



US007626547B2

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

(10) **Patent No.:** **US 7,626,547 B2**
(45) **Date of Patent:** **Dec. 1, 2009**

(54) **EMBEDDED PLANAR ANTENNA WITH
PERTAINING TUNING METHOD**

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2008/0122697 A1* 5/2008 Mierke et al. 343/700 MS

(75) Inventors: **Gerald Schillmeier**, München (DE);
Frank Mierke, München (DE)

(73) Assignee: **Kathrein-Werke KG**, Rosenheim (DE)

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

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(21) Appl. No.: **11/547,495**

(22) PCT Filed: **Mar. 24, 2005**

(86) PCT No.: **PCT/EP2005/003184**

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

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(87) PCT Pub. No.: **WO2005/096433**

PCT Pub. Date: **Oct. 13, 2005**

(Continued)

(65) **Prior Publication Data**
US 2008/0278375 A1 Nov. 13, 2008

Primary Examiner—Trinh V Dinh
(74) *Attorney, Agent, or Firm*—Nixon & Vanderhye PC

(30) **Foreign Application Priority Data**
Apr. 1, 2004 (DE) 10 2004 016 158

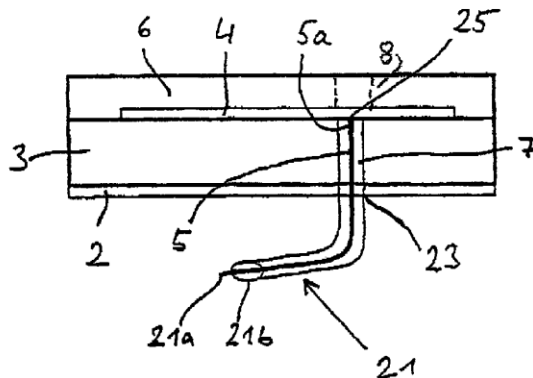
(57) **ABSTRACT**

(51) **Int. Cl.**
H01Q 1/38 (2006.01)
(52) **U.S. Cl.** **343/700 MS**; 343/829;
343/846
(58) **Field of Classification Search** None
See application file for complete search history.

A patch antenna comprising an electrically conductive ground plane; a first dielectric substrate layer arranged on said ground plane and having a first relative permittivity; at least one electrically conductive effective area arranged on the first dielectric substrate layer and electrically connected to one end of an electrically conductive feed line; at least one second dielectric substrate layer arranged on the effective area and having a second relative permittivity; whereby the second relative permittivity is larger or equal the first relative permittivity.

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18 Claims, 5 Drawing Sheets





US007626549B2

(12) **United States Patent**
Channabasappa

(10) **Patent No.:** **US 7,626,549 B2**
(45) **Date of Patent:** **Dec. 1, 2009**

(54) **COMPACT PLANAR ANTENNA FOR SINGLE AND MULTIPLE POLARIZATION CONFIGURATIONS**

(76) Inventor: **Eswarappa Channabasappa**, 1 Oxbow Dr., Acton, MA (US) 01720

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 159 days.

(21) Appl. No.: **11/692,479**

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

(65) **Prior Publication Data**

US 2008/0238793 A1 Oct. 2, 2008

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

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

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

(56) **References Cited**

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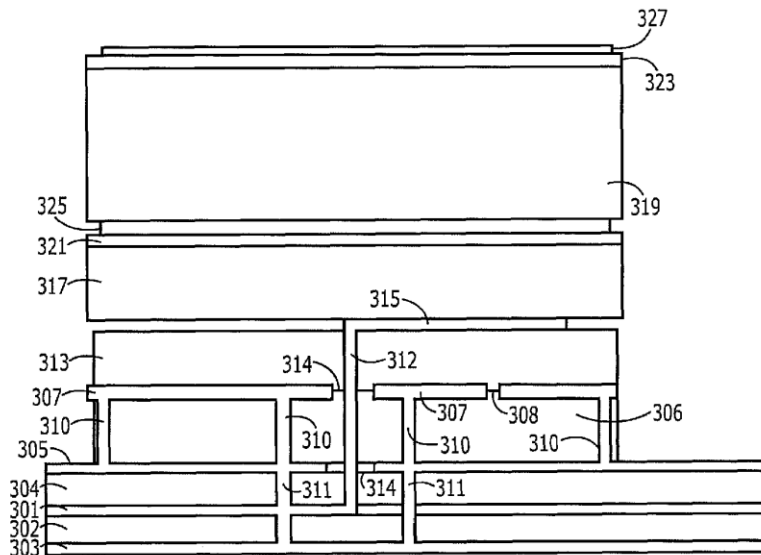
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Primary Examiner—Trinh V Dinh

(57) **ABSTRACT**

A planar antenna comprising a signal path for receiving or transmitting a signal, a conductive layer having a slot formed therein positioned to electromagnetically couple with the signal path, a conductive plate parallel to and overlying the slot and spaced therefrom by a dielectric layer, the conductive plate being electrically in contact with the signal path, and one or more patches parallel to and above the conductive plate.

