A communication device includes a ground element and an antenna element. The antenna element includes a first radiation element, a second radiation element, and a control circuit. One end of the first radiation element is coupled to a signal source, and another end of the first radiation element is an open end. The second radiation element includes at least a first portion and a second portion. A first end of the first portion is a shorted end coupled to the ground element, and a fourth end of the second portion is an open end. The second radiation element surrounds the open end of the first radiation element. The control circuit is coupled between a second end of the first portion and a third end of the second portion of the second radiation element. The control circuit provides at least two different impedances.

10 Claims, 6 Drawing Sheets
WIRELESS COMMUNICATION APPARATUS

Inventor: Akihiro Bungo, Tokyo (JP)

Assignees: Sony Corporation, Tokyo (JP); Sony Mobile Communications Inc., Tokyo (JP)

Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 269 days.

Appl. No.: 13/541,162
Filed: Jul. 3, 2012

Prior Publication Data

Related U.S. Application Data
Provisional application No. 61/537,109, filed on Sep. 21, 2011.

Int. Cl.
H01Q 1/24 (2006.01)
H01Q 1/52 (2006.01)
H01Q 21/28 (2006.01)
H01Q 25/00 (2006.01)

U.S. CL
CPC .......................... H01Q 1/243 (2013.01); H01Q 1/521 (2013.01); H01Q 21/28 (2013.01); H01Q 25/00 (2013.01)

Field of Classification Search
CPC ......... H01Q 1/243; H01Q 21/28; H01Q 1/521
USPC ............. ................................. 343/702, 767
See application file for complete search history.

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U.S. PATENT DOCUMENTS
8,483,751 B2 * 7/2013 Black et al. ............ 455/552.1

FOREIGN PATENT DOCUMENTS
CN 201289902 Y 8/2009
CN 101736957 A 6/2010

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Primary Examiner — Dien H Duong
Attorney, Agent, or Firm — Oblon, McClelland, Maier & Neustadt, L.L.P.

ABSTRACT

A wireless communication apparatus that includes a first antenna section having a first power feed point; a second antenna section having a second power feed point; a first electrically conductive plate extending between the first antenna section and the second antenna section; a second electrically conductive plate disposed substantially in parallel with the first electrically conductive plate and extending between the first antenna section and the second antenna section; and a short-circuiting member that electrically short-circuits the first electrically conductive plate and the second electrically conductive plate to each other such that a slit is formed by a part of a periphery of the first electrically conductive plate and a part of a periphery of the second electrically conductive plate.

11 Claims, 31 Drawing Sheets
A wireless device includes: a casing having a first face; a display configured to be visible from the first face; a touch sensor formed by a transparent material and mounted in the casing with respect to the display as a part of the first face; a substrate mounted to a side opposite the first face with respect to the display; and an antenna element including: a first portion built in the casing, connected to a feeding point included in the substrate, and located within a first range occupied by the touch sensor when viewed from a direction perpendicular to the first face; and a second portion located within a second range other than the first range.
An antenna comprising a laminate of dielectric ceramic layers each provided with electrode patterns, the laminate comprising a first terminal electrode connected to a feed line and a second terminal electrode for grounding on the lower surface, a radiation electrode on the upper surface or on a layer near the upper surface, and a coupling electrode between the lower surface and the radiation electrode; the coupling electrode being connected to the first terminal electrode through via-holes; the radiation electrode being connected to the second terminal electrode through via-holes; and the coupling electrode being partially opposite to the radiation electrode in a lamination direction to form a capacitance-coupling portion.
ANTENNA SYSTEM FOR WIRELESS COMMUNICATION DEVICE

Applicant: Wistron NeWeb Corporation, Hsinchu (TW)

Inventors: Ming-Fong Chang, Hsinchu (TW); Kai-Yang Cheng, Hsinchu (TW)

Assignee: Wistron NeWeb Corporation, Hsinchu Science Park, Hsinchu (TW)

Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 298 days.

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Prior Publication Data

Foreign Application Priority Data

Int. Cl. H01Q 21/28 (2006.01) H01Q 13/10 (2006.01) H01Q 1/52 (2006.01)

U.S. Cl. CPC H01Q 21/28 (2013.01); H01Q 1/521 (2013.01); H01Q 13/10 (2013.01); H01Q 13/106 (2013.01)

Field of Classification Search
CPC: H01Q 13/10; H01Q 13/106; H01Q 21/28
See application file for complete search history.

