



(19) **United States**

(12) **Patent Application Publication**

Yun et al.

(10) **Pub. No.: US 2019/0115652 A1**

(43) **Pub. Date: Apr. 18, 2019**

(54) **ANTENNA APPARATUS**

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

(71) Applicant: **TE CONNECTIVITY CORPORATION**, Berwyn, PA (US)

CPC **H01Q 1/422** (2013.01); **H01Q 1/38** (2013.01); **H01Q 1/243** (2013.01); **H01Q 9/0442** (2013.01); **H01Q 1/46** (2013.01)

(72) Inventors: **Xing Yun**, Harrisburg, PA (US); **Bruce Foster Bishop**, Aptos, CA (US)

(57) **ABSTRACT**

(21) Appl. No.: **15/782,845**

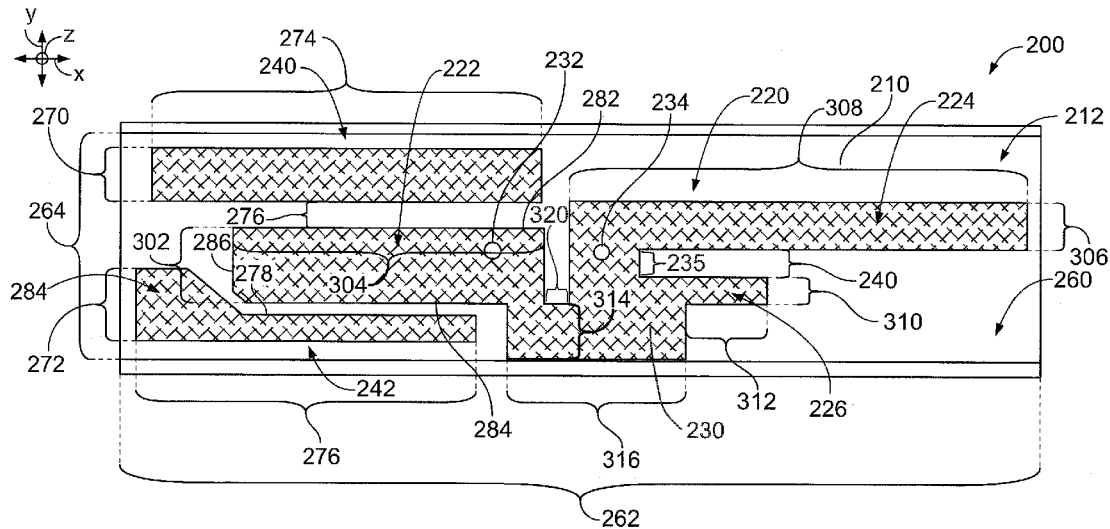
Antenna apparatus includes a driven trace coupled to a dielectric body and extending parallel to a ground plane. The driven trace includes first and second branches and an impedance-tuning portion that joins the first and second branches. Each of the first and second branches are configured to resonate at a respective radio-frequency (RF) band. The respective RF bands may or may not be the same. The antenna apparatus also includes a first conductive pathway extending from the driven trace through the dielectric body and configured to feed the driven trace. The antenna apparatus also includes a second conductive pathway that extends from the driven trace through the dielectric body and electrically connects the driven trace to the ground plane. The impedance-tuning portion extends between the first and second conductive pathways.

(22) Filed: **Oct. 12, 2017**

Publication Classification

(51) **Int. Cl.**

H01Q 1/42	(2006.01)
H01Q 1/38	(2006.01)
H01Q 1/46	(2006.01)
H01Q 9/04	(2006.01)





US 20190115654A1

(19) **United States**

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

(10) **Pub. No.: US 2019/0115654 A1**

(43) **Pub. Date: Apr. 18, 2019**

(54) **DUAL BAND ANTENNA MODULE**

H01Q 1/48 (2006.01)

H01Q 21/00 (2006.01)

(71) Applicant: **PEGATRON CORPORATION**, Taipei City (TW)

(52) **U.S. Cl.**
CPC *H01Q 1/523* (2013.01); *H01Q 5/35* (2015.01); *H01Q 5/50* (2015.01); *H01Q 21/0025* (2013.01); *H01Q 1/48* (2013.01)

(72) Inventors: **Ke-Chin Huang**, Taipei City (TW);
Jung-Yi Huang, Taipei City (TW);
Hui-An Yang, Taipei City (TW)

(73) Assignee: **PEGATRON CORPORATION**, TAIPEI CITY (TW)

(57) **ABSTRACT**

(21) Appl. No.: **16/104,115**

A dual band antenna module including a first radiator, a second radiator, a first filter and a second filter is provided. The first radiator resonates to generate a first frequency band and includes a first feeding end and a first ground end. The second radiator resonates to generate a second frequency band and includes a second feeding end and a second ground end. The first filter is extended from the first feeding end in a direction away from the first radiator and used for filtering the second frequency band. The second filter is extended from the second feeding end in a direction away from the second radiator and used for filtering the first frequency band.

