



US 20150244058A1

(19) **United States**

(12) **Patent Application Publication**
Lin

(10) **Pub. No.: US 2015/0244058 A1**

(43) **Pub. Date: Aug. 27, 2015**

(54) **ELECTRONIC DEVICE HAVING ANTENNA MODULE**

Publication Classification

(71) Applicant: **Smart Approach Co., Ltd.**, Zhudong Township (TW)

(51) **Int. Cl.**
H01Q 1/22 (2006.01)
H01Q 9/42 (2006.01)
H01Q 1/48 (2006.01)

(72) Inventor: **Lien Chih Lin**, Zhudong Township (TW)

(52) **U.S. Cl.**
CPC *H01Q 1/2266* (2013.01); *H01Q 1/48* (2013.01); *H01Q 9/42* (2013.01)

(21) Appl. No.: **14/708,337**

(22) Filed: **May 11, 2015**

(57) **ABSTRACT**

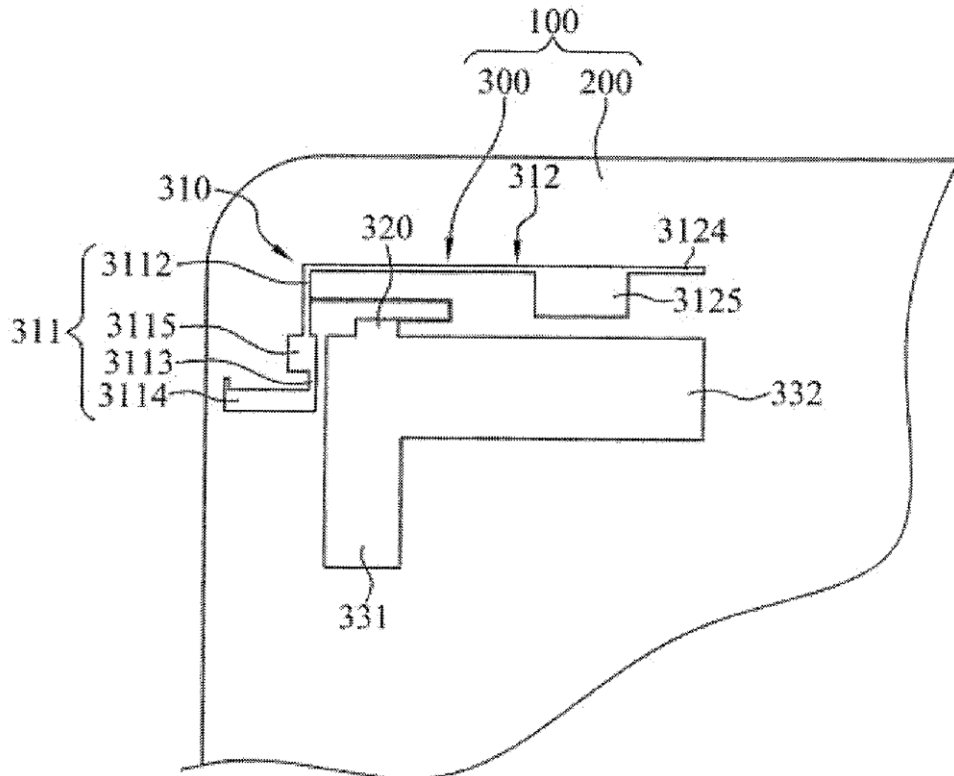
Related U.S. Application Data

(63) Continuation-in-part of application No. 13/019,347, filed on Feb. 2, 2011.

The antenna module includes a transparent substrate and an antenna component disposed on the transparent substrate. The antenna component includes a radiation portion, a feed portion and a grounding portion. The grounding portion is located at a corner of the transparent substrate, and the grounding portion includes a first strip portion and a second strip portion that are connected and integrated.

Foreign Application Priority Data

(30) Dec. 22, 2010 (TW) 099224827





US 20150244059A1

(19) **United States**

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

(10) **Pub. No.: US 2015/0244059 A1**

(43) **Pub. Date: Aug. 27, 2015**

(54) **ANTENNA DEVICE**

Publication Classification

(71) Applicant: **Murata Manufacturing Co., Ltd.**,
Nagaokakyo-shi (JP)
(72) Inventors: **Kengo Onaka**, Nagaokakyo-shi (JP);
Hiroya Tanaka, Nagaokakyo-shi (JP)

(51) **Int. Cl.**
H01Q 1/22 (2006.01)
H01Q 5/378 (2006.01)
(52) **U.S. Cl.**
CPC **H01Q 1/2266** (2013.01); **H01Q 5/378**
(2015.01)

(21) Appl. No.: **14/709,837**

(57) **ABSTRACT**

(22) Filed: **May 12, 2015**

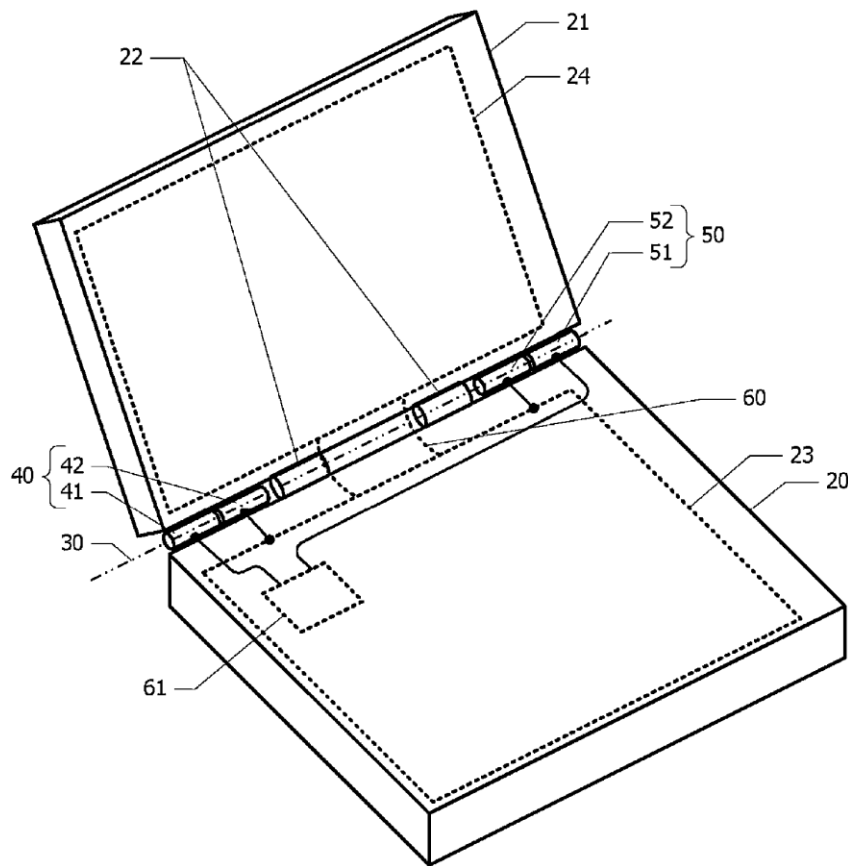
A first housing includes a first conductor plate, and a second housing includes a second conductor plate. A rotation mechanism openably and closably attaches the second housing to the first housing. A first driven element and a second driven element are arranged along a rotation axis of the rotation mechanism. Between the first driven element and the second driven element, a continuity structure intersects the rotation axis to establish direct-current or high-frequency continuity between the first conductor plate and the second conductor plate. An antenna device can be provided which can ensure sufficient isolation between a plurality of driven elements.