References Cited

U.S. PATENT DOCUMENTS
2013/0314293 A1* 11/2013 Wong et al. ............... 343/848
* cited by examiner

Primary Examiner -- Robert Karacsonyi

ABSTRACT

The present invention discloses an antenna system for a wireless communication device, which includes a first metal slice formed with a first slot structure, a second metal slice formed with a second slot structure, a first signal transmission line, and a second signal transmission line, wherein when the first metal slice and the second metal slice are not connected and have a distance between each other, a feeding direction of the first transmission corresponding to the first metal slice is substantially opposite to a feeding direction of the second transmission corresponding to the second metal slice; or when the first metal slice and the second metal slice are partially connected, a feeding direction of the first transmission corresponding to the first metal slice is substantially the same as or different to a feeding direction of the second transmission corresponding to the second metal slice.

12 Claims, 10 Drawing Sheets
United States Patent
Ko et al.

Wireless Communication Device Having Metal Assembly and Conductive Assembly for Reducing Specific Absorption Rate (SAR)

Applicant: FIH (Hong Kong) Limited, Kowloon (HK)

Inventors: Cheng-Hung Ko, Shindian (TW); Chao-Wei Ho, New Taipei (TW)

Assignee: FIH (Hong Kong) Limited, Kowloon (HK)

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

Appl. No.: 14/132,488
Filed: Dec. 18, 2013

Prior Publication Data

Foreign Application Priority Data
Jun. 24, 2013 (TW) 102122425 A

Int. Cl.
H01Q 1/38 (2006.01)
H01Q 1/24 (2006.01)
H01Q 9/04 (2006.01)
H01Q 5/371 (2015.01)

Field of Classification Search
CPC……………H01Q 1/24 (2013.01); H01Q 1/245 (2013.01); H01Q 5/371 (2015.01); H01Q 9/0421 (2013.01)

References Cited

U.S. PATENT DOCUMENTS

* cited by examiner

Primary Examiner — Sue A Purvis
Assistant Examiner — Joe Kim
Attorney, Agent, or Firm — Novak Druce Connolly Bove + Quigg LLP

ABSTRACT
A wireless communication device includes a base board, an antenna, a metal assembly, and a conductive assembly. The base board includes a feed portion and a ground portion, and defines a keep-out-zone. The antenna is located above the keep-out-zone, and is electronically connected to the feed portion and the ground portion. The metal assembly is located at the keep-out-zone, and is spaced from the antenna. The metal assembly is electronically connected to the feed portion and the ground portion through the conductive assembly.

9 Claims, 1 Drawing Sheet
TITLE

INSERT TYPE ANTENNA MODULE FOR PORTABLE TERMINAL AND METHOD FOR MANUFACTURING THE SAME

APPLICANT

Sang-Yong Ma, AnSan-si (KR)

INVENTOR

Sang-Yong Ma, AnSan-si (KR)

NATURE

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.

APPL. NO.: 14/247,337

FILED: Apr. 8, 2014

PRIORITY:

US 2014/0230237 A1 Aug. 21, 2014

US PATENT DOCUMENTS

6,369,777 B4 * 4/2002 Ohara et al. 343:395
6,006,092 B8 6/2003 Komine 343:702

* cited by examiner

ABSTRACT

The present invention relates to an antenna module for an insert type antenna module for a portable terminal and a method for manufacturing the same. More specifically, the method for manufacturing an insert type antenna module for a portable terminal comprises an antenna radiation part manufacture step wherein an antenna core is manufactured, the antenna core being engaged by an insert so that an antenna radiation part configured in a predetermined shape selected between a plane shape and a curved shape with at least one axis by cutting and bending a conductive metal sheet is exposed toward an outer surface of one side, wherein in the antenna radiation part manufacture step, in the core forming mold is disposed an antenna support protrusion maintaining a gap for the sake of a thickness development of the antenna core.