18 Claims, 9 Drawing Sheets





US007626550B2

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

(10) **Patent No.:** **US 7,626,550 B2**
(45) **Date of Patent:** **Dec. 1, 2009**

(54) **ELECTRONIC DEVICE AND ANTENNA THEREOF**

(75) Inventors: **Feng-Chi Eddie Tsai**, Taipei (TW);
Kuan-Hsueh Tseng, Taipei (TW);
Jiunn-Ming Huang, 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 405 days.

(21) Appl. No.: **11/752,884**

(22) Filed: **May 23, 2007**

(65) **Prior Publication Data**

US 2008/0030405 A1 Feb. 7, 2008

(30) **Foreign Application Priority Data**

Jun. 12, 2006 (TW) 95210218 U

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

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

(58) **Field of Classification Search** **343/700 MS,**
343/702, 725, 846

See application file for complete search history.

(56) **References Cited**

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Primary Examiner—Huedung Mancuso

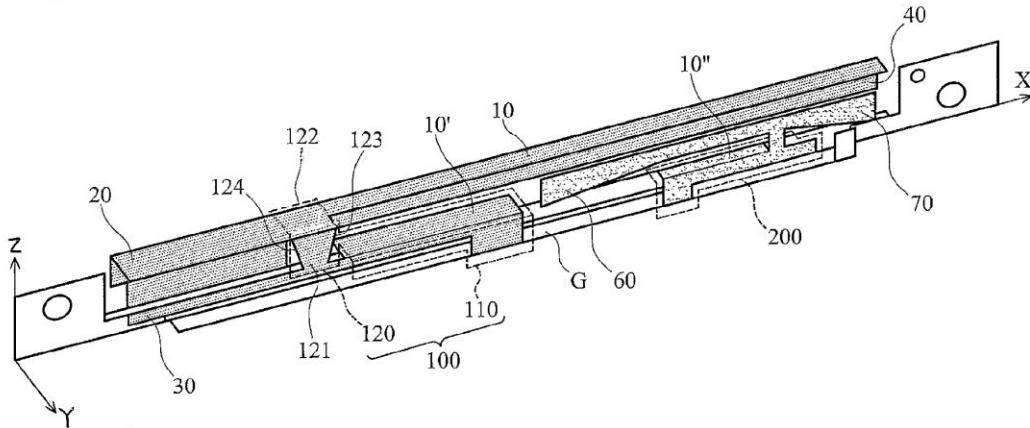
(74) *Attorney, Agent, or Firm*—Quintero Law Office

(57) **ABSTRACT**

An antenna comprising a ground element, a first conductive element, a first transmission element, a second transmission element and a third transmission element. The first conductive element is connected to the ground element. The first transmission element is connected to the first conductive element extending in a first direction. The second transmission element is connected to the first conductive element. The third transmission element is connected to the first conductive element extending in a second direction opposite to the first direction, wherein the third transmission element nears the second transmission element, and maintains a distance from the second transmission element.

25 Claims, 15 Drawing Sheets

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US007626553B2

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

(10) **Patent No.:** **US 7,626,553 B2**
(45) **Date of Patent:** **Dec. 1, 2009**

(54) **METHOD OF AUTOMATICALLY COMPENSATING SENSITIVITY OF MOBILE COMMUNICATION TERMINAL AND THE MOBILE COMMUNICATION TERMINAL**

(75) Inventors: **Jun Han Park**, Gyeonggi-do (KR);
Jong Wook Jeong, Gyeonggi-do (KR)

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

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 656 days.

(21) Appl. No.: **11/387,330**

(22) Filed: **Mar. 23, 2006**

(65) **Prior Publication Data**

US 2007/0126643 A1 Jun. 7, 2007

(30) **Foreign Application Priority Data**

Dec. 2, 2005 (KR) 10-2005-0116671

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

(52) **U.S. Cl.** **343/702; 455/277.1**

(58) **Field of Classification Search** **343/702; 455/277.1**

See application file for complete search history.