Related U.S. Application Data

(63) Continuation of application No. PCT/JP2013/071549,
filed on Aug. 8, 2013.

(30) **Foreign Application Priority Data**

Nov. 13, 2012 (JP) 2012-248927





US 20150244061A1

(19) **United States**

(12) **Patent Application Publication**
Galeev

(10) **Pub. No.: US 2015/0244061 A1**

(43) **Pub. Date: Aug. 27, 2015**

(54) **WIRELESS ELECTRONIC DEVICES WITH METAL PERIMETER PORTIONS INCLUDING A PLURALITY OF ANTENNAS**

Publication Classification

(71) Applicant: **Roustem Galeev, Lund (SE)**

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

(72) Inventor: **Roustem Galeev, Lund (SE)**

(52) **U.S. Cl.**
CPC . *H01Q 1/243* (2013.01); *H01Q 1/50* (2013.01)

(21) Appl. No.: **14/355,703**

(57) **ABSTRACT**

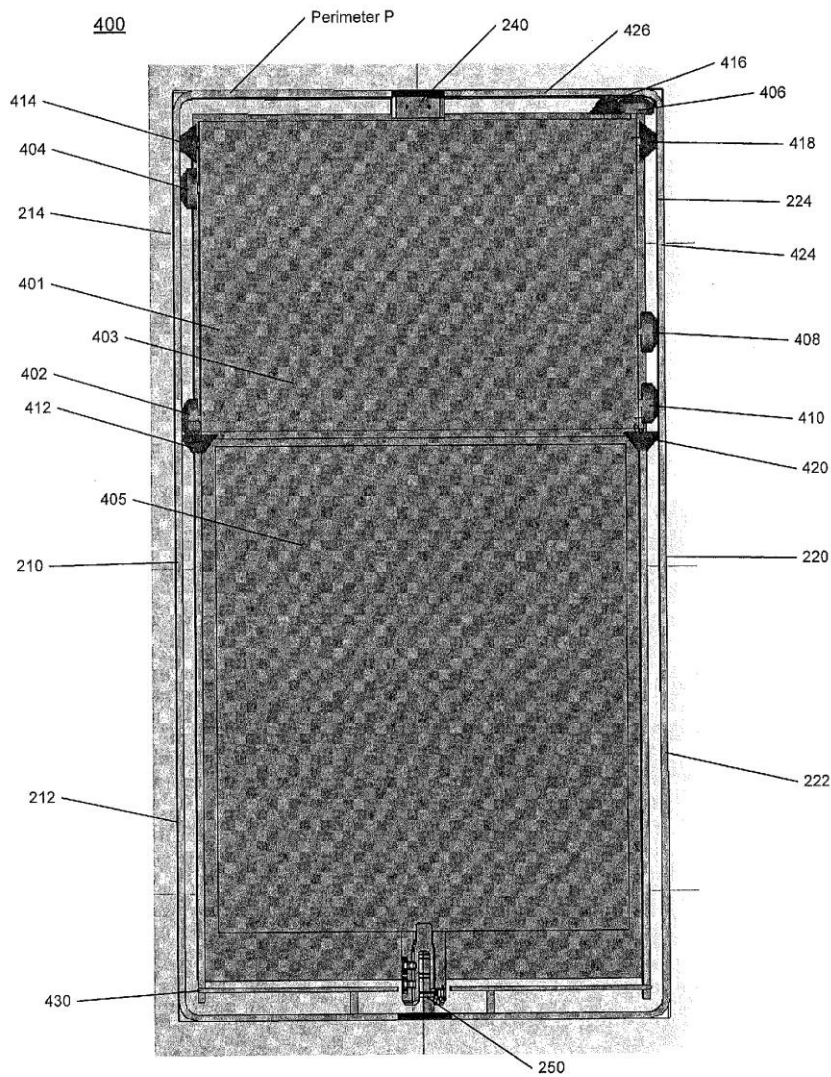
(22) PCT Filed: **Jun. 27, 2013**

(86) PCT No.: **PCT/JP13/68306**

§ 371 (c)(1),

(2) Date: **May 1, 2014**

Wireless electronic devices may include a ground plane and metal antenna portions separated by input connector portions improving the metal look and feel of the wireless electronic device.





US 20150244411A1

(19) **United States**

(12) **Patent Application Publication**
Harper

(10) **Pub. No.: US 2015/0244411 A1**

(43) **Pub. Date: Aug. 27, 2015**

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

Publication Classification

(71) Applicant: **Microsoft Corporation**, Redmond, WA (US)

(51) **Int. Cl.**
H04B 1/44 (2006.01)
H04B 1/40 (2006.01)

(72) Inventor: **Marc Harper**, Issaquah, WA (US)

(52) **U.S. Cl.**
CPC . *H04B 1/44* (2013.01); *H04B 1/401* (2013.01)

(73) Assignee: **Microsoft Corporation**, Redmond, WA (US)

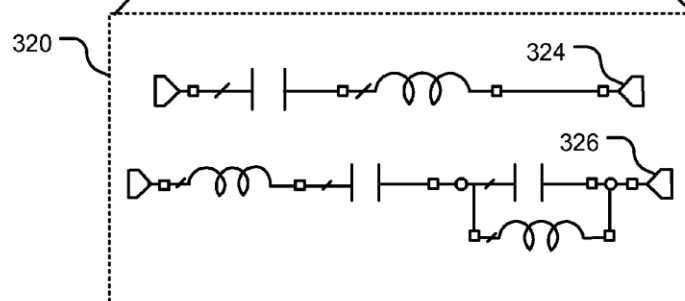
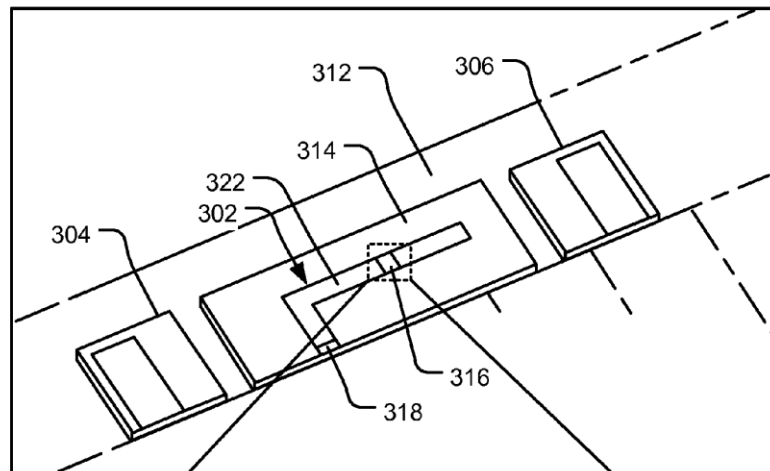
(57) **ABSTRACT**

(21) Appl. No.: **14/188,513**

An isolator assembly is configured to provide isolation in each of multiple non-overlapping frequency bands and includes a selection network to select one of the multiple non-overlapping frequency bands for an isolation operation. During the isolation operation, the isolator assembly prevents signal coupling between antennas that are positioned on opposite sides of the isolator assembly.