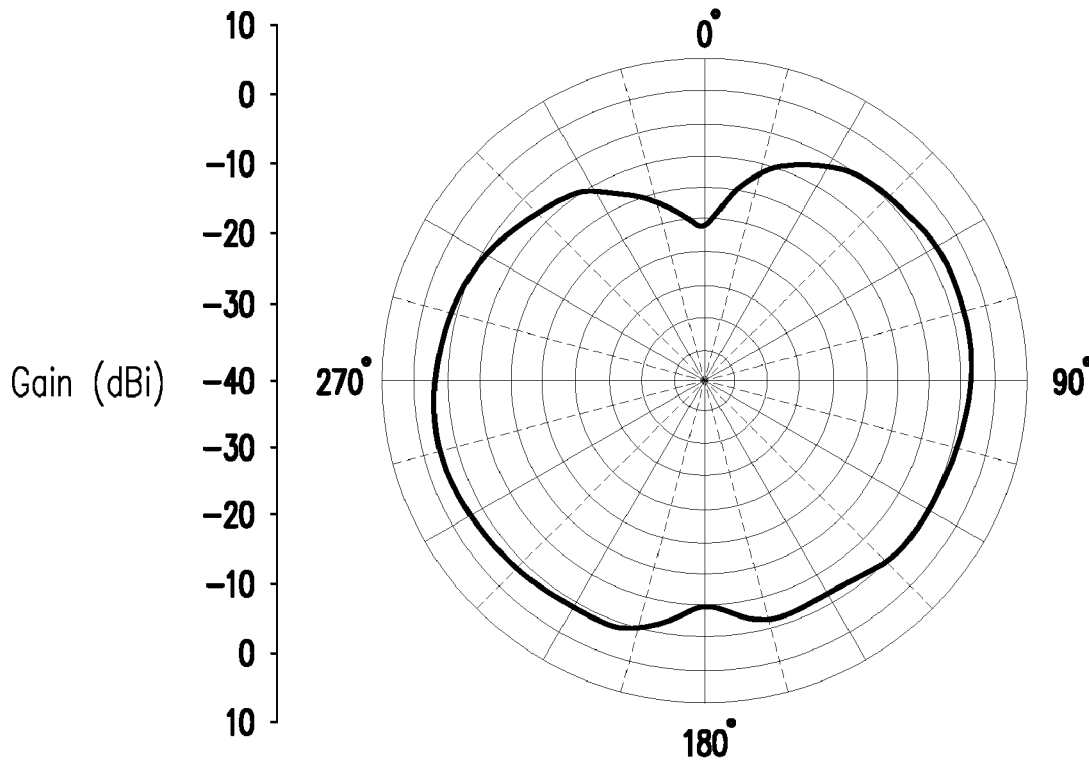
(22) Filed: **Aug. 16, 2018**

(30) **Foreign Application Priority Data**

Oct. 16, 2017 (TW) 106135274

Publication Classification

(51) **Int. Cl.**
H01Q 1/52 (2006.01)
H01Q 5/35 (2006.01)





(19) **United States**

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

(10) **Pub. No.: US 2019/0123423 A1**

(43) **Pub. Date: Apr. 25, 2019**

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

Publication Classification

(71) Applicant: **PEGATRON CORPORATION,**
TAIPEI CITY (TW)

(51) **Int. Cl.**
H01Q 1/22 (2006.01)
H01Q 1/24 (2006.01)
H01Q 1/48 (2006.01)
(52) **U.S. Cl.**
CPC *H01Q 1/2266* (2013.01); *H01Q 1/48*
(2013.01); *H01Q 1/243* (2013.01)

(72) Inventors: **Chien-Yi Wu,** Taipei City (TW);
Chao-Hsu Wu, Taipei City (TW);
Ching-Hsiang Ko, Taipei City (TW);
Cheng-Hsiung Wu, Taipei City (TW);
Shih-Keng Huang, Taipei City (TW)