(56) **References Cited**

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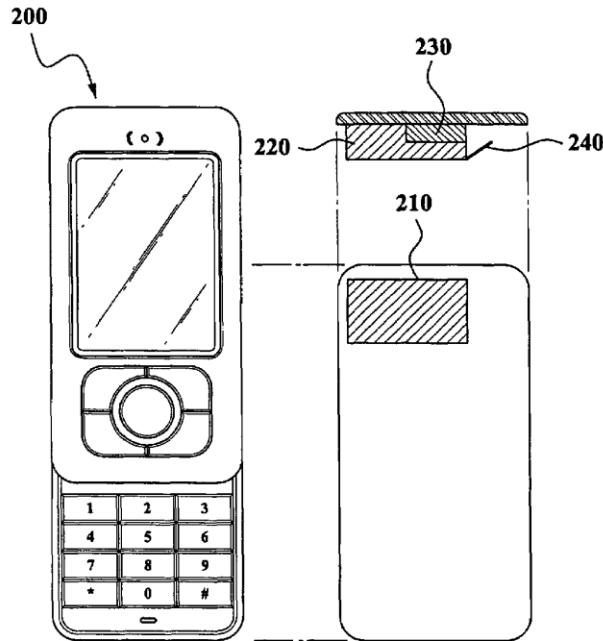
Primary Examiner—Tan Ho

(74) Attorney, Agent, or Firm—H.C. Park & Associates, PLC

(57) **ABSTRACT**

A mobile communication terminal, including an automatic sensitivity improvement antenna, wherein the automatic sensitivity improvement antenna includes: a first antenna whose antenna sensitivity is tuned in an idle state at a free space; and a second antenna for improving sensitivity by checking received signal strength indication when the mobile communication terminal is engaged.

7 Claims, 4 Drawing Sheets





US007626555B2

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

(10) **Patent No.:** **US 7,626,555 B2**
(45) **Date of Patent:** ***Dec. 1, 2009**

(54) **ANTENNA ARRANGEMENT AND METHOD FOR MAKING THE SAME**

(75) Inventors: **Ari Kalliokoski**, Kello (FI); **Antti Lilja**, Oulunsalo (FI); **Mika Maarala**, Oulu (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.

This patent is subject to a terminal disclaimer.

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Primary Examiner—Huedung Mancuso

(74) Attorney, Agent, or Firm—Hollingsworth & Funk, LLC

(57) **ABSTRACT**

An inverted-F antenna arrangement comprising a dielectric element structure, a radiating element on the dielectric element, the radiating element having a first end and a second end, a planar ground element, the dielectric element separating the radiating element and the planar ground element, a ground connection element on the dielectric element coupled to the first end of the radiating element for coupling the radiating element to the planar ground element, a feeder element on the dielectric element coupled to the first end of the radiating element for transferring electromagnetic radiation. The radiating element is arranged three-dimensionally on the dielectric element for forming an electrically conductive three-dimensional structure.

26 Claims, 3 Drawing Sheets

(21) Appl. No.: **12/152,055**

(22) Filed: **May 12, 2008**

(65) **Prior Publication Data**

US 2008/0218420 A1 Sep. 11, 2008

Related U.S. Application Data

(63) Continuation of application No. 10/878,239, filed on Jun. 28, 2004, now Pat. No. 7,372,411.

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

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

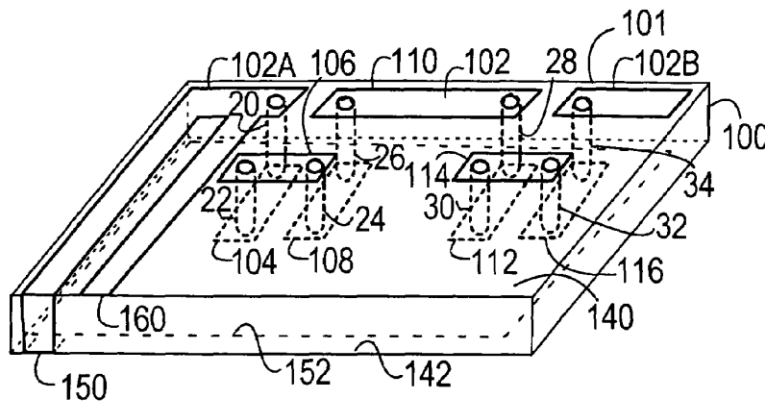
(58) **Field of Classification Search** **343/702,**
343/700 MS, 793-795, 850, 860

See application file for complete search history.

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US007626558B2

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

(10) **Patent No.:** **US 7,626,558 B2**
(45) **Date of Patent:** ***Dec. 1, 2009**

(54) **WIDEBAND ANTENNA**

(75) Inventors: **Shinichi Kuroda**, Tokyo (JP); **Hisato Asai**, 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.: **11/488,753**

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

(65) **Prior Publication Data**

US 2006/0262020 A1 Nov. 23, 2006

Related U.S. Application Data

(62) Division of application No. 10/498,813, filed as application No. PCT/JP03/13487 on Oct. 22, 2003, now Pat. No. 7,132,993.

(30) **Foreign Application Priority Data**

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| Mar. 31, 2003 | (JP) | | 2003-96903 |

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

(52) **U.S. Cl.** **343/786; 343/772; 343/773**

(58) **Field of Classification Search** **343/786, 343/772, 773**

See application file for complete search history.