(22) Filed: **Feb. 24, 2014**

300 ↘





US 20150249289A1

(19) **United States**

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

(10) **Pub. No.: US 2015/0249289 A1**

(43) **Pub. Date: Sep. 3, 2015**

(54) **METAMATERIAL ANTENNA**

Publication Classification

(71) Applicant: **EMW CO., LTD.**, Namdong-gu Incheon (KR)

(51) **Int. Cl.**
H01Q 9/04 (2006.01)
H01Q 15/00 (2006.01)

(72) Inventors: **Byung Hoon Ryu**, Seoul (KR); **Won Mo Sung**, Gyeonggi-do (KR); **Jeong Pyo Kim**, Seoul (KR)

(52) **U.S. Cl.**
CPC **H01Q 9/0442** (2013.01); **H01Q 15/0086** (2013.01)

(21) Appl. No.: **14/428,976**

(57) **ABSTRACT**

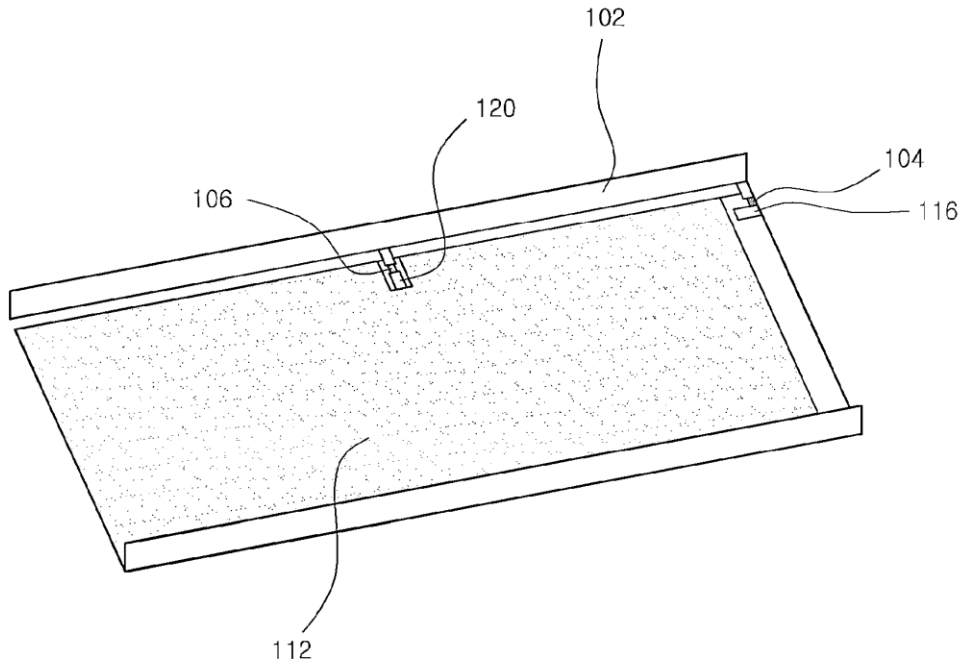
(22) PCT Filed: **Sep. 17, 2012**

Disclosed is a metamaterial antenna including a conductor cover formed at one side of a wireless terminal, a feed parallel inductor element formed to connect the conductor cover to a feed part, and at least one ground parallel inductor element formed to connect the conductor cover to at least one ground part.

(86) PCT No.: **PCT/KR2012/007391**

§ 371 (c)(1),

(2) Date: **Mar. 17, 2015**





US 20150249292A1

(19) **United States**

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

(10) **Pub. No.: US 2015/0249292 A1**

(43) **Pub. Date: Sep. 3, 2015**

(54) **ELECTRONIC DEVICE WITH SHARED ANTENNA STRUCTURES AND BALUN**

(52) **U.S. CL.**
CPC **H01Q 21/30** (2013.01); **H01Q 1/48** (2013.01); **H01Q 1/243** (2013.01)

(71) Applicant: **Apple Inc.**, Cupertino, CA (US)

(72) Inventors: **Yuehui Ouyang**, Sunnyvale, CA (US); **Dean F. Darnell**, Durham, NC (US); **Enrique Ayala Vazquez**, Watsonville, CA (US); **Erica J. Tong**, Pacifica, CA (US); **Hongfei Hu**, Santa Clara, CA (US); **Matthew A. Mow**, Los Altos, CA (US); **Mattia Pascolini**, San Mateo, CA (US); **Ming-Ju Tsai**, Cupertino, CA (US); **Nanbo Jin**, Sunnyvale, CA (US); **Robert W. Schlub**, Cupertino, CA (US)

(57) **ABSTRACT**

An electronic device may be provided with shared antenna structures that can be used to form both a near-field-communications antenna such as a loop antenna and a non-near-field communications antenna such as an inverted-F antenna. The antenna structures may include conductive structures such as metal traces on printed circuits or other dielectric substrates, internal metal housing structures, or other conductive electronic device housing structures. A main resonating element arm may be separated from an antenna ground by an opening. A non-near-field communications antenna return path and antenna feed path may span the opening. A balun may have first and second electromagnetically coupled inductors. The second inductor may have terminals coupled across differential signal terminals in a near-field communications transceiver. The first inductor may form part of the near-field communications loop antenna.

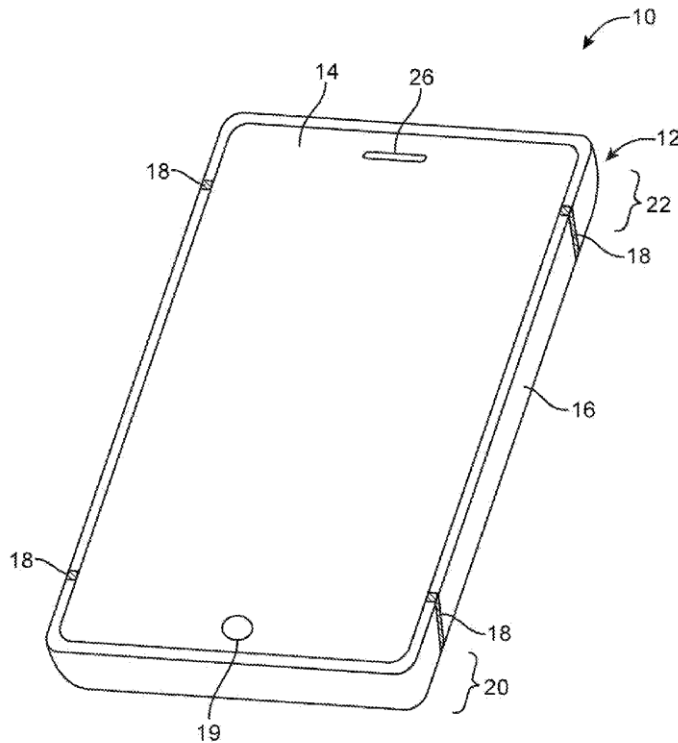
(73) Assignee: **Apple Inc.**, Cupertino, CA (US)

