



US 20130099978A1

(19) **United States**

(12) **Patent Application Publication**
CHEN et al.

(10) **Pub. No.: US 2013/0099978 A1**

(43) **Pub. Date: Apr. 25, 2013**

(54) **INTERNAL PRINTED ANTENNA**

Publication Classification

(75) Inventors: **WEN-SHAN CHEN**, TAINAN CITY
(TW); **LI-YU YEH**, TAINAN CITY
(TW)

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

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

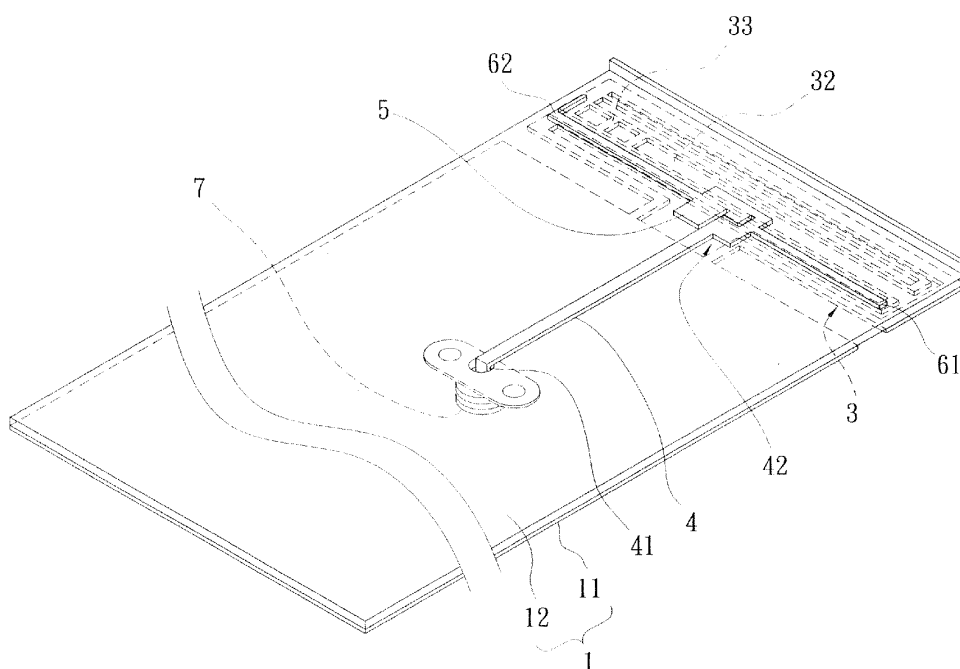
(73) Assignee: **SOUTHERN TAIWAN UNIVERSITY
OF TECHNOLOGY**, TAINAN CITY
(TW)

(57) **ABSTRACT**

An internal printed antenna is revealed. The internal printed antenna includes a dielectric substrate, a ground plane, a metal loop radiating portion, and a microstrip feed line. The metal loop radiating portion includes a plurality of bends and a gap area is formed between adjacent bends. Two short circuit parts are arranged at the gap area.

(21) Appl. No.: **13/278,271**

(22) Filed: **Oct. 21, 2011**





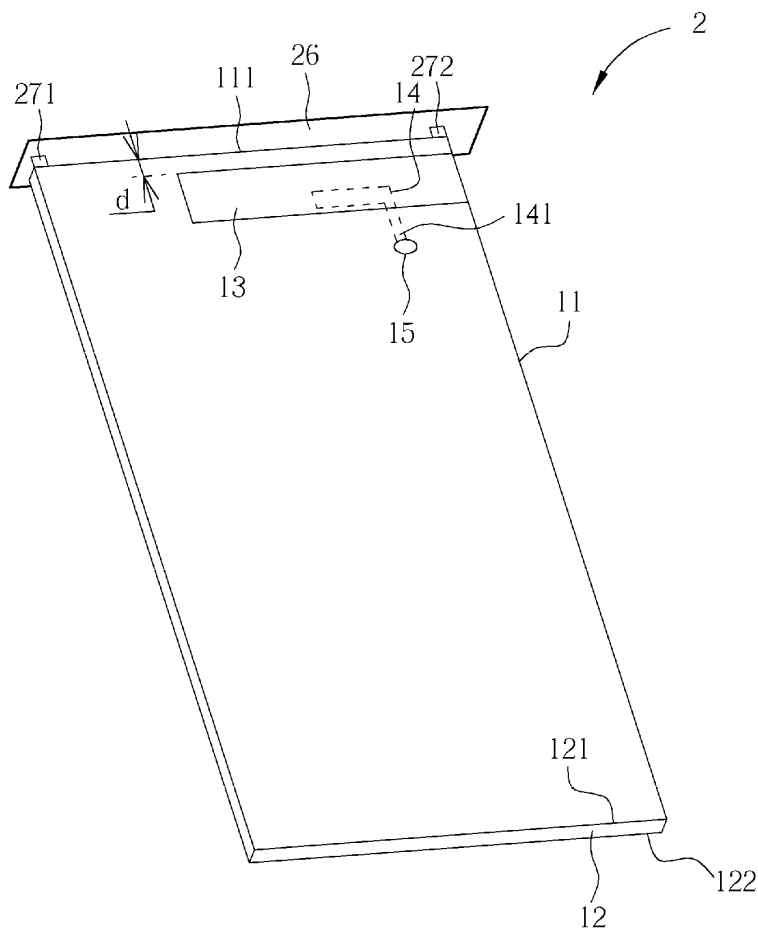
US 20130099979A1

(19) **United States**(12) **Patent Application Publication****Wong et al.**(10) **Pub. No.: US 2013/0099979 A1**(43) **Pub. Date: Apr. 25, 2013**(54) **COMMUNICATION DEVICE AND ANTENNA
STRUCTURE THEREOF**(76) Inventors: **Kin-Lu Wong**, New Taipei City (TW);
Po-Wei Lin, New Taipei City (TW)(21) Appl. No.: **13/409,128**(22) Filed: **Mar. 1, 2012**(30) **Foreign Application Priority Data**

Oct. 20, 2011 (TW) 100138154

Publication Classification(51) **Int. Cl.**
H01Q 9/04 (2006.01)(52) **U.S. Cl.**
USPC **343/700 MS**(57) **ABSTRACT**

A communication device has an antenna structure including a substrate, a ground element, an open slot and a radiating metal portion. The ground element is disposed on a first surface of the substrate. The open slot is formed on the ground element and substantially parallel with an edge of the ground element, wherein the open slot at least generates a first resonant mode, and a distance between the open slot and the edge of the ground element is shorter than 0.05 wavelength of a center frequency of the first resonant mode. The radiating metal portion is disposed on a second surface of the substrate, wherein the open slot at least partially covers the radiating metal portion, the radiating metal portion at least generates a second resonant mode, and a feed point of the radiating metal portion is electrically coupled to a signal source on the substrate.





US 20130099980A1

(19) **United States**

(12) **Patent Application Publication**
Hayashi

(10) **Pub. No.: US 2013/0099980 A1**

(43) **Pub. Date: Apr. 25, 2013**

(54) **ANTENNA DEVICE AND ELECTRONIC
APPARATUS INCLUDING ANTENNA DEVICE**

(52) **U.S. CL.**
USPC **343/700 MS**

(76) Inventor: **Kouji Hayashi**, Akishima-shi (JP)

(57) **ABSTRACT**

(21) Appl. No.: **13/564,507**

(22) Filed: **Aug. 1, 2012**

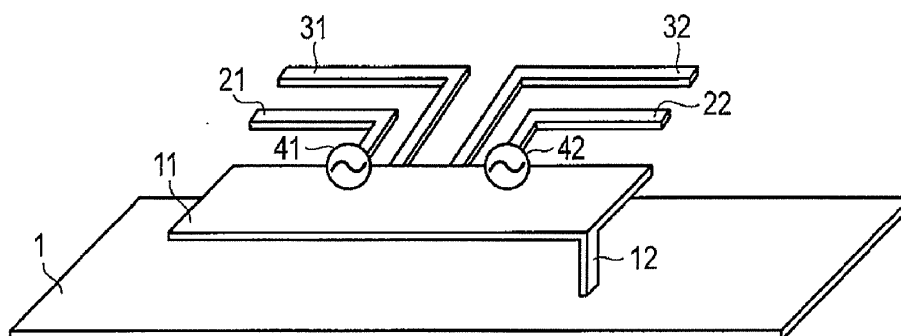
(30) **Foreign Application Priority Data**

Oct. 19, 2011 (JP) 2011-230009

Publication Classification

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

According to one embodiment, an antenna device according to this embodiment includes an antenna ground portion and first and second antenna units. The first antenna unit includes a first feed point, a first feed element connected to the first feed point, and a first parasitic element which operates upon electrically coupling to the first feed element. The second antenna unit includes a second feed point, a second feed element connected to the second feed point, and a second parasitic element which operates upon electrically coupling to the first parasitic element and the second feed element.





US 20130099981A1

(19) **United States**(12) **Patent Application Publication**
Vortmeier et al.(10) **Pub. No.: US 2013/0099981 A1**(43) **Pub. Date: Apr. 25, 2013**(54) **ANTENNA BANDWIDTH-OPTIMIZED BY
HYBRID STRUCTURE COMPRISING
PLANAR AND LINEAR EMITTERS**(52) **U.S. CL.**
CPC . **H01Q 1/38** (2013.01); **H01P 11/00** (2013.01)
USPC **343/700 MS**; 29/600(75) Inventors: **Gunther Vortmeier**, Aichtal (DE);
Christoph Degen, Krefeld (DE); **Stefan
Droste**, Herzogenrath (DE)(57) **ABSTRACT**(73) Assignee: **Saint-Gobain Glass France**,
Courbevoie (FR)(21) Appl. No.: **13/581,588**(22) PCT Filed: **May 18, 2011**(86) PCT No.: **PCT/EP2011/058091**

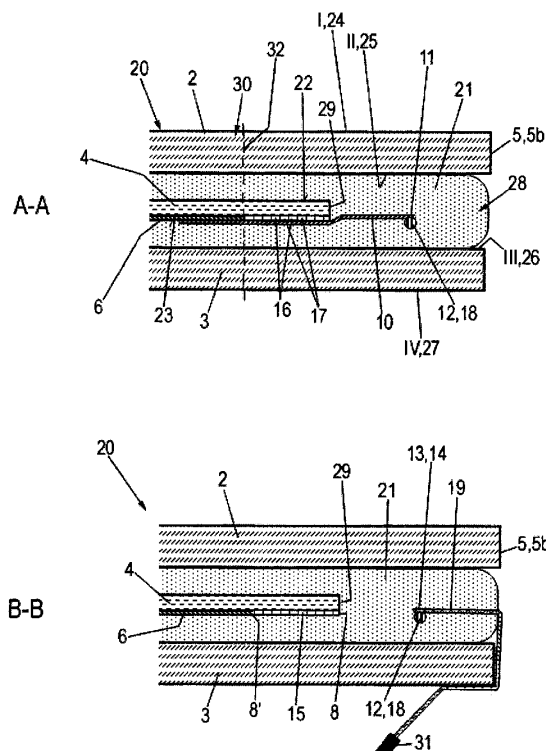
§ 371 (c)(1),

(2), (4) Date: **Jan. 4, 2013**(30) **Foreign Application Priority Data**

May 19, 2010 (EP) 10163201.6

Publication Classification(51) **Int. Cl.**
H01Q 1/38 (2006.01)
H01P 11/00 (2006.01)

The invention relates to a hybrid antenna structure that comprises at least one electrically insulating substrate, at least one electrically conductive coating that covers at least one surface of the substrate at least section-wise and serves as a planar antenna for reception of electromagnetic waves, as well as at least one coupling electrode electrically coupled to the conductive coating for coupling out of antenna signals from the planar antenna. It is essential here that the coupling electrode be electrically coupled to an unshielded, linear antenna conductor that serves as a linear antenna for reception of electromagnetic waves, with the antenna conductor situated outside an area that can be projected by orthogonal parallel projection onto the planar antenna serving as a projection area, by which means an antenna foot point of the linear antenna becomes a common antenna foot point of the linear and planar antenna. The invention further relates to a method for producing such a hybrid antenna structure.





US 20130099983A1

(19) **United States**

(12) **Patent Application Publication**

Han et al.

(10) **Pub. No.: US 2013/0099983 A1**

(43) **Pub. Date: Apr. 25, 2013**

(54) **WIRELESS COMMUNICATION DEVICE
WITH AN ANTENNA ADJACENT TO AN
EDGE OF THE DEVICE**

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

(75) Inventors: **Chul Min Han**, San Diego, CA (US);
Jorge Fabrega Sanchez, San Diego, CA
(US)

(57) **ABSTRACT**

(73) Assignee: **FUTUREWEI TECHNOLOGIES,
INC.**, Plano, TX (US)

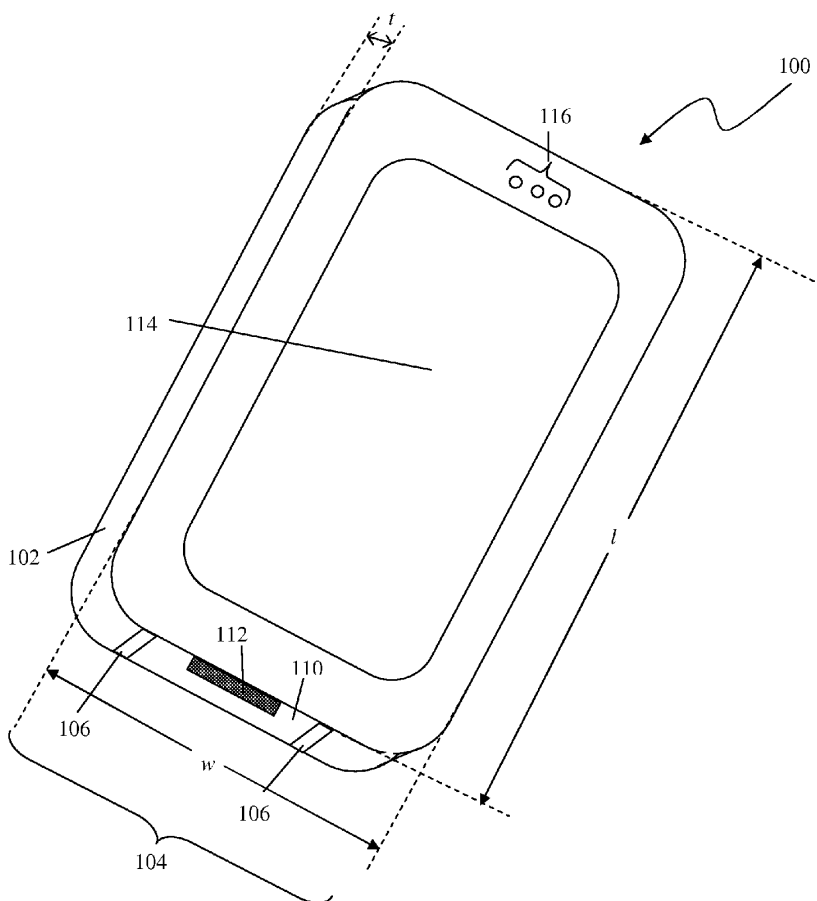
A wireless communication device comprising a housing comprising a plurality of edges and configured to serve as an external surface for the wireless communication device, and an antenna adjacent to at least a first edge of the housing, wherein the antenna comprises at least a conductive strip and at least one slot and wherein the antenna is configured to receive and transmit wireless signals, wherein the first edge of the housing is one of an edge of the housing nearest an ear piece and an edge of the housing that is opposite the edge of the housing nearest the ear piece, and wherein the conductive strip and the slot are adjacent to at least the first edge of the housing.

