



US 20110316754A1

(19) **United States**

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

(10) **Pub. No.: US 2011/0316754 A1**

(43) **Pub. Date: Dec. 29, 2011**

(54) **CASE HAVING AN ANTENNA WITH AN ACTIVE MODULE AND AN ELECTRONIC DEVICE HAVING THE SAME**

(30) **Foreign Application Priority Data**

Jun. 28, 2010 (KR) 10-2010-0061439

(75) Inventors: **Hyun Kil NAM**, Suwon (KR); **Jae Suk SUNG**, Yongin (KR); **Sung Eun CHO**, Suwon (KR); **Hyun Do PARK**, Yongin (KR); **Chang Mok HAN**, Cheonan (KR); **Dae Ki LIM**, Seongnam (KR); **Sang Woo BAE**, Suwon (KR); **Ki Won CHANG**, Suwon (KR); **Dae Seong JEON**, Suwon (KR)

Publication Classification

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

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

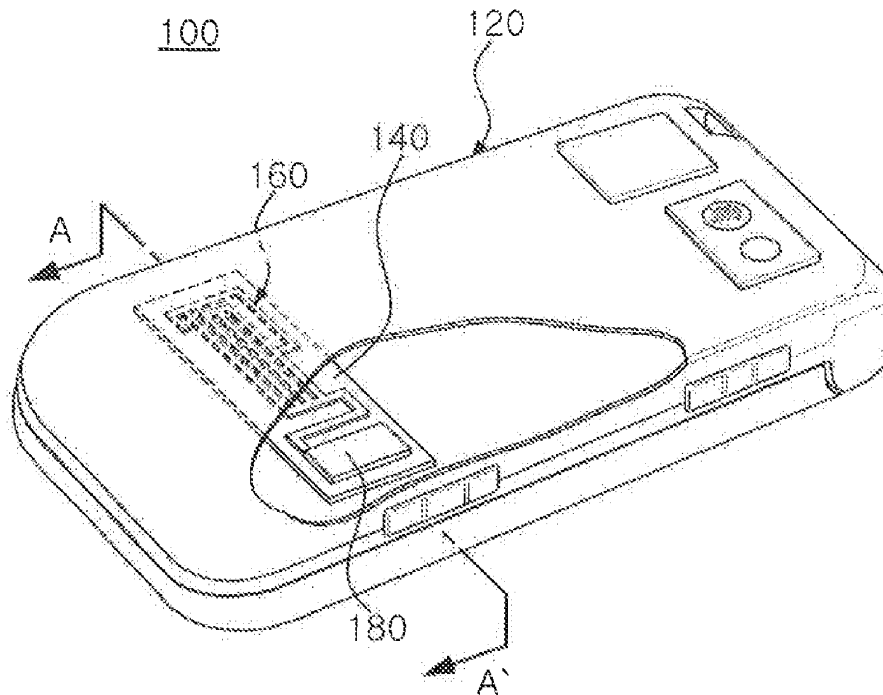
(57) **ABSTRACT**

There is provided a case having an antenna with an active module and an electronic device having the same. The case of an electronic device according to the present invention may include a radiator including an antenna pattern part transmitting and receiving signals, an active module spaced apart from a ground of a main circuit board and integrally formed with the radiator so as to interrupt the influence of noise during the transmitting and receiving of the signals to and from the radiator, and a frame formed to embed the radiator and the active module in the case.

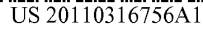
(73) Assignee: **SAMSUNG ELECTRO-MECHANICS CO., LTD.**, Gyeonggi-do (KR)

(21) Appl. No.: **13/092,679**

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



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

(43) **Pub. Date:** **Dec. 29, 2011**

Publication Classification

(51) **Int. Cl.**
H01Q 1/48 (2006.01)
H01P 11/00 (2006.01)
H01Q 9/04 (2006.01)

(52) **U.S. Cl.** **343/845**; 343/700 MS; 29/600

(57) **ABSTRACT**

An example antenna includes a first end portion, a second end portion, and an intermediate portion between the first end portion and the second end portion. The intermediate portion includes multiple folds. The second end portion includes a first conductor to couple with a communication interface of a communication module, and a second conductor to couple with a ground.

Related U.S. Application Data

(63) Continuation of application No. 11/048,999, filed on Feb. 1, 2005, now Pat. No. 7,936,318.



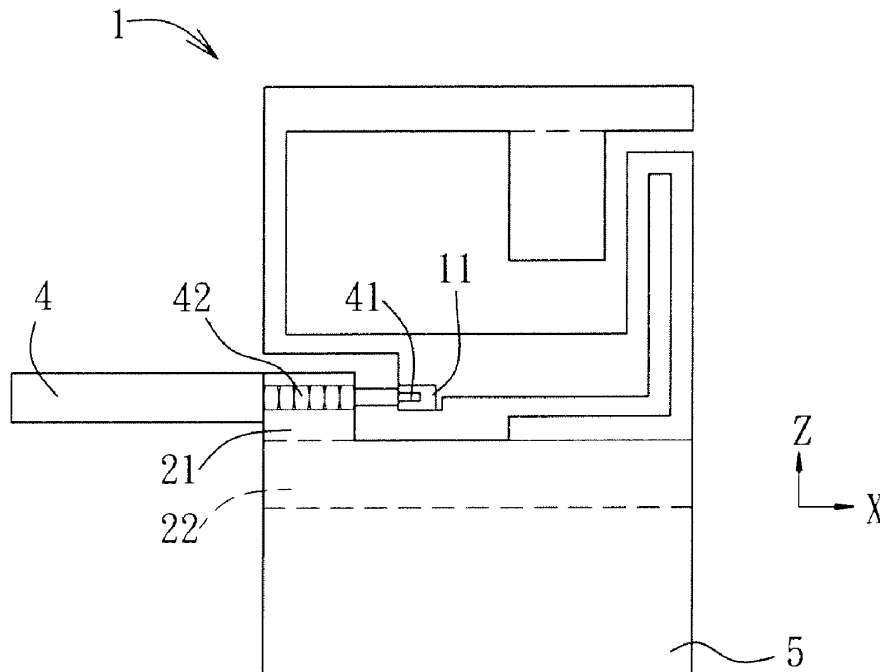


US 20110316760A1

(19) **United States**(12) **Patent Application Publication**
Wu et al.(10) **Pub. No.: US 2011/0316760 A1**(43) **Pub. Date: Dec. 29, 2011**(54) **MULTI-BAND ANTENNA****Publication Classification**(75) Inventors: **Chao-Hsu Wu**, Luzhu Township
(TW); **Chi-Yin Fang**, Pingtung City
(TW)(51) **Int. Cl.**
H01Q 5/00 (2006.01)
H01Q 1/38 (2006.01)
H01Q 1/00 (2006.01)(52) **U.S. Cl.** **343/905; 343/700 MS**(73) Assignee: **Quanta Computer Inc.**, Tao Yuan
Shien (TW)(57) **ABSTRACT**(21) Appl. No.: **12/939,066**(22) Filed: **Nov. 3, 2010**(30) **Foreign Application Priority Data**

Jun. 23, 2010 (TW) 099120422

A multi-band antenna includes a connecting conductor, first and second conducting arms, and a loop conductor. The connecting conductor has a feed-in end and a connecting end. The first conducting arm is connected to the connecting end of the connecting conductor. The second conducting arm is connected to the connecting end of the connecting conductor and is substantially perpendicular to the first connecting arm. The loop conductor has first and second radiator sections, each adjacent and substantially parallel to a respective one of the first and second conducting arms. The loop conductor forms a substantially L-shaped gap with the first and second conducting arms, further has a grounding end adjacent to the feed-in end, and extends from the grounding end to the feed-in end.



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US 20120001803A1

(19) **United States**

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

(10) **Pub. No.: US 2012/0001803 A1**

(43) **Pub. Date: Jan. 5, 2012**

(54) **WIDEBAND ANTENNA**

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

(76) **Inventors:** **Jen-Min Shau**, Hsinchu (TW);
Hsiao-Yi Lin, Hsinchu (TW);
Wei-Shan Chang, Hsinchu (TW)

(21) **Appl. No.: 12/878,038**

(22) **Filed: Sep. 9, 2010**

(30) **Foreign Application Priority Data**

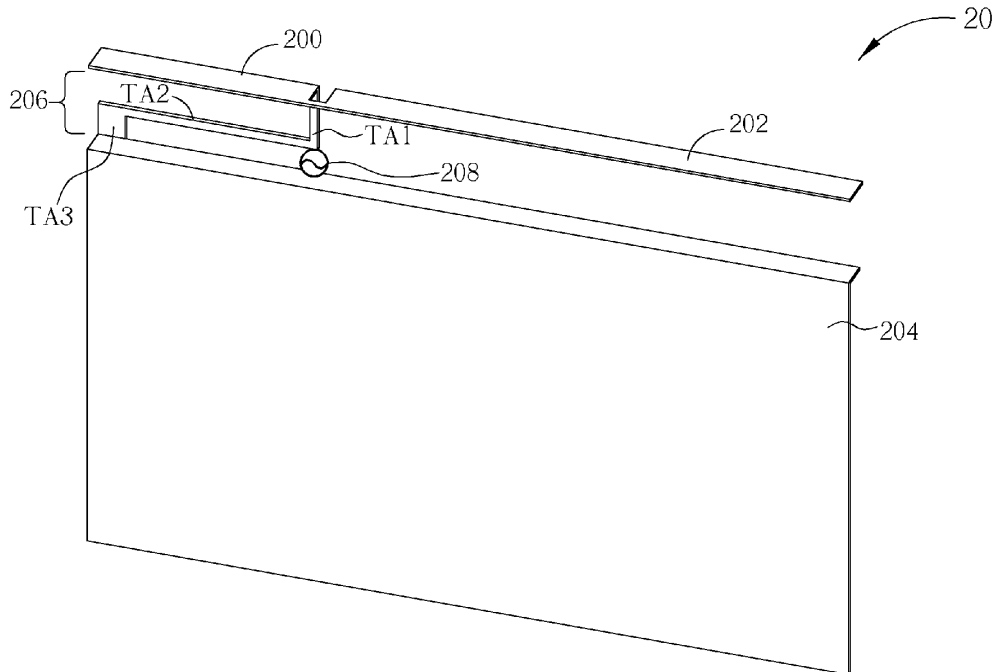
Jul. 2, 2010 (TW) 099212632

Publication Classification

(51) **Int. Cl.**
H01Q 5/00 (2006.01)
H01Q 1/38 (2006.01)

(57) **ABSTRACT**

A wideband antenna for a radio transceiver device includes a first radiating element for transmitting and receiving wireless signals of a first frequency band, a second radiating element for transmitting and receiving wireless signals of a second frequency band, a grounding unit, a connection strip having one end coupled to the first radiating element and the second radiating element, and another end coupled to the grounding unit, and a feeding terminal coupled to the connection strip for transmitting wireless signals of the first frequency band and the second frequency band. The second frequency band is lower than the second frequency band, and the connection strip includes a structure extending toward the first radiating element.