(21) Appl. No.: **14/195,130**

(22) Filed: **Mar. 3, 2014**

Publication Classification

(51) **Int. Cl.**
H01Q 21/30 (2006.01)
H01Q 1/24 (2006.01)
H01Q 1/48 (2006.01)





US 20150249485A1

(19) **United States**

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

(10) **Pub. No.: US 2015/0249485 A1**

(43) **Pub. Date: Sep. 3, 2015**

(54) **ELECTRONIC DEVICE WITH NEAR-FIELD ANTENNAS**

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

CPC *H04B 5/0081* (2013.01); *H01Q 7/00* (2013.01); *H04B 5/02* (2013.01); *H04W 88/06* (2013.01)

(71) Applicant: **Apple Inc.**, Cupertino, CA (US)

(72) Inventors: **Yuehui Ouyang**, Sunnyvale, CA (US);
Joseph Hakim, Cupertino, CA (US);
Dean F. Darnell, Durham, NC (US);
Mattia Pascolini, San Francisco, CA (US)

(57) **ABSTRACT**

An electronic device may have multiple near-field communications antennas. Multiplexer circuitry may have a transceiver port that is coupled to a near-field communications transceiver, and multiple antenna ports coupled to respective near-field communications antennas. Non-near-field communications antennas may be used by non-near-field communications circuitry. The electronic device may have a housing with opposing first and second ends and a display. One of the near-field communications antennas and one of the non-near-field communications antenna may be formed from shared antenna structures at the first end. Another of the near-field communications antennas and another of the non-near-field communications antennas may be formed from shared antenna structures at the second end. An additional near field communications antenna may be overlapped by the display.

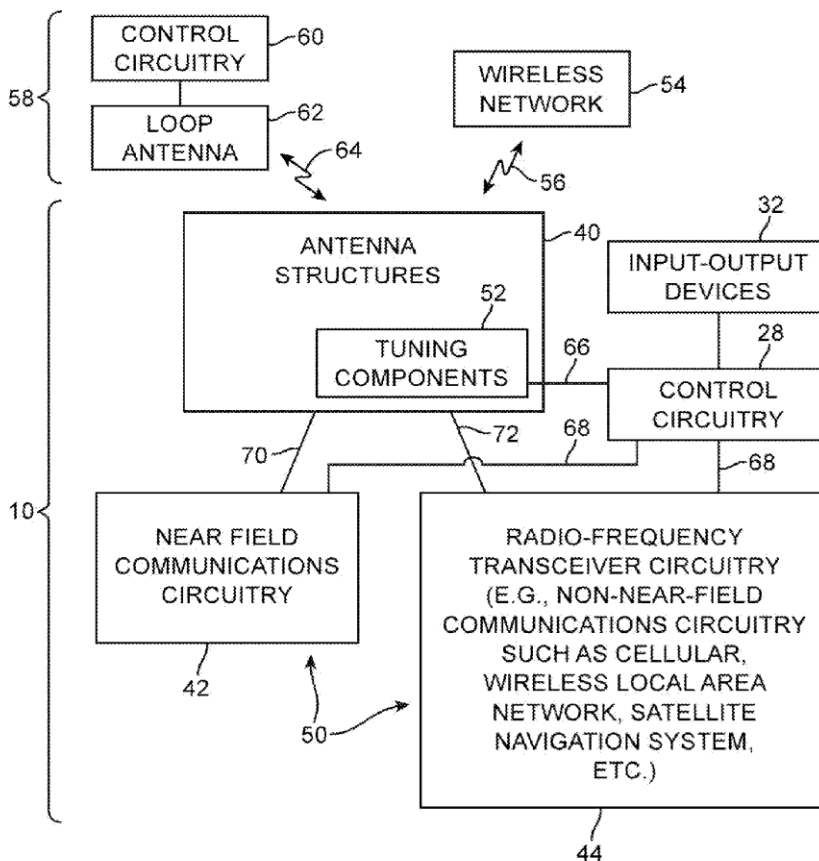
(73) Assignee: **Apple Inc.**, Cupertino, CA (US)

(21) Appl. No.: **14/195,247**

(22) Filed: **Mar. 3, 2014**

Publication Classification

(51) **Int. Cl.**
H04B 5/00 (2006.01)
H04B 5/02 (2006.01)
H01Q 7/00 (2006.01)





US 20150255851A1

(19) **United States**

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

(10) **Pub. No.: US 2015/0255851 A1**

(43) **Pub. Date: Sep. 10, 2015**

(54) **ELECTRONIC DEVICE WITH DUAL CLUTCH BARREL CAVITY ANTENNAS**

(52) **U.S. Cl.**
CPC **H01Q 1/2266** (2013.01)

(71) Applicant: **Apple Inc.**, Cupertino, CA (US)

(57) **ABSTRACT**

(72) Inventors: **Jerzy Guterman**, Mountain View, CA (US); **Qingxiang Li**, Mountain View, CA (US); **Mattia Pascolini**, San Francisco, CA (US)

An electronic device has antennas formed from cavity antenna structures. The electronic device may have a metal housing. The metal housing may have an upper housing in which a component such as a display is mounted and a lower housing in which a component such as a keyboard is mounted. Hinges may be used to mount the upper housing to the lower housing for rotation about a rotational axis. Cavity antennas may be formed in a clutch barrel region located between the hinges and running along the rotational axis. A flexible printed circuit may be formed between the cavity antennas. Each cavity antenna may have a first end that is adjacent to one of the hinges and a second end that is adjacent to the flexible printed circuit. Cavity walls for the cavity antennas may be formed from metal housing structures such as metal portions of the lower housing.