16 Claims, 13 Drawing Sheets
ELECTRONIC DEVICE WITH CAPACITIVELY LOADED ANTENNA

Inventors: Salih Yarga, Sunnyvale, CA (US);
Qingxiang Li, Mountain View, CA (US);
Robert W. Schlab, Cupertino, CA (US)

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

Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 273 days.

App. No.: 13/790,549
Filed: Mar. 8, 2013

Prior Publication Data
US 2014/0253392 A1 Sep. 11, 2014

Int. Cl.
H01Q 1/24 (2006.01)
H01Q 1/36 (2006.01)
H01Q 5/328 (2015.01)
H01Q 5/335 (2015.01)
H01Q 5/371 (2015.01)

CPC ............ H01Q 1/36 (2013.01); H01Q 1/243 (2013.01); H01Q 5/328 (2015.01); H01Q 5/335 (2015.01); H01Q 5/371 (2015.01)

Field of Classification Search
CPC ............ H01Q 1/36; H01Q 1/243; H01Q 5/0058; H01Q 5/0041; H01Q 5/0037
USPC ............ 343/702, 700 MS, 749, 750, 752, 745
See application file for complete search history.

References Cited
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2012/0046002 A1 2/2012 Hill et al.
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Primary Examiner — Hounghn Le
(74) Attorney, Agent, or Firm — Treyz Law Group, G. Victor Treyz, Joseph F. Gulhan

ABSTRACT

An electronic device may have an antenna for providing coverage in wireless communications bands of interest such as a low frequency communications band, a middle frequency communications band, and a high frequency communications band. Slot structures in the antenna that might reduce efficiency in the high frequency communications band may be avoided by capacitively loading the antenna and omitting meandering paths in the antenna. A capacitor may be coupled between an antenna ground formed from a metal housing structure and an antenna resonating element having a curved shape that conforms to the shape of the edge of the electronic device. The capacitor may have interdigitated fingers and may be adjustable to tune the antenna. The antenna may transmit and receive radio-frequency signals through a display cover layer in a display and a dielectric antenna window portion of the housing.

14 Claims, 16 Drawing Sheets
An electronic device case having an antenna pattern embedded therein includes: a radiator having an antenna pattern portion transmitting and receiving a signal and a connection terminal portion allowing the signal to be transmitted to and received from a circuit board of an electronic device; a connection portion partially forming the radiator and connecting the antenna pattern portion and the connection terminal portion to be arranged in different planes; a radiator frame manufactured by injection molding on the radiator so that the antenna pattern portion of the radiator is provided on one side of the radiator frame and the connection terminal portion is provided on the other side thereof; and a case frame covering the one side of the radiator frame on which the antenna pattern portion is provided so that the antenna pattern portion is embedded between the case frame and the radiator frame.

2 Claims, 19 Drawing Sheets
United States Patent

Chan et al.

Patent No.: US 9,099,766 B2
Date of Patent: Aug. 4, 2015

Inventors: Ming-Chieh Chan, Tao Yuan Shien (TW); Chun-I Lin, Tao Yuan Shien (TW); Hui Lin, Tao Yuan Shien (TW)

Assignee: QUANTA COMPUTER INC., Guishan Dist., Taoyuan (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.

Appl. No.: 14/181,014
Filed: Feb. 14, 2014

Prior Publication Data

Foreign Application Priority Data
Nov. 4, 2013 (TW) 102139900 A

Int. Cl.
H01Q 5/00 (2015.01)

U.S. Cl.
CPC ............ H01Q 5/0093 (2013.01); H01Q 5/0027 (2013.01)

Field of Classification Search
CPC ...................... H01Q 5/0093; H01Q 5/0027
See application file for complete search history.

References Cited
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* cited by examiner

Primary Examiner — Trinh Dinh
(74) Attorney: Agent, or Firm — McClure, Qualey & Rodack, LLP

ABSTRACT
An antenna structure includes a ground plane, a feeding element, and a coupling radiation element. The feeding element is coupled to a signal source. The feeding element substantially has a T-shape. The coupling radiation element is separate from the feeding element and is adjacent to the feeding element. The coupling radiation element is further coupled to the ground plane and at least partially surrounds the feeding element.

