



US008542149B2

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

(10) **Patent No.:** **US 8,542,149 B2**

(45) **Date of Patent:** **Sep. 24, 2013**

(54) **ANTENNA AND ELECTRONIC DEVICE
EQUIPPED WITH SAME**

(75) Inventors: **Haruyuki Watanabe**, Hitachi (JP);
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Ikegaya**, Kasumigaura (JP); **Tomoyuki
Ogawa**, Hitachi (JP)

(73) Assignee: **Hitachi Cable, 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 624 days.

(21) Appl. No.: **12/718,025**

(22) Filed: **Mar. 5, 2010**

(65) **Prior Publication Data**

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(30) **Foreign Application Priority Data**

Sep. 8, 2009 (JP) 2009-207302

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

(52) **U.S. Cl.**
USPC 343/700 MS; 343/797

(58) **Field of Classification Search**

USPC 343/700 MS, 767, 702
See application file for complete search history.

(56) **References Cited**

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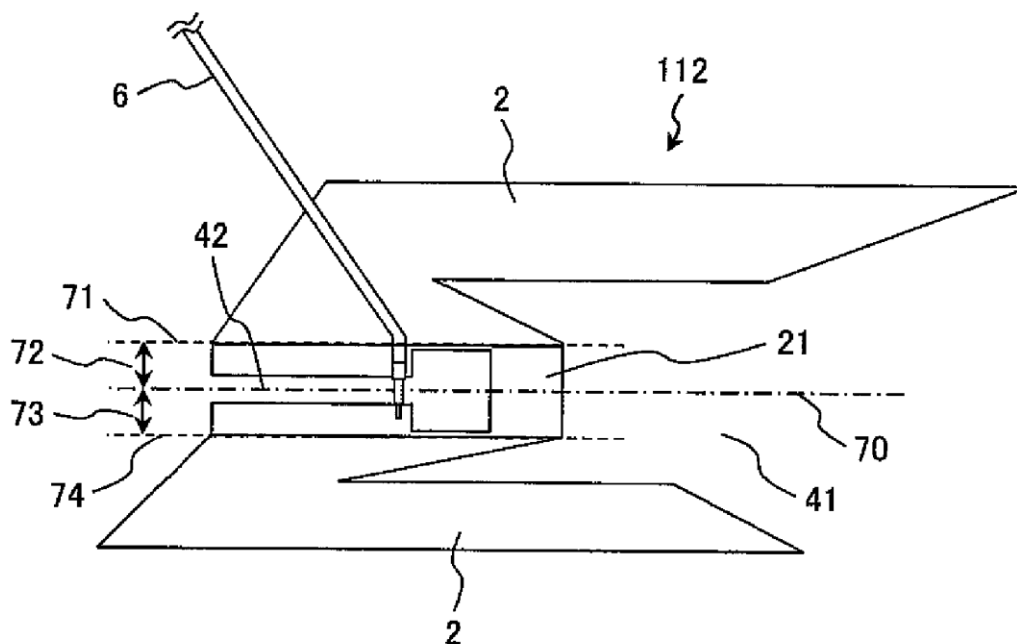
Primary Examiner — Dieu H Duong

(74) *Attorney, Agent, or Firm* — Antonelli, Terry, Stout &
Kraus, LLP.

(57) **ABSTRACT**

An antenna according to the present invention comprises: a
conductor plate with an axisymmetrical shape; a slot formed
on the conductor plate; and a feeding point provided on the
axisymmetrical axis of the conductor plate, in which the
conductor plate is folded along two locations that are parallel
to the axisymmetrical axis toward mutually different direc-
tions.

5 Claims, 38 Drawing Sheets



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US008542152B2

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

(10) **Patent No.:** **US 8,542,152 B2**
(45) **Date of Patent:** **Sep. 24, 2013**

(54) **MULTI-BAND ANTENNA**

(56) **References Cited**

(75) Inventors: **Chih-Yin Yu**, Yilan County (TW);
Shih-Chi Lai, Miaoli County (TW);
Chia-Lun Tang, Miaoli County (TW);
Jia-Yi Sze, Taoyuan County (TW)

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

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 354 days.

(21) Appl. No.: **13/004,253**

(22) Filed: **Jan. 11, 2011**

(65) **Prior Publication Data**

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

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

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

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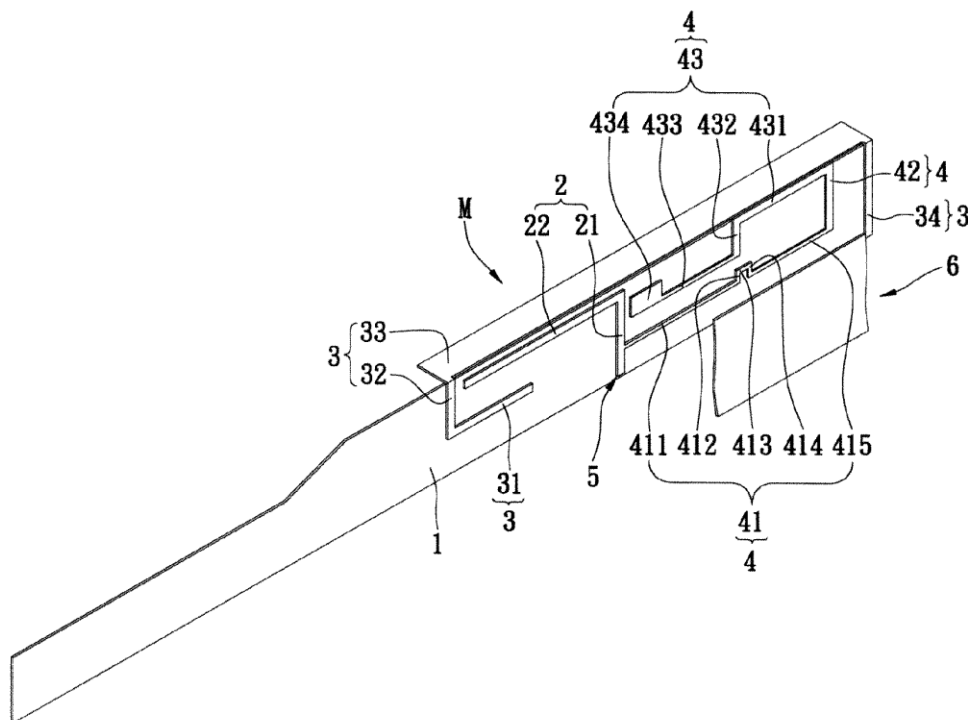
Primary Examiner — Trinh Dinh

