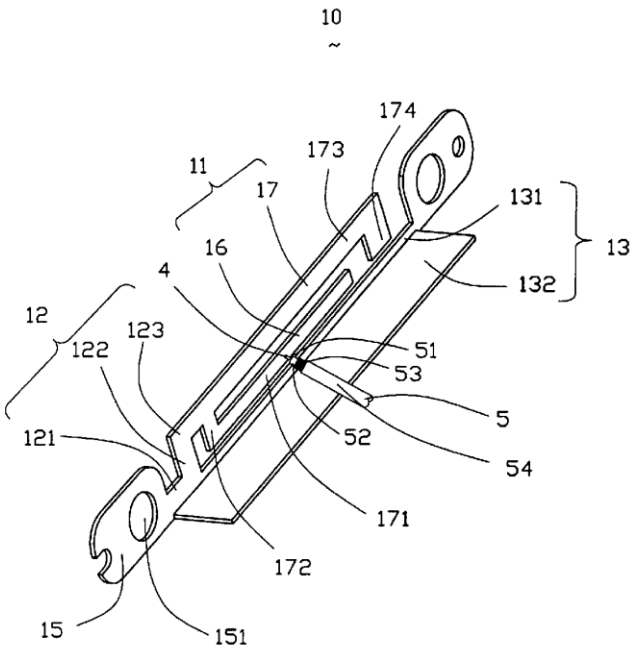
Primary Examiner—HoangAnh T Le
(74) *Attorney, Agent, or Firm*—Wei Te Chung; Andrew C. Cheng; Ming Chieh Chang

(57) **ABSTRACT**

A multi-band antenna includes a radiating element, a connecting element and a grounding element; the radiating element is made from a metal plate, and includes a first radiating portion and a second radiating portion having an end connect to one end of the first radiating portion. The first radiating portion, the second radiating portion and the connecting element is on the same planar, and the first radiating portion and the second radiating portion surround a rectangle rim.

14 Claims, 2 Drawing Sheets



US007659853B2

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

(10) **Patent No.: US 7,659,853 B2**
(45) **Date of Patent: Feb. 9, 2010**

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

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

(73) Assignee: **HTC Corporation**, Taoyuan, Taoyuan County (TW)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 86 days.

(21) Appl. No.: **11/854,557**

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

(65) **Prior Publication Data**

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(30) **Foreign Application Priority Data**

Sep. 25, 2006 (TW) ..... 95135405 A
Jan. 8, 2007 (TW) ..... 96100709 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
See application file for complete search history.

(56) **References Cited**

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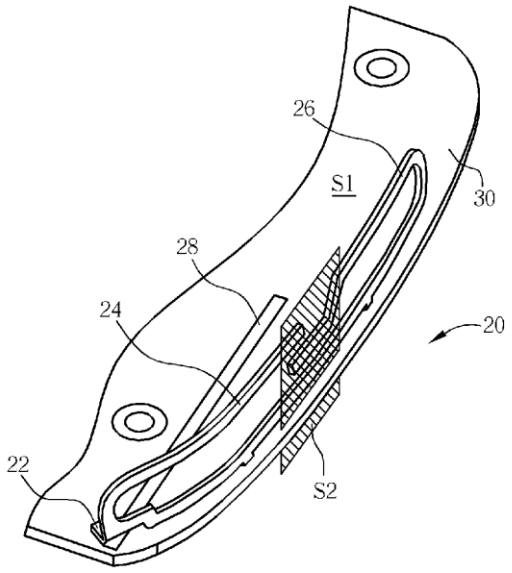
Primary Examiner—Tan Ho
(74) *Attorney, Agent, or Firm*—Winston Hsu

(57) **ABSTRACT**

A multi-band antenna includes a bent flat copper antenna forming a radiation surface to provide GSM-850/900/1800/1900 or GPS multi-band applications, and an auxiliary antenna coupled to the radiation surface provide WCDMA-2100/UMTS-2100 multi-band applications. The radiation surface and the auxiliary antenna are coupled to generate the required bandwidth for multiple radiation bands and to optimize the gain of radiation, so that the multi-band antenna can provide a broad range of services.