(21) Appl. No.: **13/278,836**

(22) Filed: **Oct. 21, 2011**

Publication Classification

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





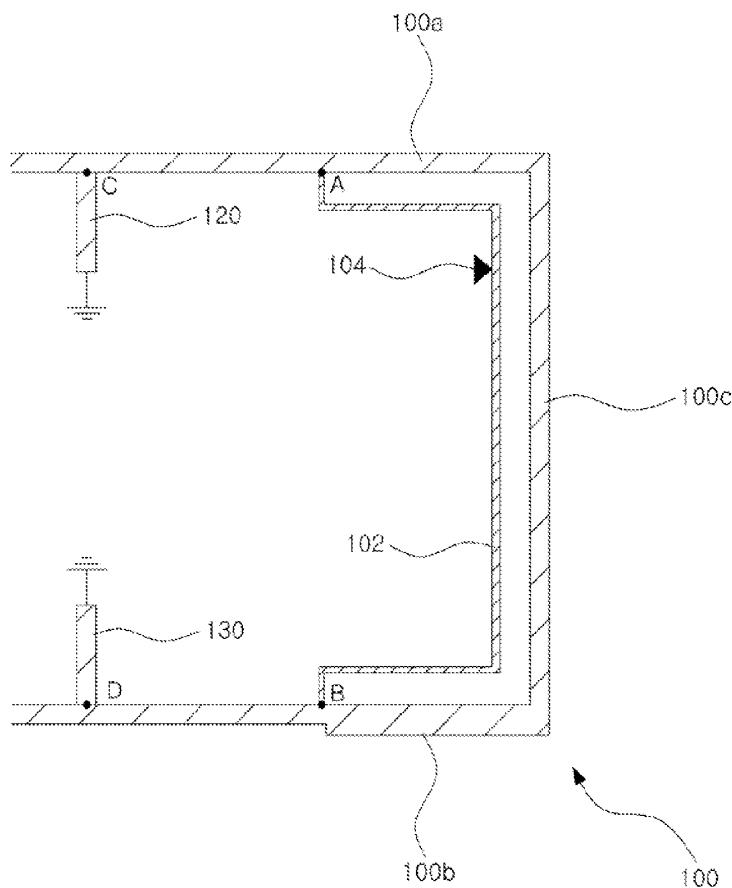
US 20130099984A1

(19) **United States**(12) **Patent Application Publication**
Jung(10) **Pub. No.: US 2013/0099984 A1**(43) **Pub. Date: Apr. 25, 2013**(54) **ANTENNA COMBINED WITH TERMINAL HOUSING****Publication Classification**(71) Applicant: **ACE TECHNOLOGIES CORPORATION**, Incheon-si (KR)(51) **Int. Cl.**
H01Q 1/50 (2006.01)
H01Q 1/24 (2006.01)(72) Inventor: **Jong-Ho Jung**, Gyeonggi-do (KR)(52) **U.S. Cl.**
USPC **343/702**(73) Assignee: **ACE TECHNOLOGIES CORPORATION**, Incheon-si (KR)(57) **ABSTRACT**(21) Appl. No.: **13/659,599**

An antenna combined with a terminal housing is disclosed. The disclosed antenna includes an outer frame radiator, which is joined to a side wall of the terminal housing, and an inner frame radiator, which has one end joined to a first point on the outer frame radiator and the other end joined to a second point on the outer frame radiator, and which forms a loop by joining the outer frame radiator, where a feed signal is provided to the inner frame radiator. The disclosed antenna provides the advantages of preventing property changes caused by contact between a person's body and the terminal, and of minimizing mounting space while maintaining stable characteristics.

(22) Filed: **Oct. 24, 2012**(30) **Foreign Application Priority Data**

Oct. 25, 2011 (KR) 10-2011-0109419





US 20130099986A1

(19) **United States**

(12) **Patent Application Publication**
Huynh

(10) **Pub. No.: US 2013/0099986 A1**

(43) **Pub. Date: Apr. 25, 2013**

(54) **ANTENNA ARRAY WITH CAPACITIVE
COUPLED UPPER AND LOWER ANTENNA
ELEMENTS AND A PEAK RADIATION
PATTERN DIRECTED TOWARD THE LOWER
ANTENNA ELEMENT**

Publication Classification

(51) **Int. Cl.**
H01Q 21/29 (2006.01)
H01Q 1/22 (2006.01)

(52) **U.S. Cl.**
CPC . **H01Q 21/29** (2013.01); **H01Q 1/22** (2013.01)
USPC **343/720**; **343/700 MS**

(71) Applicant: **Sony Ericsson Mobile
Communications AB, Lund (SE)**

(72) Inventor: **Minh-Chau Huynh, Foster City, CA
(US)**

(73) Assignee: **Sony Ericsson Mobile
Communications AB, Lund (SE)**

(21) Appl. No.: **13/711,979**

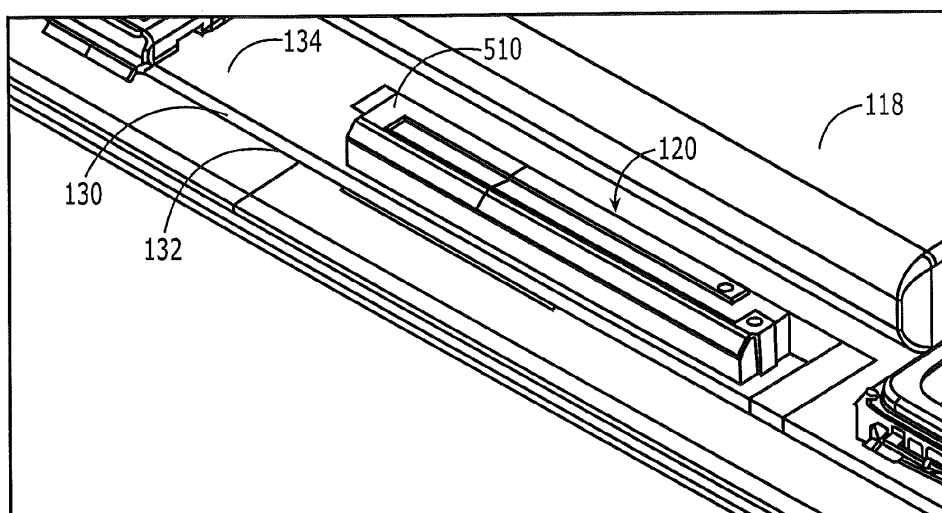
(22) Filed: **Dec. 12, 2012**

Related U.S. Application Data

(63) Continuation of application No. 12/777,718, filed on
May 11, 2010, now Pat. No. 8,354,967.

(57) **ABSTRACT**

An antenna system includes a substrate, a conductive ground plane, and an upper antenna element. A slot that is free of conductive material extends through the ground plane to define a lower antenna element from a portion of the ground plane. The upper antenna element is spaced apart and overlies at least a portion of the lower antenna element. The upper antenna element is electrically connected to the ground plane and to an antenna feed element. The upper antenna element is configured to electrically resonate responsive to a defined RF signal. The lower antenna element is configured to resonate through capacitive coupling to the resonating upper antenna element.

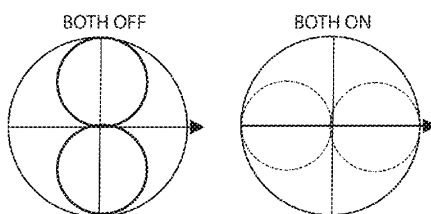
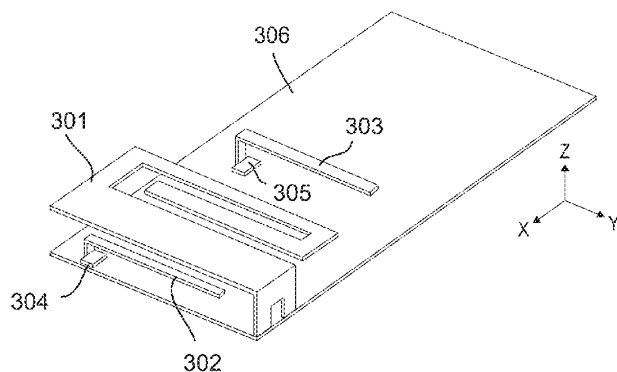




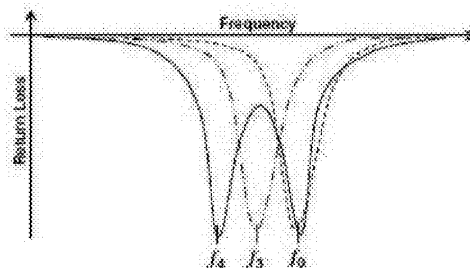
US 20130099987A1

(19) **United States**(12) **Patent Application Publication****Desclos et al.**(10) **Pub. No.: US 2013/0099987 A1**(43) **Pub. Date: Apr. 25, 2013**(54) **MULTI-FUNCTION ARRAY FOR ACCESS
POINT AND MOBILE WIRELESS SYSTEMS****Publication Classification**(76) Inventors: **Laurent Desclos**, San Diego, CA (US);
Sebastian Rowson, San Diego, CA
(US); **Jeffrey Shamblin**, Leon San
Marcos, CA (US)(51) **Int. Cl.**
H01Q 9/06 (2006.01)(52) **U.S. Cl.**
CPC **H01Q 9/06** (2013.01)
USPC **343/745**(21) Appl. No.: **13/612,833**(22) Filed: **Sep. 13, 2012****Related U.S. Application Data**(63) Continuation-in-part of application No. 13/029,564,
filed on Feb. 17, 2011, now Pat. No. 8,362,962, which
is a continuation of application No. 12/043,090, filed
on Mar. 5, 2008, now Pat. No. 7,911,402.**ABSTRACT**

A multi-function array is described where several communication system functions are realized using the same antenna architecture. An array of antenna elements where each antenna element can generate multiple radiation patterns is described; the multiple radiation patterns from each antenna element provides increased capability and flexibility in generating a phased array, a MIMO antenna system, a receive diversity antenna system, as well as direction finding feature by way of an interferometer function provided by one or multiple elements. The small volume attributes of the antenna elements populating the array lend this technique to mobile wireless devices as well as access points.



TWO DIFFERENT RADIATION PATTERNS AT THE SAME FREQUENCY



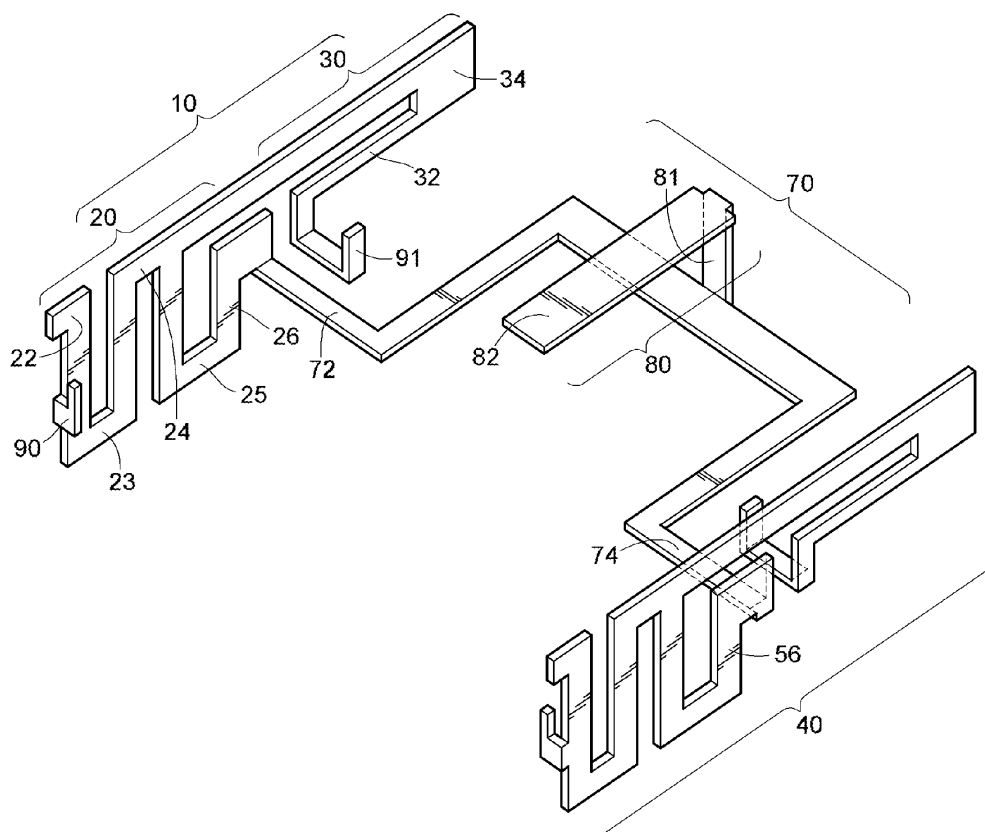


US 2013009992A1

(19) **United States**(12) **Patent Application Publication**
WU(10) **Pub. No.: US 2013/009992 A1**(43) **Pub. Date: Apr. 25, 2013**(54) **ANTENNA MODULE****Publication Classification**(71) Applicant: **Lynwave Technology Ltd.**, New Taipei City (TW)(51) **Int. Cl.**
H01Q 1/52 (2006.01)(72) Inventor: **San-Yuan WU**, New Taipei City (TW)(52) **U.S. Cl.**
USPC **343/841**(73) Assignee: **LYNWAVE TECHNOLOGY LTD.**, New Taipei City (TW)(57) **ABSTRACT**(21) Appl. No.: **13/654,712**(22) Filed: **Oct. 18, 2012**(30) **Foreign Application Priority Data**

Oct. 19, 2011 (TW) 100219607

An antenna module mainly includes at least one antenna capable of radiating signals of two frequencies, a grounding portion, and at least one isolation metal sheet capable of isolating signals of a frequency generated by different antennas from each other to avoid interference. The antenna module is integrally formed, which can reduce the volume of the antenna module, and provide a stable radiation pattern and broadband and multi-band functions.





US 20130099994A1

(19) **United States**(12) **Patent Application Publication**
YOSUI(10) **Pub. No.: US 2013/0099994 A1**(43) **Pub. Date: Apr. 25, 2013**(54) **ANTENNA APPARATUS AND
COMMUNICATION TERMINAL
INSTRUMENT****Publication Classification**

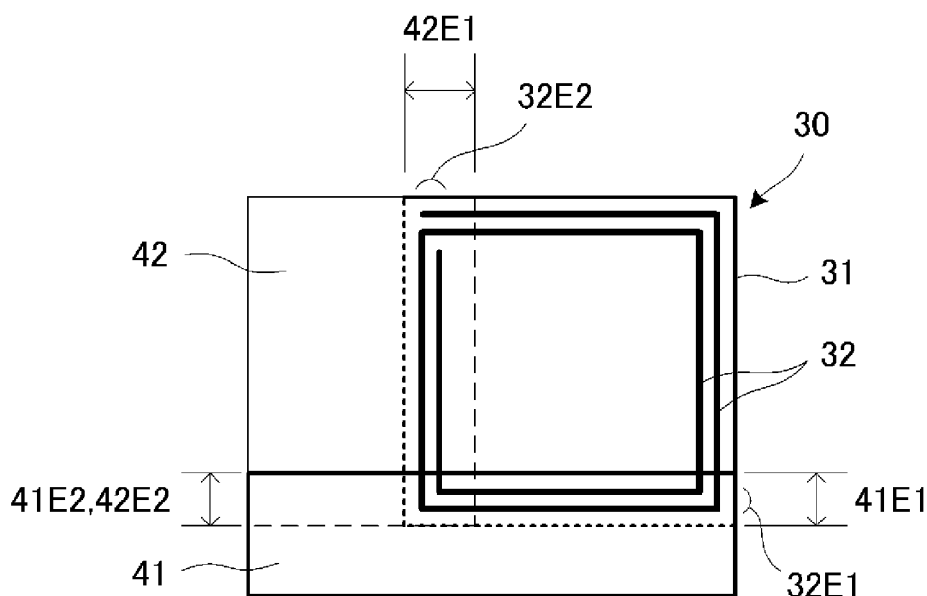
(51) **Int. Cl.**
G06K 7/10 (2006.01)
H01Q 7/00 (2006.01)
(52) **U.S. Cl.**
CPC *G06K 7/10237* (2013.01); *H01Q 7/00* (2013.01)
USPC **343/866**; 235/439; 343/787

(71) Applicant: **Murata Manufacturing Co., Ltd.**,
Nagaokakyo-shi (JP)(72) Inventor: **Kuniaki YOSUI**, Nagaokakyo-shi (JP)(73) Assignee: **Murata Manufacturing Co., Ltd.**,
Nagaokakyo-shi (JP)(21) Appl. No.: **13/706,409**(22) Filed: **Dec. 6, 2012****Related U.S. Application Data**(63) Continuation of application No. PCT/JP2011/067127,
filed on Jul. 27, 2011.(30) **Foreign Application Priority Data**

Jul. 28, 2010 (JP) 2010-169827

ABSTRACT

In an antenna apparatus, a first current is induced in a first booster conductor by a current flowing through a coil conductor of a power feed antenna, and the first current circulates along a circumference of the first booster conductor. A second current is induced in a second booster conductor by the current flowing through the coil conductor of the power feed antenna, and the second current circulates along a circumference of the second booster conductor. A third current is induced in the first booster conductor by the second current flowing through the second booster conductor, and the third current circulates along the circumference of the first booster conductor. Thus, the antenna apparatus is much less influenced by nearby metallic objects and a shape of an included radiation plate may be more freely determined without requiring a highly accurate positional relationship between the radiation plate and the coil conductor.