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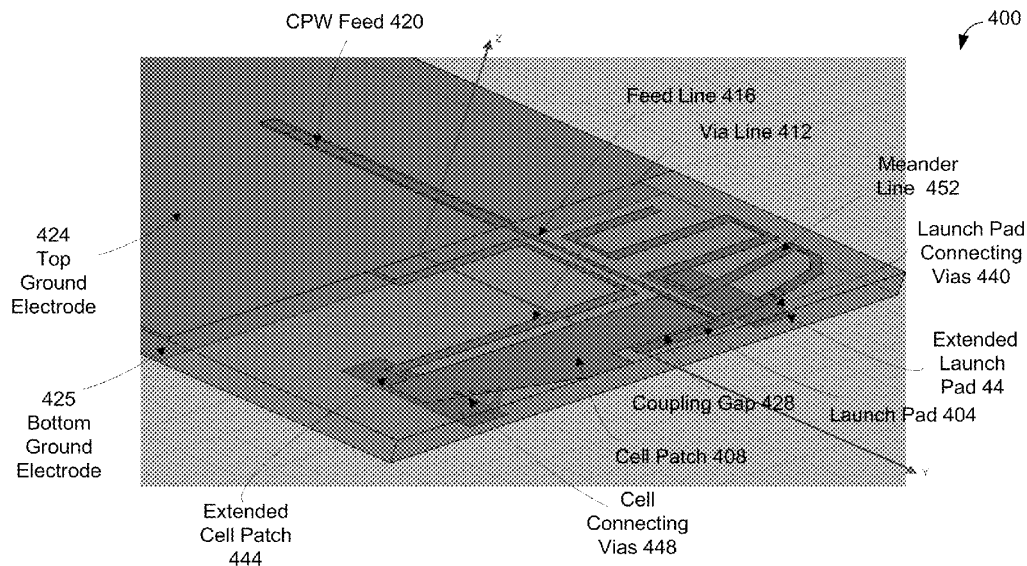
US 20120001804A1

(19) **United States**(12) **Patent Application Publication**
Pathak et al.(10) **Pub. No.: US 2012/0001804 A1**(43) **Pub. Date: Jan. 5, 2012**(54) **CRLH ANTENNA STRUCTURES****Publication Classification**(76) Inventors: **Vaneet Pathak**, San Diego, CA (US); **Gregory Poilasne**, El Cajon, CA (US); **Shane Thornwall**, San Diego, CA (US); **Tzung-I Lee**, Los Angeles, CA (US); **Alan Pasion**, Carlsbad, CA (US); **Norberto Lopez**, San Diego, CA (US); **Ajay Gummalla**, Sunnyvale, CA (US)(51) **Int. Cl.**
H01Q 1/36 (2006.01)
H01P 11/00 (2006.01)(52) **U.S. Cl.** **343/700 MS; 29/600**(21) Appl. No.: **13/021,027**(22) Filed: **Feb. 4, 2011****Related U.S. Application Data**

(60) Provisional application No. 61/302,121, filed on Feb. 6, 2010, provisional application No. 61/311,206, filed on Mar. 5, 2010.

(57) **ABSTRACT**

A variety of configurations for a CRLH structured antenna in a wireless device are presented. An antenna having portions of the CRLH structure positioned on different layers provides an elevated structure. An antenna is presented having a double folded antenna structure, wherein a cell patch includes extensions on multiple layers of a substrate.



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(19) **United States**

(12) **Patent Application Publication**
CHEN

(10) **Pub. No.: US 2012/0001805 A1**

(43) **Pub. Date:** **Jan. 5, 2012**

(54) **DUAL-BAND ANTENNA**

Publication Classification

(75) Inventor: **HSI-CHIEH CHEN**, Tu-Cheng
(TW)

(51) **Int. Cl.**
H01Q 5/01 (2006.01)
H01Q 1/36 (2006.01)

(73) Assignee: **CHI MEI COMMUNICATION
SYSTEMS, INC., Tu-Cheng (TW)**

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

(21) Appl. No.: **13/082,537**

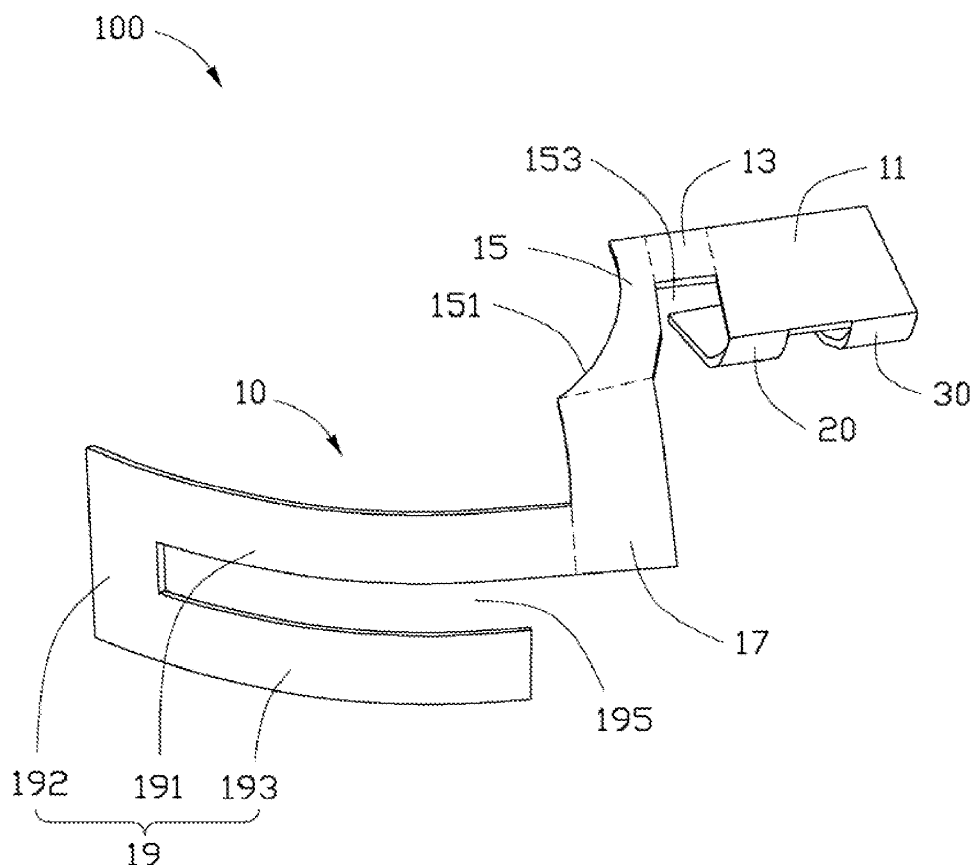
(57) **ABSTRACT**

(22) Filed: **Apr. 8, 2011**

(30) **Foreign Application Priority Data**

Jun. 30, 2010 (TW) 99121600

A dual-band antenna includes a radiator unit. The radiator unit includes a base portion, an extension portion extending from the base portion, a connecting portion extending from the extension portion, a transition portion extending from the connecting portion, and a u-shaped portion extending from the transition section. The connecting portion, the extension portion, and the base portion define a first slot. The u-shaped portion defines a second slot.