20 Claims, 9 Drawing Sheets



US007659864B2

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

(10) **Patent No.: US 7,659,864 B2**
(45) **Date of Patent: Feb. 9, 2010**

(54) **BROADBAND ANTENNA**

(75) Inventors: **Wen-Shyang Chen**, Hsin-Tien (TW); **Yao-Yuan Chang**, Hsin-Tien (TW); **Chih-Ren Hsiao**, Hsin-Tien (TW); **Tsung-Wen Chiu**, Hsin-Tien (TW); **Fu-Ren Hsiao**, Hsin-Tien (TW)

(73) Assignee: **Advanced Connectek Inc.**, Hsin-Tien, 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.: **12/101,549**

(22) Filed: **Apr. 11, 2008**

(65) **Prior Publication Data**

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(30) **Foreign Application Priority Data**

Apr. 20, 2007 (TW) ..... 96113999 A

(51) **Int. Cl.**
H01Q 1/50 (2006.01)
H01Q 9/30 (2006.01)

(52) **U.S. Cl.** ..... **343/860**; 343/700 MS; 343/731; 343/732

(58) **Field of Classification Search** 343/860, 343/731
See application file for complete search history.

(56) **References Cited**

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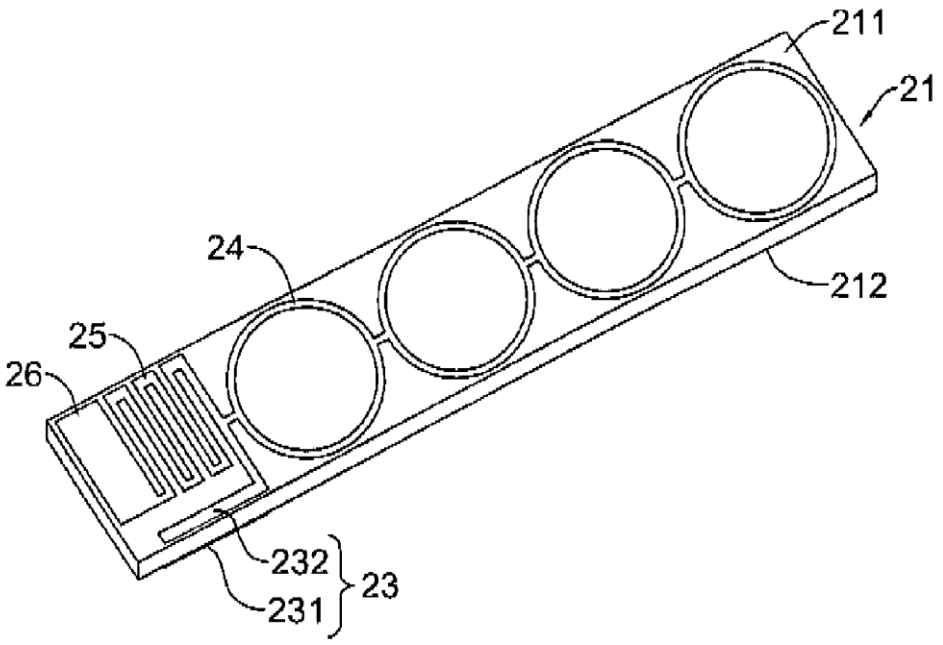
Primary Examiner—Trinh V Dinh
(74) *Attorney, Agent, or Firm*—patenttm.us

(57) **ABSTRACT**

A broadband antenna has a substrate, a coupling conductor, a conductor string, a ground conductor and a ground plane. The coupling conductor has a first coupling member and a second coupling member being separated from each other. The conductor string and the ground conductor are connected to the second coupling member. The conductor string extends along a direction opposite to the second coupling member. The ground conductor is connected to the ground plane. The broadband antenna uses the coupling conductor and the ground conductor to adjust input impedance for impedance match. The conductor string functions as a multi level resonance circuit to increase impedance bandwidth.

15 Claims, 7 Drawing Sheets



US007659866B1

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

(10) **Patent No.: US 7,659,866 B1**
(45) **Date of Patent: Feb. 9, 2010**

(54) **MULTIPLE FREQUENCY BAND ANTENNA**

(75) Inventors: **Huang-Tse Peng**, Taipei (TW); **Kuo-Jen Lai**, Taipei (TW); **E-Den Hsiao**, Taipei (TW)

(73) Assignee: **Arima Communications Co., Ltd.**, Taipei County (TW)

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

(21) Appl. No.: **12/173,421**

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

(51) **Int. Cl.**
H01Q 1/24 (2006.01)
H01Q 21/30 (2006.01)

(52) **U.S. Cl.** **343/893**; 343/702; 343/828

(58) **Field of Classification Search** ..... 343/700 MS, 343/702, 828, 846, 893
See application file for complete search history.