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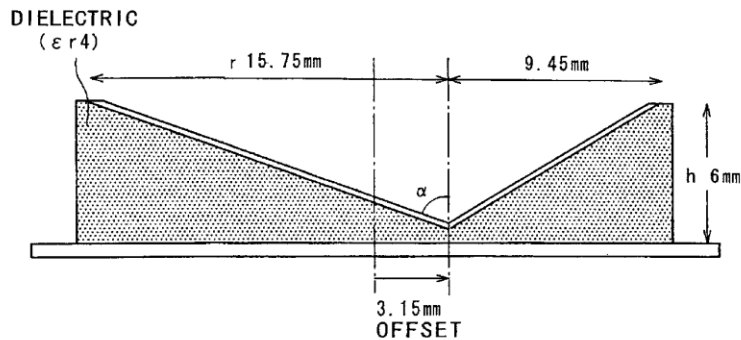
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Primary Examiner—Trinh V Dinh
(74) *Attorney, Agent, or Firm*—Oblon, Spivak, McClelland, Maier & Neustadt, L.L.P.

(57) **ABSTRACT**

A monoconical antenna comprises: a substantially conical concavity formed in one end face of a dielectric; a radiation electrode provided on the surface of the concavity; and a ground conductor provided in proximity to and substantially in parallel with the other end face opposite the one end face of the dielectric. The monoconical antenna is so constituted that electrical signals are fed to between the near vertex region of the radiation electrode and the region of the ground conductor. The half-cone angle α of the substantially conical concavity formed in the one end face of the dielectric is determined by a predetermined rule corresponding to relative dielectric constant ϵ_r . Thus, the quality of wideband characteristics inherent in the monoconical antenna can be sufficiently maintained, and further size reduction can be accomplished by dielectric loading.

9 Claims, 26 Drawing Sheets



CROSS-SECTIONAL VIEW



US007629932B2

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

(10) **Patent No.:** **US 7,629,932 B2**
(45) **Date of Patent:** **Dec. 8, 2009**

(54) **ANTENNA APPARATUS, AND ASSOCIATED METHODOLOGY, FOR A MULTI-BAND RADIO DEVICE**

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(75) Inventors: **Dong Wang**, Waterloo (CA); **Geyi Wen**, Waterloo (CA); **Qinjiang Rao**, Waterloo (CA); **Mark Pecen**, Waterloo (CA)

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

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| WO | 0126182 | A1 | 4/2001 |

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 25 days.

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(21) Appl. No.: **11/690,427**

Primary Examiner—Trinh V Dinh
Assistant Examiner—Dieu Hien T Duong

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

(57) **ABSTRACT**

(65) **Prior Publication Data**

US 2008/0231531 A1 Sep. 25, 2008

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

(52) **U.S. Cl.** **343/702**; 343/700 MS;
343/866

(58) **Field of Classification Search** 343/702,
343/700 MS, 866

See application file for complete search history.

Antenna apparatus, and an associated methodology, for a multi-frequency-band-capable radio device, such as a quad-band mobile station. The antenna apparatus forms a hybrid strip antenna having a pair of resonant elements. A first resonant element forms a peripheral loop extending about the periphery of a substrate. A meander line extends along a portion of the peripheral loop. And, second resonant element is formed of an L-shaped strip. The peripheral loop is resonant at a set of frequencies, and the L-shaped strip is resonant at a single frequency. Through appropriate selection of the lengths of the resonant elements, the frequencies at which the elements are resonant are controlled.

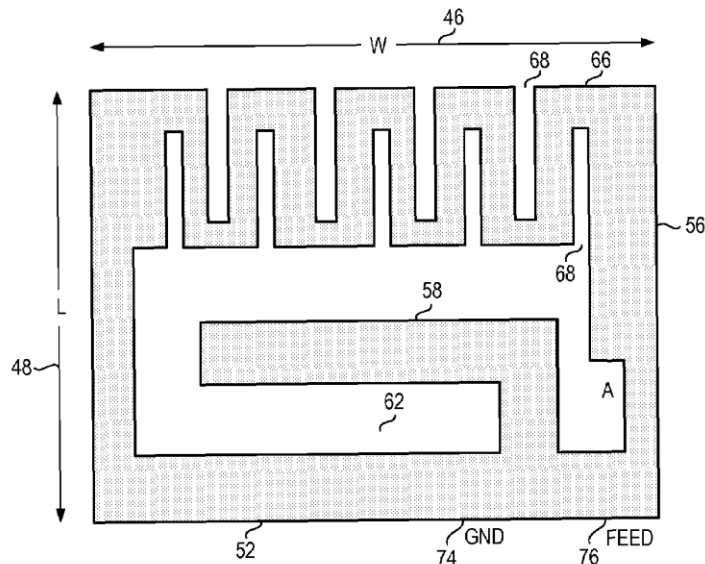
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17 Claims, 4 Drawing Sheets