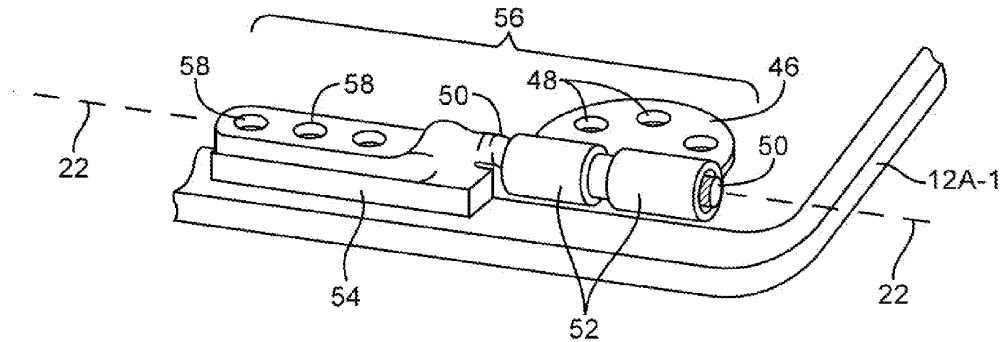
(73) Assignee: **Apple Inc.**, Cupertino, CA (US)

(21) Appl. No.: **14/202,860**

(22) Filed: **Mar. 10, 2014**

Publication Classification

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





US 20150255853A1

(19) **United States**

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

(10) **Pub. No.: US 2015/0255853 A1**
(43) **Pub. Date: Sep. 10, 2015**

(54) **ELECTRONIC DEVICE WITH DISPLAY
FRAME ANTENNA**

(52) **U.S. Cl.**
CPC **H01Q 1/24** (2013.01); **H01Q 1/2258**
(2013.01); **H01Q 1/243** (2013.01)

(71) Applicant: **Apple Inc.**, Cupertino, CA (US)

(57) **ABSTRACT**

(72) Inventors: **Kelvin Kwong**, Cupertino, CA (US);
Lee E. Hooton, Cupertino, CA (US)

An electronic device has a display mounted in a housing using a plastic display frame. The display has an active area and an inactive area. A display cover layer may have polymer coating layers in the inactive area. The display frame may lie under the inactive area. A patterned metal coating layer may be formed on the display frame. The patterned metal coating layer may have portions that form adhesion promotion structures for promoting adhesion between the frame and the adhesive. The patterned metal coating layer may also have portions that form antenna structures. The antenna structures may be used to transmit and receive radio-frequency signals and may be used as adhesion promotion structures. Adhesive may be interposed between the polymer coating layers and the metal coating layer on the display frame to attach the display cover layer and the display to the display frame.

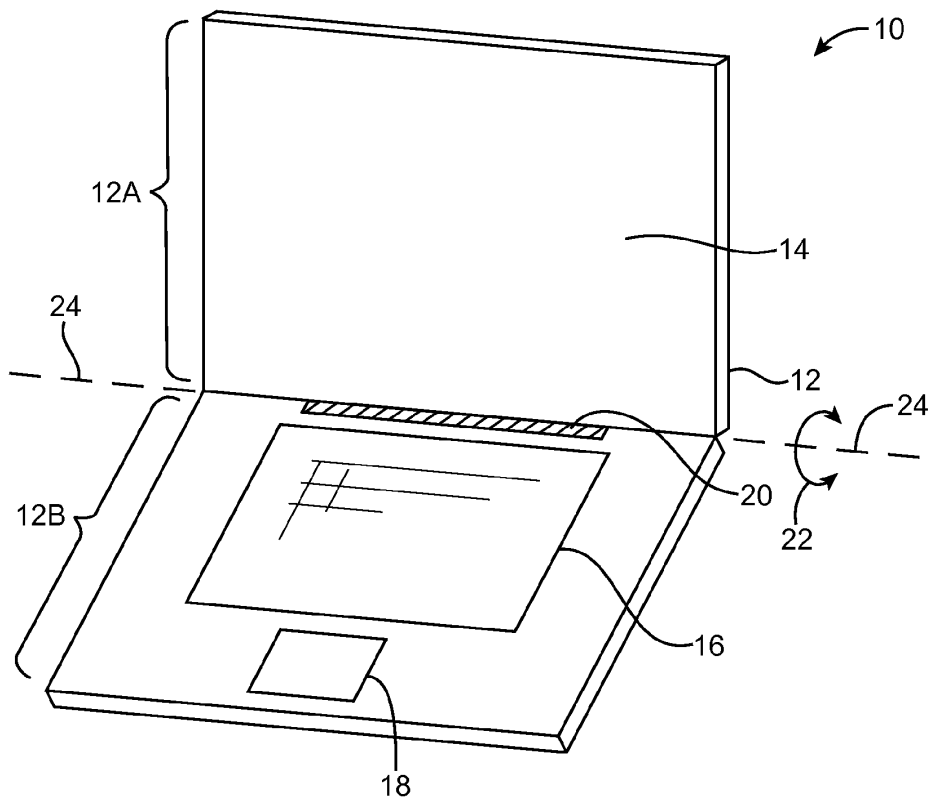
(73) Assignee: **Apple Inc.**, Cupertino, CA (US)

(21) Appl. No.: **14/201,501**

(22) Filed: **Mar. 7, 2014**

Publication Classification

(51) **Int. Cl.**
H01Q 1/24 (2006.01)
H01Q 1/22 (2006.01)





US 20150255854A1

(19) **United States**

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

(10) **Pub. No.: US 2015/0255854 A1**
(43) **Pub. Date: Sep. 10, 2015**

(54) **MOBILE DEVICE AND ANTENNA ELEMENT THEREIN**

Publication Classification

(71) Applicant: **Quanta Computer Inc.**, Kuei Shan Hsiang (TW)

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

(72) Inventors: **Chun-I Lin**, Kuei Shan Hsiang (TW);
Hui Lin, Kuei Shan Hsiang (TW);
Ming-Che Chan, Kuei Shan Hsiang (TW)

(52) **U.S. Cl.**
CPC **H01Q 1/243** (2013.01)

(57) **ABSTRACT**

(73) Assignee: **Quanta Computer Inc.**, Kuei Shan Hsiang (TW)

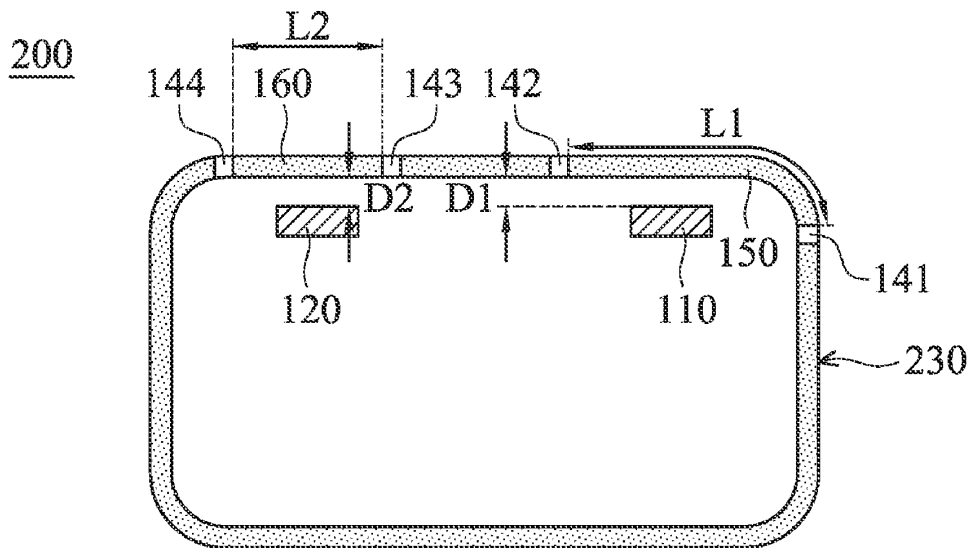
A mobile device includes an antenna element and a metal frame. A first separating gap and a second separating gap are formed on the metal frame. The metal frame includes a float portion. The float portion of the metal frame is positioned between the first separating gap and the second separating gap. The antenna element is disposed adjacent to the float portion of the metal frame. The float portion of the metal frame is configured to direct radiation of the antenna element outwardly.