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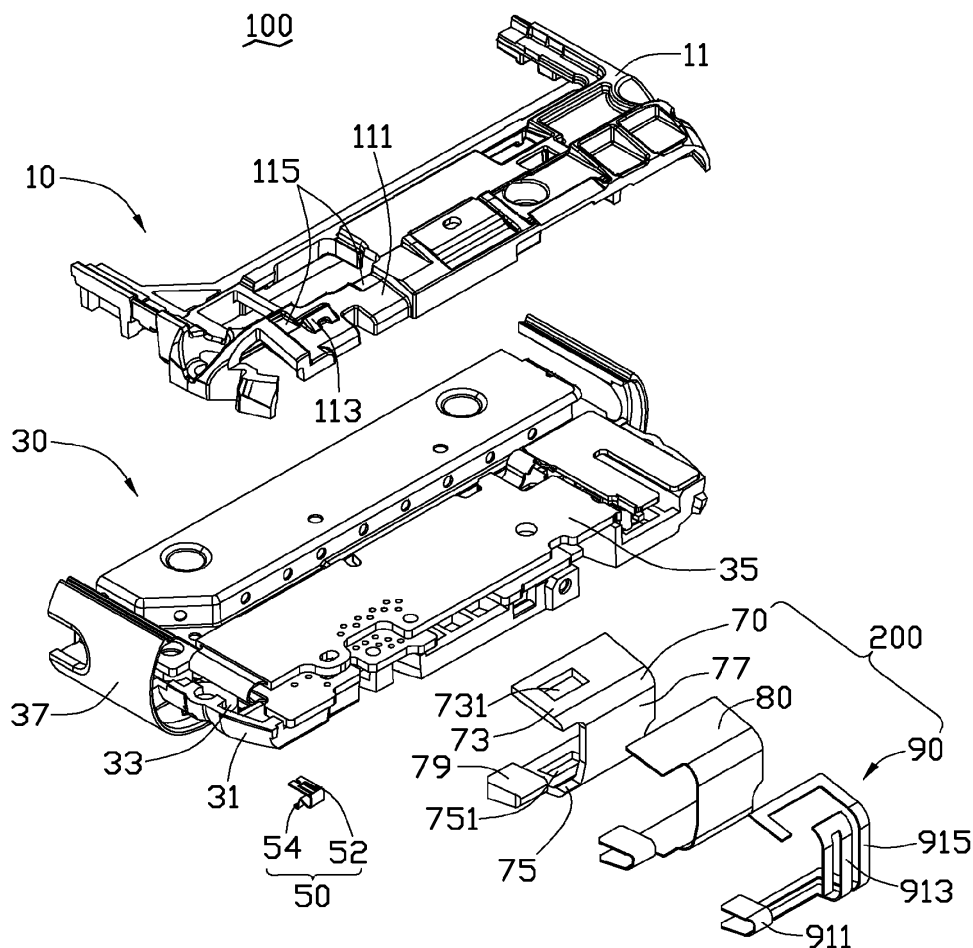
US 20120001806A1

(19) **United States**(12) **Patent Application Publication**
HSIUNG(10) **Pub. No.: US 2012/0001806 A1**(43) **Pub. Date: Jan. 5, 2012**(54) **PORTABLE ELECTRONIC DEVICE WITH
ANTENNA MODULE****Publication Classification**(51) **Int. Cl.**
H01Q 1/24 (2006.01)(52) **U.S. Cl.** **343/702**(57) **ABSTRACT**

A portable electronic device includes a main body, and an antenna module. The main body includes an upper surface and a lower surface. A recessed portion is formed in the upper surface and a receiving portion is formed in the lower surface. The antenna module includes an antenna and a holder. The antenna is attached to the holder. The holder includes a first end portion and a second end portion. The first end portion and the second end portion are respectively engaged in the recessed portion and the receiving portion. A connector electronically connects the antenna.

(75) **Inventor:** **MING-CHUN HSIUNG**, Shindian
(TW)(73) **Assignee:** **FIH (HONG KONG) LIMITED**,
Kowloon (HK)(21) **Appl. No.:** **12/891,903**(22) **Filed:** **Sep. 28, 2010**(30) **Foreign Application Priority Data**

Jun. 30, 2010 (CN) 201020242992.6



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US 20120001807A1

(19) **United States**(12) **Patent Application Publication****LEE et al.**(10) **Pub. No.: US 2012/0001807 A1**(43) **Pub. Date: Jan. 5, 2012**

(54) **ELECTRONIC DEVICE CASE HAVING ANTENNA PATTERN EMBEDDED THEREIN, METHOD FOR MANUFACTURING THE SAME, MOLD FOR MANUFACTURING ANTENNA PATTERN FRAME, AND ELECTRONIC DEVICE**

(75) **Inventors:** **Dae Kyu LEE**, Suwon (KR); **Jae Suk SUNG**, Yongin (KR); **Sung Eun CHO**, Suwon (KR); **Chan Gwang AN**, Suwon (KR); **Ha Ryong HONG**, Hwaseong (KR); **Ki Won CHANG**, Suwon (KR)

(73) **Assignee:** **SAMSUNG ELECTRO-MECHANICS CO., LTD.**, Suwon (KR)

(21) **Appl. No.:** **13/091,850**

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

(30) **Foreign Application Priority Data**

Jun. 30, 2010 (KR) 10-2010-0063078

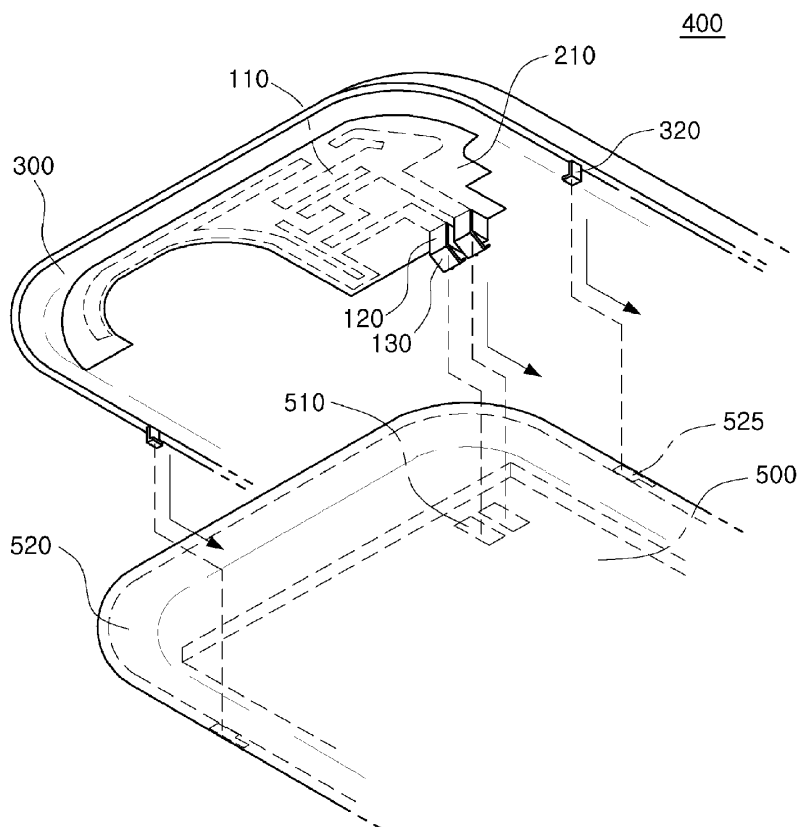
Publication Classification

(51) **Int. Cl.**
H01Q 1/24 (2006.01)
B29C 45/14 (2006.01)
B29C 45/04 (2006.01)

(52) **U.S. Cl.** **343/702; 425/116; 264/259**

(57) **ABSTRACT**

An electronic device case includes: a radiator including an antenna pattern part transmitting or receiving a signal and a connection terminal part allowing the signal to be transmitted to or received from a circuit board of an electronic device; a radiator frame including the radiator injection-molded thereon, separated from the connection terminal part so that the connection part can have elasticity, and having a radiator support protruded from the opposite surface of one surface on which the antenna pattern part is formed; and a case frame covering one surface of the radiator frame to allow the antenna pattern part to be embedded between the case frame and the radiator frame.



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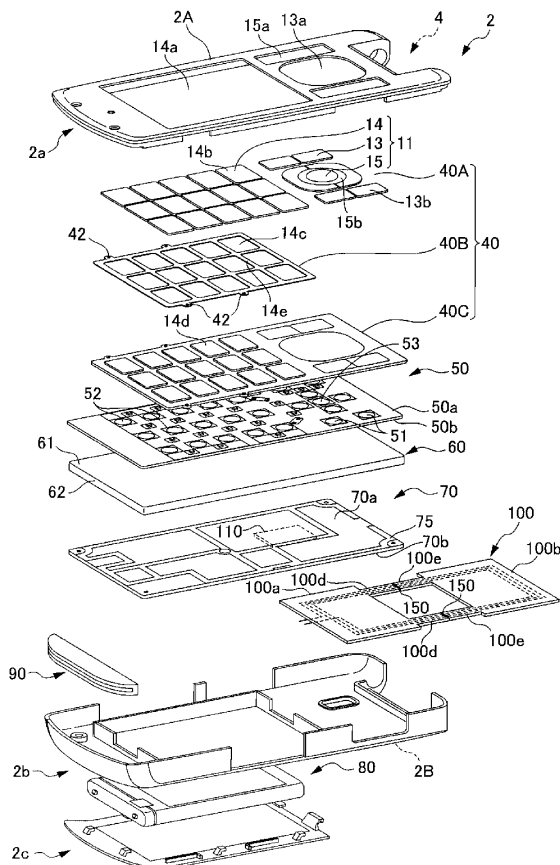
US 20120001808A1

(19) **United States**(12) **Patent Application Publication**
Nekozuka(10) **Pub. No.: US 2012/0001808 A1**(43) **Pub. Date: Jan. 5, 2012**(54) **PORTABLE ELECTRONIC DEVICE****Publication Classification**(75) Inventor: **Hikaru Nekozuka, Kanagawa (JP)**(51) **Int. Cl.**
H01Q 1/24 (2006.01)(73) Assignee: **KYOCERA CORPORATION,**
Kyoto (JP)(52) **U.S. Cl.** **343/702**(21) Appl. No.: **13/131,493**(57) **ABSTRACT**(22) PCT Filed: **Nov. 26, 2009**(86) PCT No.: **PCT/JP2009/006394**§ 371 (c)(1),
(2), (4) Date: **Jul. 25, 2011**

Provided is a portable electronic device which can be changed between a first state and a second state and comprises an antenna that forms a loop in the first state and does not form the loop in the second state. A mobile telephone (1) comprises: an operation unit-side casing (2); a display unit-side casing (3); a linking part (4) which links the operation unit-side casing (2) and the display unit-side casing (3) to allow the relative positions thereof to be changed, in such a way that it is possible to change between the first state and the second state; and a loop antenna (100) for forming a loop. The loop antenna (100) comprises a first part (100a) disposed at the operation unit-side casing (2), a second part (100b) disposed at the display unit-side casing (3), a contacting part (150a) disposed at the operation unit-side casing (2), and a contacted part (150b) disposed at the display unit-side casing (3).