6 Claims, 4 Drawing Sheets
ABSTRACT
An electronic device may be provided with a display and wireless circuits. The wireless circuits may include antenna structures and radio-frequency transceiver circuitry that transmits and receives radio-frequency signals using the antenna structures. A ground plane for the antenna structures may be located in the center of the electronic device under the display. A resonating element may be used to reduce signal interference that otherwise arises when simultaneously operating the display and the antenna structures. The resonating element may be implemented using an L-shaped structure have an arm that extends parallel to one of the edges of the display.

20 Claims, 5 Drawing Sheets
AN ANTENNA APPARATUS FOR PORTABLE TERMINAL

Inventor: Young-Mi Kwon, Bucheon-si (KR)

Assignee: SAMSUNG ELECTRONICS CO., LTD., Suwon-Si (KR)

Notice: Subject to any disclaimer, the term of this patent is estimated or adjusted under 35 U.S.C. 154(b) by 498 days.

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Prior Publication Data

Foreign Application Priority Data
Dec. 8, 2010 (KR) 10-2010-0124717

Int. CL
H01Q 1/24 (2006.01)
H01Q 1/44 (2006.01)
H01Q 9/04 (2006.01)
H04M 1/02 (2006.01)

U.S. CL
CPC H01Q 1/243 (2013.01); H01Q 1/44

ABSTRACT
An antenna apparatus for a portable terminal includes a main board and a display device. The main board has a ground for grounding and a feed terminal for feeding. The display device electrically communicates with the main board by the medium of a Flexible Printed Circuit Board (FPCB) and has an ElectroStatic Charge (ESD) prevention ground. If the display device is mounted above the main board, the ESD prevention ground of the display device comes in electric contact with the feed terminal of the main board, for emission.

17 Claims, 4 Drawing Sheets
An apparatus including an antenna having an active element and a parasitic element; and at least one support, where the antenna is at least partially on the at least one support, where the at least one support includes a first section coupled to a second different section, where the active element is at least partially on the first section, and where the first section is at least partially formed with a first manufacturing process and a first material. The parasitic element is at least partially on the second section, and the second section is at least partially formed with a second different manufacturing process and a second different material.
An antenna assembly employed by a wireless communication device having a housing includes a base board, a grounding member secured on the base board and grounding the antenna assembly, a first radio member electrically connected to the based board to receive and transmit wireless signals having a first central frequency, and a second radio member forming a portion of the housing and electrically connected to the grounding member. The second radio member couples with the first radio member to receive and transmit wireless signals having a second central frequency.

13 Claims, 4 Drawing Sheets
Antenna Device for Circuit Board

Inventor: Shih-Chieh Cheng, Hsinchu (TW)
Assignee: Arcadyan Technology Corp., Hsinchu (TW)

Abstract
An antenna device is provided. The antenna device includes a circuit board including a first side configured with a transmission unit, and a second side opposite to the first side; a main radiator disposed at the first side, electrically connected to the transmission unit, and having a major axis direction; a first parasitic radiator adjacent to the main radiator, and coaxially disposed in the major axis direction at the first side; and a second parasitic radiator coaxially disposed in the major axis direction at the second side.
ARRAY ANTENNA OF MOBILE TERMINAL AND IMPLEMENTING METHOD THEREOF

Inventors: Hui Jiang, Shenzhen (CN); Hao Ai, Shenzhen (CN); Lu Zhang, Shenzhen (CN); Ying Liu, Shenzhen (CN); Chao Li, Shenzhen (CN)

Assignee: ZTE Corporation (CN)

Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 266 days.

Appl. No.: 13/076,700
FCT Filed: Jun. 13, 2011

PCT No.: PCT/CN2011/0075666

Prior Publication Data

Foreign Application Priority Data
Dec. 27, 2010 (CN) 2010 1 0607713

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

US Cl.
CPC...................... H01Q 1/50 (2013.01); H01Q 1/243 (2013.01); H01Q 9/0407 (2013.01); H01Q 21/29 (2013.01); Y10T 29/49016 (2015.01)

Field of Classification Search
CPC...................... H01Q 1/50; H01Q 1/243; H01Q 21/29; Y10T 9/0407; Y10T 29/49016

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U.S. PATENT DOCUMENTS

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CN 101316008 A 12/2008
CN 101719593 A 1/2010

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Primary Examiner — Hoanganh Le