US 2013009996A1

(19) **United States**(12) **Patent Application Publication****Tseng et al.**(10) **Pub. No.: US 2013/0099996 A1**(43) **Pub. Date: Apr. 25, 2013**(54) **HANDHELD DEVICE AND PLANAR ANTENNA THEREOF**(52) **U.S. Cl.**

USPC 343/876

(75) Inventors: **Chun-Wei Tseng**, Taoyuan City (TW);
Chien-Chih Chen, Taoyuan City (TW);
Yen-Liang Kuo, Taoyuan City (TW);
Wan-Ming Chen, Taoyuan City (TW)

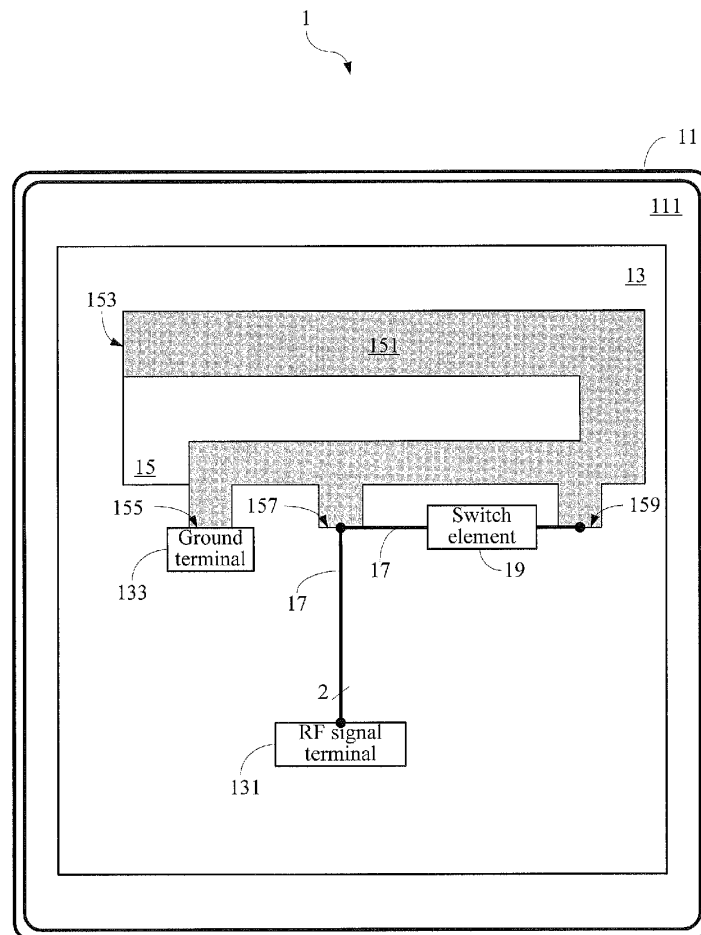
(57)

ABSTRACT

A handheld device and a planar antenna thereof are provided. The planar antenna comprises a radiator with an open terminal, a short terminal, a first feeding terminal and a second feeding terminal. The short terminal is coupled to a ground terminal. The first feeding terminal is formed between the open terminal and the short terminal, and coupled to a radio frequency (RF) signal terminal. The second feeding terminal is formed between the open terminal and the first feeding terminal, and coupled to the first feeding terminal by a transmission line and a switch element. The radiator resonates at the first central frequency when the switch element is turned off, and resonates at the second central frequency when the switch element is turned on.

(73) Assignee: **HTC CORPORATION**, TAOYUAN CITY (TW)(21) Appl. No.: **13/277,539**(22) Filed: **Oct. 20, 2011****Publication Classification**(51) **Int. Cl.**
H01Q 1/38

(2006.01)





US 2013009998A1

(19) **United States**(12) **Patent Application Publication****Lin et al.**(10) **Pub. No.: US 2013/0099998 A1**(43) **Pub. Date: Apr. 25, 2013**(54) **THREE DIMENSIONAL COMBO ANTENNA
AND MANUFACTURING METHOD
THEREOF**(52) **U.S. Cl.**

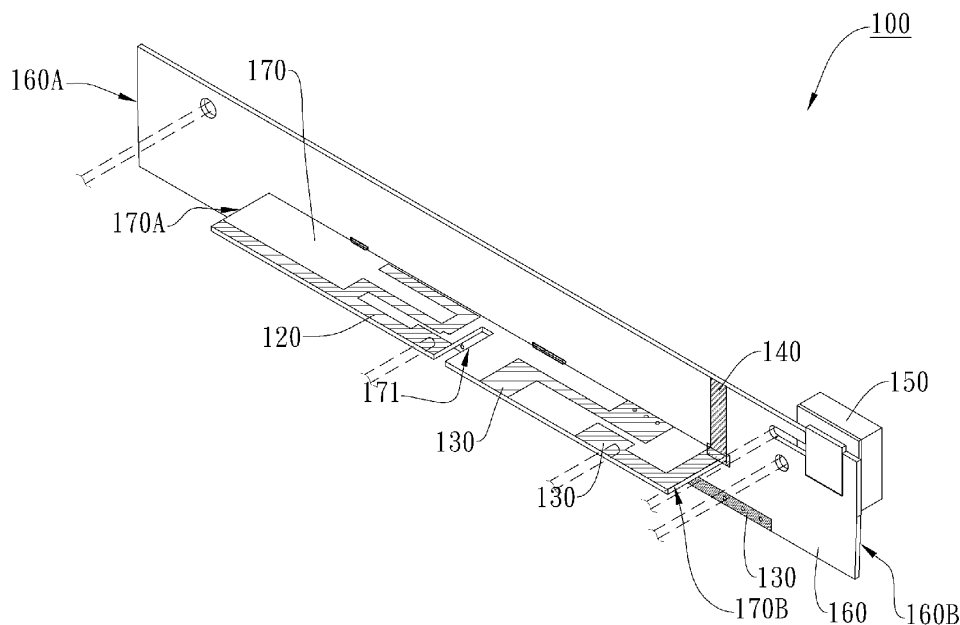
USPC 343/893; 29/600

(76) Inventors: **Yu Ching Lin**, Taipei (TW); **Chi-Chen
Chuang**, Taipei (TW); **Yen-Chih Chen**,
Taipei (TW)

(57)

ABSTRACT

A three dimensional combo antenna having a first insulating substrate, a second insulating substrate, a first antenna and a second antenna. The first insulating substrate has a first surface and a second surface opposite to the first surface. The second insulating substrate, perpendicular to the first insulating substrate, is positioned on the first surface. The first antenna, formed on the first insulating substrate, is coupled to a first ground. The second antenna, formed on the second insulating substrate, is coupled to a second ground that is different from the first ground. The first and the second antennas operate at a first frequency band.

(21) Appl. No.: **13/277,497**(22) Filed: **Oct. 20, 2011****Publication Classification**(51) **Int. Cl.****H01Q 21/00** (2006.01)**H01P 11/00** (2006.01)



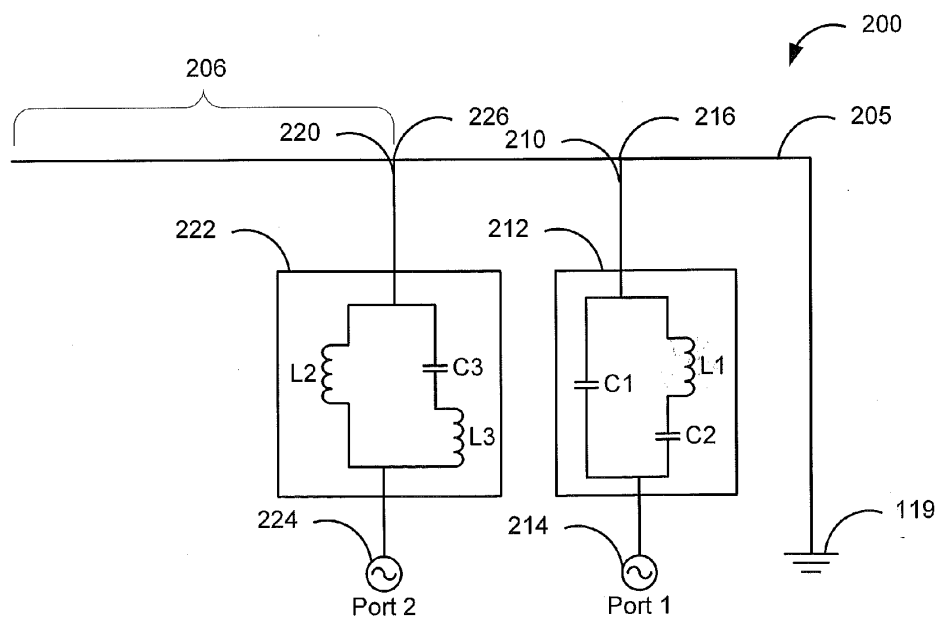
US 20130102357A1

(19) **United States**(12) **Patent Application Publication****Vance**(10) **Pub. No.: US 2013/0102357 A1**(43) **Pub. Date: Apr. 25, 2013**(54) **TWO PORT ANTENNAS WITH SEPARATE ANTENNA BRANCHES INCLUDING RESPECTIVE FILTERS**(75) Inventor: **Scott LaDell Vance**, Staffanstorp (SE)(73) Assignee: **TOYOTA JIDOSHA KABUSHIKI KAISHA**(21) Appl. No.: **13/133,476**(22) PCT Filed: **Jun. 18, 2010**(86) PCT No.: **PCT/IB2010/001508**

§ 371 (c)(1),

(2), (4) Date: **Jun. 8, 2011****Publication Classification**(51) **Int. Cl.**
H01Q 1/50 (2006.01)
H04M 1/02 (2006.01)(52) **U.S. Cl.**CPC **H01Q 1/50** (2013.01); **H04M 1/0202** (2013.01)USPC **455/550.1**; 343/857(57) **ABSTRACT**

A communication structure may include a mobile terminal ground plane including a ground point. A primary radiator is electrically coupled to the ground point. A first antenna branch includes a first filter circuit that is coupled between a first point on the primary radiator and a first antenna port and that corresponds to a first frequency band. A second antenna branch includes a second filter circuit that is coupled between a second point on the primary radiator and a second antenna port that corresponds to a second frequency band that is different from the first frequency band. In addition, a radio frequency (RF) transmitter and/or receiver may be provided with the ground plane and the primary radiator being electrically coupled to the RF transmitter and/or receiver.





US 20130102367A1

(19) **United States**

(12) **Patent Application Publication**
KONG

(10) **Pub. No.: US 2013/0102367 A1**

(43) **Pub. Date: Apr. 25, 2013**

(54) **ANTENNA CASE FOR SMARTPHONES AND WIRELESS TERMINALS**

(52) **U.S. Cl.**

USPC 455/571

(76) Inventor: **Byung-Won KONG**, Seoul (KR)

(21) Appl. No.: **13/424,894**

(22) Filed: **Mar. 20, 2012**

(30) **Foreign Application Priority Data**

Oct. 20, 2011 (KR) 10-2011-0107713

Feb. 9, 2012 (KR) 10-2012-0013331

Publication Classification

(51) **Int. Cl.**

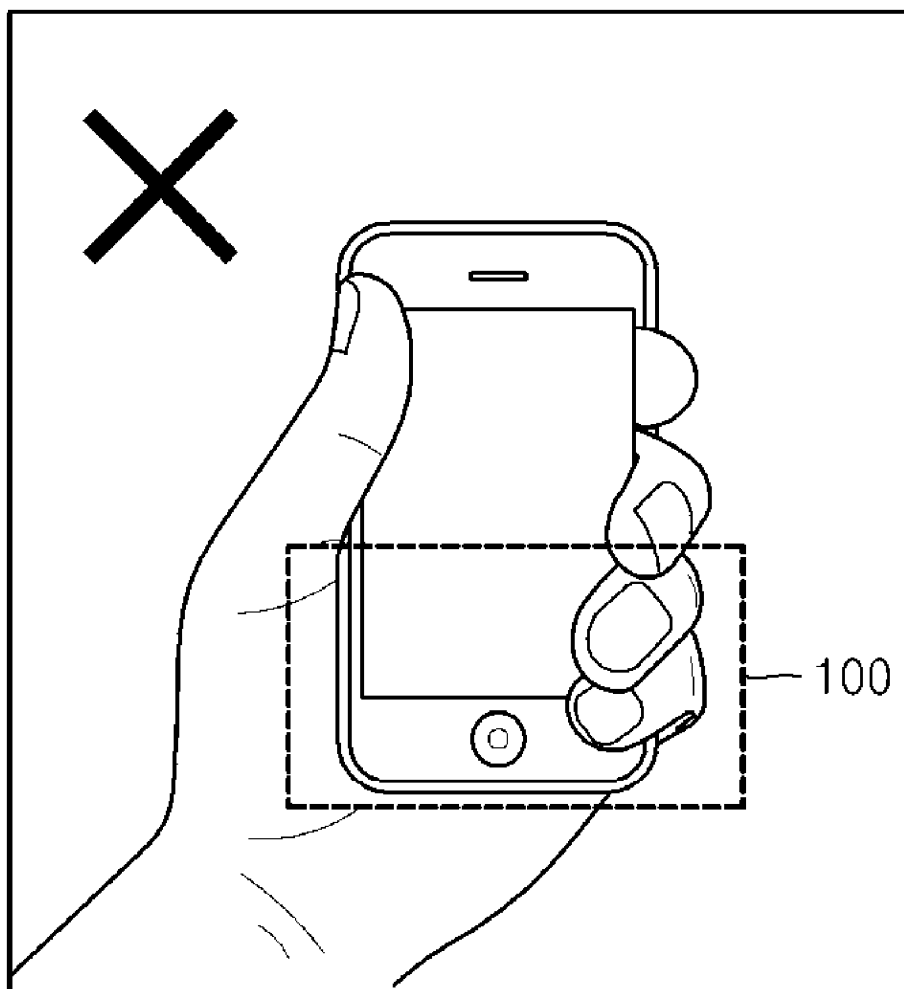
H04B 1/40

(2006.01)

(57)

ABSTRACT

A portable accessory for preventing death grip of a hand-held apparatus and improving radio wave transmission and reception of the hand-held apparatus. The portable accessory includes an inductive signal amplifying circuit including: a radio transmission/radio unit that transmits or receives radio waves; a capacitive coupled unit that is capacitively coupled with an antenna mounted in the hand-held apparatus; and an impedance matching unit that connects the radio wave transmission/reception unit and the capacitive coupled unit and transmits radio waves.