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

(57) **ABSTRACT**

A multi-frequency antenna includes a microwave substrate, a first antenna unit, a second antenna unit, a third antenna unit and a grounding unit. The first antenna unit, the second antenna unit, and the third antenna unit are disposed on the microwave substrate surface. The grounding unit is disposed at an edge on the surface of the microwave substrate. The grounding unit is in connection with the second antenna unit. The second antenna unit and the third antenna unit are bent to form perpendicular structures to the microwave substrate. The compact arrangement reduces the physical footprint of the antenna module to enable fitment in a wide range of products having tight special constraint.

6 Claims, 6 Drawing Sheets



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US008542154B2

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

(10) **Patent No.:** **US 8,542,154 B2**
(45) **Date of Patent:** **Sep. 24, 2013**

(54) **PORTABLE TERMINAL**

(75) Inventors: **Chisang You**, Gyeonggi-Do (KR);
Moonsoo Song, Gyeonggi-Do (KR);
Jaehyun Choi, Seoul (KR); **Songyi Lee**,
Gyeonggi-Do (KR); **Namyong Kim**,
Seoul (KR); **Yochuol Ho**, Gyeonggi-Do
(KR); **Euntaek Jeoung**, Gyeonggi-Do
(KR)

(73) Assignee: **LG Electronics Inc.**, Seoul (KR)

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 553 days.

(21) Appl. No.: **12/829,134**

(22) Filed: **Jul. 1, 2010**

(65) **Prior Publication Data**

US 2011/0001673 A1 Jan. 6, 2011

(30) **Foreign Application Priority Data**

Jul. 2, 2009 (KR) 10-2009-0060349
Jul. 20, 2009 (KR) 10-2009-0066027

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

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

(58) **Field of Classification Search**
USPC 343/702, 700 MS, 803; 455/575.7
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

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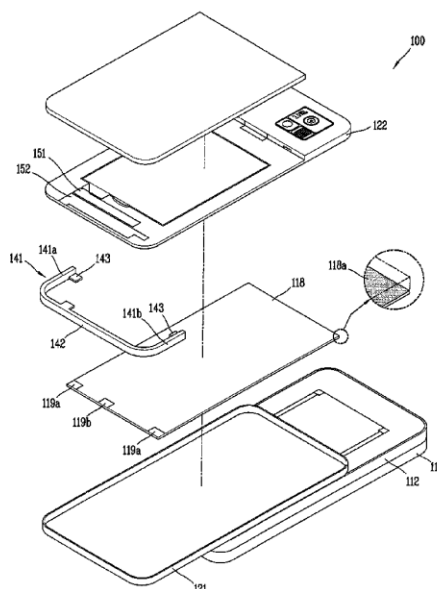
Primary Examiner — Huedung Mancuso

(74) *Attorney, Agent, or Firm* — Birch, Stewart, Kolasch &
Birch, LLP

(57) **ABSTRACT**

A portable terminal comprises a ground portion mounted in a body of the portable terminal, and configured to form electrical ground of a circuit board which controls the portable terminal, a conductive member mounted to a case which forms appearance of the body, and formed of a conductive material, a first radiator electrically connected to the ground portion so as to be fed by the ground portion, and configured to transmit and receive radio electromagnetic waves, a second radiator formed of a conductive material, and connected to the conductive member so as to form an antenna pattern together with the ground portion and the conductive member, the antenna pattern consecutive with a feed point of the first radiator, and a connection member configured to electrically connect edges of the ground portion to the conductive member such that the first radiator and the antenna pattern form a dipole antenna.

19 Claims, 14 Drawing Sheets



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US008547282B2

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

(10) **Patent No.:** **US 8,547,282 B2**
(45) **Date of Patent:** **Oct. 1, 2013**

(54) **MIMO ANTENNA AND COMMUNICATION
DEVICE USING THE SAME**

(75) Inventors: **Se-hyun Park**, Suwon-si (KR);
Dong-jin Kim, Yongin-si (KR);
Byung-tae Yoon, Suwon-si (KR)

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

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

(21) Appl. No.: **13/426,032**

(22) Filed: **Mar. 21, 2012**

(65) **Prior Publication Data**

US 2013/0050052 A1 Feb. 28, 2013

Related U.S. Application Data

(62) Division of application No. 12/112,033, filed on Apr.
30, 2008, now Pat. No. 8,164,525.

(30) **Foreign Application Priority Data**

Oct. 17, 2007 (KR) 10-2007-0104549

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

(52) **U.S. Cl.**
USPC **343/700 MS**; 343/702; 343/876

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

(56) **References Cited**

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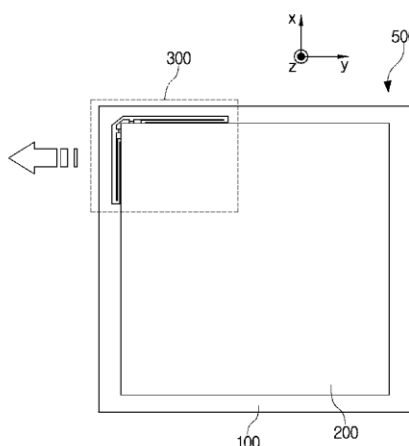
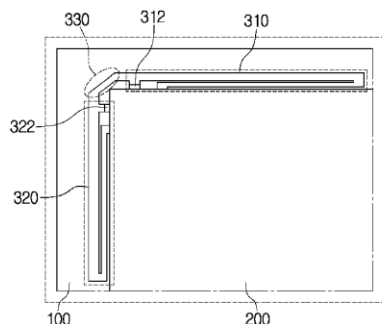
Primary Examiner — Tho G Phan

(74) *Attorney, Agent, or Firm* — NSIP Law

(57) **ABSTRACT**

A multiple-input multiple-output (MIMO) antenna and a communication device using the same is provided. The MIMO antenna includes a plurality of antenna elements in which a feeding unit is formed at one end, and another end is connected to a ground, and a connection unit which connects the antenna elements.