Attorney, Agent, or Firm — Plumpsea Law Group, LLC

ABSTRACT

An antenna array of a mobile terminal and an implementing method thereof are disclosed in this document. The antenna array includes a mobile terminal floorboard, configured to act as a radiation body to radiate antenna energy coupled by multiple pairs of coupling units, and multiple pairs of coupling units corresponding to multiple antennas, each of which are fixed at two ends of the mobile terminal floorboard and are configured to inspire a waveguide mode of the mobile terminal floorboard to radiate the coupled antenna energy through feed points of feed lines of each coupling unit therein, located at the same side of a dielectric material plate; and a matching circuit located at the other side of the dielectric material plate, connected with the feed points located at the opposite side of the dielectric material plate and configured to implement impedance matching of a micro-strip feed line of each coupling unit.

14 Claims, 4 Drawing Sheets
(54) DUAL-BAND INVERTED SLOT ANTENNA

(71) Applicant: AMAZON TECHNOLOGIES, INC., Reno, NV (US)

(72) Inventor: Joseph Christopher Modro, Palo Alto, CA (US)

(73) Assignee: Amazon Technologies, Inc., Reno, NV (US)

(56) References Cited

U.S. PATENT DOCUMENTS

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7,646,341 B1* 1/2010 Lin et al. 343/700 MS

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Primary Examiner — Haeding Masencop
Attorney, Agent, or Firm — Lowenstein Sandler LLP

(57) ABSTRACT

Methods and systems for radiating electromagnetic energy with a dual-band inverted slot antenna are described. The dual-band inverted slot antenna may be formed of a metallic member with two open ends at one or more edges of the metallic member. The inverted slot antenna is configured to radiate electromagnetic energy in response to the RF signal at two resonant modes.

25 Claims, 8 Drawing Sheets
A mobile device includes a ground element, a conductive bezel, a nonconductive layer, and a feeding element. The conductive bezel is substantially independent of the ground element. A slot is formed in the conductive bezel. The nonconductive layer is affixed to the conductive bezel and covers the slot of the conductive bezel. The feeding element is close to the slot of the conductive bezel and is coupled to a signal source. An antenna structure is formed by the feeding element and the slot.
A user device having a non-radiating exciter operatively coupled to feed a multi-band aperture antenna is described.

16 Claims, 18 Drawing Sheets
(12) United States Patent
(10) Patent No.: US 9,105,968 B2
(45) Date of Patent: Aug. 11, 2015

(54) ANTENNA ASSEMBLY AND MOBILE TERMINAL USING SAME

(71) Applicants: Ng Guan Hong, Shenzhen (CN); Tay Yew Siew, Shenzhen (CN)

(72) Inventors: Ng Guan Hong, Shenzhen (CN); Tay Yew Siew, Shenzhen (CN)

(73) Assignee: AAC TECHNOLOGIES PTE. LTD., Singapore (SG)

(52) U.S. CL
CPC .......... H01Q 1/243 (2013.01); H01Q 1/48 (2013.01); H01Q 5/378 (2015.01); H01Q 9/42 (2013.01)

(58) Field of Classification Search
USPC: .................................................. 343/702
See application file for complete search history.

(56) References Cited
U.S. PATENT DOCUMENTS
* cited by examiner

Primary Examiner — Graham Smith
(74) Attorney, Agent, or Firm — IPro, Inc.; Na Xu

(57) ABSTRACT
An antenna assembly of the present disclosure includes a grounding plate, a metal plate, a metal frame and an antenna body disposed between the grounding plate and the metal plate. The metal frame includes a closed annular portion, and the antenna body includes a feeding portion. One end of the feeding portion is electrically connected to the metal plate and the other end thereof is spaced apart from the grounding plate, and the closed annular portion is spaced apart from the metal plate. The antenna assembly of the present disclosure can improve the performances of the product and make the appearance of the product more aesthetic. Meanwhile, the present disclosure also provides a mobile terminal using the antenna assembly described above.

12 Claims, 6 Drawing Sheets
United States Patent

Satou et al.

ANTENNA DEVICE AND PORTABLE WIRELESS TERMINAL EQUIPPED WITH THE SAME

Inventors: Hiroshi Satou, Kanagawa (JP); Takamori Hirose, Ishikawa (JP); Yoshio Koyanagi, Kanagawa (JP); Tomosaki Nishikido, Ishikawa (JP)

Assignee: Panasonic Intellectual Property Management Co., Ltd., Osaka (JP)

Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 324 days.