US 20130106660A1

(19) **United States**

(12) **Patent Application Publication**
KANG

(10) **Pub. No.: US 2013/0106660 A1**

(43) **Pub. Date: May 2, 2013**

(54) **RADIATION DEVICE FOR PLANAR
INVERTED-F ANTENNA AND ANTENNA
USING THE SAME**

Publication Classification

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

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

(71) Applicant: **LG Innotek .Co., Ltd.**, Seoul (KR)

(72) Inventor: **Jin Ho KANG**, Seoul (KR)

(73) Assignee: **LG INNOTEK CO., LTD.**, Seoul (KR)

(21) Appl. No.: **13/662,608**

(22) Filed: **Oct. 29, 2012**

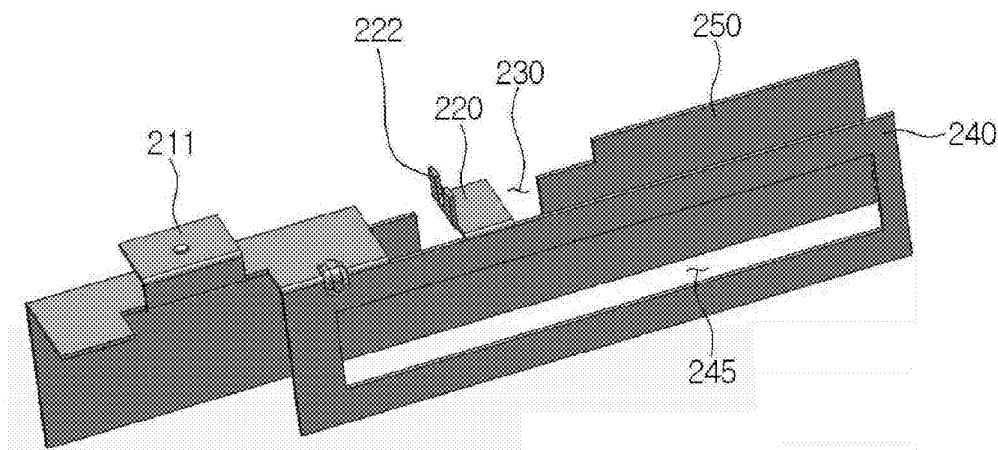
(30) **Foreign Application Priority Data**

Oct. 28, 2011 (KR) 10-2011-0110925

(57) **ABSTRACT**

A planar inverted-F antenna according to an embodiment includes a ground plane, a radiator spaced apart from the ground plane, and a feeding member for feeding a current to the radiator. A first slot is formed in the radiator, and the first slot is excited as the current is fed to the radiator through the feeding member such that the current flows around the first slot and the first slot implements a resonance frequency according to the excitation.

200





US 20130106661A1

(19) **United States**

(12) **Patent Application Publication**
Xiang

(10) **Pub. No.: US 2013/0106661 A1**

(43) **Pub. Date: May 2, 2013**

(54) **CASE OR ATTACHMENT FOR AN
ELECTRONIC COMMUNICATIONS DEVICE**

Publication Classification

(75) Inventor: **Xin Xiang**, Brighton (AU)

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

(73) Assignee: **Classic Promotions Pty Ltd**, Brighton
(AU)

(52) **U.S. Cl.**
CPC **H01Q 1/245** (2013.01)
USPC **343/702**

(21) Appl. No.: **13/581,581**

(22) PCT Filed: **Jul. 6, 2012**

(86) PCT No.: **PCT/AU12/00823**

§ 371 (c)(1),

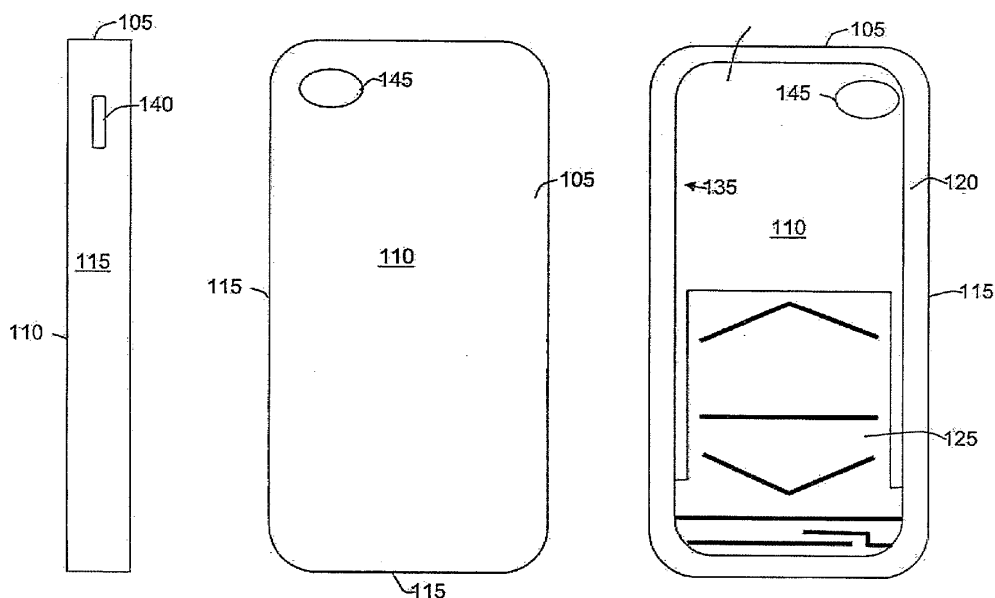
(2), (4) Date: **Aug. 28, 2012**

(57) **ABSTRACT**

A case or attachment for an electronic communications device including added materials that exhibit dielectric properties and a passive antenna either incorporated within or affixed to the case or attachment and held in sufficiently close proximity to the electronic communications device such that the passive antenna is electromagnetically coupled to the device, the arrangement reducing the radiation directed toward a user.

(30) **Foreign Application Priority Data**

Jul. 7, 2011 (AU) 2011203352





US 20130106662A1

(19) **United States**(12) **Patent Application Publication**
ISHIDA(10) **Pub. No.: US 2013/0106662 A1**(43) **Pub. Date: May 2, 2013**(54) **ELECTRONIC APPARATUS**(52) **U.S. CL.**

USPC 343/702

(71) Applicant: **Sony Corporation**, Tokyo (JP)(72) Inventor: **Tatsuya ISHIDA**, Nagano (JP)(73) Assignee: **Sony Corporation**, Tokyo (JP)(21) Appl. No.: **13/660,040**(22) Filed: **Oct. 25, 2012**(30) **Foreign Application Priority Data**

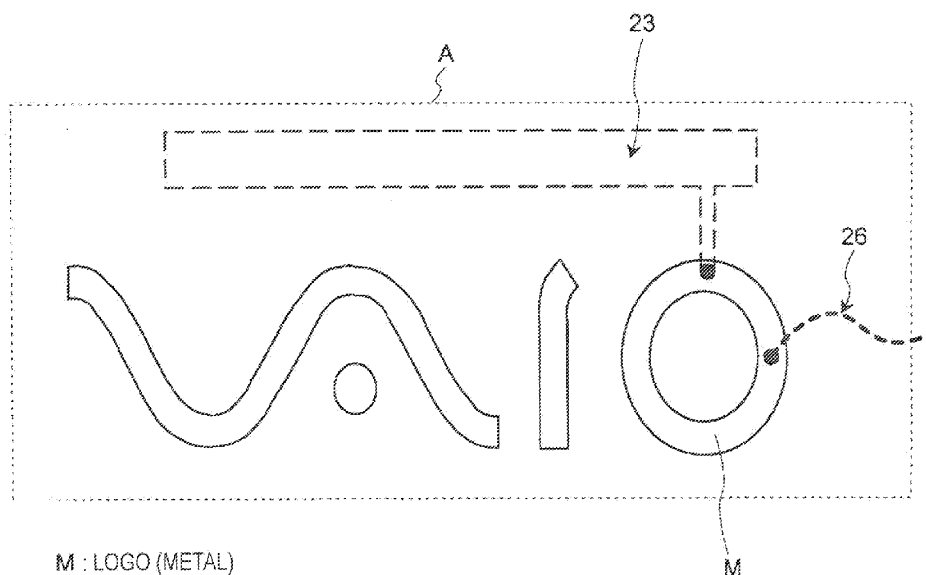
Nov. 1, 2011 (JP) 2011-240120

Publication Classification(51) **Int. Cl.**
H01Q 1/24

(2006.01)

(57) **ABSTRACT**

Provided is an electronic apparatus including a casing that is formed of a non-conductive material and is configured such that a hole is formed in a part of the casing, an antenna element that is formed on an outer surface of the casing, a logo mark that is configured such that at least a part thereof is formed of a conductor to be disposed to cover the hole of the casing, a part of a conductor portion comes into contact with the antenna element, and another part of the conductor portion is exposed to the hole of the casing, and a feeding wire that is connected to the logo mark through the hole formed in the casing.





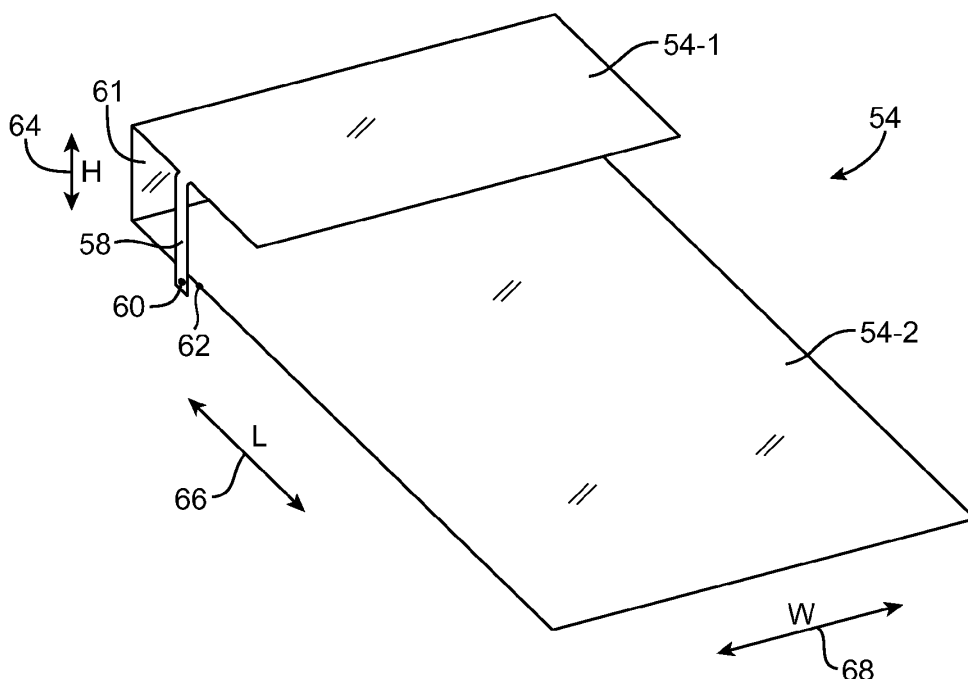
US 20130106665A1

(19) **United States**(12) **Patent Application Publication****Hill et al.**(10) **Pub. No.: US 2013/0106665 A1**(43) **Pub. Date: May 2, 2013**(54) **ANTENNAS FOR HANDHELD ELECTRONIC DEVICES**(71) Applicant: **Apple Inc.**, Cupertino, CA (US)(72) Inventors: **Robert J. Hill**, Salinas, CA (US);
Robert W. Schlub, Cupertino, CA (US);
Juan Zavala, Watsonville, CA (US);
Ruben Caballero, San Jose, CA (US)(73) Assignee: **Apple Inc.**, Cupertino, CA (US)(21) Appl. No.: **13/718,524**(22) Filed: **Dec. 18, 2012****Related U.S. Application Data**

(63) Continuation of application No. 11/650,187, filed on Jan. 4, 2007, now Pat. No. 8,350,761.

Publication Classification(51) **Int. Cl.**
H01Q 21/30 (2006.01)(52) **U.S. Cl.**CPC **H01Q 21/30** (2013.01)USPC **343/725**(57) **ABSTRACT**

Handheld electronic devices are provided that contain wireless communications circuitry having at least one antenna. The antenna may have a planar ground element and a planar resonating element. The planar ground element may have a rectangular shape that matches a rectangular housing shape for a handheld electronic device. A dielectric-filled slot may be formed in one end of the planar ground element. The planar resonating element may be located above the slot. The antenna may be a hybrid antenna that contains both a slot antenna structure formed from the slot and a planar inverted-F structure formed from the planar resonating element and the planar ground element. The antenna may be fed using a single transmission line or two transmission lines. With two transmission lines, one transmission line may be associated with the slot antenna structure and one transmission line may be associated with the planar inverted-F antenna structure.





US 20130106666A1

(19) **United States**

(12) **Patent Application Publication**

Shan et al.

(10) **Pub. No.: US 2013/0106666 A1**

(43) **Pub. Date: May 2, 2013**

(54) **ANTENNA SYSTEM SWITCHING METHOD
AND MOBILE TERMINAL**

Publication Classification

(75) Inventors: **Wenying Shan**, Beijing (CN); **Gong Cui**, Beijing (CN); **Jianjun Zhi**, Beijing (CN); **Jiangwei Zhong**, Beijing (CN)

(51) **Int. Cl.**
H01Q 21/28 (2006.01)

(52) **U.S. Cl.**
CPC **H01Q 21/28** (2013.01)
USPC **343/725**

(73) Assignee: **Beijing Lenovo Software Ltd.**, Haidian District, Beijing (CN)

(57) **ABSTRACT**

An antenna system switching method and a mobile terminal is described. The mobile terminal includes a first portion and a second portion, a first antenna system and a second antenna system. The mobile terminal has a first physical status and a second physical status according to the difference of the relative positions of the first portion and the second portion. The mobile terminal operates through the different first antenna system and second antenna system according to the difference of the physical statuses in which it is, so that an antenna ground unit and an antenna radiating unit can be located on different parts of the mobile terminal, the demand for the height of the antenna of the mobile terminal is satisfied while the light and thin of the mobile terminal is implemented.

(21) Appl. No.: **13/807,458**

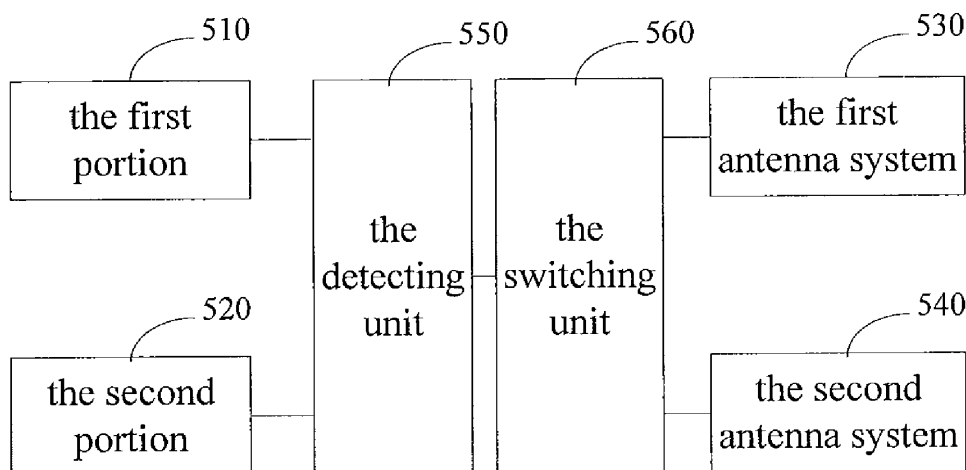
(22) PCT Filed: **Jun. 24, 2011**

(86) PCT No.: **PCT/CN2011/076306**

§ 371 (c)(1),
(2), (4) Date: **Dec. 28, 2012**

(30) **Foreign Application Priority Data**

Jun. 30, 2010 (CN) 201010223599.7





US 20130106669A1

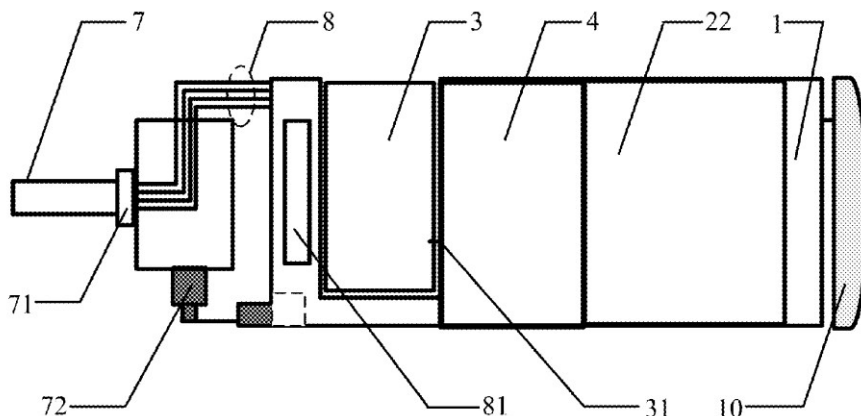
(19) **United States**(12) **Patent Application Publication**
XU et al.(10) **Pub. No.: US 2013/0106669 A1**(43) **Pub. Date: May 2, 2013**(54) **WIRELESS TERMINAL****Publication Classification**(71) Applicant: **Huawei Device Co., Ltd.**, Shenzhen (CN)(51) **Int. Cl.**
H01Q 1/52 (2006.01)(72) Inventors: **Huilian XU**, Shenzhen (CN); **Shuhui SUN**, Shenzhen (CN); **Yao LAN**, Shenzhen (CN); **Dongxing TU**, Shenzhen (CN)(52) **U.S. Cl.**
CPC **H01Q 1/526** (2013.01)
USPC **343/841**(73) Assignee: **HUAWEI DEVICE CO., LTD.**, Shenzhen (CN)(57) **ABSTRACT**(21) Appl. No.: **13/714,248**(22) Filed: **Dec. 13, 2012****Related U.S. Application Data**

(63) Continuation of application No. PCT/CN2012/080282, filed on Aug. 17, 2012.