17 Claims, 4 Drawing Sheets



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US008547283B2

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

(10) **Patent No.:** **US 8,547,283 B2**
(45) **Date of Patent:** **Oct. 1, 2013**

(54) **MULTIBAND ANTENNA AND METHOD FOR AN ANTENNA TO BE CAPABLE OF MULTIBAND OPERATION**

(75) Inventors: **Kin-Lu Wong**, Kaohsiung (TW); **Ming-Fang Tu**, Hsinchu (TW); **Wei-Yu Li**, Yilan (TW); **Chun-Yih Wu**, Taipei (TW)

(73) Assignees: **Industrial Technology Research Institute**, Hsinchu (TW); **National Sun-Yat-Sen University**, Kaohsiung (TW)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 329 days.

(21) Appl. No.: **13/013,623**

(22) Filed: **Jan. 25, 2011**

(65) **Prior Publication Data**

US 2012/0001815 A1 Jan. 5, 2012

(30) **Foreign Application Priority Data**

Jul. 2, 2010 (TW) 99121914 A

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

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

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

(56) **References Cited**

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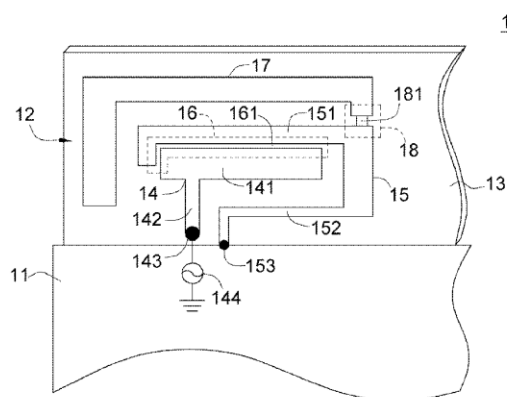
Primary Examiner — Hoanganh Le

(74) *Attorney, Agent, or Firm* — McClure, Qualey & Rodack, LLP

(57) **ABSTRACT**

A multiband antenna having a ground plane and a radiating portion is provided. The radiating portion includes a first metal portion, a second metal portion, an inductively-coupled portion, and a third metal portion. The first metal portion has a first coupling metal portion and a signal feeding line electrically connected thereto. The second metal portion has a second coupling metal portion and a shorting metal portion electrically connected thereto with a shorting point connected to the ground plane. The first and second coupling metal portions are coupled and a capacitively-coupled portion is formed therebetween. The inductively-coupled portion is connected between the third and second metal portions. The first and second metal portions enable the antenna to generate a first operating band. The first, second and third metal portions enable the antenna to generate a second operating band, the frequencies of which are lower than those of the first operating band.

25 Claims, 15 Drawing Sheets



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US008547289B2

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

(10) **Patent No.:** **US 8,547,289 B2**

(45) **Date of Patent:** ***Oct. 1, 2013**

(54) **MULTIMODE ANTENNA STRUCTURE**

(75) Inventors: **Mark T. Montgomery**, Melbourne Beach, FL (US); **Frank M. Caimi**, Vero Beach, FL (US); **Mark W. Kishler**, Rockledge, FL (US)

(73) Assignee: **Skycross, Inc.**, Fremont, 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.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **13/454,738**

(22) Filed: **Apr. 24, 2012**

(65) **Prior Publication Data**

US 2012/0299792 A1 Nov. 29, 2012

Related U.S. Application Data

(63) Continuation of application No. 12/750,196, filed on Mar. 30, 2010, now Pat. No. 8,164,538, which is a continuation of application No. 12/099,320, filed on Apr. 8, 2008, now Pat. No. 7,688,273, which is a continuation-in-part of application No. 11/769,565, filed on Jun. 27, 2007, now Pat. No. 7,688,275.

(60) Provisional application No. 60/925,394, filed on Apr. 20, 2007, provisional application No. 60/916,655, filed on May 8, 2007.

(51) **Int. Cl.**
H01Q 9/16 (2006.01)

(52) **U.S. Cl.**
USPC **343/820; 343/844; 343/850; 343/853**

(58) **Field of Classification Search**

USPC 343/700, 820, 844, 850, 860, 893, 343/853; 455/552.1

See application file for complete search history.

(56) **References Cited**

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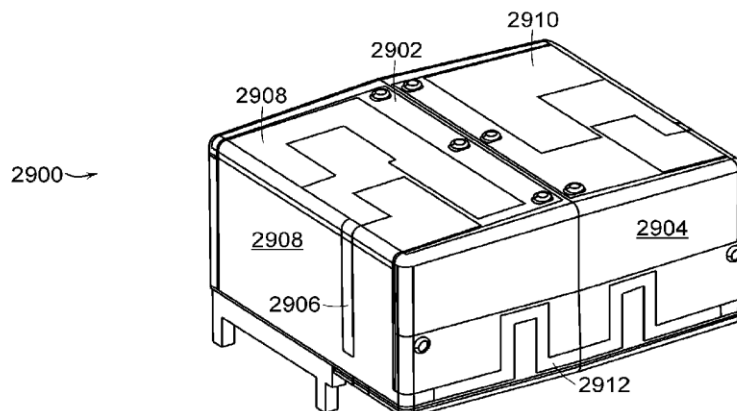
Primary Examiner — Tho G Phan

(74) *Attorney, Agent, or Firm* — Guntin & Gust, PLC; Andrew Gust

(57) **ABSTRACT**

A multimode antenna structure transmits and receives electromagnetic signals in a communications device.