(21) Appl. No.: **14/271,843**

(22) Filed: **May 7, 2014**

(30) **Foreign Application Priority Data**

Mar. 5, 2014 (TW) 103107360





US 20150255855A1

(19) **United States**

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

(10) **Pub. No.: US 2015/0255855 A1**
(43) **Pub. Date: Sep. 10, 2015**

(54) **WEARABLE DEVICE**

H01Q 13/10 (2006.01)
H01Q 1/27 (2006.01)

(71) Applicant: **Wistron Corporation**, New Taipei City (TW)

(52) **U.S. Cl.**
CPC *H01Q 1/243* (2013.01); *H01Q 1/273* (2013.01); *G04R 60/06* (2013.01); *H01Q 13/10* (2013.01)

(72) Inventors: **Wen-Yi Tsai**, New Taipei City (TW);
Chia-Ching Lee, New Taipei City (TW)

(21) Appl. No.: **14/301,345**

(57) **ABSTRACT**

(22) Filed: **Jun. 11, 2014**

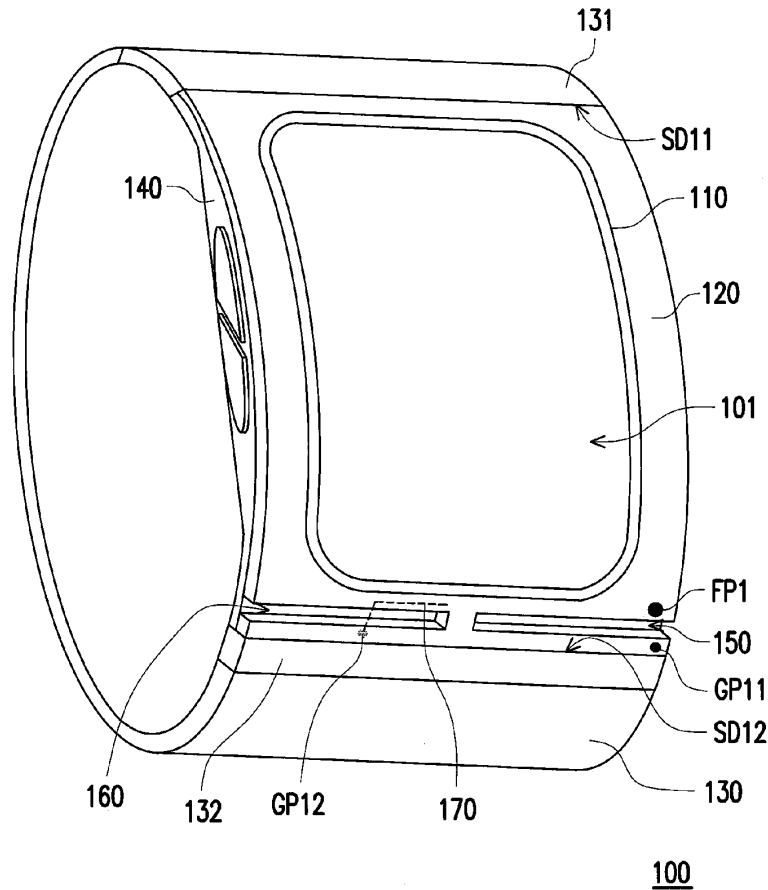
(30) **Foreign Application Priority Data**

Mar. 5, 2014 (TW) 103107456

Publication Classification

(51) **Int. Cl.**
H01Q 1/24 (2006.01)
G04R 60/06 (2006.01)

A wearable device including a display unit, a conductive frame and a belt-like structure is provided. The conductive frame surrounds a display region of the display unit, and the conductive frame has a first open slot. Besides, a feeding point and a first ground point are disposed on two sides of an opening of the first open slot, and the conductive frame forms a first antenna element. The belt-like structure is respectively connected to a first edge and a second edge, which are opposite to each other, of the conductive frame.





US 20150255856A1

(19) **United States**

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

(10) **Pub. No.: US 2015/0255856 A1**

(43) **Pub. Date: Sep. 10, 2015**

(54) **ANTENNA DEVICE AND ELECTRONIC DEVICE HAVING THE ANTENNA DEVICE**

Publication Classification

(71) Applicant: **Samsung Electronics Co., Ltd.**,
Gyeonggi-do (KR)

(51) **Int. Cl.**
H01Q 1/24 (2006.01)
H01Q 9/04 (2006.01)

(72) Inventors: **Won-Bin HONG**, Seoul (KR);
Yoon-Geon Kim, Busan (KR)

(52) **U.S. Cl.**
CPC **H01Q 1/243** (2013.01); **H01Q 9/0407**
(2013.01)

(73) Assignee: **Samsung Electronics Co., Ltd.**

(57) **ABSTRACT**

(21) Appl. No.: **14/639,397**

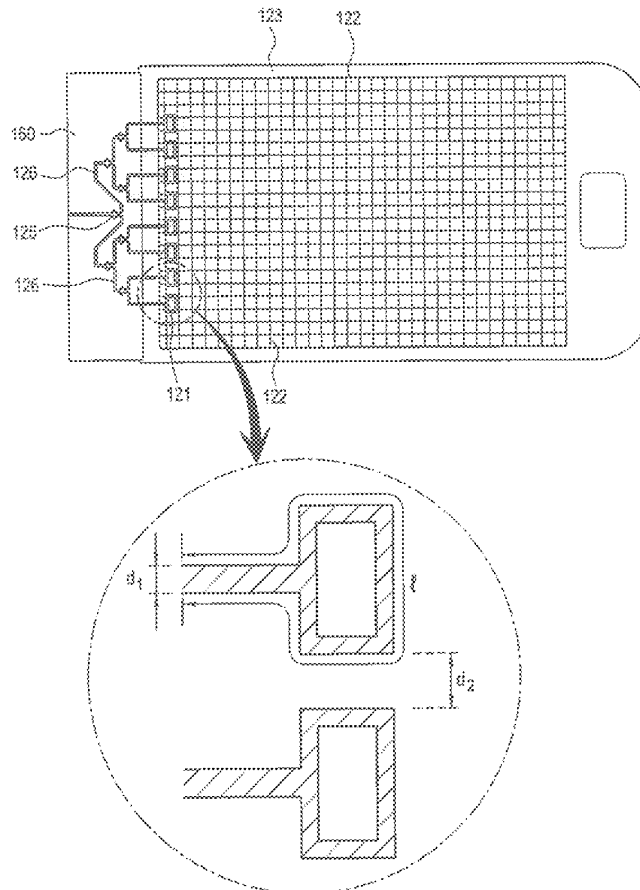
The present disclosure relates to a pre-5th-Generation (5G) or 5G communication system to be provided for supporting higher data rates Beyond 4th-Generation (4G) communication system such as Long Term Evolution (LTE).