(30) **Foreign Application Priority Data**

Aug. 31, 2011 (CN) 201110255653.0

An embodiment of the present invention discloses a wireless terminal. The wireless terminal according to the embodiment of the present invention includes a PCB primary board, a primary board circuit printed on both sides of the PCB primary board, and a diversity antenna, where the diversity antenna is disposed at an end of the PCB primary board, a first primary board metal shielding cover and a second primary board metal shielding cover are each disposed on the primary board circuit on the both sides of the PCB primary board, a radiator is printed on at least one side panel of the PCB primary board, the radiator and the primary board circuit are located in different areas of the PCB primary board, and a first wave absorbing sheet is attached to the first primary board metal shielding cover and/or the second primary board metal shielding cover.





(19) **United States**

(12) **Patent Application Publication**
PAN et al.

(10) Pub. No.: US 2013/0106670 A1

(43) **Pub. Date:** **May 2, 2013**

(54) ANTENNA FOR ACHIEVING EFFECTS OF MIMO ANTENNA

Publication Classification

(71) Applicants: **CHUN-JUI PAN**, Tu-Cheng (TW);
SHENG-HSIUNG YANG, Tu-Cheng
(TW); **WEN-CHIEH TSAI**, Tu-Cheng
(TW)

(51) **Int. Cl.**
H01Q 9/06 (2006.01)

(52) **U.S. Cl.**
USPC 343/843

(72) Inventors: **CHUN-JUI PAN**, Tu-Cheng (TW);
SHENG-HSIUNG YANG, Tu-Cheng
(TW); **WEN-CHIEH TSAI**, Tu-Cheng
(TW)

(57) **ABSTRACT**

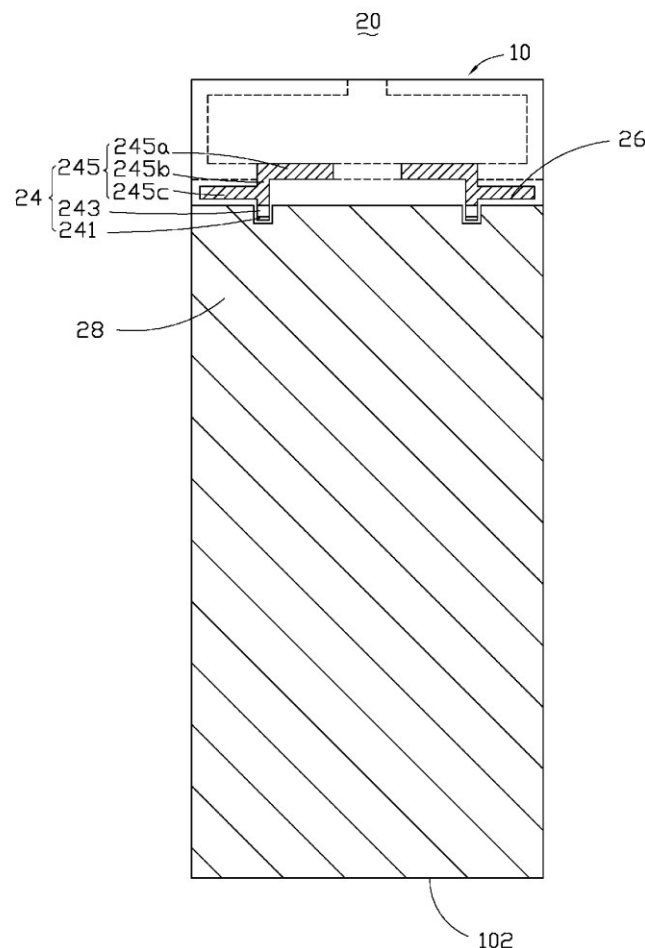
An antenna disposed on a substrate includes a radiating portion, a first coupling and feeding portion, and a second coupling and feeding portion. A length of the radiating portion is substantially equal to a half wavelength of electromagnetic signals radiated by the radiating portion. Each coupling and feeding portion includes a feeding part and a coupling part. The feeding part feeds the electromagnetic signals to the radiating portion via the coupling part so as to achieve effects of a multiple-input multiple-output (MIMO) antenna. A gap is defined between the coupling part and the radiating portion to improve an isolation of the MIMO antenna.

(21) Appl. No.: 13/656,753

(22) Filed: **Oct. 22, 2012**

(30) Foreign Application Priority Data

Oct. 28, 2011 (TW) 100139312

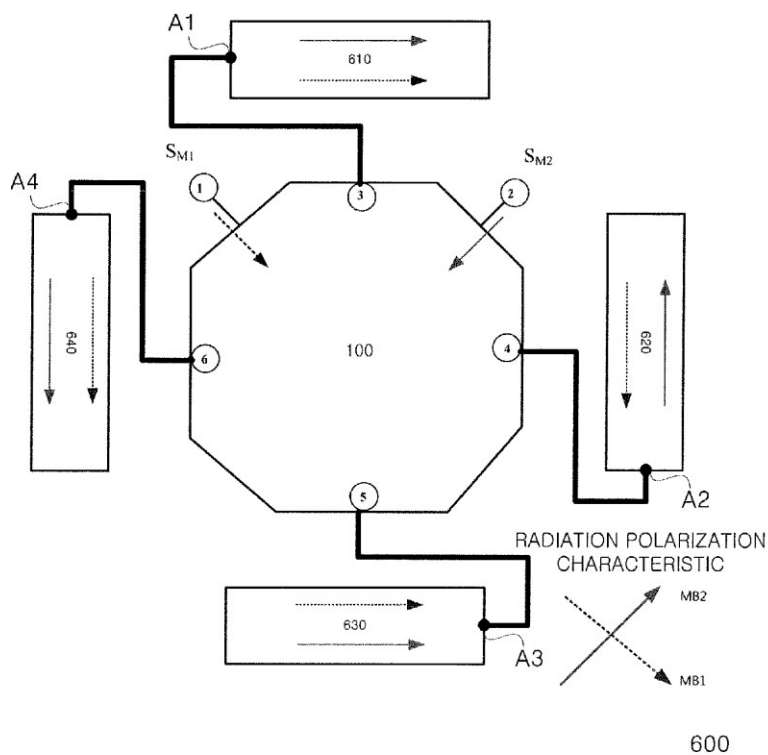




US 20130106671A1

(19) **United States**(12) **Patent Application Publication**
EOM et al.(10) **Pub. No.: US 2013/0106671 A1**(43) **Pub. Date: May 2, 2013**(54) **MULTI-FUNCTION FEED NETWORK AND
ANTENNA IN COMMUNICATION SYSTEM****Publication Classification**(71) Applicant: **Electronics and Telecommunications
Research In, Daejeon (KR)**(51) **Int. Cl.**
H01Q 21/00 (2006.01)
H01Q 3/24 (2006.01)
H01P 5/12 (2006.01)(72) Inventors: **Soon-Young EOM, Daejeon (KR);
Joung-Myoun KIM, Daejeon (KR);
Jeong-Ho JU, Daejeon (KR); Dong-Uk
SIM, Chungbuk (KR); Jae-Ick CHOI,
Daejeon (KR)**(52) **U.S. Cl.**
USPC **343/853**; 333/136; 343/876; 343/893(73) Assignee: **ELECTRONICS AND
TELECOMMUNICATIONS
RESEARCH, Daejeon (KR)**(57) **ABSTRACT**

Disclosed are a multi-function feed network capable of controlling a radiation pattern diversity and an orthogonal polarization diversity of an antenna transmitting and receiving a signal in a communication system and an antenna including the multi-function feed network. The multi-function feed network includes a plurality of output nodes; boundary transmission lines connecting between the output nodes; cross transmission lines configured to be connected with a part of the boundary transmission lines and crossed in an area configured of the boundary transmission lines; input terminals configured to be connected with one of nodes formed by the boundary transmission lines and nodes formed by the crossing transmission lines and input signals; and output terminals configured to be connected with each of the output nodes and divide and output the input signals.

(21) Appl. No.: **13/661,251**(22) Filed: **Oct. 26, 2012**(30) **Foreign Application Priority Data**Oct. 27, 2011 (KR) 10-2011-0110681
Sep. 25, 2012 (KR) 10-2012-0106353



US 20130109449A1

(19) **United States**(12) **Patent Application Publication****Desclos et al.**(10) **Pub. No.: US 2013/0109449 A1**(43) **Pub. Date: May 2, 2013**(54) **ANTENNA SYSTEM OPTIMIZED FOR SISO AND MIMO OPERATION**(71) Applicant: **Ethertronics, Inc.**, San Diego, CA (US)(72) Inventors: **Laurent Desclos**, San Diego, CA (US);
Sebastian Rowson, San Diego, CA (US); **Jeffrey Shamblin**, San Marcos, CA (US)(73) Assignee: **Ethertronics, Inc.**, San Diego, CA (US)(21) Appl. No.: **13/621,811**(22) Filed: **Sep. 17, 2012****Related U.S. Application Data**

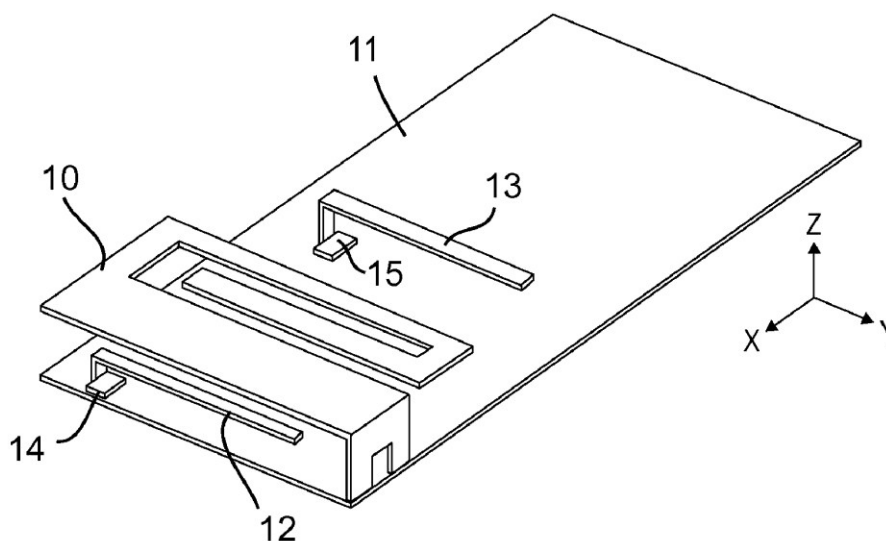
(63) Continuation-in-part of application No. 13/029,564, filed on Feb. 17, 2011, now Pat. No. 8,362,962, which is a continuation of application No. 12/043,090, filed on Mar. 5, 2008, now Pat. No. 7,911,402, Continuation-in-part of application No. 13/289,901, filed on Nov. 4, 2011, which is a continuation of application No. 12/894,052, filed on Sep. 29, 2010, now Pat. No. 8,077,116, which is a continuation of application No. 11/841,207, filed on Aug. 20, 2007, now Pat. No.

7,830,320, Continuation-in-part of application No. 13/227,361, filed on Sep. 7, 2011.

(60) Provisional application No. 61/535,360, filed on Sep. 16, 2011, provisional application No. 61/683,673, filed on Aug. 15, 2012.

Publication Classification(51) **Int. Cl.**
H04B 7/04 (2006.01)(52) **U.S. Cl.**
CPC **H04B 7/0413** (2013.01)
USPC **455/575.7**(57) **ABSTRACT**

An active antenna system and algorithm is described that provides for improved performance from LTE communication systems operating in Category 1 mode, where one antenna is used. For the LTE SISO case (category 1), a modal antenna capable of generating multiple radiation patterns will provide improved throughput due to improved resistance to fading. Modal (Null Steering) antenna technology is implemented in a multi-antenna system to provide for single and multiple antenna operation wherein one or more antennas have two or more radiation modes. An algorithm has been developed that determines when to switch from SISO to MIMO operation.





US 2013011096A1

(19) **United States**(12) **Patent Application Publication**
CHANG(10) **Pub. No.: US 2013/011096 A1**(43) **Pub. Date: May 2, 2013**(54) **DOCKING DEVICE WITH A BUILT-IN
NETWORK SHARE MODULE**(52) **U.S. Cl.**

USPC 710/303

(76) Inventor: **Nai-Chien CHANG**, New Taipei City
(TW)

(57)

ABSTRACT

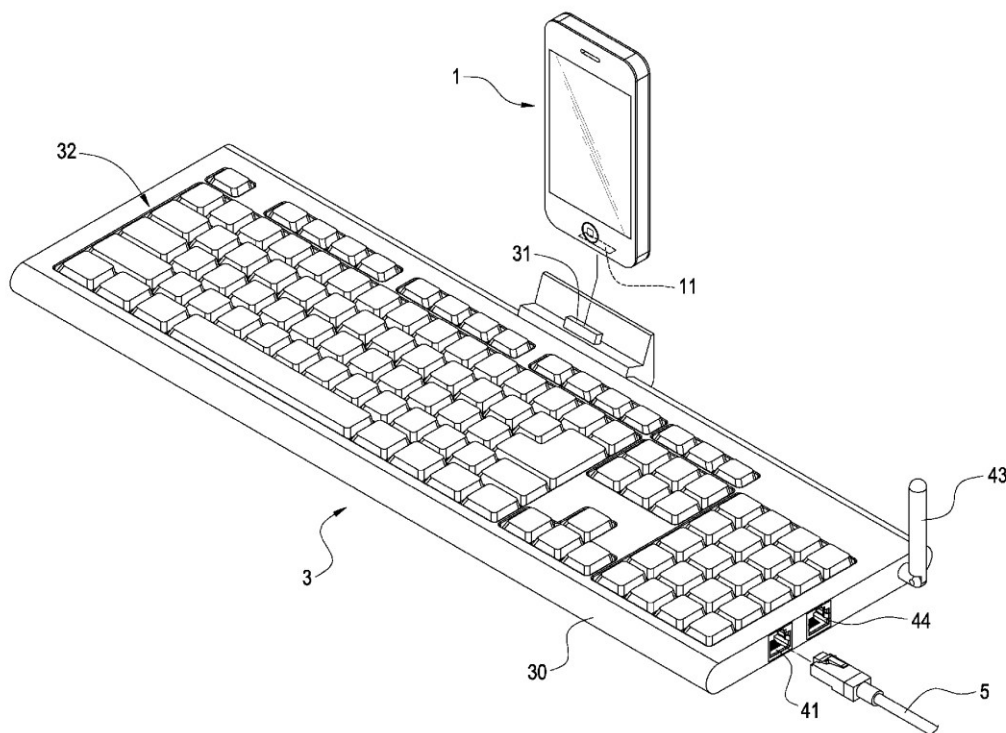
A docking device with a built-in network share module is coupled to an external electronic apparatus via a connector, thereby providing additional hardware functions to the electronic apparatus. The docking device is provided with a built-in network share module including a network input port, a wireless network chip, and an antenna unit. The docking device is coupled to an external modem via the network input port, so that the docking device can access the Internet via the modem. Further, the network share module is coupled to a processing unit inside the docking device, so that the electronic apparatus can access the Internet via the docking device and the modem. Further, the wireless network chip is configured to convert network signals and transmit the converted network signals to the outside via the antenna unit, thereby sharing the wireless network with the outside.