(30) **Foreign Application Priority Data**

Nov. 26, 2008 (JP) 2008-301177



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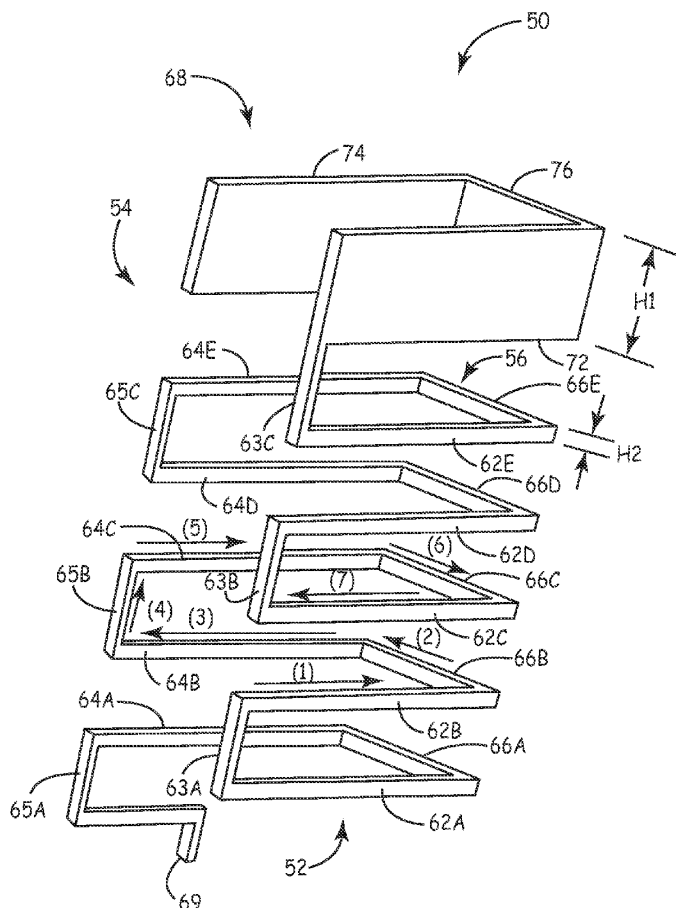
(19) **United States**(12) **Patent Application Publication**
Zhao et al.(10) **Pub. No.: US 2012/0001812 A1**(43) **Pub. Date: Jan. 5, 2012**(54) **IMPLANTABLE MEDICAL DEVICE**
ANTENNA**Publication Classification**

(51) **Int. Cl.**
H01Q 9/30 (2006.01)
H01P 11/00 (2006.01)
H01Q 1/12 (2006.01)
(52) **U.S. Cl.** **343/718; 343/900; 29/600**
(57) **ABSTRACT**

(75) Inventors: **Yanzhu Zhao**, Blaine, MN (US);
Quentin S. Denzene, Andover, MN (US)(73) Assignee: **Medtronic, Inc.**, Minneapolis, MN (US)(21) Appl. No.: **12/841,778**(22) Filed: **Jul. 22, 2010****Related U.S. Application Data**

(60) Provisional application No. 61/360,395, filed on Jun. 30, 2010.

This disclosure is directed to a three-dimensional antenna that may be used for an implantable medical device (IMD). The antenna includes a first antenna portion that includes a plurality of segments arranged substantially parallel to one another in a first plane. The antenna further includes a second antenna portion that includes a plurality of segments arranged substantially parallel to one another in a second plane that is substantially parallel to the first plane. The antenna further includes a third antenna portion that includes a plurality of segments arranged substantially parallel to one another in a third plane. The plurality of segments of the third portion are coupled between segments of the first and second portions. The third plane is arranged substantially perpendicular to the first plane and the second plane.



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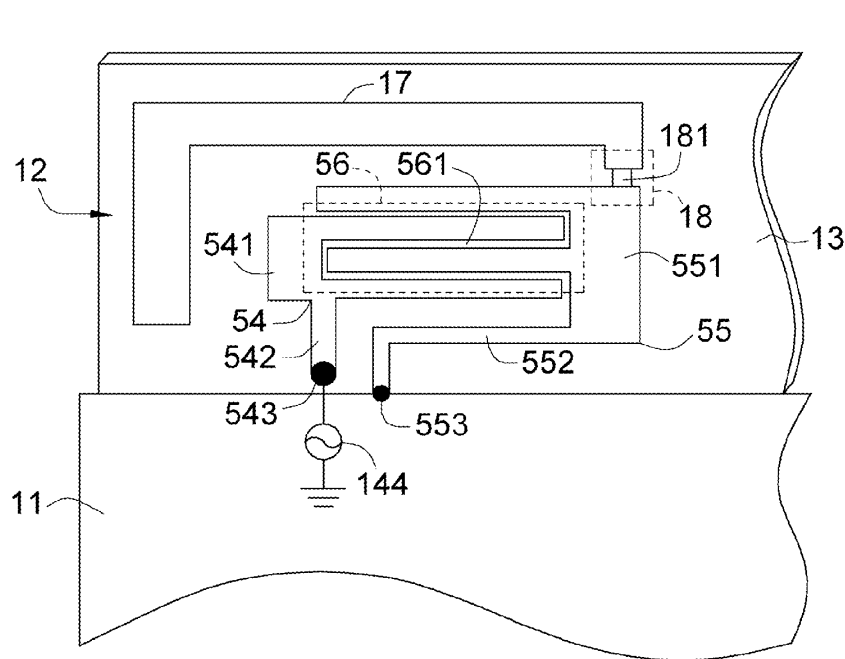
US 20120001815A1

(19) **United States**(12) **Patent Application Publication**
Wong et al.(10) **Pub. No.: US 2012/0001815 A1**(43) **Pub. Date: Jan. 5, 2012**(54) **MULTIBAND ANTENNA AND METHOD FOR
AN ANTENNA TO BE CAPABLE OF
MULTIBAND OPERATION****H01P 11/00**
H01Q 1/38(2006.01)
(2006.01)(75) Inventors: **Kin-Lu Wong**, Kaohsiung City
(TW); **Ming-Fang Tu**, Hsinchu City
(TW); **Wei-Yu Li**, Yilan City (TW);
Chun-Yih Wu, Taipei City (TW)(52) **U.S. CL.** **343/749**; 343/700 MS; 343/843;
343/848; 29/600(73) Assignees: **NATIONAL SUN-YAT-SEN
UNIVERSITY**, Kaohsiung City
(TW); **INDUSTRIAL
TECHNOLOGY RESEARCH
INSTITUTE**, Hsinchu (TW)(57) **ABSTRACT**

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

(21) Appl. No.: **13/013,623**(22) Filed: **Jan. 25, 2011**(30) **Foreign Application Priority Data**

Jul. 2, 2010 (TW) 99121914

Publication Classification(51) **Int. Cl.**
H01Q 5/01 (2006.01)
H01Q 1/48 (2006.01)5

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US 20120001817A1

(19) **United States**

(12) **Patent Application Publication**
CHEN

(10) **Pub. No.: US 2012/0001817 A1**

(43) **Pub. Date: Jan. 5, 2012**

(54) **GLOBAL POSITIONING SYSTEM ANTENNA**

Publication Classification

(75) Inventor: **HSI-CHIEH CHEN**, Tu-Cheng
(TW)

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

(73) Assignee: **CHI MEI COMMUNICATION
SYSTEMS, INC.**, Tu-Cheng City
(TW)