42





US007629933B2

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

(10) **Patent No.:** **US 7,629,933 B2**
(45) **Date of Patent:** **Dec. 8, 2009**

(54) **MULTI-BAND ANTENNA, AND ASSOCIATED METHODOLOGY, FOR A RADIO COMMUNICATION DEVICE**

(75) Inventors: **Geyi Wen**, Waterloo (CA); **Shirook Ali**, Mississauga (CA); **Mark Pecen**, Waterloo (CA)

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

(*) 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.: **11/843,825**

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

(65) **Prior Publication Data**
US 2009/0051596 A1 Feb. 26, 2009

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

(52) **U.S. Cl.** **343/702**; 343/700 MS; 343/795; 343/850

(58) **Field of Classification Search** 343/700 MS, 343/702, 750, 793, 795, 850, 852
See application file for complete search history.

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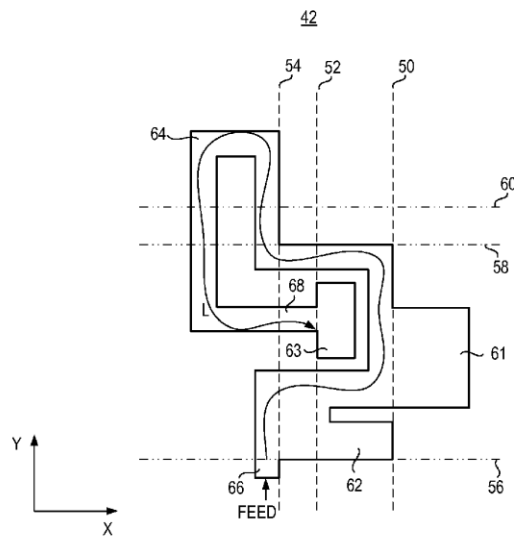
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Primary Examiner—Douglas W Owens
Assistant Examiner—Chuc D Tran

(57) **ABSTRACT**

An antenna, and an associated methodology, for a portable radio device, such as a mobile station capable of operation at a plurality of frequency bands spread across a wide range of frequencies. The antenna includes a dielectric substrate and a monopole disposed about the substrate. The monopole includes a first end having a feed point connection and is folded in a serpentine manner about at least three planar surfaces of the substrate. A first patch element improves matching at a first frequency band, extends from the monopole. A second patch element improves matching at a second frequency band, extends from the monopole and is proximate to the feed point connection. A third patch element improves matching at a third frequency band, extends from a second end of the monopole, opposed to the feed point connection.

20 Claims, 8 Drawing Sheets



----- FOLDING IN THE X-DIRECTION
 - - - - - FOLDING IN THE Y-DIRECTION



US007629940B2

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

(10) **Patent No.:** **US 7,629,940 B2**
(45) **Date of Patent:** **Dec. 8, 2009**

(54) **MULTI-BAND ANTENNA**

(75) Inventors: **Yun-Long Ke**, Tu-Cheng (TW);
Chen-Ta Hung, Tu-Cheng (TW);
Lung-Sheng Tai, Tu-Cheng (TW);
Yao-O-Shien Huang, Tu-Cheng (TW);
Po-Kang Ku, 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 113 days.

(21) Appl. No.: **11/824,783**

(22) Filed: **Jul. 3, 2007**

(65) **Prior Publication Data**
US 2008/0007460 A1 Jan. 10, 2008

(30) **Foreign Application Priority Data**
Jul. 10, 2006 (TW) 95125031 A

(51) **Int. Cl.**
H02Q 1/24 (2006.01)
H01Q 1/48 (2006.01)

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

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

See application file for complete search history.

(56) **References Cited**

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Primary Examiner—Douglas W Owens