(21) Appl. No.: **13/548,031**(22) Filed: **Jul. 12, 2012**(30) **Foreign Application Priority Data**

Oct. 26, 2011 (TW) 100220109

Publication Classification(51) **Int. Cl.**
G06F 13/00

(2006.01)





(19) **United States**

(12) **Patent Application Publication**
IKEMOTO

(10) **Pub. No.: US 2013/0112754 A1**

(43) **Pub. Date:** **May 9, 2013**

(54) **READER/WRITER ANTENNA MODULE AND ANTENNA DEVICE**

(71) Applicant: **MURATA MANUFACTURING CO., LTD.**, Nagaokakyo-shi (JP)

(72) Inventor: **Nobuo IKEMOTO**, Nagaokakyo-shi
(JP)

(73) Assignee: **MURATA MANUFACTURING CO., LTD.**, Nagaokakyo-shi (JP)

(21) Appl. No.: 13/731,207

(22) Filed: **Dec. 31, 2012**

Related U.S. Application Data

(63) Continuation of application No. PCT/JP2011/070776,
filed on Sep. 13, 2011.

(30) **Foreign Application Priority Data**

Sep. 14, 2010 (JP) 2010-205454

Publication Classification

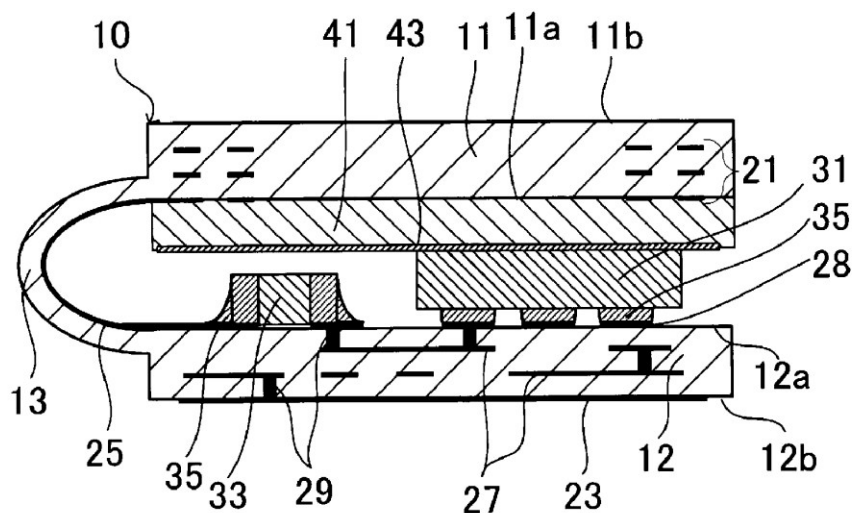
(51) **Int. Cl.**
G06K 19/07 (2006.01)

(52) **U.S. Cl.**
USPC 235/488

(57) **ABSTRACT**

A reader/writer antenna module includes a flexible substrate that includes a first base portion, a second base portion and a bending portion that connects the first base portion and the second base portion to each other. The flexible substrate has a structure that is folded by utilizing the flexibility of the bending portion such that a first main surface of the first base portion and a first main surface of the second base portion face each other, and a magnetic layer is provided between an antenna conductor and the chip component in the folded structure.

1





US 20130113662A1

(19) **United States**

(12) **Patent Application Publication**
KATO et al.

(10) **Pub. No.: US 2013/0113662 A1**

(43) **Pub. Date: May 9, 2013**

(54) **ANTENNA DEVICE AND METHOD OF
SETTING RESONANT FREQUENCY OF
ANTENNA DEVICE**

(75) Inventors: **Noboru KATO**, Moriyama-shi (JP);
Katsumi TANIGUCHI, Kyoto-shi (JP);
Jun SASAKI, Kyoto-shi (JP); **Naoki
GOCHI**, Nagaokakyo-shi (JP)

(73) Assignee: **MURATA MANUFACTURING CO.,
LTD.**, Nagaokakyo-shi (JP)

(21) Appl. No.: **13/604,807**

(22) Filed: **Sep. 6, 2012**

Related U.S. Application Data

(63) Continuation of application No. 13/272,365, filed on
Oct. 13, 2011, which is a continuation of application
No. PCT/JP2009/066336, filed on Sep. 18, 2009.

(30) **Foreign Application Priority Data**

Apr. 21, 2009 (JP) 2009-103358

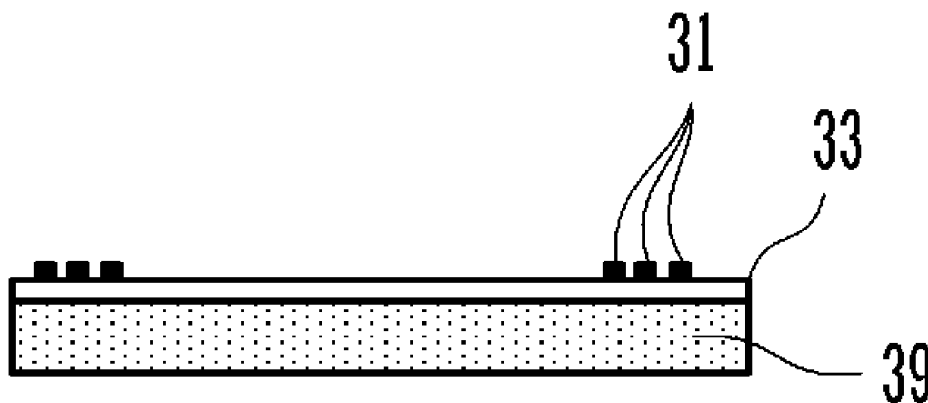
Publication Classification

(51) **Int. Cl.**
H01Q 1/36 (2006.01)
H01Q 1/22 (2006.01)
H01P 11/00 (2006.01)
H01Q 7/06 (2006.01)

(52) **U.S. Cl.**
CPC . **H01Q 1/36** (2013.01); **H01Q 7/06** (2013.01);
H01Q 1/22 (2013.01); **H01P 11/001** (2013.01)
USPC **343/702**; 343/788; 343/787; 29/600

(57) **ABSTRACT**

In antenna device, a coil conductor of an antenna coil module and a conductor layer at least partially overlap. A current flows in the conductor layer to block a magnetic field generated by a current flowing in the coil conductor. A current flows along the periphery of a slit and around the periphery of the conductor layer due to a cut-edge effect. Since magnetic flux does not pass through the conductor layer, magnetic flux attempts to bypass the conductor layer along a path in which the conductor opening of the conductor layer is on the inside and the outer edge of the conductor layer is on the outside. As a result, the magnetic flux generates large loops that link the inside and the outside of a coil conductor of an antenna on a reader/writer side to couple an antenna device and the antenna on the reader/writer side.





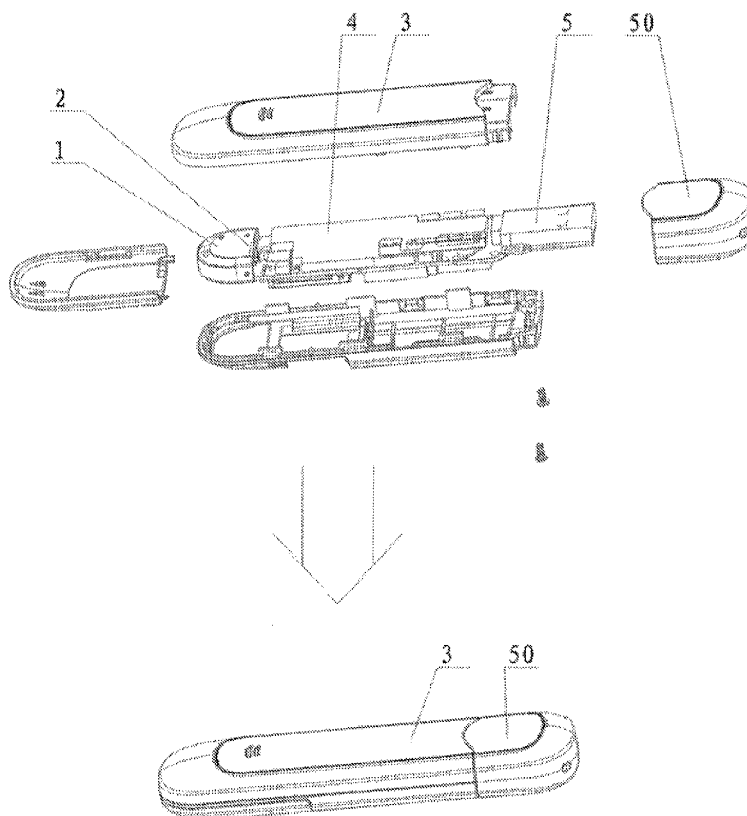
US 20130113663A1

(19) **United States**(12) **Patent Application Publication**
Zhang et al.(10) **Pub. No.: US 2013/0113663 A1**(43) **Pub. Date: May 9, 2013**(54) **ANTENNA COMPONENT AND ELECTRONIC COMMUNICATION DEVICE****Publication Classification**(71) Applicant: **Huawei Device Co., Ltd.**, Shenzhen (CN)(51) **Int. Cl.**
H01Q 1/24 (2006.01)(72) Inventors: **Bin Zhang**, Shenzhen (CN); **Yaming Jiang**, Wuhan (CN); **Pengsheng Chen**, Wuhan (CN)(52) **U.S. Cl.**
CPC **H01Q 1/241** (2013.01)
USPC **343/702**(73) Assignee: **Huawei Device Co., Ltd.**, Shenzhen (CN)(57) **ABSTRACT**(21) Appl. No.: **13/729,740**(22) Filed: **Dec. 28, 2012****Related U.S. Application Data**

(63) Continuation of application No. PCT/CN2011/077048, filed on Jul. 12, 2011.

(30) **Foreign Application Priority Data**Jul. 12, 2010 (CN) 201010227602.2
Aug. 13, 2010 (CN) 201020291352.4

The embodiments of the invention discloses an antenna component and an electronic communication device. The antenna component comprises a plate-shaped front cover made of a transparent plastic material and at least one antenna made of a conductor material. The front cover comprises an antenna accommodation part and a circuit accommodation part. One end of the antenna is embedded in the antenna accommodation part via an injection molding process, and the other end of the antenna extends to the circuit accommodation part and is exposed out of the circuit accommodation part. The electronic communication device comprises a housing, a circuit board, and an antenna component disclosed in the present invention. The present invention is applied to reduce the volume of the antenna component.





US 20130113666A1

(19) **United States**

(12) **Patent Application Publication**

Orsi et al.

(10) **Pub. No.: US 2013/0113666 A1**

(43) **Pub. Date: May 9, 2013**

(54) **CAPACITIVELY COUPLED COMPOUND LOOP ANTENNA**

Publication Classification

(71) Applicant: **DOCKON AG**, Zurich (CH)

(51) **Int. Cl.**
H01Q 7/00 (2006.01)

(72) Inventors: **Ryan James Orsi**, San Diego, CA (US);
Matthew Robert Foster, San Diego, CA (US);
Gregory Poilasne, El Cajon, CA (US)

(52) **U.S. Cl.**
USPC **343/745; 343/866**

(73) Assignee: **DOCKON AG**, Zurich (CH)

(21) Appl. No.: **13/669,389**

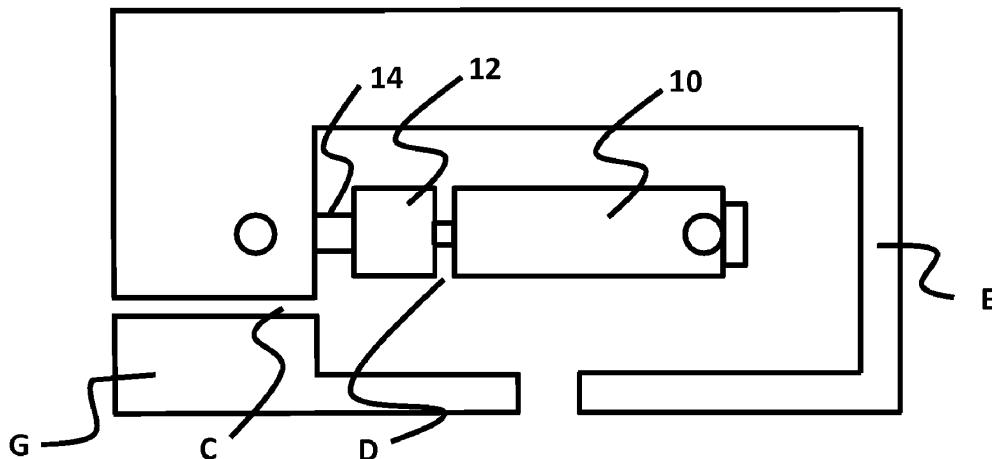
(22) Filed: **Nov. 5, 2012**

(57) **ABSTRACT**

A compound loop antenna (CPL) is described that includes a capacitively fed magnetic loop and/or a capacitively fed electric field radiator. Embodiments include single-band CPL antennas and multi-band CPL antennas. The CPL antennas have been reduced in physical size by capacitively feeding the loop and/or radiator. The embodiments include at least one e-field radiation element that is capacitively coupled or not capacitively coupled, at least one magnetic loop element that is capacitively coupled. A continuation of the magnetic loop may be continued with either a wire or a connection to a second layer.

Related U.S. Application Data

(60) Provisional application No. 61/556,145, filed on Nov. 4, 2011.





US 20130113667A1

(19) **United States**

(12) **Patent Application Publication**
ROWSON et al.

(10) **Pub. No.: US 2013/0113667 A1**

(43) **Pub. Date: May 9, 2013**

(54) **ANTENNA AND METHOD FOR STEERING
ANTENNA BEAM DIRECTION**

(71) Applicants: **Sebastian ROWSON**, San Diego, CA
(US); **Laurent DESCLOS**, San Diego,
CA (US); **Jeffrey SHAMBLIN**, San
Marcos, CA (US)

(72) Inventors: **Sebastian ROWSON**, San Diego, CA
(US); **Laurent DESCLOS**, San Diego,
CA (US); **Jeffrey SHAMBLIN**, San
Marcos, CA (US)

(73) Assignee: **ETHERTRONICS, Inc.**, San Diego,
CA (US)

(21) Appl. No.: **13/726,477**

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

Related U.S. Application Data

(63) Continuation of application No. 13/029,564, filed on
Feb. 17, 2011, now Pat. No. 8,362,962, Continuation
of application No. 12/043,090, filed on Mar. 5, 2008,
now Pat. No. 7,911,402.

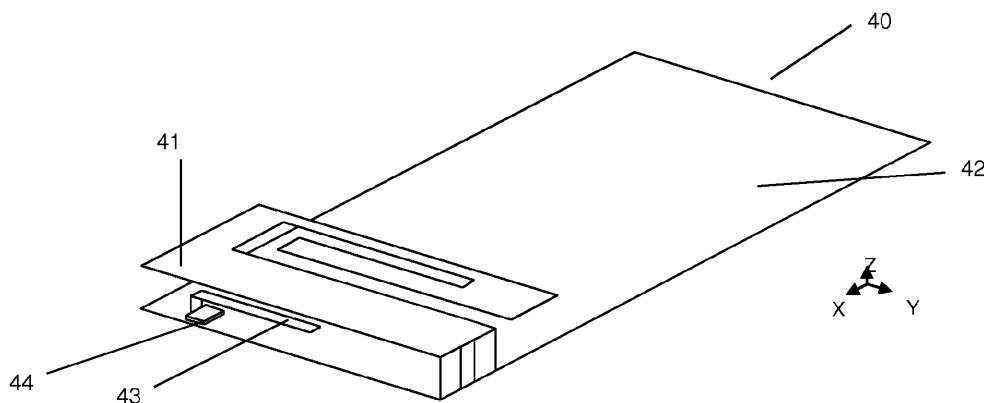
Publication Classification

(51) **Int. Cl.**
H01Q 3/00 (2006.01)

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

(57) **ABSTRACT**

An antenna comprising an IMD element and one or more
parasitic and active tuning elements is disclosed. The IMD
element, when used in combination with the active tuning and
parasitic elements, allows antenna operation at multiple reso-
nant frequencies. In addition, the direction of antenna radia-
tion pattern may be arbitrarily rotated in accordance with the
parasitic and active tuning elements.