(56) **References Cited**

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Primary Examiner—Michael C Wimer
(74) *Attorney, Agent, or Firm*—Kirton & McConkie; Evan R. Witt

(57) **ABSTRACT**

A multiple frequency band antenna includes a common connecting element, a first radiating element, a second radiating element, a common feeding point and a common ground terminal. The common connecting element includes a connecting part and a turning part, which are arranged in different planes. The first radiating element is connected with the connecting part of the common connecting element. The second radiating element is connected with the turning part of the common connecting element. The second radiating element has a longer path length compared with the first radiating element. A combination of the common connecting element and the first radiating element is configured to transmit and receive wireless signals in a first frequency band. A combination of the common connecting element and the second radiating element is configured to transmit and receive wireless signals in a second frequency band.

19 Claims, 7 Drawing Sheets

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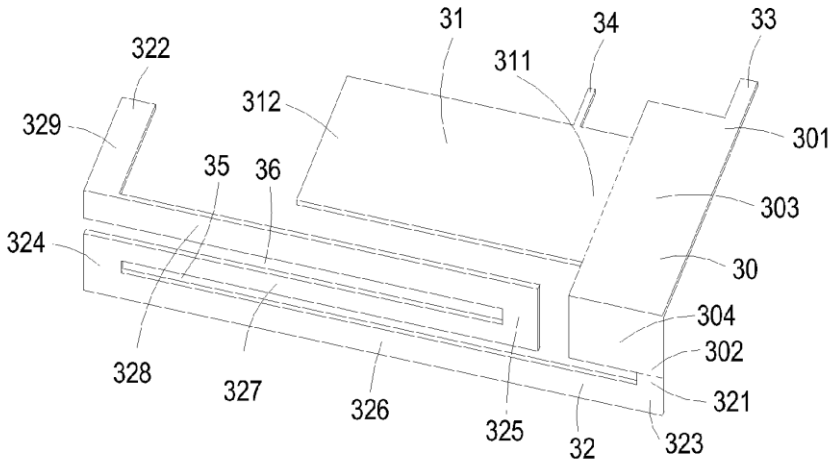

US007663551B2

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

(10) **Patent No.: US 7,663,551 B2**
(45) **Date of Patent: Feb. 16, 2010**

(54) **MULTIBAND ANTENNA APPARATUS AND METHODS**

(75) Inventors: **Pertti Nissinen**, Kempele (FI); **Petteri Annamaa**, Oulunsalo (FI); **Kimmo Koskiniemi**, Oulu (FI)

(73) Assignee: **Pulse Finald Oy** (FI)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 209 days.

(21) Appl. No.: **11/603,511**

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

(65) **Prior Publication Data**

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(30) **Foreign Application Priority Data**

Nov. 24, 2005 (FI) 20055621

(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, 846, 829
See application file for complete search history.

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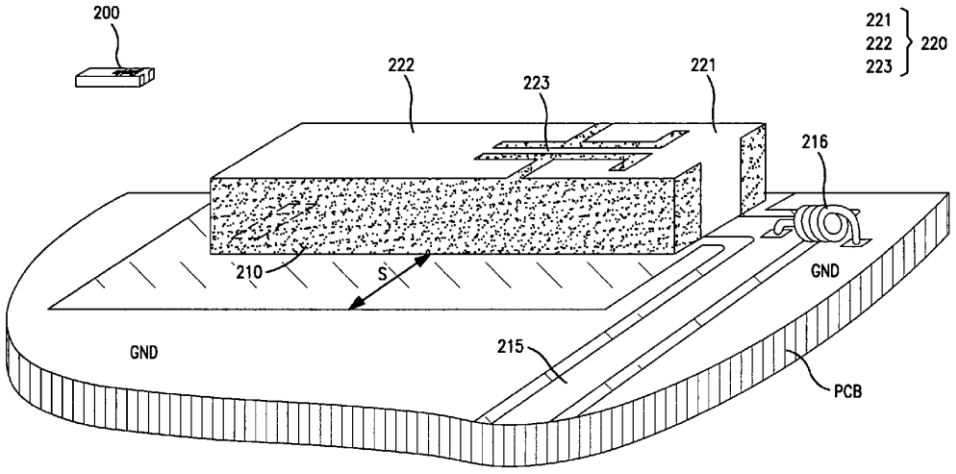
Primary Examiner—Tho G Phan
(74) *Attorney, Agent, or Firm*—Gazdzinski & Associates, PC