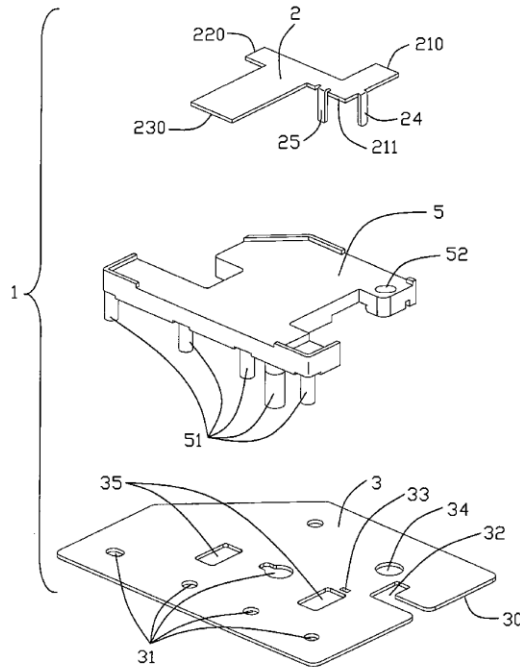
Assistant Examiner—Jennifer F Hu

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

(57) **ABSTRACT**

A multi-band antenna includes a radiating element comprising a first metal patch, a second metal patch extending along a direction different from the first metal patch, a grounding element parallel to the radiating element with a certain distance, a resonant cavity produced by said certain distance between separated the radiating element and the grounding element, a first pad downward extending from an edge of the first metal patch to form a feeding pad, and a second pad downward extending from an edge of the second metal patch to form a grounding pad; wherein the edge from which the first pad extending is bordering the edge of the second metal patch with the second pad.

17 Claims, 3 Drawing Sheets





US007633448B2

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

(10) **Patent No.:** **US 7,633,448 B2**
(45) **Date of Patent:** **Dec. 15, 2009**

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

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7,196,665 B2 * 3/2007 Koshi et al. 343/700 MS
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(75) Inventors: **Wen-Fong Su**, Tu-Cheng (TW);
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(73) Assignee: **Hon Hai Precision Ind. Co., Ltd.**,
Taipei Hsien (TW)

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(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 112 days.

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

(21) Appl. No.: **11/799,514**

(57) **ABSTRACT**

(22) Filed: **May 1, 2007**

A multi-band antenna assembly, comprising: a first antenna
used for wireless local area network and comprising a first
radiating element comprising a high frequency radiating
portion and a low frequency radiating portion, and a first
grounding element adapted for assembling said first antenna on
an electric device; a second antenna used for wireless wide area
network and comprising a second radiating element compris-
ing a high frequency radiating portion and a low frequency
radiating portion, and a second grounding element adapted
for assembling said second antenna on an electric device;
wherein said first antenna and said second antenna independ-
ent from each other; said grounding elements of said two
antennas comprising two main bodies substantially aligned
with each other, said first and second radiating elements of
said first antenna and said second antenna locating on the
same side of said first and second grounding elements, said
low frequency radiating portions of said first antenna and said
second antenna extend more than directions.

(65) **Prior Publication Data**

US 2007/0257847 A1 Nov. 8, 2007

(30) **Foreign Application Priority Data**

May 2, 2006 (TW) 95207457 U

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

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

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

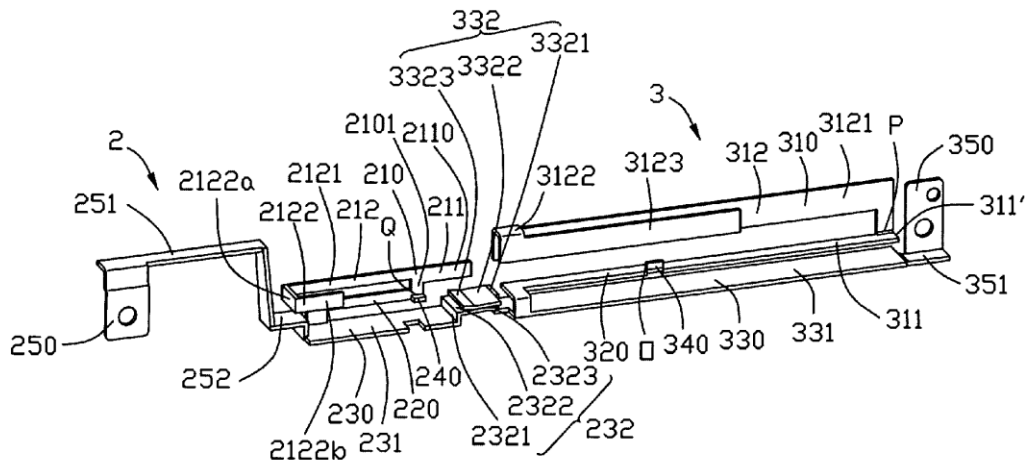
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15 Claims, 4 Drawing Sheets

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US007633449B2

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

(10) **Patent No.:** **US 7,633,449 B2**
(45) **Date of Patent:** **Dec. 15, 2009**

(54) **WIRELESS HANDSET WITH IMPROVED HEARING AID COMPATIBILITY**

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(75) Inventors: **Sung-Hoon Oh**, Tamarac, FL (US);
Carlo Dinallo, Plantation, FL (US);
Mattia Pascolini, Plantation, FL (US)

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

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 47 days.