(52) **U.S. Cl.** **343/767**

(21) Appl. No.: **12/890,697**

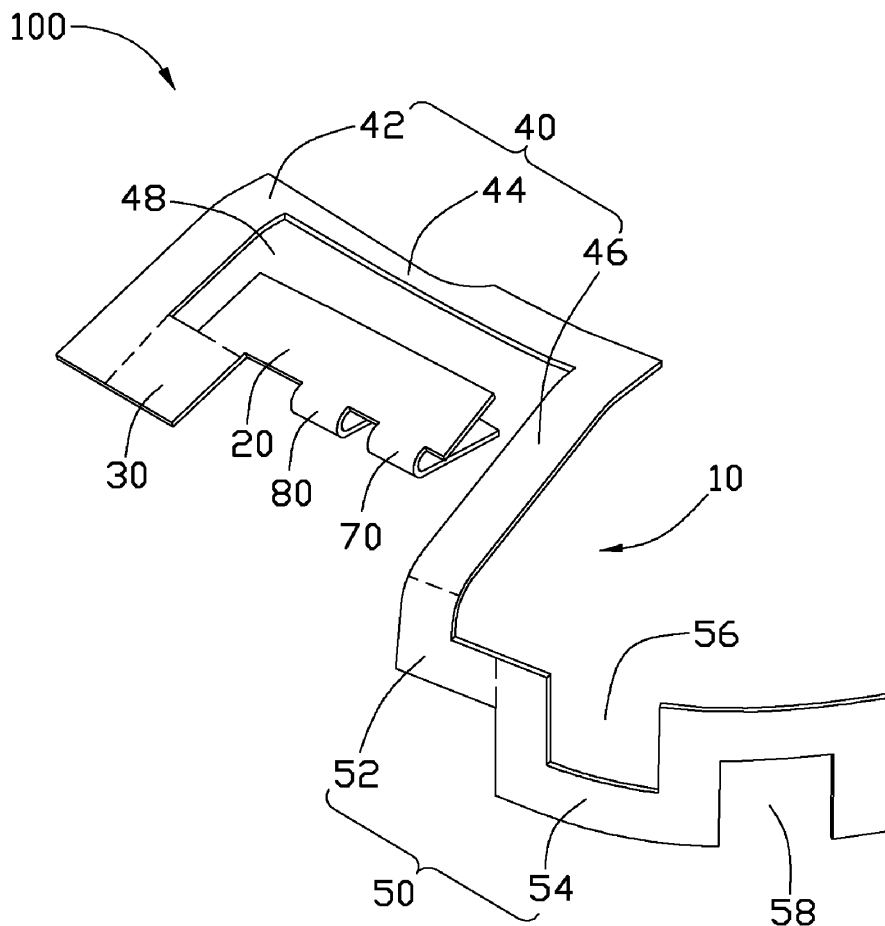
(22) Filed: **Sep. 26, 2010**

(30) **Foreign Application Priority Data**

Jun. 30, 2010 (TW) 99121477

(57) **ABSTRACT**

A global positioning system antenna includes a radiator. The radiator includes a base section, an extension section connected to an edge of the base section, a first curved section connected to an edge of the extension section, and a second curved section connected to a distal end of the first curved section. The first curved section and the base section define a slot therebetween. The second curved section defines a first gap and a second gap thereon. The first gap and the second gap face each other.



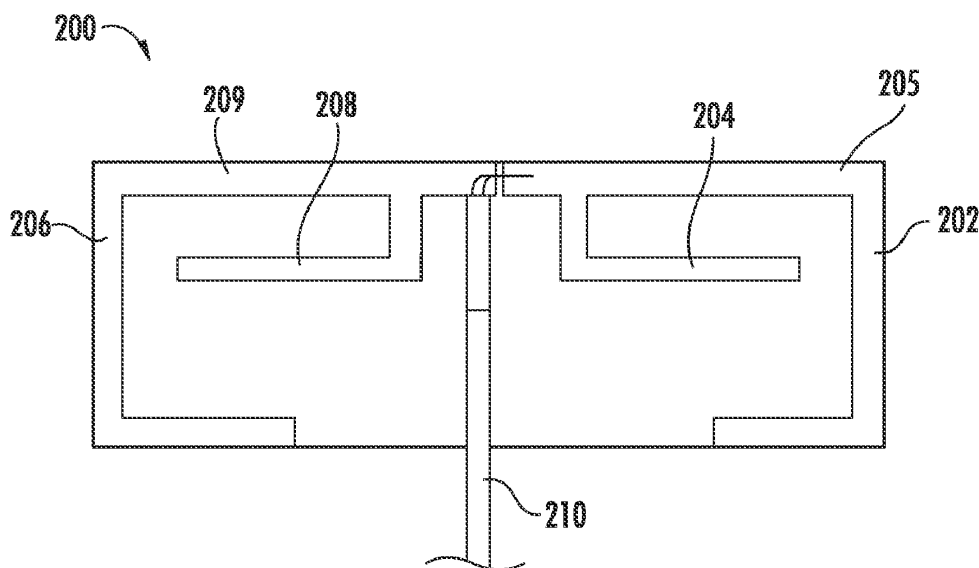
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US 20120001818A1

(19) **United States**(12) **Patent Application Publication****Lee et al.**(10) **Pub. No.: US 2012/0001818 A1**(43) **Pub. Date: Jan. 5, 2012**(54) **MULTI-BAND DIPOLE ANTENNAS****Publication Classification**(75) Inventors: **Ting Hee Lee**, Penang (MY); **Kok Jiunn Ng**, Butterworth (MY)(51) **Int. Cl.**
H01Q 21/30 (2006.01)(52) **U.S. Cl.** 343/817(73) Assignee: **LAIRD TECHNOLOGIES, INC.**,
Chesterfield, MO (US)(57) **ABSTRACT**(21) Appl. No.: **13/224,730**(22) Filed: **Sep. 2, 2011****Related U.S. Application Data**(63) Continuation-in-part of application No. PCT/
MY2009/000052, filed on Apr. 13, 2009.

Multi-band dipole antennas for wireless application devices are disclosed. An example antenna includes at least one dipole including a resonant element and a ground element. A feed point is coupled to the resonant element, and a ground point is coupled to the ground element. The example antenna also includes a parasitic element adjacent at least a portion of the resonant element. The parasitic element is coupled to the ground element and configured to be operable for changing a resonant frequency of at least a portion of the resonant element.



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(19) **United States**

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

(10) **Pub. No.: US 2012/0001820 A1**

(43) **Pub. Date: Jan. 5, 2012**

(54) **WIRELESS COMMUNICATION APPARATUS
AND PLANAR ANTENNA THEREOF**

Publication Classification

(75) Inventors: **Sy-Been WANG**, Hsinchu County
(TW); **Kuo-Chang LO**, Miaoli
County (TW); **Shih-Chieh**
CHENG, Tainan County (TW)

(51) **Int. Cl.**
H01Q 1/48 (2006.01)
H01Q 1/38 (2006.01)

(52) **U.S. Cl.** **343/845; 343/700 MS**

(57) **ABSTRACT**

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

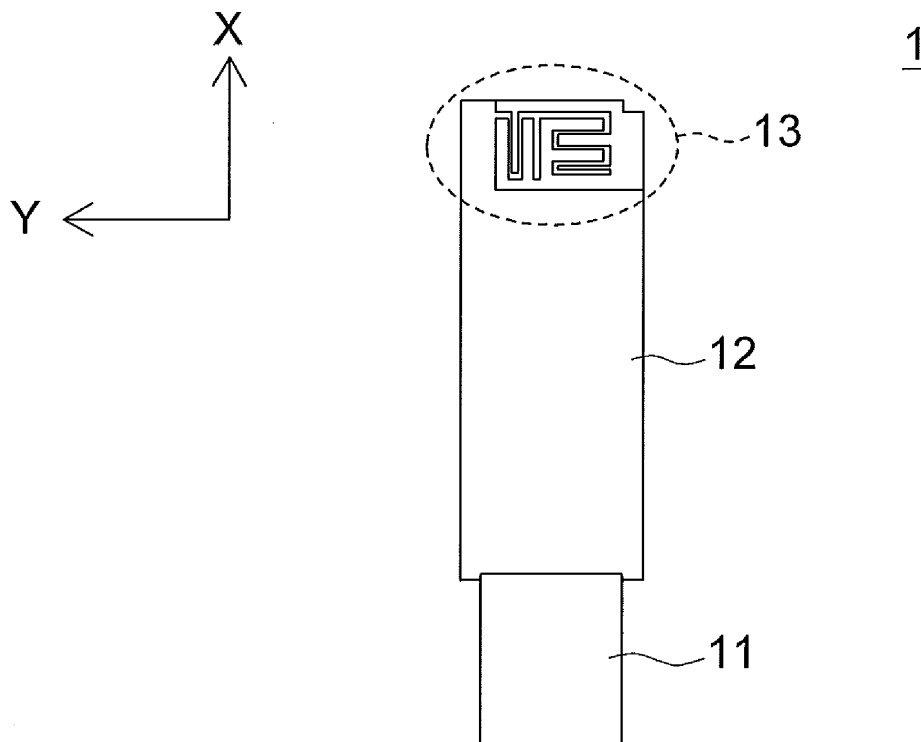
(21) Appl. No.: **13/175,821**

(22) Filed: **Jul. 1, 2011**

(30) **Foreign Application Priority Data**

Jul. 2, 2010 (TW) 099121911

A wireless communication apparatus and a planar antenna thereof are provided. The wireless communication apparatus comprises a connecting port, a printed circuit board, and a planar antenna. The printed circuit board is connected to the connecting port, and the planar antenna is formed on the printed circuit board. The planar antenna comprises a radiation portion, a shorting portion, and a feeding portion. The feeding portion is connected to the radiation portion and the shorting portion, and the radiation portion and the shorting portion are in a bent shape so that the radiation portion, the shorting portion and the feeding portion are distributed in a rectangular region.



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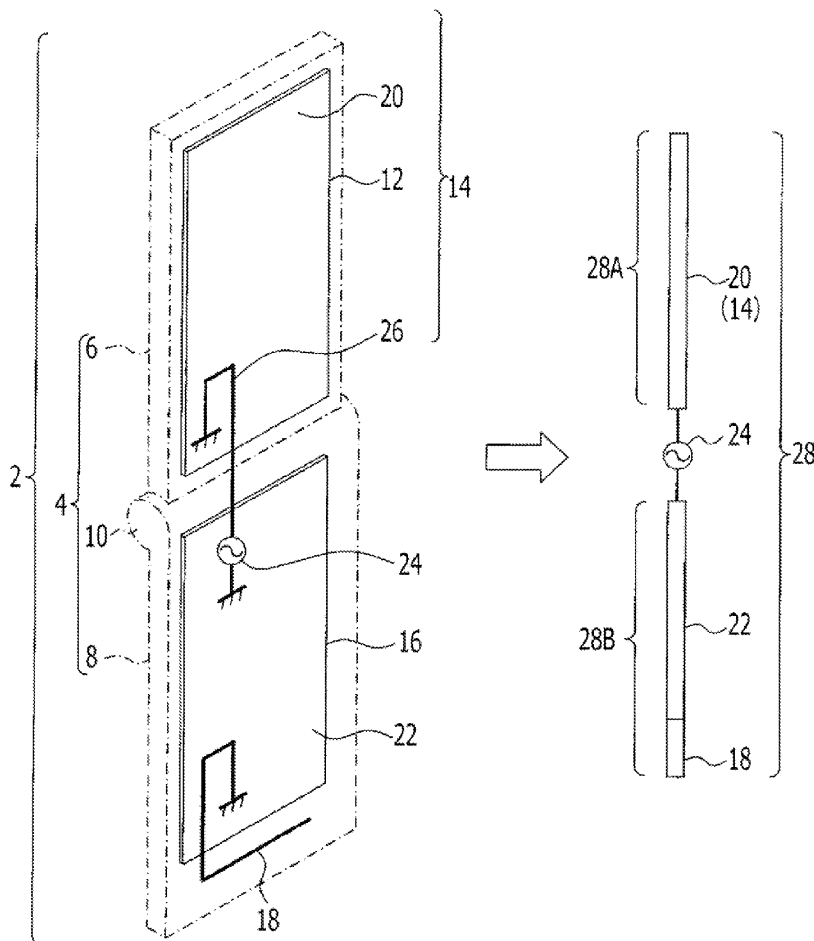