(57) **ABSTRACT**

A multiband antenna, and component for implementing a multiband antenna for, e.g., a small-sized radio device. In one embodiment, the antenna component comprises a simple and reliable dielectric substrate, the conductive coating of which forms a radiating element. This has a plurality (e.g., two) resonances for forming separate operating bands. The lower resonance is based on the entire element, and the upper resonance on the head part of the element. The conductive coating has a pattern, which functions as a parallel resonance circuit between the head part and the tail part of the element. The natural frequency of this parallel resonance circuit is in the range of the upper operating band of the antenna. The resonance frequencies of the antenna and thus its operating bands can be tuned independently of each other so that the tuning cycle need not be repeated.

45 Claims, 5 Drawing Sheets



US007663552B2

(12) **United States Patent**
Mei

(10) **Patent No.: US 7,663,552 B2**
(45) **Date of Patent: Feb. 16, 2010**

(54) **PRINTED ANTENNA**

(75) Inventor: **Chia-Hao Mei**, Taipei Hsien (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 258 days.

(21) Appl. No.: **11/944,419**

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

(65) **Prior Publication Data**

US 2008/0158067 A1 Jul. 3, 2008

(30) **Foreign Application Priority Data**

Dec. 29, 2006 (CN) 2006 1 0064631

(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

See application file for complete search history.

(56) **References Cited**

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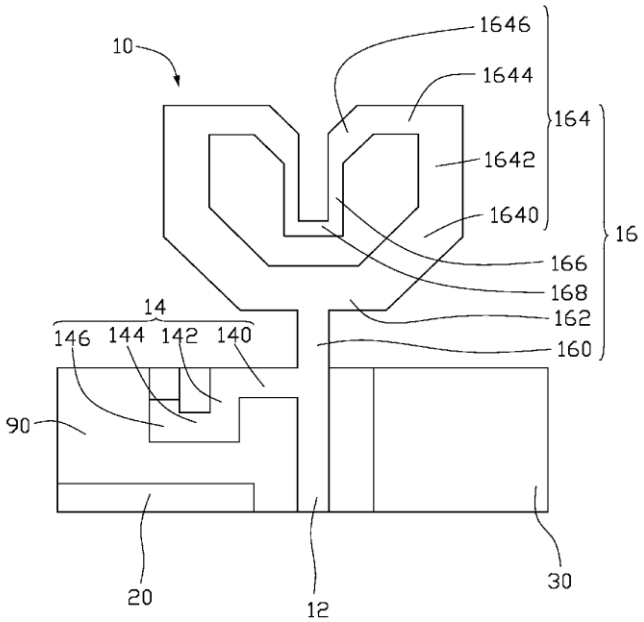
Primary Examiner—HoangAnh T Le
(74) *Attorney, Agent, or Firm*—Frank R. Niranjan

(57) **ABSTRACT**

A printed antenna (**10**) disposed on a substrate (**90**) includes a feeding portion (**12**), an antenna body (**16**), a first grounded portion (**20**), a second grounded portion (**30**), and a matching portion (**14**). The feeding portion feeds electromagnetic signals. The antenna body electronically connected to the feeding portion transmits and receives electromagnetic signals, and includes a first radiation portion (**162**), a pair of second radiation portions (**164**), and a pair of third radiation portions (**166**). The first radiation portion, the second radiation portions, and the third radiation portions co-form, a "D" shape with an indentation in a straight side of the "D" shape which extends into a middle of the "D" shape. The first grounded portion and the second grounded portion are respectively disposed on opposite sides of the feeding portion. The matching portion is disposed on one side of the feeding portion, and located adjacent to the first grounded portion.