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(21) Appl. No.: **12/040,455**

Primary Examiner—Huedung Mancuso

(22) Filed: **Feb. 29, 2008**

(57) **ABSTRACT**

(65) **Prior Publication Data**

US 2009/0219214 A1 Sep. 3, 2009

A "candy bar" form factor wireless handset (200) having an internal antenna (222, 306) a bottom end of a main internal circuit board (208) and an auxiliary field shaping conductor (226, 502, 1102, 1304) at a top end of the main internal circuit board (208) behind the an earpiece speaker (104). The field shaping conductor (226, 502, 1102, 1304) is spaced from a ground plane (304) of the main circuit board (208) but is inductively and capacitively coupled to the ground plane (304). The field shaping conductor (226, 502, 1102, 1304) lowers the electric field intensity in front of the earpiece speaker and thereby reduces interference of the wireless handset (200) with hearing aids.

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

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

(58) **Field of Classification Search** 343/702,
343/700 MS, 841, 846-848, 895; 455/247
See application file for complete search history.

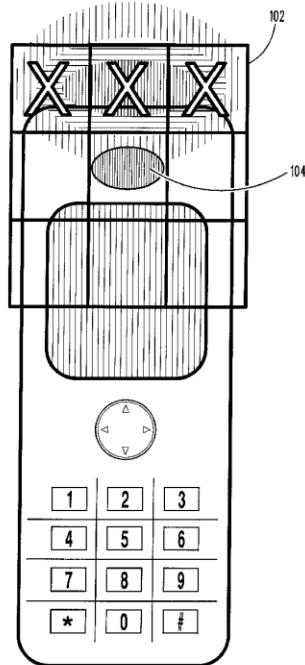
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8 Claims, 12 Drawing Sheets

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US007639186B2

(12) **United States Patent**
Chang

(10) **Patent No.:** **US 7,639,186 B2**
(45) **Date of Patent:** **Dec. 29, 2009**

- (54) **DUAL BAND ANTENNA**
- (75) Inventor: **The-Nan Chang**, Taipei (TW)
- (73) Assignees: **Tatung Company**, Taipei (TW); **Tatung 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 44 days.

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- (21) Appl. No.: **11/962,123**
- (22) Filed: **Dec. 21, 2007**
- (65) **Prior Publication Data**
US 2009/0096677 A1 Apr. 16, 2009

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- (30) **Foreign Application Priority Data**
Oct. 11, 2007 (TW) 96137989 A

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Primary Examiner—Huedung Mancuso
(74) *Attorney, Agent, or Firm*—Jianq Chyun IP Office

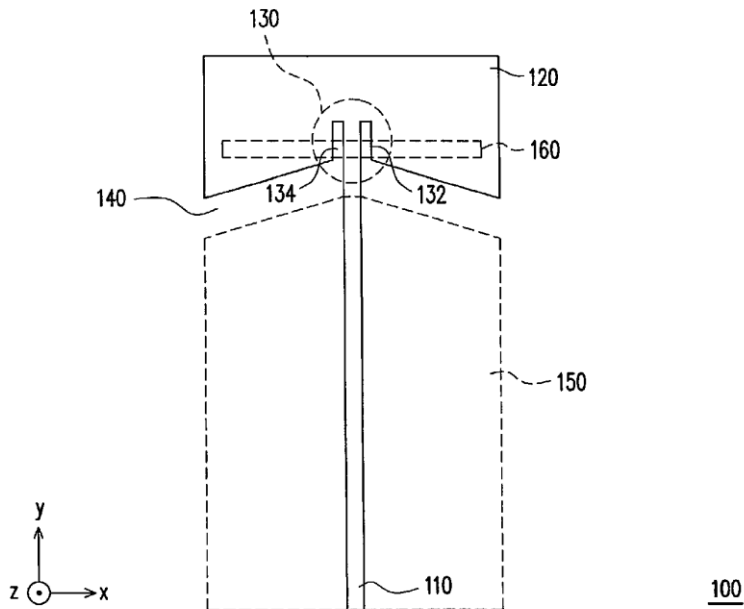
- (51) **Int. Cl.**
H01Q 1/38 (2006.01)
- (52) **U.S. Cl.** **343/700 MS**
- (58) **Field of Classification Search** 343/700 MS,
343/702, 846, 833-834
See application file for complete search history.

(57) **ABSTRACT**

A dual band antenna covering both DTV and ISM bands is provided in the present invention. The antenna includes a signal line, a coupling block, a ground part and at least a floating metal strip, wherein the signal line and the coupling block are etched on upside of a substrate and connected with each other with an inset feeding structure, and the ground part and the floating metal strip are etched on backside of the substrate.

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9 Claims, 7 Drawing Sheets





US007639189B2

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

(10) **Patent No.:** **US 7,639,189 B2**
(45) **Date of Patent:** **Dec. 29, 2009**

(54) **ANTENNA DEVICE OF A MOBILE TERMINAL**

(75) Inventors: **Yong Hyun Kim**, Gumi-si (KR); **Dong Woo Kim**, Daegu Metropolitan (KR); **Hong Chul Park**, Gumi-si (KR); **Kyung Mok Yoo**, Gumi-si (KR); **Sung Kee Kim**, Gumi-si (KR)

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

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 143 days.