Appl. No.: 13/698,181
PCT Filed: May 16, 2011
PCT No.: PCT/JP2011/002714
§ 371 (c)(1), (2), (4) Date: Nov. 15, 2012
PCT Pub. No.: WO2011/145323
PCT Pub. Date: Nov. 24, 2011

Prior Publication Data

Foreign Application Priority Data
May 17, 2010 (JP) 2010-112852

Int. Cl. H01Q 21/00 (2006.01) H01Q 1/52 (2006.01)

US Cl. CPC H01Q 1/52 (2013.01); H01Q 1/245 (2013.01); H01Q 1/36 (2013.01); H01Q 9/42 (2013.01); H01Q 21/28 (2013.01)

Field of Classification Search
CPC .......................... H01Q 3/26; H01Q 21/08; H01Q 1/246
USPC .............................. 343/853, 893, 702

See application file for complete search history.

References Cited

U.S. PATENT DOCUMENTS
5,526,603 A 6/1996 Ogawa et al.

FOREIGN PATENT DOCUMENTS
JP 7-288423 A 10/1995

OTHER PUBLICATIONS

Primary Examiner — Dameon E. Levi
Assistant Examiner — Collin Dawkins
Attorney, Agent, or Firm — Seed IP Law Group PLLC

ABSTRACT

A second slit 117 and a fourth slit 119 provided in a first antenna element 150 and a first slit 116 and a third slit 118 provided in a second antenna element 151 are adjusted such that the mutual coupling between the first antenna element 150 and the second antenna element 151 in the desired frequency band is canceled, and reduces degradation in coupling between antenna elements without connecting the antenna elements through components and the like. With such a configuration, it is possible to achieve high-efficiency loosely coupled MIMO array antennas operating in the same frequency band in a portable wireless terminal.

5 Claims, 6 Drawing Sheets
A radio communication apparatus (100) includes an antenna device (40) that faces at least a part of a conductor plate of a conductor surface (second casing) or a conductor layer of an interconnect substrate (30) and a plurality of conductor components (34) that are located between the antenna device (40) and the conductor surface and are arranged in a repetitive manner so as to intersect in a surface-normal direction of the conductor surface. The radio communication apparatus is, for example, a slide-opening and closing type cellular phone and includes a first casing (10), a second casing (20), and a flexible interconnect substrate (30). The first casing (10) and the second casing (20) are slid relatively so that the radio communication apparatus (100) is switched between first and second states. In the first state, the interconnect substrate (30) is folded. The interconnect substrate (30) is extended further in the second state than in the first state.

15 Claims, 9 Drawing Sheets
ABSTRACT
A wireless communication device includes a base board, a metal zone, and a filter. The metal zone and the filter are disposed on the base board. The metal zone defines a slot. The filter is connected to the slot to divide the slot into a first slot section and a second slot section. When a current having a first frequency flows through the first slot section and the second slot section, the filter is in an open circuit state, and the first slot section and the second slot section are activated to receive/transmit wireless signals having a first central frequency. When a current having a second frequency only flows through the first slot section, the filter is in a closed circuit state, and the first slot section is activated to receive/transmit wireless signals having a second central frequency.

11 Claims, 4 Drawing Sheets
A communication device and a method for enhancing impedance bandwidth of an antenna thereof include at least one ground, at least one antenna, a current-drawing conductor structure, and at least one coupling conductor structure. The antenna is electrically connected to the ground through a source and generates at least one operating frequency band for transmitting or receiving electromagnetic signals of at least one communication band. The current-drawing conductor structure includes a plurality of conductor elements, where there is at least one mutual coupling portion formed between neighboring conductor elements. The coupling conductor structure has a first conductor portion and a second conductor portion. One end of the first conductor portion is electrically connected to the ground and another end thereof is electrically connected to the second conductor portion. There is at least one coupling portion formed between the second conductor portion and the current-drawing conductor structure.
A multiband antenna, includes a main antenna, a coupling unit, and a matching unit. The main antenna includes a feed portion, a bent portion, a radiation portion, and an extending portion in a same plane. One end of the feed portion is connected to the coupling unit. The bent portion is perpendicularly connected to the other end of the feed portion. The radiation portion is parallel with the feed portion and perpendicularly connected to one end of the bent portion away from the feed portion. The extending portion is connected to one end of the radiation portion away from the bent portion, the coupling unit is parallel with the main antenna and connected to the matching unit, the matching unit feeds signals to and grounds the multiband antenna.