(22) Filed: **Mar. 5, 2015**

An antenna device and an electronic device having the antenna device are provided. The antenna device includes a conductive film member including mesh grid areas formed by transparent wires and electrodes, and a radiation pattern path formed between the mesh grid areas. The electronic device includes a display including a touch panel, wherein the touch panel comprises a conductive film member including mesh grid areas formed by transparent wires and electrodes, and a radiation pattern path formed between the mesh grid areas.

(30) **Foreign Application Priority Data**

Mar. 5, 2014 (KR) 10-2014-0026117
Dec. 3, 2014 (KR) 10-2014-0172529





US 20150255857A1

(19) **United States**

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

(10) **Pub. No.: US 2015/0255857 A1**
(43) **Pub. Date: Sep. 10, 2015**

(54) **ANTENNA APPARATUS FOR PORTABLE TERMINAL**

(30) **Foreign Application Priority Data**

Apr. 14, 2011 (KR) 10-2011-0034548

(71) Applicant: **Samsung Electronics Co., Ltd.**,
Gyeonggi-do (KR)

Publication Classification

(72) Inventors: **Jae-Hee KIM**, Gyeonggi-do (KR);
Joon-Ho BYUN, Gyeonggi-do (KR);
Se-Hyun PARK, Gyeonggi-do (KR);
Dong-Hyun LEE, Gyeonggi-do (KR);
Austin KIM, Gyeonggi-do (KR)

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

(52) **U.S. Cl.**
CPC **H01Q 1/243** (2013.01)

(57) **ABSTRACT**

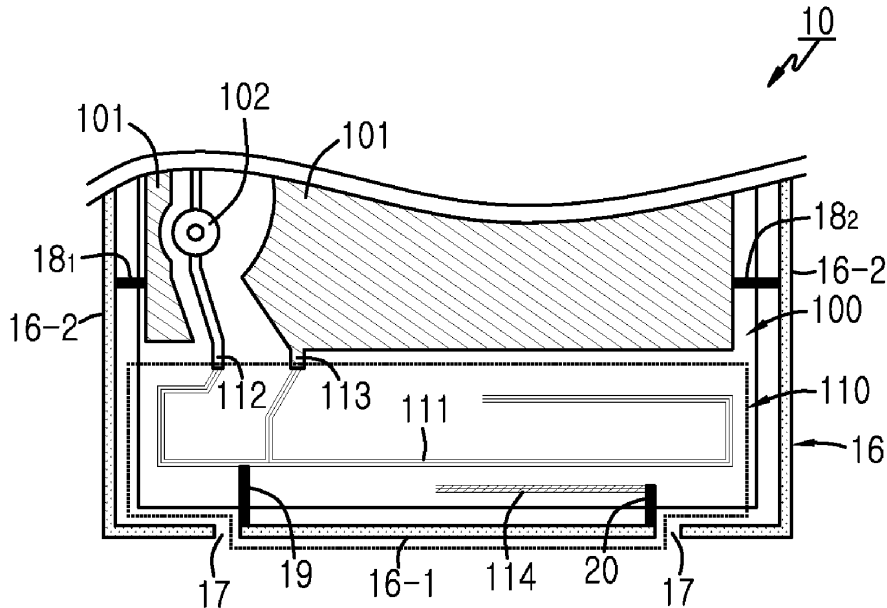
An antenna apparatus for a portable terminal having a main board is provided. The antenna apparatus includes a main antenna that electrically connects to a feed line of the main board. A metal frame is constructed as part of a case frame forming an exterior of the portable terminal. The metal frame is divided into first and second parts that are separated. The first part electrically connects to the main antenna or to the main board feed line, and is designed to radiate. The second part electrically connects to a ground surface of the main board. The metal frame enhances overall antenna performance rather than causing degradation through interference.

(21) Appl. No.: **14/719,642**

(22) Filed: **May 22, 2015**

Related U.S. Application Data

(63) Continuation of application No. 14/461,527, filed on Aug. 18, 2014, now Pat. No. 9,059,506, which is a continuation of application No. 13/440,235, filed on Apr. 5, 2012, now Pat. No. 8,842,048.





US 20150263414A1

(19) **United States**

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

(10) **Pub. No.: US 2015/0263414 A1**

(43) **Pub. Date: Sep. 17, 2015**

(54) **ANTENNA APPARATUS FOR PORTABLE TERMINAL**

Publication Classification

(71) Applicant: **Samsung Electronics Co., Ltd.**,
Gyeonggi-do (KR)

(72) Inventors: **Jae-Bong CHUN**, Gyeonggi-do (KR);
Sung-Cheol KIM, Gyeonggi-do (KR);
Jae-Ho LIM, Gyeonggi-do (KR);
Kyung-Jong LEE, Gyeonggi-do (KR);
Austin KIM, Gyeonggi-do (KR);
Jae-Ho LEE, Gyeonggi-do (KR)

(51) **Int. Cl.**
H01Q 1/24 (2006.01)
H01Q 13/10 (2006.01)
H01Q 9/04 (2006.01)
H01Q 1/48 (2006.01)

(52) **U.S. Cl.**
CPC **H01Q 1/243** (2013.01); **H01Q 1/48**
(2013.01); **H01Q 13/106** (2013.01); **H01Q**
9/0407 (2013.01)

(21) Appl. No.: **14/725,433**

(57) **ABSTRACT**

(22) Filed: **May 29, 2015**

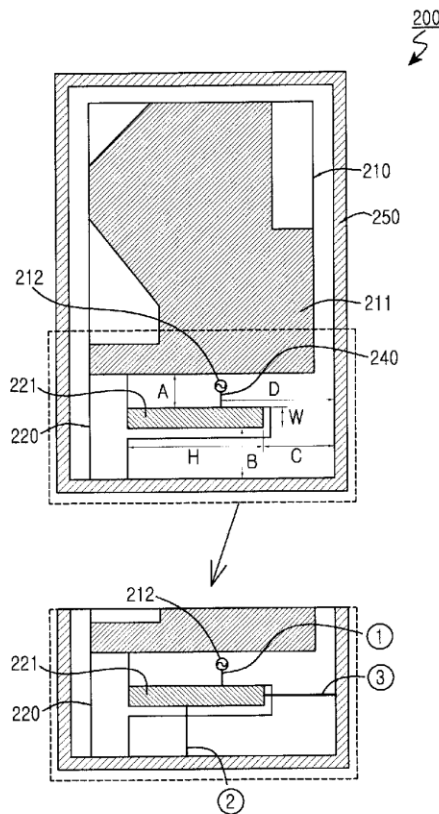
Related U.S. Application Data

(63) Continuation of application No. 13/275,701, filed on
Oct. 18, 2011, now Pat. No. 9,065,168.

An antenna apparatus for a portable terminal which is light, thin, compact, and small. The antenna apparatus preferably includes a main board equipped with a power feeding part for feeding power and a ground surface for grounding the main board and at least one sub-board, each sub-board which has a ground surface and electrically communicates with the main board, wherein the ground surface of each sub-board receives power from the power feeding part of the main board and resonates.