20 Claims, 7 Drawing Sheets



US007663553B2

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

(10) **Patent No.: US 7,663,553 B2**
(45) **Date of Patent: Feb. 16, 2010**

(54) **DIELECTRIC RESONATOR ANTENNA (DRA) WITH A TRANSVERSE-RECTANGLE 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 73 days.

(21) Appl. No.: **12/038,190**

(22) Filed: **Feb. 27, 2008**

(65) **Prior Publication Data**

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(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, 343/846, 848

See application file for complete search history.

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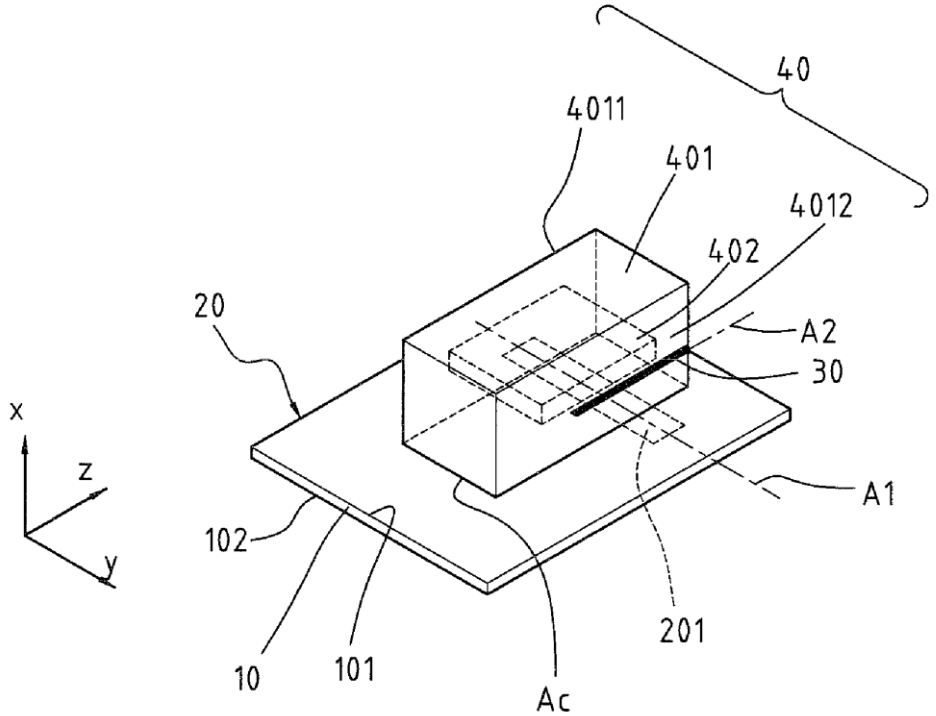
Primary Examiner—HoangAnh T Le
(74) *Attorney, Agent, or Firm*—Rabin & Berdo, P.C.

(57) **ABSTRACT**

The present invention relates to a dielectric resonator antenna (DRA) with a transverse-rectangle well. The DRA comprising a substrate, a ground plane, a feed conductor, and a dielectric resonator. The resonator further includes a main body and a well penetrating the main body to enhance the electric field, to increase the radiation efficiency, to broaden the bandwidth, and to create new resonant mode. The DRA has the radiation pattern of broad beamwidth with vertical polarization. Accordingly, the invention can also be adjusted as WLAN 802.11a antenna.

9 Claims, 7 Drawing Sheets



US007663556B2

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

(10) **Patent No.: US 7,663,556 B2**
(45) **Date of Patent: Feb. 16, 2010**

(54) **ANTENNA CONFIGURED FOR LOW FREQUENCY APPLICATION**

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(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 363 days.

(21) Appl. No.: **11/396,442**

(22) Filed: **Apr. 3, 2006**

(65) **Prior Publication Data**

US 2007/0229372 A1 Oct. 4, 2007

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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.