20 Claims, 67 Drawing Sheets



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

(54) **COMMUNICATION DEVICE WITH EMBEDDED ANTENNA**

(75) Inventors: **Min-Chung Wu**, Taoyuan County (TW);
Shao-Chin Lo, Miaoli (TW)

(73) Assignee: **Ralink Technology Corp.**, Jhubei,
Hsinchu County (TW)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 457 days.

(21) Appl. No.: 12/895,795

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

(65) **Prior Publication Data**

US 2011/0095963 A1 Apr. 28, 2011

(30) **Foreign Application Priority Data**

Oct. 22, 2009 (TW) 98135751 A

(51) **Int. Cl.**
H01Q 1/50 (2006.01)
H01Q 1/24 (2006.01)

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

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US008548396B2

(12) **United States Patent**
Yoon

(10) **Patent No.:** **US 8,548,396 B2**
(45) **Date of Patent:** **Oct. 1, 2013**

(54) **ANTENNA ELEMENT AND
COMMUNICATION APPARATUS**

(75) Inventor: **Sung-Hyuk Yoon**, Nagano (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 334 days.

(21) Appl. No.: **12/984,131**

(22) Filed: **Jan. 4, 2011**

(65) **Prior Publication Data**

US 2011/0189963 A1 Aug. 4, 2011

(30) **Foreign Application Priority Data**

Feb. 4, 2010 (JP) 2010-023421

(51) **Int. Cl.**
H04B 1/38 (2006.01)
H01Q 11/00 (2006.01)
H01Q 1/36 (2006.01)

(52) **U.S. Cl.**
USPC **455/90.2**; 343/700; 343/843; 343/893

(58) **Field of Classification Search**
USPC 455/552, 552.1, 553, 553.1, 562.1,
455/575.7; 343/700
See application file for complete search history.

(56) **References Cited**

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Primary Examiner — Nay A Maung

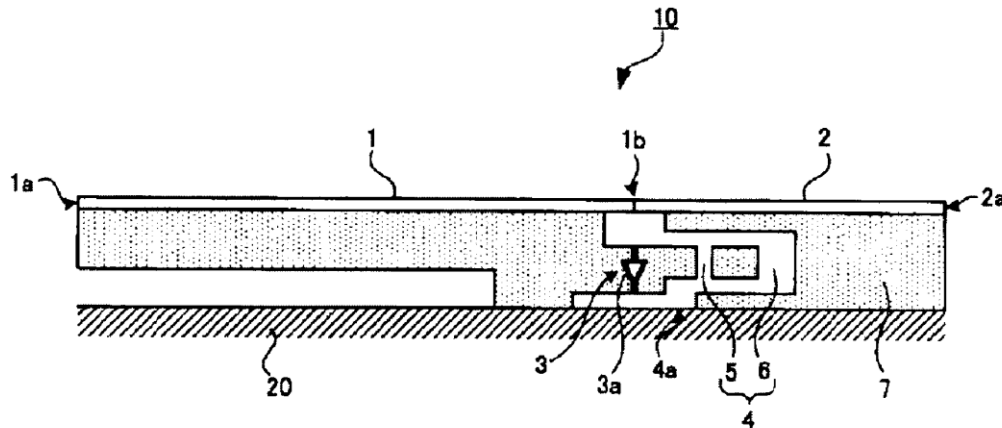
Assistant Examiner — Maryam Soltanzadeh

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

(57) **ABSTRACT**

An antenna element includes a feeding path unit connected to a feeding point, first and second antenna main body units, and first and second short-circuit path units. The first antenna main body unit has one end connected to the feeding path unit and the other end that is opened. The second antenna main body unit has one end connected to a connection point between the feeding path unit and the first antenna main body unit and the other end that is opened. The first short-circuit path unit contributes to a resonance to a radio signal in a predetermined first frequency band, and is formed between the connection point and a ground point. The second short-circuit path unit contributes to a resonance to a radio signal in a second frequency band higher than the first frequency band, and has a path length different from that of the first short-circuit path unit.

17 Claims, 14 Drawing Sheets



Structural example of antenna element of first embodiment



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US008552912B2

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

(10) **Patent No.:** **US 8,552,912 B2**
(45) **Date of Patent:** **Oct. 8, 2013**

(54) **ANTENNA FOR THIN COMMUNICATION APPARATUS**

(75) Inventors: **Ching-Sung Wang**, Taoyuan County (TW); **Min-Che Chen**, Taoyuan County (TW)

(73) Assignee: **HTC Corporation**, 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 381 days.

(21) Appl. No.: **12/269,888**

(22) Filed: **Nov. 13, 2008**

(65) **Prior Publication Data**

US 2009/0128426 A1 May 21, 2009

(30) **Foreign Application Priority Data**

Nov. 15, 2007 (TW) 96143267 A

(51) **Int. Cl.**
H01Q 1/24 (2006.01)
H01Q 9/38 (2006.01)
H01Q 9/30 (2006.01)

(52) **U.S. Cl.**
USPC 343/702; 343/828; 343/829; 343/846

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

(56) **References Cited**

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Primary Examiner — Jacob Y Choi

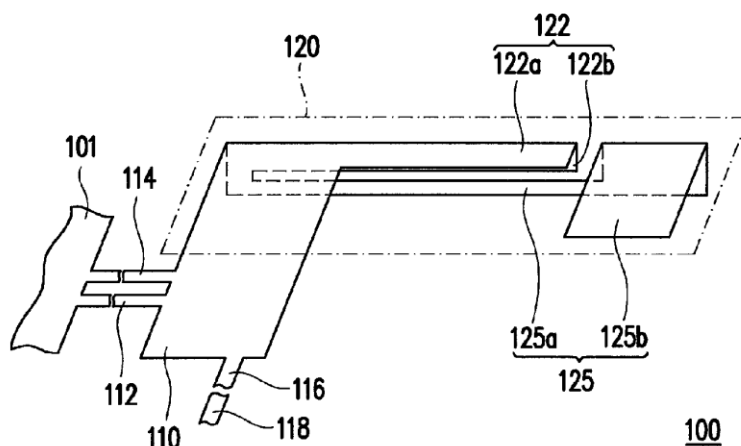
Assistant Examiner — Graham Smith

(74) Attorney, Agent, or Firm — Jianq Chyun IP Office

(57) **ABSTRACT**

A PIFA for a thin communication apparatus is provided. The PIFA includes a main body, a ground area and two ground segments, wherein the ground segments are adjacent with each other and extending out from a same side of the ground area. The SAR value and a required height for setting the antenna can be reduced through the design of two grounding paths on the antenna.