(21) Appl. No.: **11/780,795**

(22) Filed: **Jul. 20, 2007**

(65) **Prior Publication Data**
US 2008/0079651 A1 Apr. 3, 2008

(30) **Foreign Application Priority Data**
Oct. 2, 2006 (KR) 10-2006-0097046

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

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

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

See application file for complete search history.

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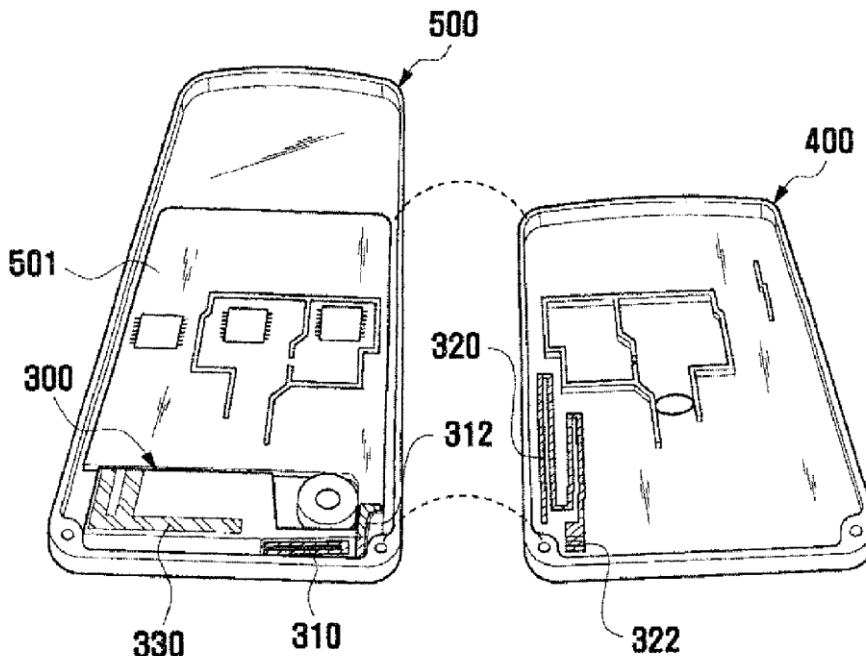
Primary Examiner—Hoang V Nguyen

(74) *Attorney, Agent, or Firm*—H.C. Park & Associates, PLC

(57) **ABSTRACT**

An antenna device for a mobile terminal. The antenna device includes a first antenna pattern provided within a case of the mobile terminal, and a second antenna pattern provided within the case and electrically connected to the first antenna pattern through contact with the first antenna pattern. Therefore, by forming an antenna device with an antenna pattern for use in a low frequency band, the antenna device may be conveniently used and decrease the size of the mobile terminal.

9 Claims, 4 Drawing Sheets





US007639194B2

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

(10) **Patent No.:** **US 7,639,194 B2**
(45) **Date of Patent:** **Dec. 29, 2009**

(54) **DUAL-BAND LOOP ANTENNA**
(75) Inventors: **Yun-Wen Chi**, Sinjhuang (TW); **Kin-Lu Wong**, Kaohsiung (TW)

(58) **Field of Classification Search** 343/700 MS,
343/702, 728, 729, 741, 846
See application file for complete search history.

(73) Assignee: **Auden Techno Corp.**, Kaohsiung (TW)

(56) **References Cited**

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

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Primary Examiner—Michael C Wimer

(74) *Attorney, Agent, or Firm*—Ming Chow; Sinorica, LLC

(21) Appl. No.: **12/186,584**

(57) **ABSTRACT**

(22) Filed: **Aug. 6, 2008**

(65) **Prior Publication Data**

US 2008/0291100 A1 Nov. 27, 2008

Related U.S. Application Data

(63) Continuation-in-part of application No. 11/564,893, filed on Nov. 30, 2006, now abandoned.

A dual-band loop antenna for using in a mobile phone for (890–960 MHz)/DCS(1710–1880 MHz) application is disclosed to include a ground plane in a substantially rectangular shape having a grounding point and a shorting point, a radiating metallic loop having a feeding end and a shorting end electrically connected to the shorting point of the ground plane and spaced from the feeding end at a predetermined distance, and a radiating metallic plate surrounded by the radiating metallic loop and having one end electrically connected to a vicinity around the shorting end of the radiating metallic loop and spaced from the shorting end of the radiating metallic loop at a distance less than 10 mm.

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

(52) **U.S. Cl.** **343/702; 343/728; 343/741**

10 Claims, 7 Drawing Sheets