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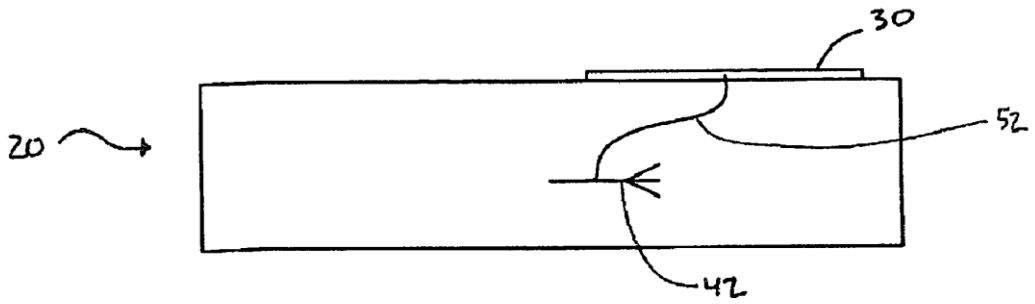
Primary Examiner—HoangAnh T Le
(74) *Attorney, Agent, or Firm*—Coastal Patent, LLC; Joshua S. Schoonover

(57) **ABSTRACT**

An antenna configured for low frequency applications on a mobile device includes an antenna element coupled to a conductive structure which, in turn, is coupled to the user of the mobile device such that the user of the mobile device effectively becomes part of the antenna. The conductive structure can include, for example, the device housing being made from a conductive material, a conductive structure embedded inside the device housing, or conductive pads exposed in the device housing. The antenna element is electrically connected to the conductive structure and the user can be coupled to the conductive structure either through direct contact or through capacitive coupling.

19 Claims, 31 Drawing Sheets



US007667661B2

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

(10) **Patent No.: US 7,667,661 B2**
(45) **Date of Patent: Feb. 23, 2010**

(54) **ELECTRONIC DEVICE AND SHORT-CIRCUITED DIPOLE ANTENNA THEREOF**

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

(73) Assignee: **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 4 days.

(21) Appl. No.: **12/076,298**

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

(65) **Prior Publication Data**

US 2009/0015501 A1 Jan. 15, 2009

(30) **Foreign Application Priority Data**

Jul. 10, 2007 (TW) ..... 96125142 A

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

(52) **U.S. Cl.** **343/795**; 343/809

(58) **Field of Classification Search** 343/795, 343/793, 803, 809

See application file for complete search history.

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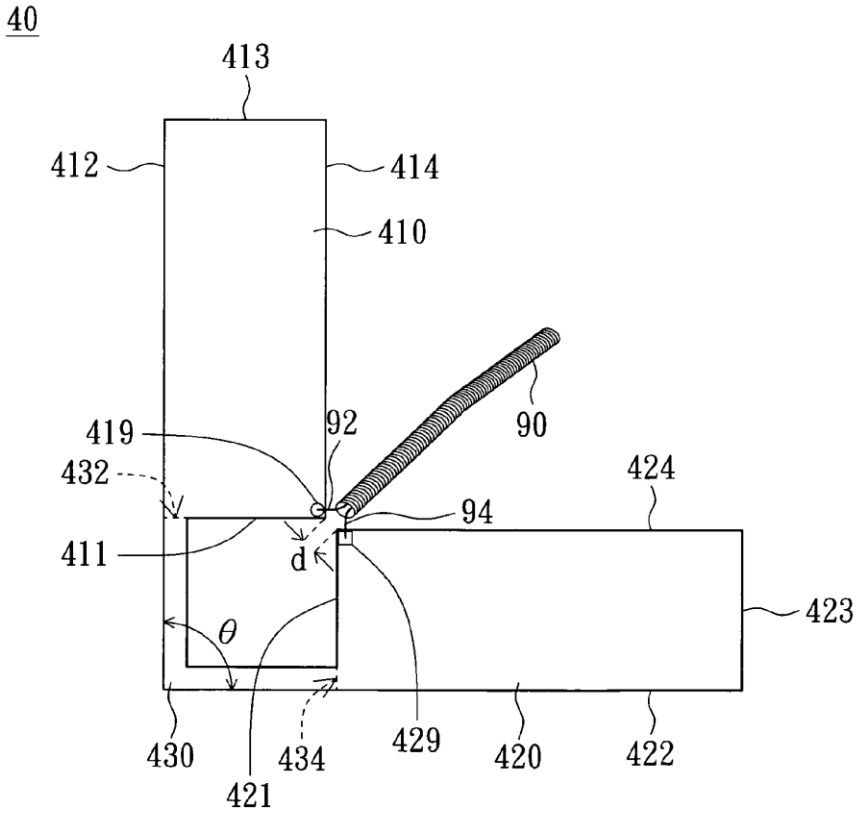
Primary Examiner—Hoang V Nguyen
(74) *Attorney, Agent, or Firm*—Bacon & Thomas, PLLC

(57) **ABSTRACT**

An electronic device and short-circuited dipole antenna thereof are provided. The short-circuited dipole antenna comprises a first radiation unit, a second radiation unit and a short-circuited unit. The short-circuited unit comprises a first terminal connected to the first radiation unit, and a second terminal connected to the second radiation unit.