US 20120001822A1

(19) **United States**(12) **Patent Application Publication**
LIU et al.(10) **Pub. No.: US 2012/0001822 A1**(43) **Pub. Date: Jan. 5, 2012**(54) **WIRELESS COMMUNICATION APPARATUS****Publication Classification**(75) Inventors: **Zhao LIU**, Kawasaki (JP); **Masaru KANAZAWA**, Kawasaki (JP); **Masatomo MORI**, Kawasaki (JP)(51) **Int. Cl.**
H01Q 1/50 (2006.01)
H01Q 3/24 (2006.01)(52) **U.S. Cl.** **343/852; 343/876**(73) Assignee: **FUJITSU LIMITED**,
Kawasaki-shi (JP)(57) **ABSTRACT**(21) Appl. No.: **13/166,906**(22) Filed: **Jun. 23, 2011**(30) **Foreign Application Priority Data**

Jun. 30, 2010 (JP) 2010-150530

A wireless communication apparatus includes a first housing, a second housing which is openably and closably connected to the first housing through a hinge, a first conductor part which is arranged on the first housing, a second conductor and an antenna element, which are arranged on the second housing and an antenna switching part that makes the first conductor part, the second conductor part, and the antenna element serve as a dipole antenna when the first housing and the second housing are in an open state, and makes the antenna element serve as a monopole antenna when the first conductor and the second conductor are in a closed state.



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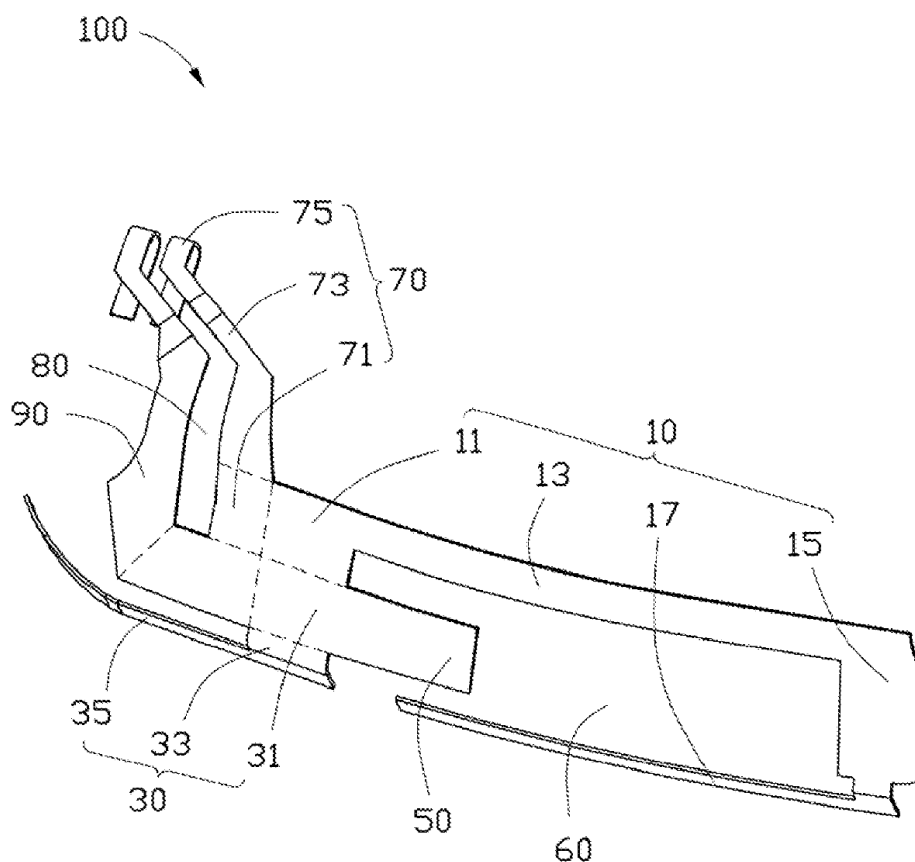


US 20120001827A1

(19) **United States**(12) **Patent Application Publication**
CHEN(10) **Pub. No.: US 2012/0001827 A1**(43) **Pub. Date: Jan. 5, 2012**(54) **ANTENNA MODULE****Publication Classification**(75) Inventor: **HSI-CHIEH CHEN**, Tu-Cheng
(TW)(51) **Int. Cl.**
H01Q 1/36 (2006.01)
H01Q 1/38 (2006.01)(73) Assignee: **CHI MEI COMMUNICATION**
SYSTEMS, INC., Tu-Cheng City
(TW)(52) **U.S. Cl.** **343/908; 343/700 MS**(21) Appl. No.: **12/862,786**(57) **ABSTRACT**(22) Filed: **Aug. 25, 2010**(30) **Foreign Application Priority Data**

Jun. 30, 2010 (TW) 99121605

An antenna module for a portable device includes a first antenna section, a second antenna section, a third antenna section, a feed section, and a ground section. The first antenna section and the third antenna section form a first groove. The feed section and the ground section are parallel to each other. The first antenna section and the second antenna section jointly connect with the feed section.





US 20120001851A1

(19) **United States**(12) **Patent Application Publication**(10) **Pub. No.: US 2012/0001851 A1****Qiu et al.**(43) **Pub. Date:****Jan. 5, 2012**

(54) **MOBILE WIRELESS COMMUNICATIONS
DEVICE INCLUDING A KEYBOARD
ASSEMBLY FOR REDUCING SAR AND
RELATED METHODS**

(52) **U.S. Cl. 345/168**(57) **ABSTRACT**

(75) Inventors: **Meide Qiu, Ottawa (CA); Huanyu
CHEN, Ottawa (CA)**

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

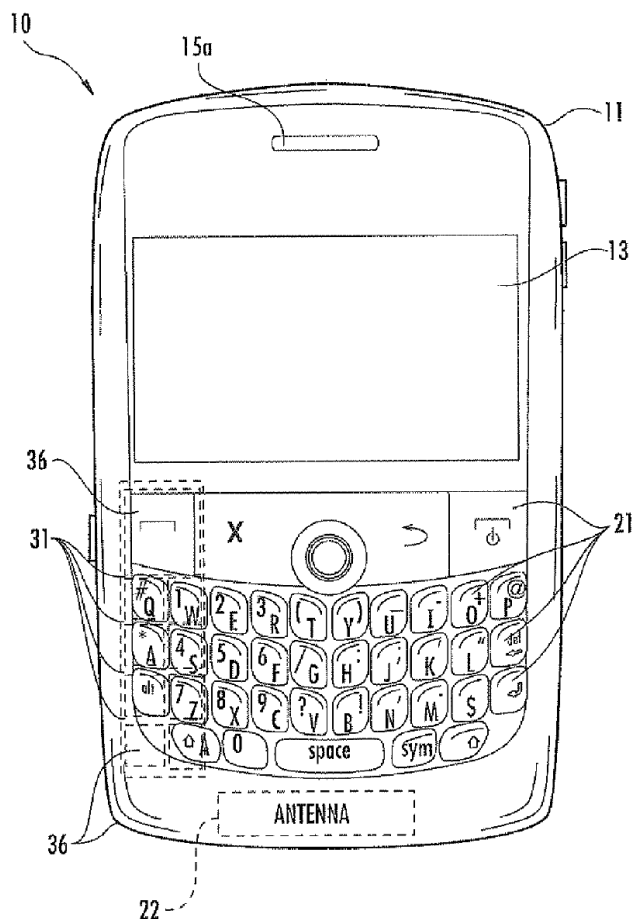
(21) Appl. No.: **12/829,914**

(22) Filed: **Jul. 2, 2010**

Publication Classification

(51) **Int. Cl.**
G06F 3/02 (2006.01)

A mobile wireless communications device may include a portable housing and wireless transceiver circuitry carried by the portable housing. The mobile wireless communications device may also include an antenna carried by the portable housing and coupled to the wireless transceiver circuitry, and a light source carried by the portable housing. The device may further include a keyboard assembly carried by the portable housing including a light guide coupled to the light source and having input key receiving openings therein, and a mask carried by the light guide and having input key receiving openings. The mask may include an electrically conductive layer positioned relative to the antenna to reduce a Specific Absorption Rate value for the mobile wireless communications device.