17 Claims, 3 Drawing Sheets
An antenna structure includes a feed portion, a ground portion, a first radiating body, a second radiating body, and a third radiating body. The feed portion is connected to a first shared portion of the first radiating body. The second radiating body further includes a second shared portion connected to the first shared portion. The first and second shared portions are included in a third radiating body together with a combining portion between the second shared portion and the ground portion. The first radiating body receives and sends wireless signals of a first frequency band, the second radiating body uses a second frequency band, and the third radiating body uses a third frequency band.
METHODOLOGY FOR MANUFACTURING ANTENNA STRUCTURE

Inventors: Tzuh-Suan Wang, Hsinchu (TW); Yu-Fu Kuo, Hsinchu (TW); Yuan-Chin Hsu, Hsinchu (TW); Chih-Yung Shih, Hsinchu (TW)

Assignee: WISTRON NEWEB 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 202 days.

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Prior Publication Data

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Jan. 1, 2012 (TW) 101119808 A

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H01P 11/00 (2006.01)
H01Q 1/24 (2006.01)
H01Q 1/38 (2006.01)

U.S. Cl.
CPC ............. H01Q 1/243 (2013.01); H01Q 1/38 (2013.01); Y10T 29/49016 (2015.01)

Field of Classification Search
CPC ............. H01P 11/00; H01Q 1/243; H01Q 1/38
USPC ........ 29/600, 592.1, 830, 831, 846, 847, 829; 427/555

See application file for complete search history.

ABSTRACT

A method for manufacturing an antenna structure is disclosed. Employing steps of mixing with a catalyst and embedding a metal insert can simplify steps for manufacturing the antenna structure. Further, a non-conductive frame produced by the process disclosed herein can exhibit waterproof effects. The catalyst mentioned above is mixed with a plastic and then injected into a mold to form the non-conductive frame. The metal insert mentioned above is disposed in the mold before the step of injecting the plastic. Alternatively, the metal insert is embedded in the non-conductive frame after the step of injecting the plastic.

18 Claims, 5 Drawing Sheets
A multiband monopole antenna for a mobile device is disclosed that can be dynamically switched between a quarter-wave monopole antenna and a half-wave folded monopole antenna. In one embodiment, a radiator element can be built into at least part of a decorative trim on an outer casing of the mobile device. A circuit element embedded into the radiator element can electrically connect or disconnect a radiator element tip from a grounded portion of the decorative trim. In some embodiments, the circuit element can be a switch or a passive filter element, such as an inductor/capacitance-based filter. In other embodiments, the circuit element can be a tunable filter circuit whose impedance can be dynamically changed.
ABSTRACT

A communication device including a ground element and an antenna element is provided. An edge of the ground element has a notch, and the antenna element includes a metal element disposed inside the notch. The metal element of the antenna element has a first end and a second end. The first and second ends are spaced away from each other and are respectively positioned adjacent to two ends of a diagonal line of the notch. The first end is used as a first feeding point of the antenna element, and the second end is used as a second feeding point of the antenna element. The first feeding point is coupled through a switch and a first matching circuit to a first signal source, and the second feeding point is coupled through an inductive element and a second matching circuit to a second signal source.

10 Claims, 5 Drawing Sheets
An antenna apparatus may include a conductor layer having an aperture and a slit that adjoins the aperture; and a resonance tuning component including a first element, a second element, and a third element coupled with the first and second elements. The slit may have an opening at a periphery of the conductor layer. A first gap may be arranged between the first element and the conductor layer. At least a part of the first element may be coupled with the conductor layer. A second gap may be arranged between the second element and the conductor layer. The antenna apparatus may include a capacitor and an inductor. The capacitor may be connected with the inductor in parallel between the first element and the conductor layer. The terminal device may include the antenna apparatus.