17 Claims, 7 Drawing Sheets



US007667662B2

(12) **United States Patent**
Chiang

(10) **Patent No.: US 7,667,662 B2**
(45) **Date of Patent: Feb. 23, 2010**

(54) **ANTENNA**

(75) Inventor: **Yuh-Yuh Chiang**, Taipei (TW)

(73) Assignee: **Wistron NeWeb Corp.**, Taipei Hsien (TW)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 22 days.

(21) Appl. No.: **12/172,879**

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

(65) **Prior Publication Data**

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(30) **Foreign Application Priority Data**

Jan. 31, 2008 (TW) ..... 97202097 U

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

(52) **U.S. Cl.** **343/846**; 343/702; 343/828

(58) **Field of Classification Search** ..... 343/700 MS, 343/702, 828, 846, 893
See application file for complete search history.

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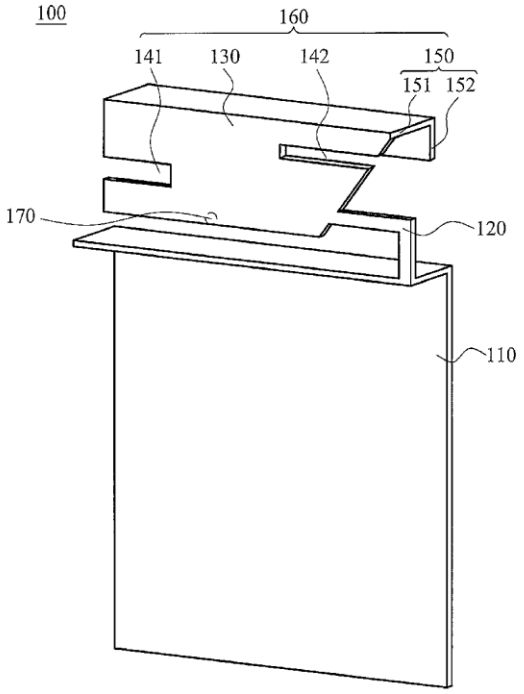
Primary Examiner—Michael C Wimer
(74) *Attorney, Agent, or Firm*—Quintero Law Office

(57) **ABSTRACT**

An antenna is provided. The antenna has a ground element, a radiator and a conductive element. The radiator has a body, wherein the body has a first edge, a second edge, a third edge and a fourth edge, and the first edge is parallel to the third edge, a length of the first edge is shorter than a length of the third edge, the first edge is close to the ground element, the second edge connects the first edge and the third edge, a fourth edge connects the first edge and the third edge, and a first slot is formed on the radiator. The second edge and the fourth edge extend separately from the first edge to the third edge. The conductive element connects the ground element and the radiator.

32 Claims, 10 Drawing Sheets



US007667663B2

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

(10) **Patent No.: US 7,667,663 B2**
(45) **Date of Patent: Feb. 23, 2010**

(54) **COUPLING ANTENNA**

(75) Inventors: **Chih-Jen Hsiao**, Hsin-Tien (TW); **Po-Yuan Liao**, Hsin-Tien (TW); **Tsung-Wen Chiu**, Hsin-Tien (TW); **Fu-Ren Hsiao**, Hsin-Tien (TW)

(73) Assignee: **Advanced Connectek, Inc.**, 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.: **12/069,145**

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

(65) **Prior Publication Data**

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(30) **Foreign Application Priority Data**

Feb. 15, 2007 (TW) ..... 96105853 A

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

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

(58) **Field of Classification Search** ..... 343/700 MS, 343/846, 829, 850
See application file for complete search history.