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(19) **United States**

(12) **Patent Application Publication**
CHIANG

(10) **Pub. No.: US 2012/0007780 A1**

(43) **Pub. Date: Jan. 12, 2012**

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

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

(75) **Inventor: CHI-MING CHIANG**, Bade City
(TW)

(57) **ABSTRACT**

(73) **Assignee: AUDEN TECHNO CORP.**

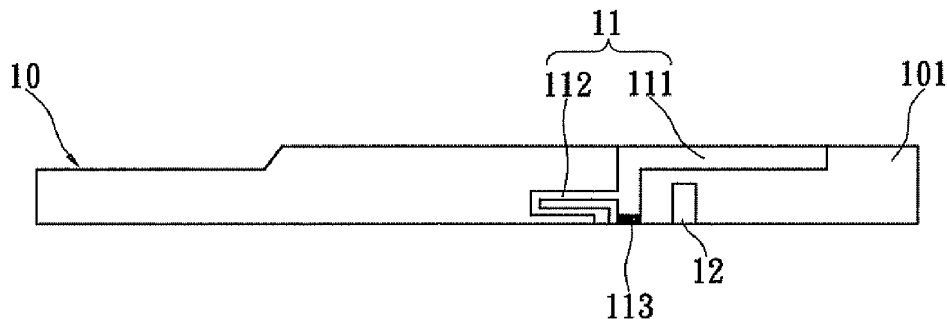
A multi-band antenna structure includes a substrate having a first surface and a second surface that is opposite to the first surface, a first metal strip and a second metal strip formed on the first surface, a third metal strip formed on the second surface, and a metal part located on the substrate. The first metal strip has a first strip and a second strip and the second strip has an inductance characteristic. The first strip of the first metal strip and the third metal strip define a first overlap area in the direction vertical to the substrate. The first overlap area has a first capacitor characteristic. The second metal strip and the third metal strip define a second overlap area in the direction vertical to the substrate. The second overlap area has a second capacitor characteristic.

(21) **Appl. No.: 12/832,401**

(22) **Filed: Jul. 8, 2010**

Publication Classification

(51) **Int. Cl.**
H01Q 1/38 (2006.01)
H01Q 5/01 (2006.01)



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

(10) **Pub. No.: US 2012/0007782 A1**
(43) **Pub. Date: Jan. 12, 2012**

Publication Classification

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

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

(57) **ABSTRACT**

(57) **ABSTRACT**

An antenna apparatus comprises a ground board; a feeding portion for supplying electric power to the antenna apparatus, disposed on said ground board; a first line element having one end connected to said ground board, wherein a length from said feeding portion to an other end thereof is $\frac{1}{4}$ wave of resonance frequency; and a second line element having one end connected to said first line element, disposed along said first line element from the other end of said first line element, wherein a length from said feeding portion to an other end thereof is not $k/12$ (k is integer) wave of resonance frequency.

(57) **ABSTRACT**

(57) **ABSTRACT**

Jul. 6, 2010 (JP) 2010-154070





US 20120007783A1

(19) **United States**

(12) **Patent Application Publication**
Taura

(10) **Pub. No.: US 2012/0007783 A1**

(43) **Pub. Date: Jan. 12, 2012**

(54) **SLOT ANTENNA, ELECTRONIC APPARATUS,
AND METHOD FOR MANUFACTURING
SLOT ANTENNA**

Publication Classification

(51) **Int. Cl.**
H01Q 13/10 (2006.01)
H01P 11/00 (2006.01)

(52) **U.S. Cl.** **343/702; 343/767; 29/601**

(57) **ABSTRACT**

(76) **Inventor:** **Toru Taura**, Tokyo (JP)

(21) **Appl. No.:** **13/148,904**

(22) **PCT Filed:** **Feb. 19, 2010**

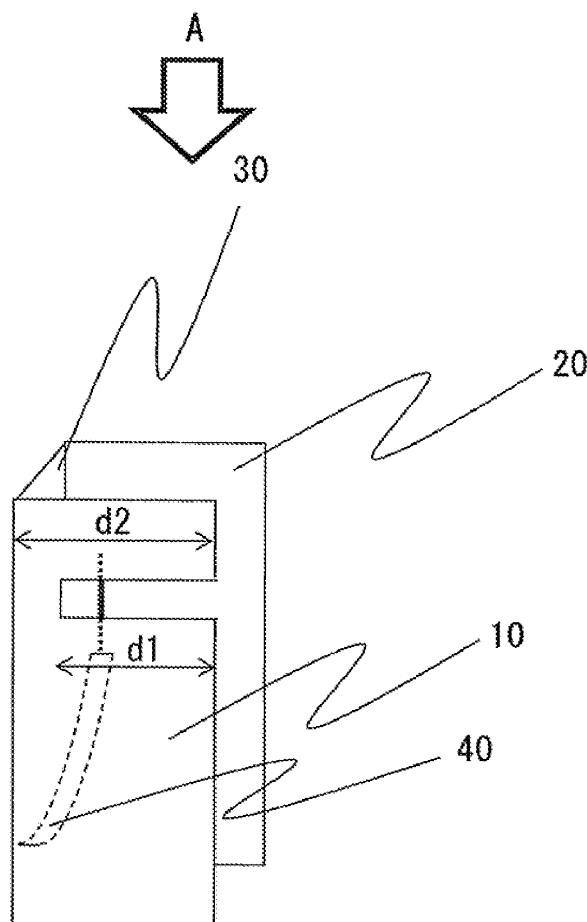
(86) **PCT No.:** **PCT/JP2010/001084**

§ 371 (c)(1),
(2), (4) **Date:** **Aug. 10, 2011**

(30) **Foreign Application Priority Data**

Mar. 30, 2009 (JP) 2009-081476

The present invention aims to provide a slot antenna, an electronic apparatus, and a method for manufacturing a slot antenna which are capable of obtaining multiple resonances with a small mounting space. The slot antenna according to the present invention includes three conductor plates: a rectangular conductor plate **10** having a notch with an open end formed at one side of the conductor plate; a rectangular conductor plate **20** disposed to face the conductor plate **10**; a third conductor plate connecting the conductor plates **10** and **20** on a side opposite to the open end of the conductor plate **10**; and a feeder **40** connecting a core wire **41** and a ground **42** at two points across the notch of the conductor plate **10**.



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US 20120007784A1

(19) **United States**

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

(10) **Pub. No.: US 2012/0007784 A1**

(43) **Pub. Date: Jan. 12, 2012**

(54) **INVERTED-F ANTENNA AND WIRELESS
COMMUNICATION APPARATUS USING THE
SAME**

Publication Classification

(51) **Int. Cl.**
H01Q 1/36 (2006.01)
H01Q 9/00 (2006.01)

(52) **U.S. Cl.** **343/720; 343/700 MS; 343/843**

(57) **ABSTRACT**

(76) Inventors: **Ching-Wei LING**, Tainan County
(TW); **Chih-Pao Lin**, Zhubei City
(TW)

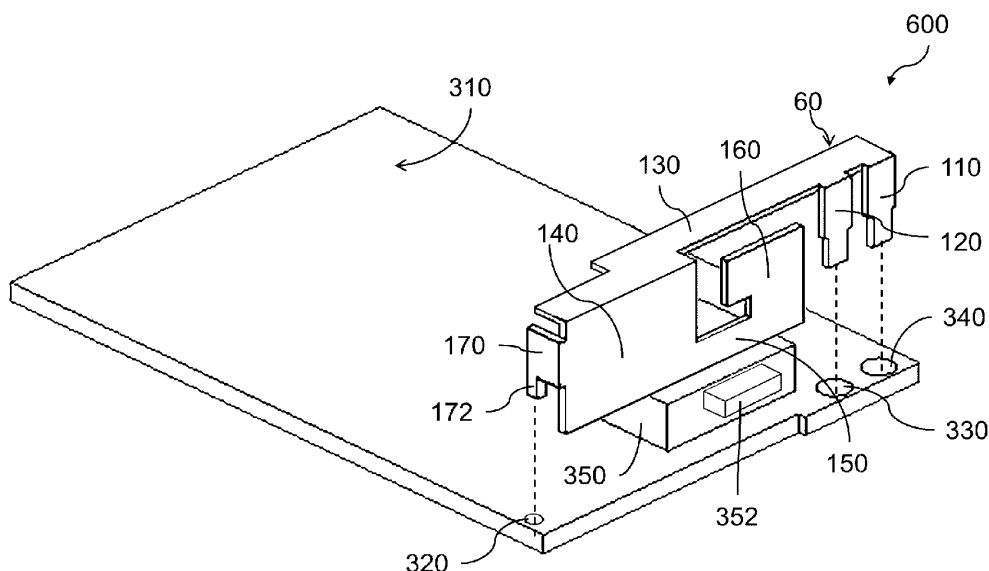
(21) Appl. No.: **13/179,181**

(22) Filed: **Jul. 8, 2011**

(30) **Foreign Application Priority Data**

Jul. 9, 2010 (TW) 099122701

An inverted-F antenna is disclosed including: a radiating body including a plurality of radiating portions, and some of the radiating portions located on a same plane; a shorting element extending outward from the radiating body and forming a first predetermined included angle with one of the radiating portions; a feeding element extending outward from the radiating body and forming a second predetermined included angle with one of the radiating portions; and a protrusion extending outward from the radiating body and forming a third predetermined included angle with one of the radiating portions; wherein at least one of the first, second, and third predetermined included angles is substantially a right angle.