16 Claims, 4 Drawing Sheets



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US008552913B2

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

(10) **Patent No.:** **US 8,552,913 B2**
(45) **Date of Patent:** ***Oct. 8, 2013**

(54) **HIGH ISOLATION MULTIPLE PORT
ANTENNA ARRAY HANDHELD MOBILE
COMMUNICATION DEVICES**

(75) Inventors: **Mina Ayatollahi**, Waterloo (CA);
Qinjiang Rao, Waterloo (CA)

(73) Assignee: **BlackBerry 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 347 days.

This patent is subject to a terminal dis-
claimer.

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(21) Appl. No.: **12/776,678**

International Search Report and Written Opinion for Application No.
PCT/CA2011/050284, Aug. 3, 2011.

(22) Filed: **May 10, 2010**

(Continued)

(65) **Prior Publication Data**

US 2010/0238079 A1 Sep. 23, 2010

Related U.S. Application Data

(63) Continuation-in-part of application No. 12/405,955,
filed on Mar. 17, 2009, now Pat. No. 8,085,202.

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

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

(58) **Field of Classification Search**
USPC 343/702, 770, 767, 725, 729, 893
See application file for complete search history.

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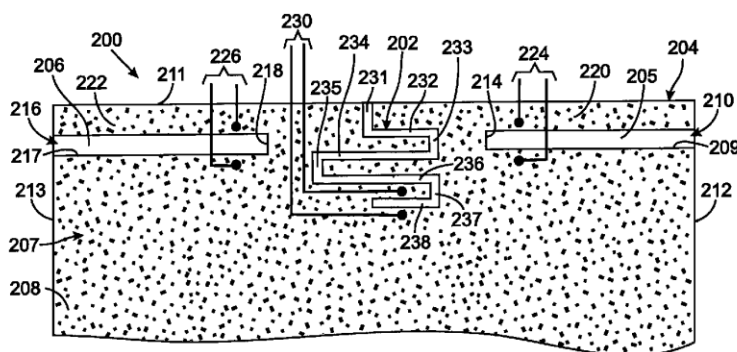
Primary Examiner — Hoanganh Le

(74) *Attorney, Agent, or Firm* — Moffat & Co.; Timothy
Clise; Joseph Ulvr

(57) **ABSTRACT**

A multiple input-multiple output antenna assembly with high isolation between the antennas is disclosed. The antenna assembly includes a substrate with a ground layer at its surface. Two antennas are disposed opposing each other on the substrate. A meandering slot is interposed between the first and second antennas on the ground plane. A first signal port is provided for applying a first signal to excite the first antenna and a second signal port is provided for applying a second signal to excite the second antenna. The meandering slot provides isolation that inhibits electromagnetic propagation between the first and second antennas. A third signal port is provided for applying a third signal to excite the meandering slot to act as another antenna for multiple input, multiple output operation.

29 Claims, 5 Drawing Sheets



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US008552914B2

(12) **United States Patent**
Xie

(10) **Patent No.:** **US 8,552,914 B2**
(45) **Date of Patent:** **Oct. 8, 2013**

(54) **ANTENNA AND ANTENNA ASSEMBLY
USING SAME**

(75) Inventor: **Jia-Jun Xie**, Shenzhen (CN)

(73) Assignees: **AAC Acoustic Technologies
(Shenzhen) Co., Ltd.**, Shenzhen (CN);
American Audio Components Inc., La
Verne, CA (US)

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 364 days.

(21) Appl. No.: **13/015,903**

(22) Filed: **Jan. 28, 2011**

(65) **Prior Publication Data**
US 2011/0260938 A1 Oct. 27, 2011

(30) **Foreign Application Priority Data**
Apr. 27, 2010 (CN) 2010 2 0178660 U

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

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

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

(56) **References Cited**

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Primary Examiner — Hoanganh Le

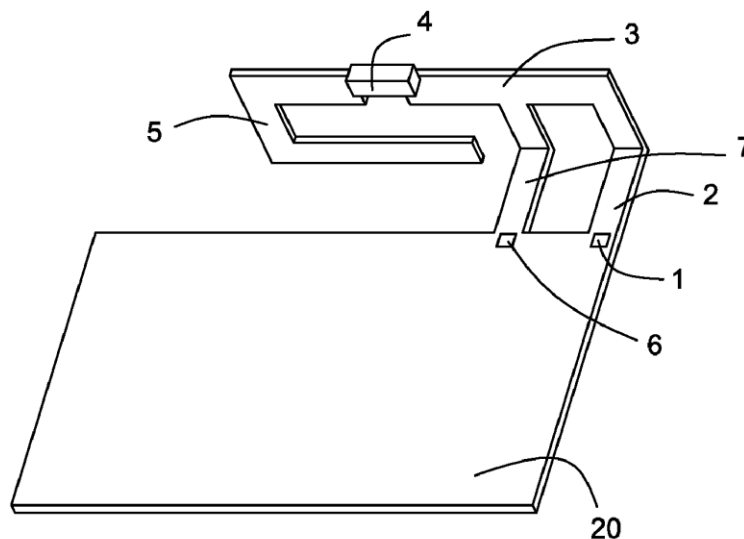
(74) *Attorney, Agent, or Firm* — IPro, Inc.; Na Xu

(57) **ABSTRACT**

The present invention provides an antenna for transmitting/receiving a first frequency signal and a second frequency signal. The antenna includes a first frequency antenna branch for transmitting/receiving the first frequency signal, a second frequency antenna branch separated from the first frequency antenna branch for transmitting/receiving the second frequency signal and an inductance for connecting the first and second frequency antenna branches in series with one another. The inductance is capable of preventing the first frequency signal passing through the second frequency antenna branch.