US 20130113671A1

(19) **United States**

(12) **Patent Application Publication**
SU et al.

(10) **Pub. No.: US 2013/0113671 A1**

(43) **Pub. Date: May 9, 2013**

(54) **SLOT ANTENNA**

(52) **U.S. CL.**

USPC 343/767

(76) Inventors: **Wei-Cheng SU**, Taipei City (TW);
Cheng-Wen WANG, Taipei City (TW)

(21) Appl. No.: **13/433,032**

(57) **ABSTRACT**

(22) Filed: **Mar. 28, 2012**

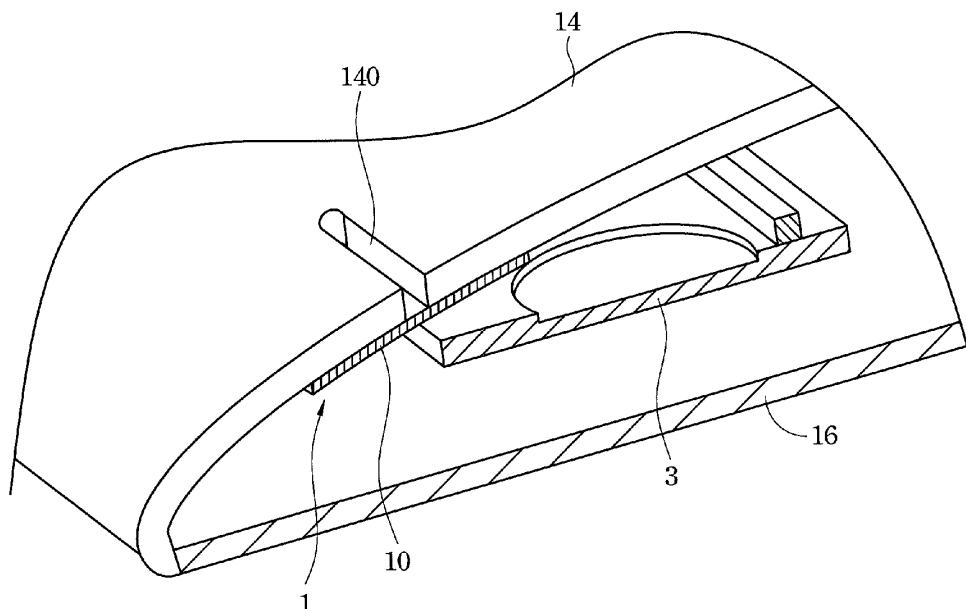
(30) **Foreign Application Priority Data**

Nov. 3, 2011 (TW) 100140149

Publication Classification

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

A slot antenna includes a substrate, a coupling-feed structure, and a grounding member. The coupling-feed structure is disposed at a top surface of the substrate. The coupling-feed structure includes a first coupling member and a second coupling member. The second coupling member is separately disposed near by the first coupling member. The grounding member is electrically connected to a bottom surface of the substrate and has a slot. A portion of the slot is disposed under the first coupling member and the second coupling member.





US 20130113673A1

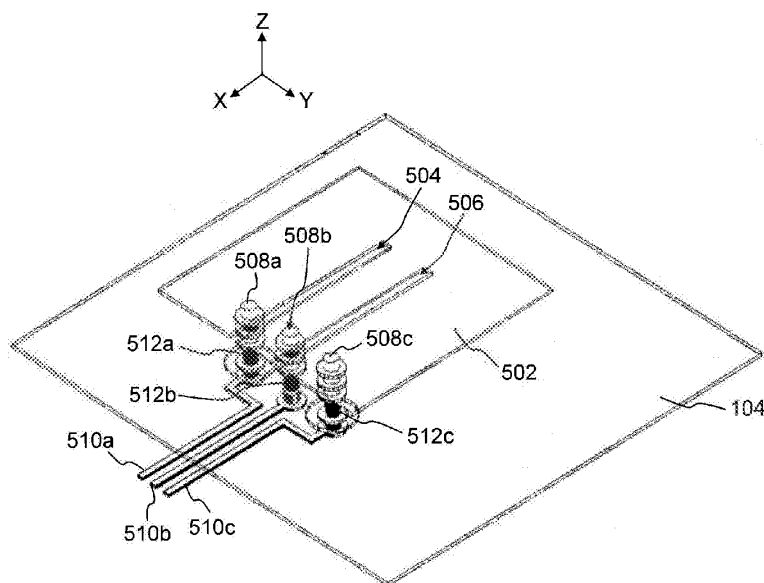
(19) **United States**(12) **Patent Application Publication**
KYRIAZIDOU(10) **Pub. No.: US 2013/0113673 A1**(43) **Pub. Date: May 9, 2013**(54) **RECONFIGURABLE POLARIZATION**
ANTENNA(52) **U.S. Cl.**USPC **343/848**(76) Inventor: **Chryssoula A. KYRIAZIDOU**, Kifisia
(GR)(57) **ABSTRACT**(21) Appl. No.: **13/361,570**(22) Filed: **Jan. 30, 2012****Related U.S. Application Data**(60) Provisional application No. 61/556,094, filed on Nov.
4, 2011.(30) **Foreign Application Priority Data**

Dec. 28, 2011 (GR) 20110100742

Publication Classification(51) **Int. Cl.**
H01Q 3/00

(2006.01)

Embodiments include antenna systems capable of producing high quality circularly, elliptically, or linearly polarized radiation. Embodiments include single feed (single-ended or differential) or multiple feed antennas. Embodiments can be electronically configured to adjust the type of polarization of the antenna system. In an embodiment, the polarization of the antenna system is adjusted by adjusting at least the position of a grounding node relative to the position of a feed node. In another embodiment, the polarization of the antenna system is adjusted by configuring one or more input nodes of the antenna between feed nodes, grounding nodes, and open nodes. In another embodiment, the polarization of the antenna system is adjusted by adjusting the phase of a single differential feed of the system.

500



US 20130113674A1

(19) **United States**(12) **Patent Application Publication**
RYU(10) **Pub. No.: US 2013/0113674 A1**(43) **Pub. Date: May 9, 2013**(54) **ANTENNA DEVICE AND MOBILE
TERMINAL HAVING THE SAME**(52) **U.S. CL.**

USPC 343/848

(76) Inventor: **Seungwoo RYU**, Uijeongbu (KR)(21) Appl. No.: **13/536,714**(22) Filed: **Jun. 28, 2012**(30) **Foreign Application Priority Data**

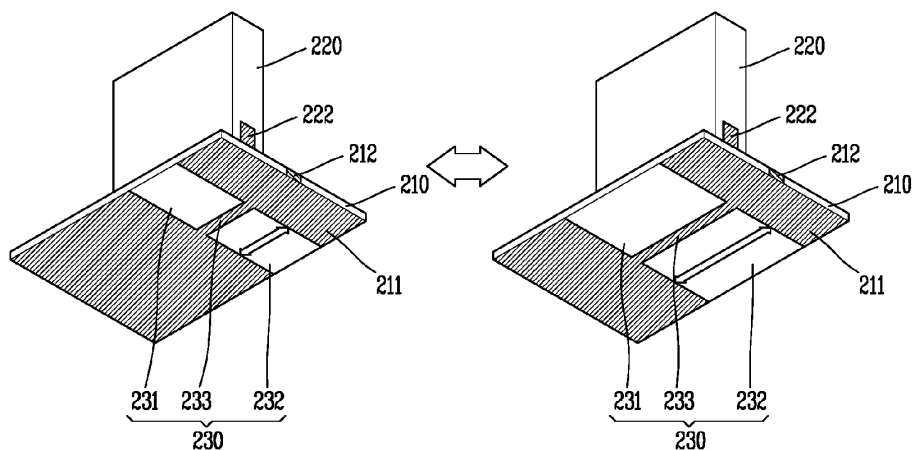
Nov. 7, 2011 (KR) 10-2011-0115269

Publication Classification(51) **Int. Cl.**
H01Q 5/01

(2006.01)

(57) **ABSTRACT**

An antenna device including a dielectric resonator antenna configured to generate resonances in a first frequency band; a printed circuit board electrically connected to the dielectric resonator antenna and configured to process radio signals; and a defected ground structure formed on the printed circuit board and configured to generate resonances in a second frequency band using a current flowing on the dielectric resonator antenna and the printed circuit board.





US 20130113677A1

(19) **United States**(12) **Patent Application Publication****Boyle et al.**(10) **Pub. No.: US 2013/0113677 A1**(43) **Pub. Date: May 9, 2013**(54) **ADAPTIVE ANTENNA MODULE****Publication Classification**

(75) Inventors: **Kevin R. Boyle**, Horsham (GB);
Maurice de Jongh, Nijmegen (NL);
Adrianus Van Bezooijen, Molenhoek (NL)

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

(52) **U.S. Cl.**
USPC **343/852; 343/860**

(73) Assignee: **EPCOS AG**, Muenchen (DE)

(21) Appl. No.: **13/695,396**

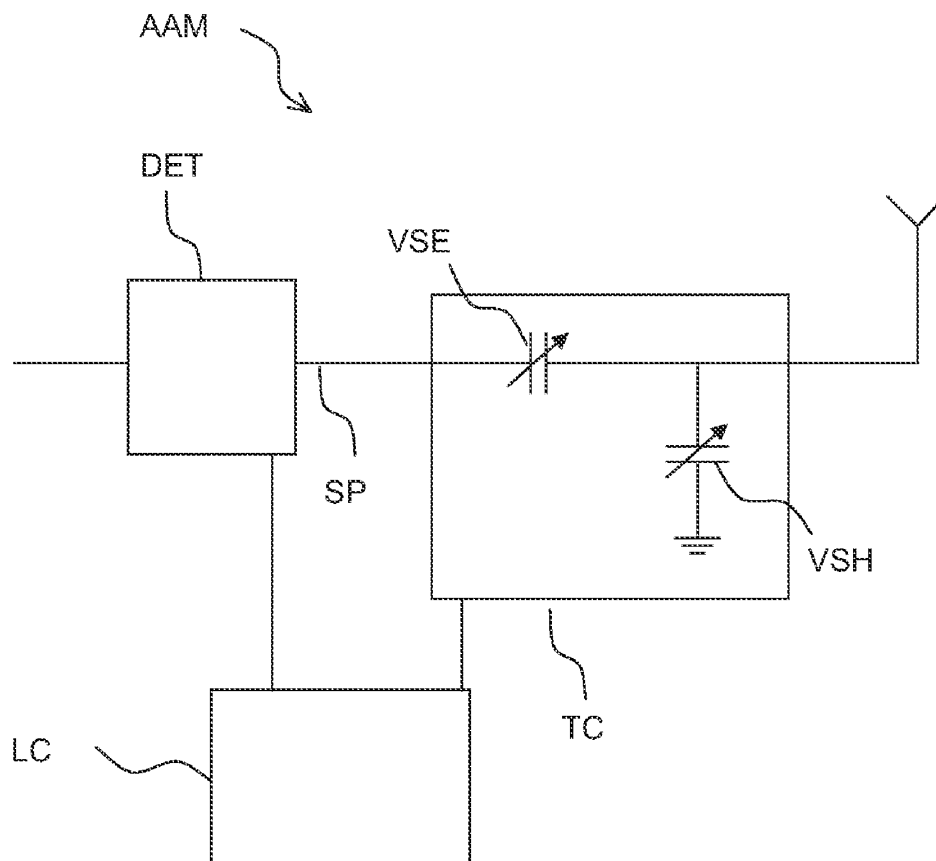
(22) PCT Filed: **Apr. 30, 2010**

(86) PCT No.: **PCT/EP10/55932**

§ 371 (c)(1),
(2), (4) Date: **Jan. 17, 2013**

(57) **ABSTRACT**

A cheaper to produce, smaller and easy to drive adaptive antenna module is presented. The module comprises a signal path, an antenna, and a tuning circuit with two variable impedance elements. The tuning circuit operates over a restricted range of impedances and maintains the series resonance characteristic of the antenna.





US 20130115884A1

(19) **United States**

(12) **Patent Application Publication**
Zhang

(10) **Pub. No.: US 2013/0115884 A1**

(43) **Pub. Date: May 9, 2013**

(54) **FIVE-BAND BLUETOOTH BUILT-IN
ANTENNA AND ITS MOBILE
COMMUNICATION TERMINAL**

Publication Classification

(75) Inventor: **Lian Zhang**, Huizhou (CN)

(51) **Int. Cl.**
H01Q 13/10 (2006.01)
H04B 7/00 (2006.01)

(73) Assignee: **HUIZHOU TCL MOBILE
COMMUNICATION CO., LTD.**
HUIZHOU, GUANGDONG (CN)

(52) **U.S. Cl.**
CPC . **H01Q 13/10** (2013.01); **H04B 7/00** (2013.01)
USPC **455/41.2**; 343/770

(21) Appl. No.: **13/810,801**

(57) **ABSTRACT**

(22) PCT Filed: **Nov. 5, 2011**

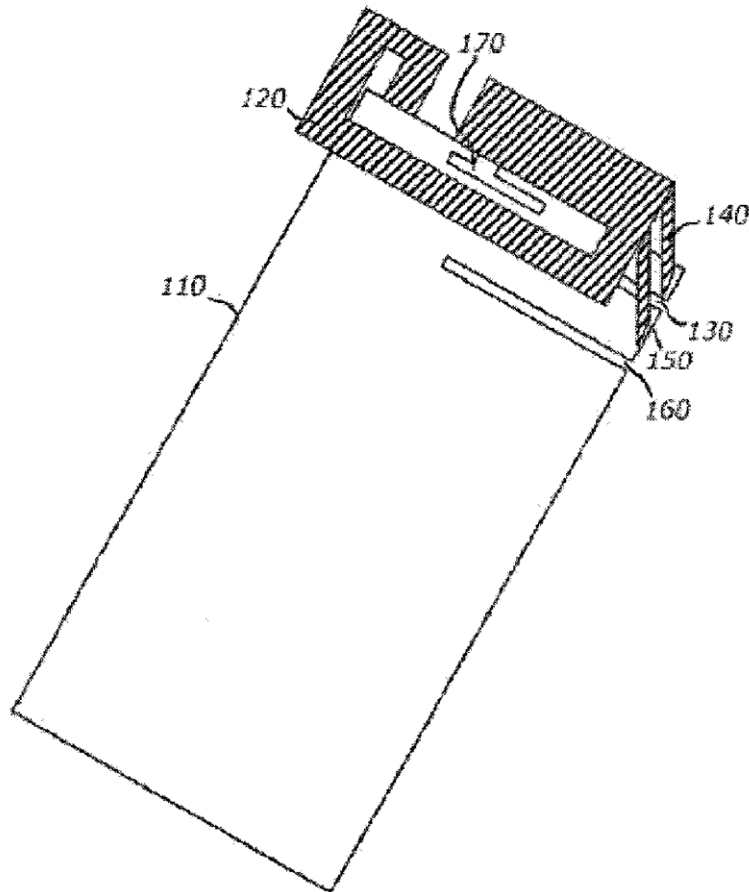
(86) PCT No.: **PCT/CN11/81836**

§ 371 (c)(1),
(2), (4) Date: **Jan. 17, 2013**

A five-band Bluetooth built-in antenna and its mobile communication terminal provide bandwidth for communication. A built-in antenna comprises an antenna radiation unit and a first slot, a second slot and a third slot; Slots are added to approach a center frequency of a low-frequency branch part of the antenna so that the antenna generates resonance, so the low-frequency bandwidth of the antenna is increased. A high-frequency part of the antenna generates resonance by means of capacitive coupling