(30) **Foreign Application Priority Data**

Oct. 20, 2010 (KR) 10-2010-0102263





US 20150263416A1

(19) **United States**

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

(10) **Pub. No.: US 2015/0263416 A1**

(43) **Pub. Date: Sep. 17, 2015**

(54) **ANTENNA AND ELECTRONIC DEVICE FOR CLOSE PROXIMITY WIRELESS COMMUNICATION**

Publication Classification

(71) Applicant: **KABUSHIKI KAISHA TOSHIBA**,
Tokyo (JP)

(51) **Int. Cl.**
H01Q 1/36 (2006.01)
H01Q 1/24 (2006.01)

(72) Inventors: **Motochika Okano**, Tokyo (JP); **Toshiki Miyasaka**, Saitama-shi (JP)

(52) **U.S. Cl.**
CPC . **H01Q 1/36** (2013.01); **H01Q 1/243** (2013.01)

(73) Assignee: **KABUSHIKI KAISHA TOSHIBA**

(57) **ABSTRACT**

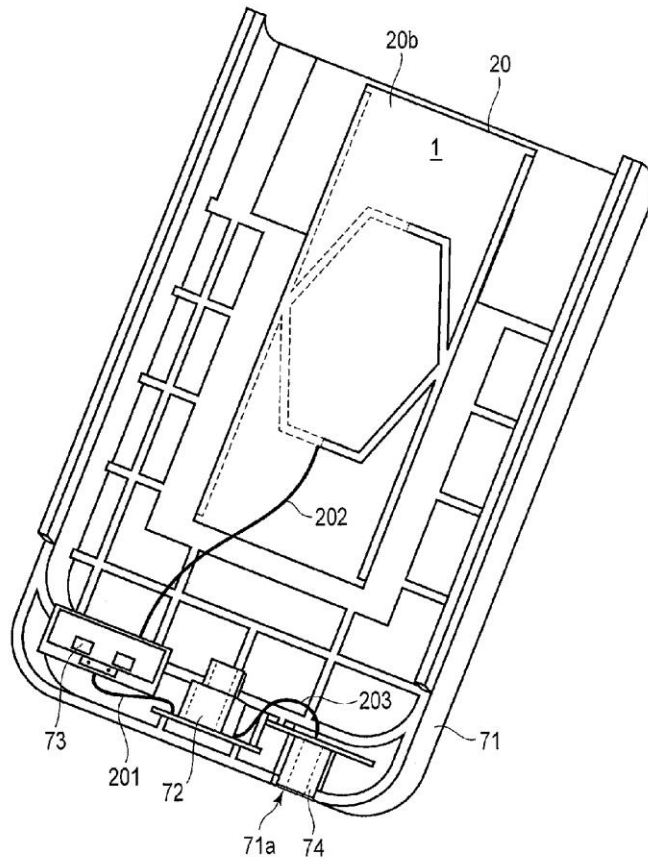
(21) Appl. No.: **14/321,253**

According to one embodiment, an antenna includes first and second coupling elements and first to fourth connecting elements. An electrical length between a middle point of the first coupling element and each of both open ends thereof is a first electrical length which is an odd multiple of $\frac{1}{4}$ of a wavelength λ corresponding to a frequency used for close proximity wireless communication. An electrical length between a middle point of the second coupling element and each of both open ends thereof is the first electrical length. An electrical length of each of the first to fourth connecting elements is a second electrical length which is an odd multiple of $\frac{1}{4}$ of the wavelength λ .

(22) Filed: **Jul. 1, 2014**

(30) **Foreign Application Priority Data**

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(54) **ANTENNA STRUCTURE AND WIRELESS COMMUNICATION DEVICE USING THE SAME**

Publication Classification

(71) Applicant: **Chiun Mai Communication Systems, Inc.**, New Taipei (TW)

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

(72) Inventors: **GENG-HONG LIOU**, Tu-Cheng (TW);
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CPC . **H01Q 9/42** (2013.01); **H01Q 1/243** (2013.01)

(21) Appl. No.: **14/576,768**

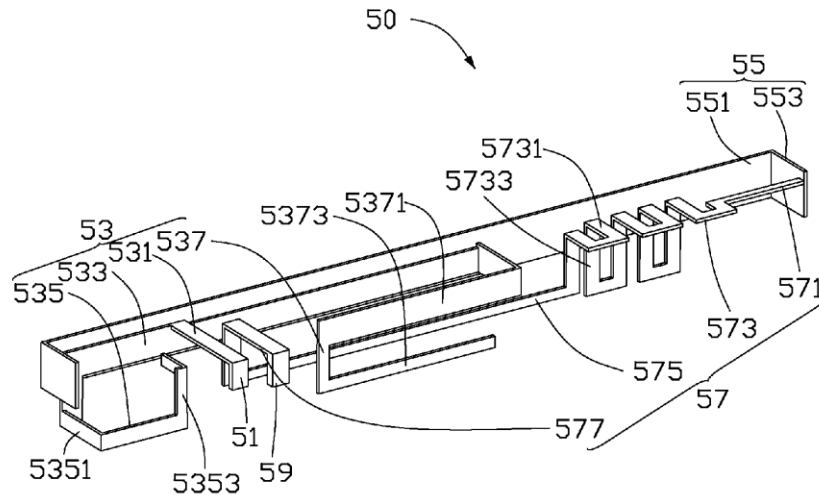
(57) **ABSTRACT**

(22) Filed: **Dec. 19, 2014**

An antenna structure includes a feed end plate, a ground end plate, a first radiator, a second radiator, and a metallic plate. The first radiator is coupled to the feed end plate. The second radiator is coupled to the ground end plate. The metallic plate is spaced from the first radiator and is couple the second radiator. The metallic plate includes a main sheet and at least one side sheet connected to the main sheet, a gap is defined between the main sheet and the first radiator, and the second radiator is coupled to the at least one side sheet.

(30) **Foreign Application Priority Data**

Mar. 17, 2014 (CN) 201410096878.X





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(19) **United States**

(12) **Patent Application Publication**
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(43) **Pub. Date: Sep. 17, 2015**

(54) **ANTENNA STRUCTURE**

Publication Classification

(71) Applicant: **Quanta Computer Inc.**, Kuei Shan Hsiang (TW)

(51) **Int. Cl.**
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Hui Lin, Kuei Shan Hsiang (TW)

(52) **U.S. Cl.**
CPC **H01Q 13/106** (2013.01); **H01Q 1/48** (2013.01); **H01Q 5/30** (2015.01)

(73) Assignee: **Quanta Computer Inc.**, Kuei Shan Hsiang (TW)

(57) **ABSTRACT**

(21) Appl. No.: **14/293,029**

An antenna structure includes a ground plane and a grounding extension branch. The ground plane has a slot. The grounding extension branch is disposed in the slot, and is coupled to the ground plane. The ground plane and the slot are excited by a signal source to generate a low-frequency band. The grounding extension branch is excited by the signal source to generate a high-frequency band.

(22) Filed: **Jun. 2, 2014**

(30) **Foreign Application Priority Data**

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