(56) **References Cited**

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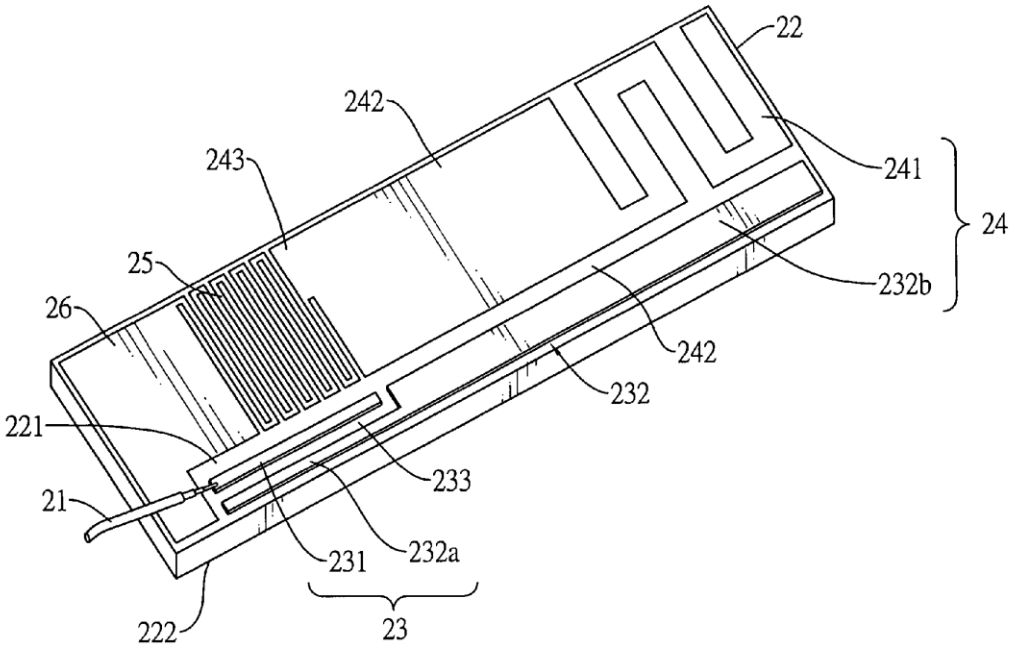
Primary Examiner—Tho G Phan
(74) *Attorney, Agent, or Firm*—Schmeiser, Olsen & Watts LLP

(57) **ABSTRACT**

A coupling antenna has a substrate, an inducting conductor, a ground plane, a first coupling member and a second coupling member. The inducting conductor is mounted on the substrate. The ground plane is formed on and protrudes from the inducting conductor and is mounted on the substrate. The first coupling member is mounted on the substrate and is connected to a feeding cable. The second coupling member is mounted on the substrate and is connected to the first coupling member. The coupling antenna with the first coupling member, the second coupling member and the inducting conductor has a wide bandwidth and a small size.

4 Claims, 6 Drawing Sheets



US007667664B2

(12) **United States Patent**
Tao

(10) **Patent No.: US 7,667,664 B2**
(45) **Date of Patent: Feb. 23, 2010**

(54) **EMBEDDED ANTENNA**

(75) Inventor: **Wen-Szu Tao**, Hsinchu (TW)

(73) Assignee: **Arcadyan Technology Corporation**, Hsinchu (TW)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 66 days.

(21) Appl. No.: **11/970,566**

(22) Filed: **Jan. 8, 2008**

(65) **Prior Publication Data**

US 2008/0316141 A1 Dec. 25, 2008

(30) **Foreign Application Priority Data**

Jun. 21, 2007 (TW) ..... 96122371 A

(51) **Int. Cl.**
H01Q 1/40 (2006.01)
H01Q 1/24 (2006.01)

(52) **U.S. Cl.** ..... **343/873**; 343/872; 343/702; 343/700 MS

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

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Primary Examiner—Trinh V Dinh
(74) *Attorney, Agent, or Firm*—Muncy, Geissler, Olds & Lowe, PLLC

(57) **ABSTRACT**

The present invention provides an embedded antenna. It is to form meanders on a radiating element of the embedded antenna for dividing the resonant length of the radiating element into several short resonant length to extend the bandwidth of the radiating element. It is also to form meanders on the radiating element to extend the resonant length. This design can minimize the size of the embedded antenna and achieve the same as performance of a larger size antenna.

16 Claims, 9 Drawing Sheets