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US 20120007785A1

(19) **United States**(12) **Patent Application Publication**
Amari et al.(10) **Pub. No.: US 2012/0007785 A1**(43) **Pub. Date: Jan. 12, 2012**(54) **ANTENNA APPARATUS FOR
SIMULTANEOUSLY TRANSMITTING
MULTIPLE RADIO SIGNALS WITH
DIFFERENT RADIATION
CHARACTERISTICS****Publication Classification**(51) **Int. Cl.**
H01Q 1/50 (2006.01)(52) **U.S. Cl.** **343/722**(76) **Inventors:** **Satoru Amari**, Osaka (JP); **Atsushi Yamamoto**, Kyoto (JP); **Tsutomu Sakata**, Osaka (JP)(57) **ABSTRACT**

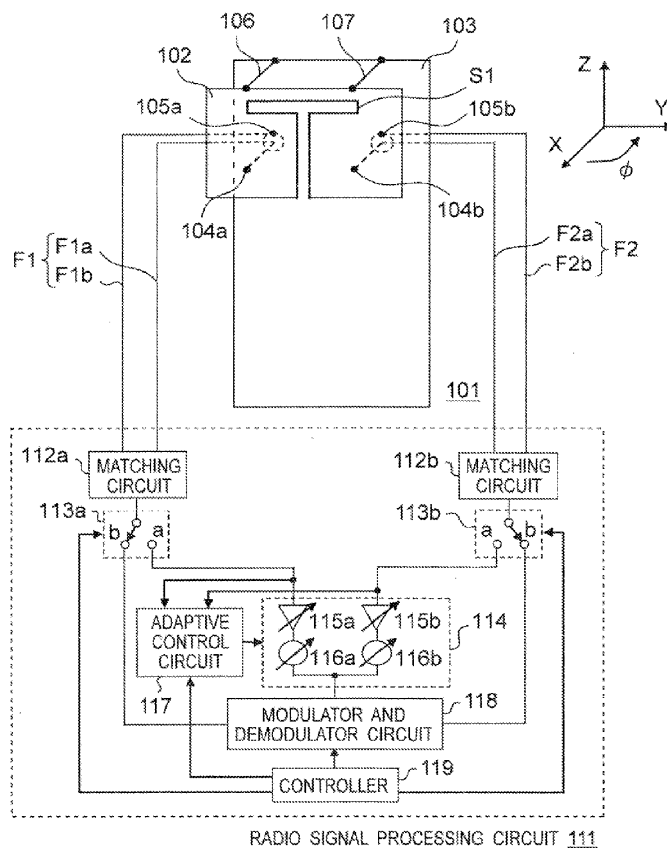
An antenna element has a slit including a first portion and a second portion, the first portion extending in a first direction so as to separate first and second feed points from each other, and the second portion extending in a second direction different from the first direction. The slit is configured to resonate at an isolation frequency to produce isolation between the first and second feed points, and configured to form a current path around the slit. A current distribution along the current path generated by exciting through the first feed point is different from a current distribution along the current path generated by exciting through the second feed point, thus providing different radiation characteristics by the different current distributions.

(21) **Appl. No.:** **13/257,108**(22) **PCT Filed:** **Dec. 20, 2010**(86) **PCT No.:** **PCT/JP2010/007373**

§ 371 (c)(1),

(2), (4) **Date:** **Sep. 16, 2011**(30) **Foreign Application Priority Data**

Jan. 19, 2010 (JP) 2010-008654



RADIO SIGNAL PROCESSING CIRCUIT 111



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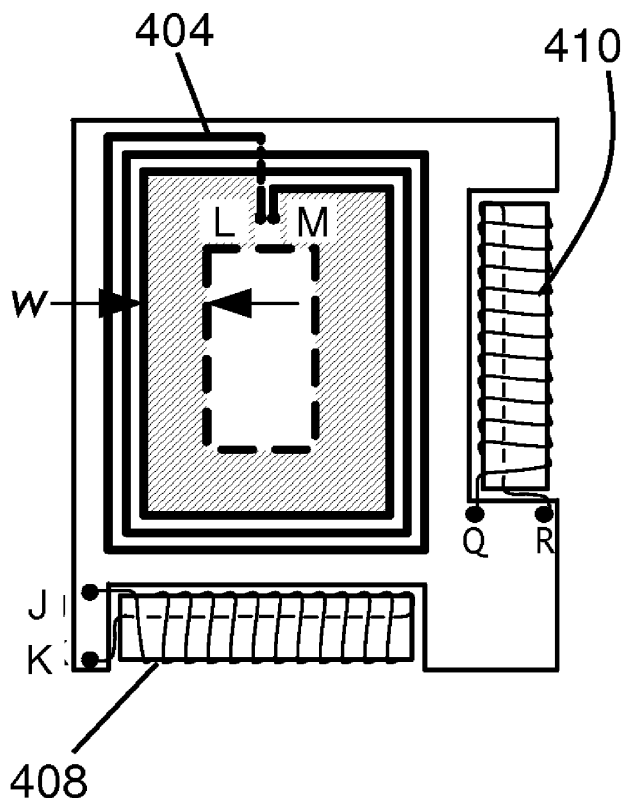
US 20120007787A1

(19) **United States**(12) **Patent Application Publication**
Schantz et al.(10) **Pub. No.: US 2012/0007787 A1**(43) **Pub. Date: Jan. 12, 2012**(54) **PLANAR LOOP ANTENNA SYSTEM**(52) **U.S. CL. 343/788; 343/867**(75) **Inventors:** **Hans Gegory Schantz**, Hampton Cove, AL (US); **Eric Richards**, Madison, AL (US); **Andrew Compston**, Stanford, CA (US)(57) **ABSTRACT**(73) **Assignee:** **Q-Track Corporation**, Huntsville, AL (US)(21) **Appl. No.:** **12/857,528**(22) **Filed:** **Aug. 16, 2010****Related U.S. Application Data**

(63) Continuation-in-part of application No. 12/834,821, filed on Jul. 12, 2010.

Publication Classification(51) **Int. Cl.**
H01Q 7/06 (2006.01)
H01Q 21/24 (2006.01)

An inexpensive planar antenna fabricated as a plurality of parallel layers of multi turn spiral loops co-located with conductive material at the center of the loops, there being an exclusion zone free of conductive material between the innermost loop and the conductive material at the center. The conductive material may comprise circuit elements, for example batteries, amplifiers, antenna drivers or other functional elements as well as passive elements. In one embodiment, the loop traces may be staggered. In another embodiment, the loop traces are varied in width as a function of position within the loop cross section. In further embodiments, the planar form is integrated with additional orthogonal planar antennas substantially coplanar with the first planar antenna and having axes orthogonal to the first planar antenna and to one another. In further embodiments the exclusion zone is extended by design rules and confining routes in a circuit section. The antenna system may be configured as a three dimensional omnidirectional antenna and is well adapted for small form factor hand held and portable wireless applications.



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US 20120009983A1

(19) **United States**(12) **Patent Application Publication****Mow et al.**(10) **Pub. No.: US 2012/0009983 A1**(43) **Pub. Date: Jan. 12, 2012**(54) **TUNABLE ANTENNA SYSTEMS**(52) **U.S. Cl. 455/575.7; 343/745**

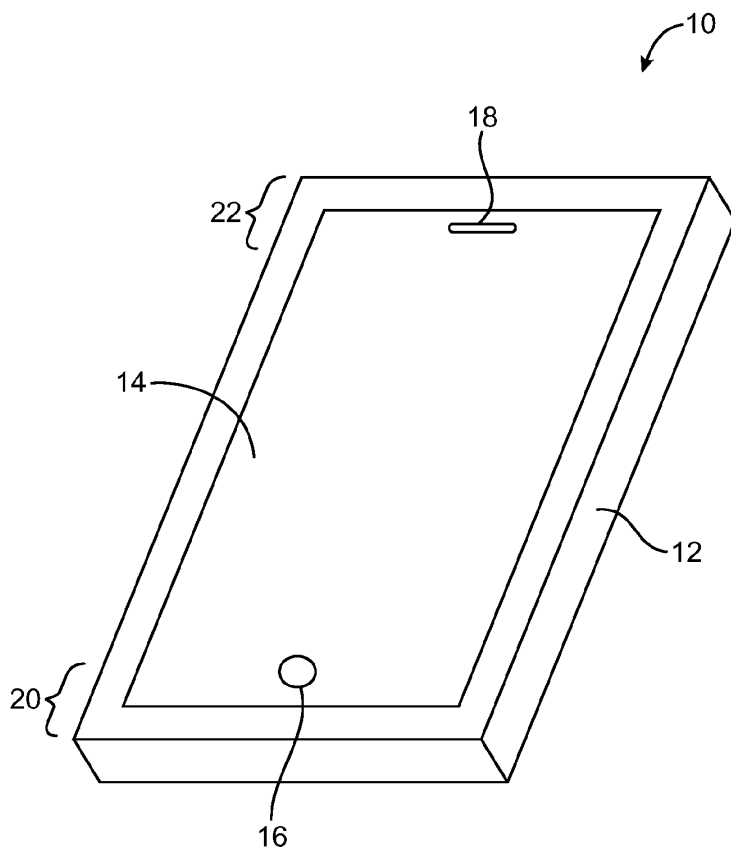
(76) Inventors: **Matt A. Mow**, Los Altos, CA (US);
Robert W. Schlub, Cupertino, CA (US);
Mattia Pascolini, Campbell, CA (US);
Robert J. Hill, Salinas, CA (US);
Ruben Caballero, San Jose, CA (US)

(57) **ABSTRACT**

An electronic device has wireless communications circuitry including an adjustable antenna system coupled to a radio-frequency transceiver. The adjustable antenna system may include one or more adjustable electrical components that are controlled by storage and processing circuitry in the electronic device. The adjustable electrical components may include switches and components that can be adjusted between numerous different states. The adjustable electrical components may be coupled between antenna system components such as transmission line elements, matching network elements, antenna elements and antenna feeds. By adjusting the adjustable electrical components, the storage and processing circuitry can tune the adjustable antenna system to ensure that the adjustable antenna system covers communications bands of interest.

(21) Appl. No.: **12/831,180**(22) Filed: **Jul. 6, 2010****Publication Classification**

(51) **Int. Cl.**
H04W 88/02 (2009.01)
H01Q 9/00 (2006.01)



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