12 Claims, 3 Drawing Sheets

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US008552916B2

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

(10) **Patent No.:** **US 8,552,916 B2**
(45) **Date of Patent:** **Oct. 8, 2013**

(54) **ANTENNA AND RADIO COMMUNICATION APPARATUS**

(75) Inventors: **Md. Golam. Sorwar Hossain**, Kawasaki (JP); **Takashi Yamagajo**, Kawasaki (JP)

(73) Assignee: **Fujitsu Limited**, Kawasaki (JP)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 395 days.

(21) Appl. No.: **12/889,689**

(22) Filed: **Sep. 24, 2010**

(65) **Prior Publication Data**

US 2011/0128200 A1 Jun. 2, 2011

(30) **Foreign Application Priority Data**

Nov. 27, 2009 (JP) 2009-269934

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

(52) **U.S. Cl.**
USPC **343/745**

(58) **Field of Classification Search**
USPC 343/745
See application file for complete search history.

(56) **References Cited**

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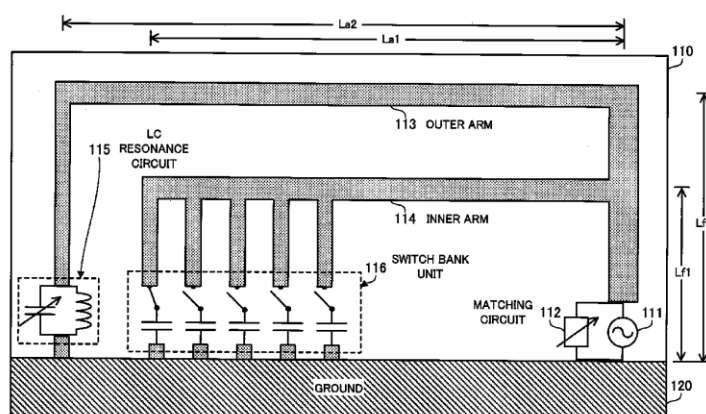
Primary Examiner — Jerome Jackson, Jr.
Assistant Examiner — Hai Tran

(74) *Attorney, Agent, or Firm* — Katten Muchin Rosenman LLP

(57) **ABSTRACT**

An antenna includes a first arm whose one end is connected to a feeding unit, a second arm whose one end is connected to the first arm at a position that is away from the one end of the first arm and whose other end is connected to ground, and a variable impedance unit whose impedance is variable, provided between the ground and the other end of the first arm.

3 Claims, 13 Drawing Sheets



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US008552919B2

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

(10) **Patent No.:** **US 8,552,919 B2**

(45) **Date of Patent:** **Oct. 8, 2013**

(54) **ANTENNA MODULE**

(75) Inventors: **Shih-Wei Hsieh**, Taipei (TW);
Shyh-Tirng Fang, Tai-Nan (TW)

(73) Assignee: **Mediatek Inc.**, Hsin-Chu (TW)

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

(21) Appl. No.: **13/069,643**

(22) Filed: **Mar. 23, 2011**

(65) **Prior Publication Data**

US 2012/0242555 A1 Sep. 27, 2012

(51) **Int. Cl.**
H01Q 19/00 (2006.01)

(52) **U.S. Cl.**
USPC **343/833; 343/722**

(58) **Field of Classification Search**
USPC 343/747, 833, 834, 722, 767, 702,
343/700 MS
See application file for complete search history.

(56) **References Cited**

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Primary Examiner — Thien M Le

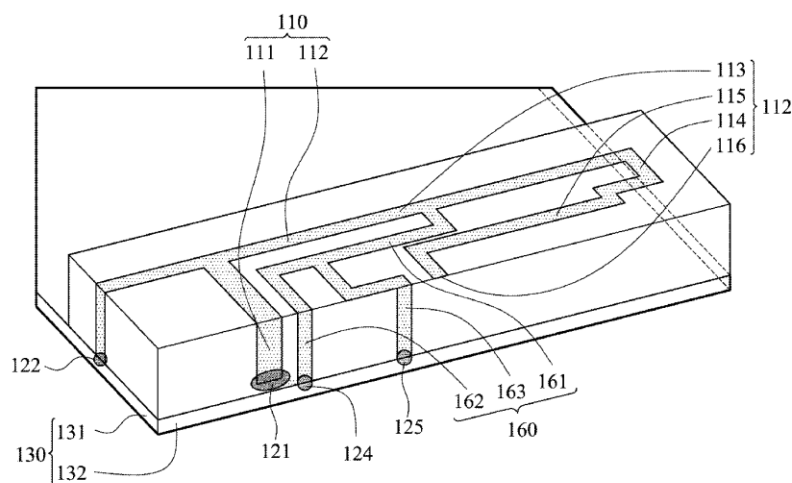
(74) *Attorney, Agent, or Firm* — McClure, Qualey & Rodack, LLP

(57) **ABSTRACT**

An antenna module is provided. The antenna module includes a radiator, a feed pin, a ground element, a first parasitic arm, a second parasitic arm and an impedance matching unit. The radiator includes a first section and a second section, wherein an end of the first section is connected to the second section, and the first section is perpendicular to the second section. The feed pin is connected to another end of the first section. The first parasitic arm is parallel to the second section, wherein an end of first parasitic arm is connected to the ground element, and the first parasitic arm couples with the second section of the radiator. The impedance matching unit is connected to the second section and the ground element. The second parasitic arm is partially parallel to the first section, and the second parasitic arm couples with the first section of the radiator, and an end of the second parasitic arm is connected to the ground element.