(30) **Foreign Application Priority Data**

Dec. 1, 2010 (CN) 201010568400.4





US 20130120200A1

(19) **United States**(12) **Patent Application Publication**
Desclos et al.(10) **Pub. No.: US 2013/0120200 A1**(43) **Pub. Date: May 16, 2013**(54) **MULTI LEVELED ACTIVE ANTENNA
CONFIGURATION FOR MULTIBAND MIMO
LTE SYSTEM****Publication Classification**

(51) **Int. Cl.**
H01Q 25/04 (2006.01)

(52) **U.S. Cl.**
CPC **H01Q 25/04** (2013.01)
USPC **343/745**

(75) Inventors: **Laurent Desclos**, San Diego, CA (US);
Jeffrey Shamblin, San Marcos, CA
(US); **S.S. Nam**, Seoul (KR); **J.C. Lee**,
Gyeonggi-do (KR); **S. Hwan**,
Gyeonggi-do (KR); **C.S. Yoon**,
Gyeonggi-do (KR)

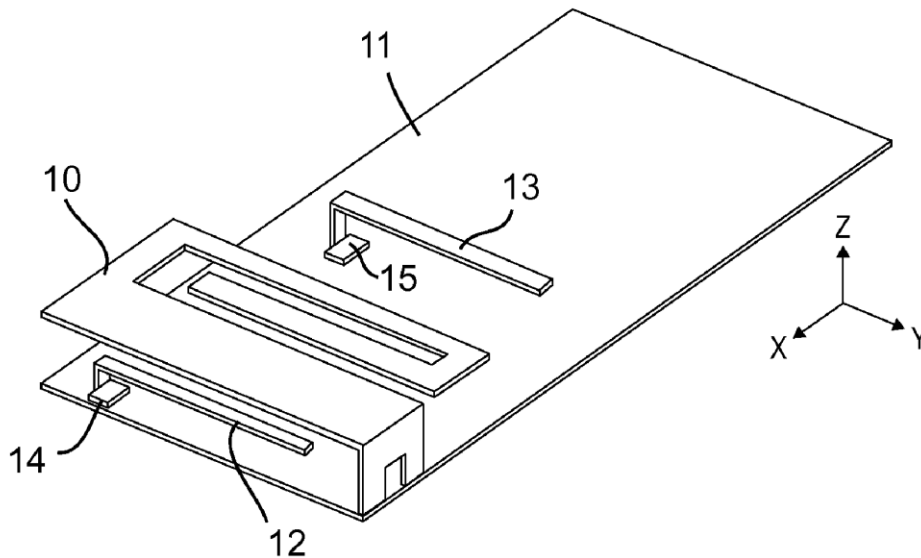
(73) Assignee: **Ethertronics, Inc.**, San Diego, CA (US)(21) Appl. No.: **13/612,809**(22) Filed: **Sep. 12, 2012****Related U.S. Application Data**

(63) Continuation-in-part of application No. 13/029,564,
filed on Feb. 17, 2011, now Pat. No. 8,362,962, Con-
tinuation-in-part of application No. 13/227,361, filed
on Sep. 7, 2011.

(60) Provisional application No. 61/533,559, filed on Sep.
12, 2011.

(57) **ABSTRACT**

An active antenna system and algorithm is described that provides for dynamic tuning and optimization of antenna system parameters for a MIMO system where correlation and isolation between antennas in the system are dynamically altered to provide for greater throughput. As one or multiple antennas are loaded or de-tuned due to environmental changes, corrections to correlation and/or isolation are made by selecting the optimal antenna radiation pattern and by adjusting electrical length and/or reactive loading of transmission lines connecting the antennas. Multiple Isolated Magnetic Dipole (IMD) antennas are co-located and connected with a feed network that can include switches that adjust phase length for transmission lines connecting the antennas. Filtering is integrated into the feed network to improve rejection of unwanted frequencies. Filtering can also be implemented on the antenna structure.





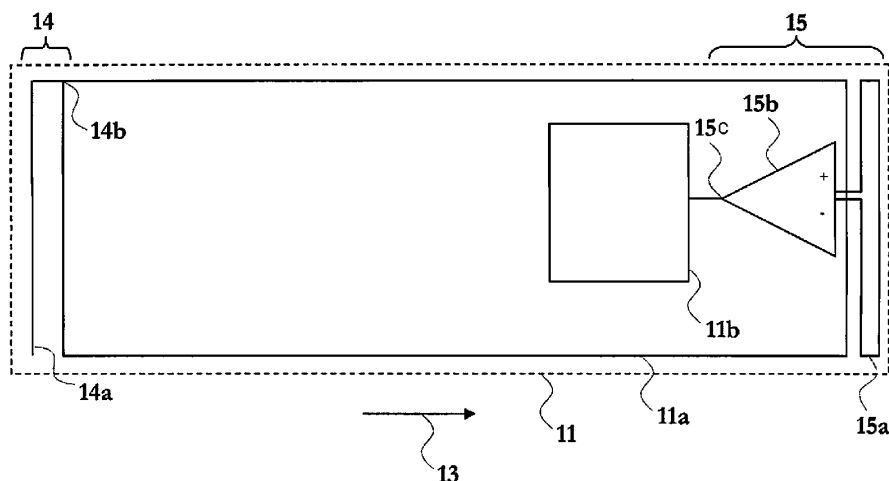
US 20130120208A1

(19) **United States**(12) **Patent Application Publication**
Kaikkonen et al.(10) **Pub. No.: US 2013/0120208 A1**(43) **Pub. Date: May 16, 2013**(54) **AUXILIARY ANTENNA DEVICE, ANTENNA SET, AND HANDHELD RADIO COMMUNICATION DEVICE**(71) Applicants: **Andrei Kaikkonen**, Jarfalla (SE); **Peter Lindberg**, Uppsala (SE); **Stefan Irmischer**, Sollentuna (SE)(72) Inventors: **Andrei Kaikkonen**, Jarfalla (SE); **Peter Lindberg**, Uppsala (SE); **Stefan Irmischer**, Sollentuna (SE)(21) Appl. No.: **13/736,260**(22) Filed: **Jan. 8, 2013****Related U.S. Application Data**

(63) Continuation of application No. PCT/EP2010/061088, filed on Jul. 30, 2010.

Publication Classification(51) **Int. Cl.**
H01Q 25/00 (2006.01)
H01Q 9/06 (2006.01)(52) **U.S. CL.**CPC **H01Q 25/00** (2013.01); **H01Q 9/065** (2013.01)USPC **343/803**; 343/700 MS; 343/893; 343/793(57) **ABSTRACT**

In an exemplary embodiment, there is an auxiliary antenna device for a handheld radio communication device including ground plane means extending in a main direction and a main antenna device having an antenna element operatively coupled to the ground plane means and configured for reception of signals at a selected frequency and polarized essentially in the main direction. The auxiliary antenna device includes a balanced or self-balanced antenna element arrangement, an amplifier, and an output port. The balanced or self-balanced antenna element arrangement is configured for reception of signals at the selected frequency and polarized in a direction essentially orthogonal to the main direction. The amplifier is operatively connected to the balanced or self-balanced antenna element arrangement and configured for amplification of signals received by the balanced or self-balanced antenna element arrangement. The output port is operatively connected to the amplifier and configured to output signals amplified by the amplifier.





US 20130120213A1

(19) **United States**(12) **Patent Application Publication****Cetiner et al.**(10) **Pub. No.: US 2013/0120213 A1**(43) **Pub. Date: May 16, 2013**(54) **BROADBAND ANTENNA SYSTEMS AND METHODS**(71) Applicant: **Utah State University**, North Logan, UT (US)(72) Inventors: **Bedri A. Cetiner**, Logan, UT (US);
Hema Swaroop Mopidevi, Logan, UT (US); **Daniel Rodrigo**, Barcelona (ES);
Luis Jofre, Barcelona (ES)(73) Assignee: **Utah State University**, North Logan, UT (US)(21) Appl. No.: **13/674,298**(22) Filed: **Nov. 12, 2012****Related U.S. Application Data**

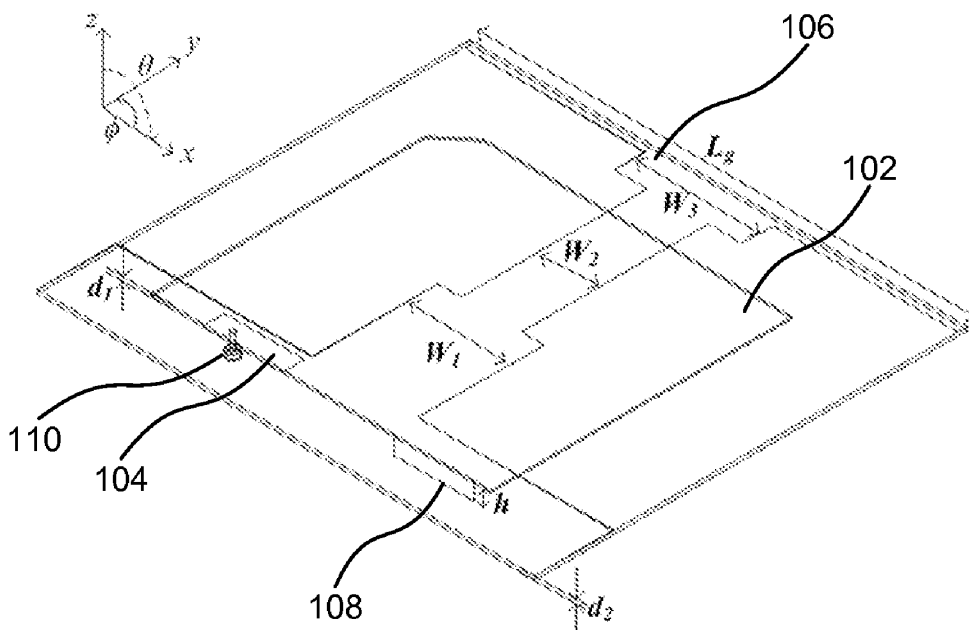
(60) Provisional application No. 61/558,976, filed on Nov. 11, 2011.

Publication Classification(51) **Int. Cl.****H01Q 1/48** (2006.01)**H01Q 21/00** (2006.01)**H01Q 1/38** (2006.01)(52) **U.S. Cl.**CPC . **H01Q 1/48** (2013.01); **H01Q 1/38** (2013.01);**H01Q 21/00** (2013.01)USPC **343/846**

(57)

ABSTRACT

A multi-band antenna that may be designed to operate well in both Public Safety (PS) and Long-Term Evolution (LTE) wireless communication may employ a stepped T-shape structure in conjunction with patch tapering or a reconfigurable ground plane architecture and capacitive feeding to achieve broad bandwidth performance (e.g., over a frequency range from 220 MHz to 4900 MHz). To achieve desired performance, the antenna may include a three-dimensional structure having lateral dimensions of approximately 0.25λ in length and 0.01λ in height at a low desired frequency of operation (e.g., 426 MHz). In some embodiments, the disclosed antenna may exhibit good gain flatness and have a radiation pattern that remains substantially constant over a broad range of operating frequencies.





US 20130120214A1

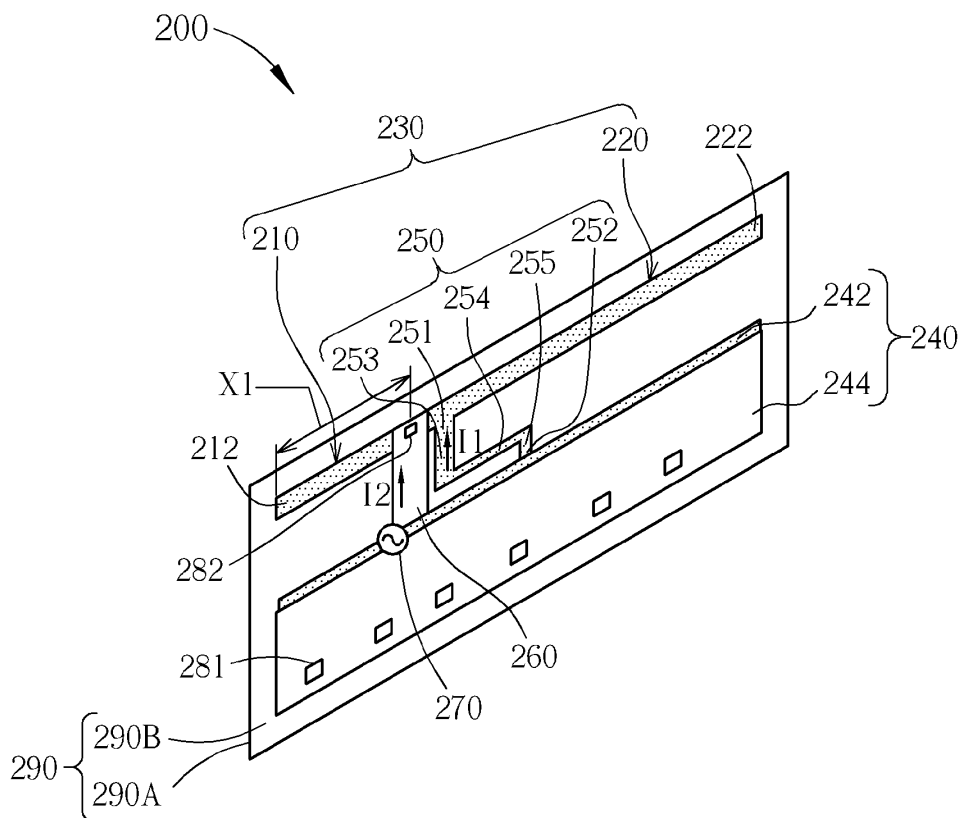
(19) **United States**(12) **Patent Application Publication**
Tseng(10) **Pub. No.: US 2013/0120214 A1**(43) **Pub. Date: May 16, 2013**(54) **ANTENNA STRUCTURE****Publication Classification**(71) Applicant: **Wistron NeWeb Corporation**, Hsinchu (TW)(51) **Int. Cl.**
H01Q 1/38 (2006.01)
H01Q 1/48 (2006.01)(72) Inventor: **Kuan-Hsueh Tseng**, Hsinchu (TW)(52) **U.S. Cl.**
CPC ... **H01Q 1/38** (2013.01); **H01Q 1/48** (2013.01)
USPC **343/846**; 343/700 MS(73) Assignee: **WISTRON NEWEB CORPORATION**, Hsinchu (TW)(57) **ABSTRACT**(21) Appl. No.: **13/735,045**(22) Filed: **Jan. 7, 2013****Related U.S. Application Data**

(62) Division of application No. 12/752,141, filed on Apr. 1, 2010.

(30) **Foreign Application Priority Data**

Jan. 7, 2010 (TW) 099200248

An antenna structure includes a radiation element, a grounding element, a short element, and a feeding element. The radiation element includes a first radiator and a second radiator, wherein the second radiator is extended from the first radiator and coupled to the first radiator. The short element includes a first end as well as a second end, wherein the first end of the short element is coupled to a joint in between the first radiator and the second radiator, and the second end of the short element is coupled to the grounding element. The feeding element includes a first end and a second end, and the first end of the feeding element is electrically connected with the radiation element. The short element is located on a first plane, and the feeding element is located on a second plane being different from the first plane.





US 20130120218A1

(19) **United States**(12) **Patent Application Publication****Kuo et al.**(10) **Pub. No.: US 2013/0120218 A1**(43) **Pub. Date: May 16, 2013**(54) **MULTI-FEED ANTENNA**(52) **U.S. CL.**USPC **343/876**(76) Inventors: **Yen-Liang Kuo**, Taoyuan County (TW);
Wan-Ming Chen, Taoyuan County (TW)(57) **ABSTRACT**

A multi-feed antenna is disclosed. The multi-feed antenna includes a first feed terminal, a second feed terminal, a first ground terminal, a second ground terminal, a radiator and a control circuit. The radiator is coupled to the first feed terminal, the second feed terminal, the first ground terminal and the second ground terminal. The control circuit is coupled to the first feed terminal and the second feed terminal and used for switching a radio frequency (RF) signal between the first feed terminal to the first ground terminal and the second feed terminal to the second ground terminal.

(21) Appl. No.: **13/294,187**(22) Filed: **Nov. 11, 2011****Publication Classification**(51) **Int. Cl.**
H01Q 3/22 (2006.01)