19 Claims, 5 Drawing Sheets

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US008553396B2

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

(10) **Patent No.:** **US 8,553,396 B2**

(45) **Date of Patent:** **Oct. 8, 2013**

(54) **COMMUNICATIONS DEVICE CAPABLE OF COUPLING CURRENT REDUCTION**

(75) Inventors: **Chieh-Ping Chiu**, Tianwei (TW);
Feng-Jen Weng, Tao Yuan Shien (TW);
Hsiao-Wei Wu, Zhongli (TW); **I-Ping Yen**, New Taipei (TW)

(73) Assignee: **Quanta Computer, Inc.**, Tao Yuan Hsien (TW)

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

(21) Appl. No.: **13/085,821**

(22) Filed: **Apr. 13, 2011**

(65) **Prior Publication Data**

US 2012/0075780 A1 Mar. 29, 2012

(30) **Foreign Application Priority Data**

Sep. 28, 2010 (TW) 99132764 A

(51) **Int. Cl.**
H05K 5/00 (2006.01)

(52) **U.S. Cl.**
USPC ... **361/679.01**; 361/752; 361/753; 455/575.1;
455/575.4; 455/574

(58) **Field of Classification Search**
USPC 361/752–756, 679.01, 679.27, 814;
455/575.1–575.4, 574

See application file for complete search history.

(56) **References Cited**

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Primary Examiner — Jayprakash N Gandhi

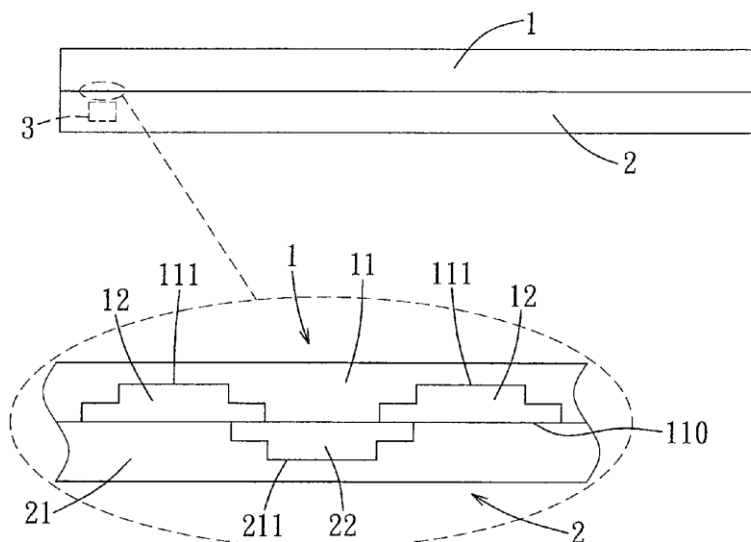
Assistant Examiner — Hung Dang

(74) *Attorney, Agent, or Firm* — Brinks Hofer Gilson & Lione

(57) **ABSTRACT**

A communications device capable of coupling current reduction includes a first casing, a second casing, and an antenna. The first casing includes a first metal layer part. The second casing includes a second metal layer part. The antenna is adjacent to the first and second metal layer parts when the second casing is at a covering position. The first metal layer part has a surface that confronts the second metal layer part when the second casing is at the covering position and that is formed with a plurality of first recesses. The second metal layer part has a surface that confronts the first metal layer part when the second casing is at the covering position and that is formed with a plurality of second recesses.

10 Claims, 8 Drawing Sheets



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US008558742B2

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

(10) **Patent No.:** **US 8,558,742 B2**

(45) **Date of Patent:** **Oct. 15, 2013**

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

(75) Inventors: **Chen-Yu Chou**, New Taipei (TW);
Chih-Wei Lee, New Taipei (TW);
Chang-Hsin Lai, New Taipei (TW)

(73) Assignee: **Wistron Corporation**, Hsichih, New Taipei (TW)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 211 days.

(21) Appl. No.: **13/314,150**

(22) Filed: **Dec. 7, 2011**

(65) **Prior Publication Data**
US 2013/0063312 A1 Mar. 14, 2013

(30) **Foreign Application Priority Data**
Sep. 14, 2011 (TW) 100217190 U

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

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

(58) **Field of Classification Search**

USPC 343/700 MS, 702
See application file for complete search history.

(56) **References Cited**

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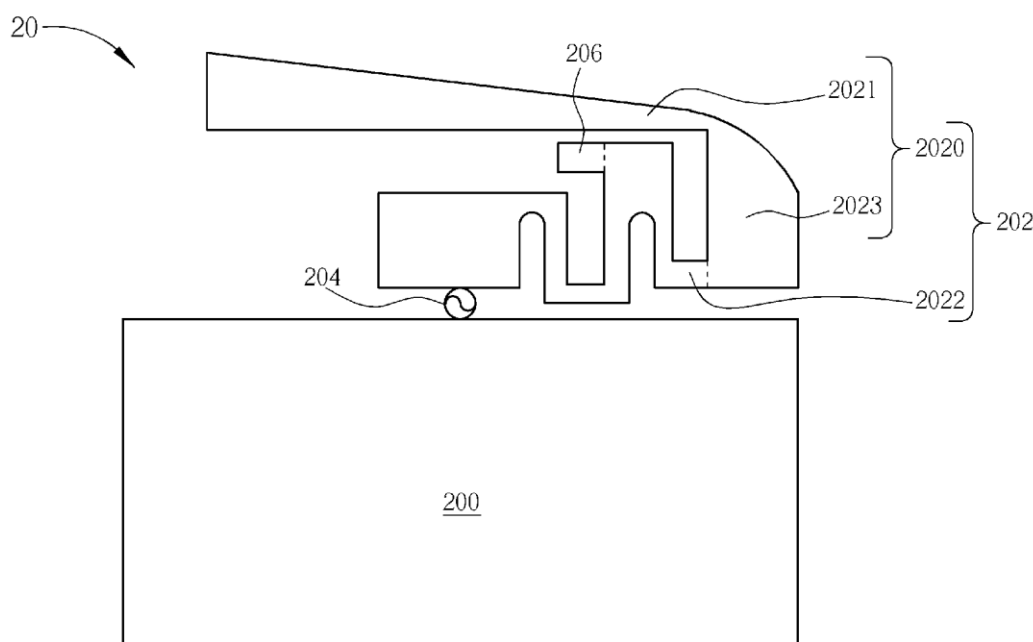
Primary Examiner — Hoang V Nguyen

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

(57) **ABSTRACT**

A monopole antenna for an electronic device includes a grounding element electrically connected to a ground, a radiating element including a first radiator and a second radiator for transmitting and receiving a wireless signal of a first frequency band, a coupling element electrically connected to the second radiator for transmitting and receiving a wireless signal of a second frequency band, and a feed-in element electrically connected between the second radiator of the radiating element and the grounding element for transmitting the wireless signals of the first frequency band and the second frequency band.

14 Claims, 8 Drawing Sheets



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US008558748B2

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

(10) **Patent No.:** **US 8,558,748 B2**

(45) **Date of Patent:** **Oct. 15, 2013**

(54) **PRINTED DUAL-BAND YAGI-UDA ANTENNA
AND CIRCULAR POLARIZATION ANTENNA**

(75) Inventors: **Xin-Chang Chen**, Taipei (TW);
Min-Chung Wu, Taoyuan County (TW)

(73) Assignee: **Ralink Technology Corp.**, Jhubei,
Hsinchu County (TW)

(*) Notice: Subject to any disclaimer, the term of this
patent is extended or adjusted under 35
U.S.C. 154(b) by 468 days.

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(21) Appl. No.: **12/895,765**

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

(65) **Prior Publication Data**

US 2011/0090131 A1 Apr. 21, 2011

(30) **Foreign Application Priority Data**

Oct. 19, 2009	(TW)	98135250 A
Oct. 22, 2009	(TW)	98135749 A

(51) **Int. Cl.**
H01Q 21/12 (2006.01)
H01Q 9/16 (2006.01)
H01Q 11/10 (2006.01)

(52) **U.S. Cl.**
USPC **343/815**; 343/792.5; 343/795; 343/822;
343/793; 343/818

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

(56) **References Cited**

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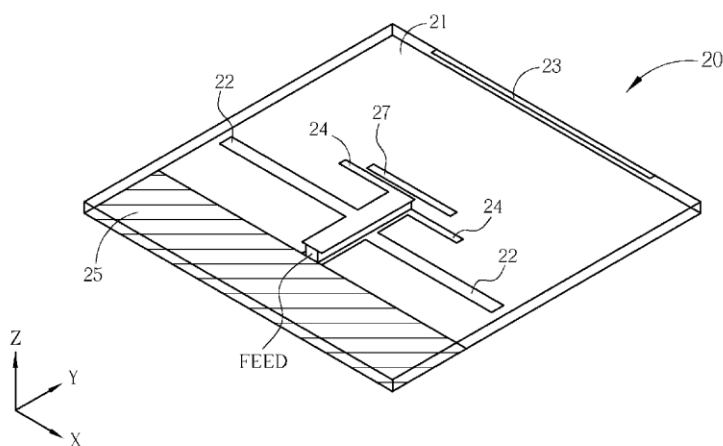
Primary Examiner — Trinh Dinh

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

(57) **ABSTRACT**

A printed dual-band Yagi-Uda antenna is disclosed, which includes a substrate, a first driver, a first director, a second driver and a reflector. The first driver is formed on the substrate, and is utilized for generating a radiation pattern of a first frequency band. The first director is formed at a side of the first driver on the substrate, and is utilized for directing the radiation pattern of the first frequency band toward a first direction. The second driver is formed between the first driver and the first director on the substrate, and is utilized for generating a radiation pattern of a second frequency band. The reflector is formed at another side of the first driver on the substrate, and is utilized for reflecting both the radiation patterns of the first frequency band and the second frequency band toward the first direction.

21 Claims, 18 Drawing Sheets



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US008559897B2

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

(10) **Patent No.:** **US 8,559,897 B2**

(45) **Date of Patent:** **Oct. 15, 2013**

(54) **INFORMATION PROCESSING APPARATUS
AND RADIO WAVE INTENSITY CONTROL
METHOD**

(75) Inventors: **Yasuhiko Isobe**, Inagi (JP); **Michihiro
Konishi**, Sagamihara (JP)

(73) Assignee: **Fujitsu Limited**, Kawasaki (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.: **13/447,422**

(22) Filed: **Apr. 16, 2012**

(65) **Prior Publication Data**

US 2012/0276861 A1 Nov. 1, 2012

(30) **Foreign Application Priority Data**

Apr. 28, 2011 (JP) 2011-100395

(51) **Int. Cl.**
H01Q 11/12 (2006.01)
H04B 1/04 (2006.01)

(52) **U.S. Cl.**
USPC **455/117; 455/127.2**

(58) **Field of Classification Search**
USPC 455/575.7, 115.1, 117, 127.2, 129
See application file for complete search history.

(56) **References Cited**

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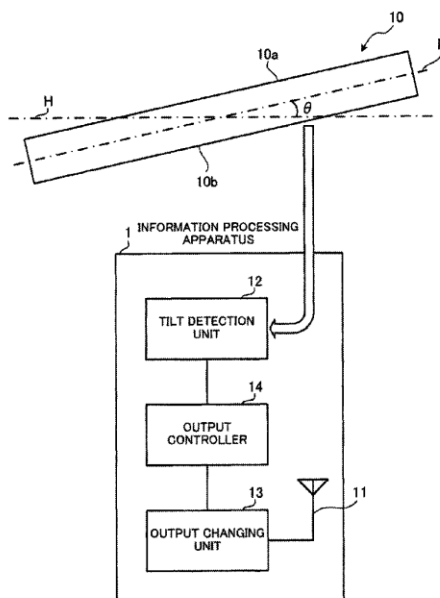
Primary Examiner — Nguyen Vo

(74) Attorney, Agent, or Firm — Fujitsu Patent Center

(57) **ABSTRACT**

An information processing apparatus has radio communication function. A tilt detection unit detects a tilt of the information processing apparatus. An output changing unit changes an output of radio waves from an antenna for radio communication. Based on a detection result through the tilt detection unit, when a tilt θ of a predetermined external surface of a chassis of the information processing apparatus to a horizontal surface H is a predetermined angle or less, an output controller reduces an output of radio waves from the antenna to a predetermined value or less with respect to the output changing unit.

9 Claims, 15 Drawing Sheets



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