(57) **ABSTRACT**

An antenna structure including a metal outer cover and an antenna assembly is provided. The metal outer cover has a bent slit. The antenna assembly is stacked on the metal outer cover and covers a portion of the bent slit. The antenna assembly includes a substrate and an antenna pattern disposed on the substrate. The antenna pattern includes a feed end, a first ground end and a second ground end. In the antenna pattern, a first loop and a second loop are formed from the feed end to the first ground end in two respective paths. A third loop is formed from the feed end to the second ground end. The first loop and the third loop resonate with the bent slit to generate a low frequency band and a portion of a high frequency band. The second loop and the third loop resonate with the bent slit to generate another portion of the high frequency band. An electronic device having the antenna structure is further provided.

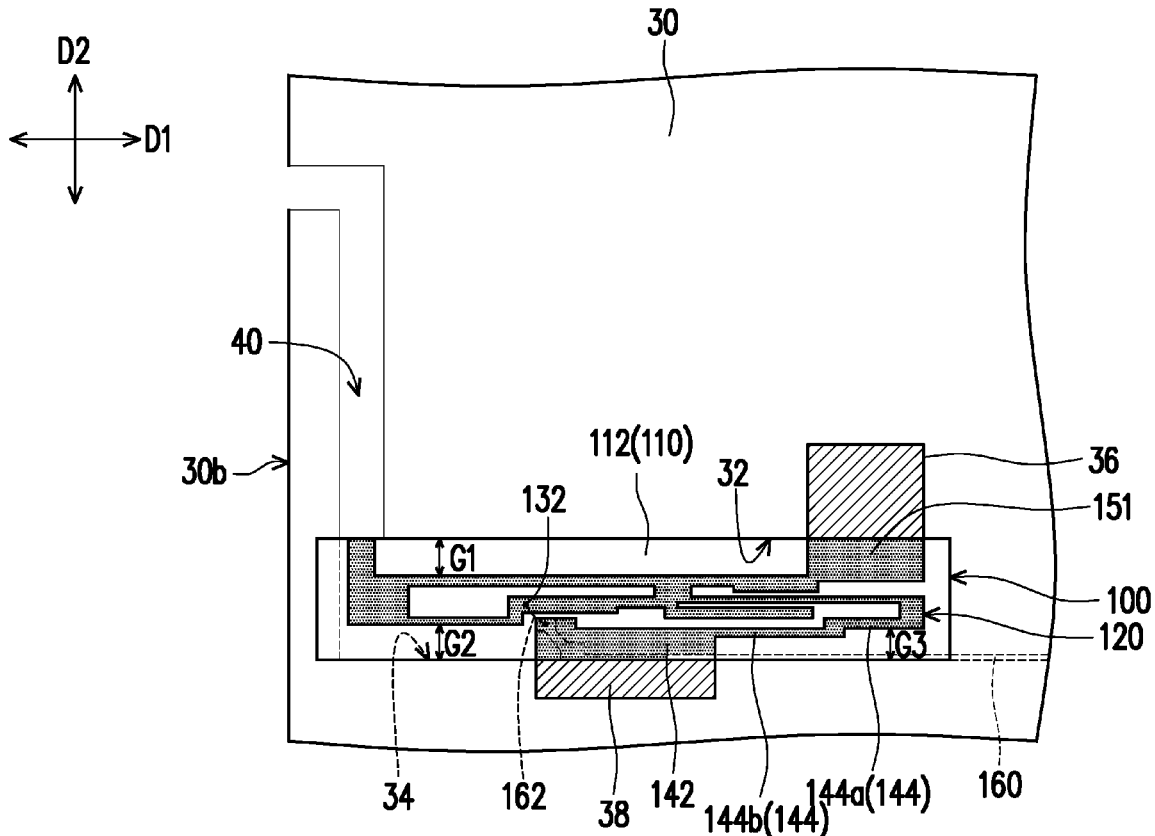
(73) Assignee: **PEGATRON CORPORATION,**
TAIPEI CITY (TW)

(21) Appl. No.: **16/107,811**

(22) Filed: **Aug. 21, 2018**

(30) **Foreign Application Priority Data**

Oct. 24, 2017 (TW) 106136586





US 20190123430A1

(19) **United States**

(12) **Patent Application Publication**
Heppell

(10) **Pub. No.: US 2019/0123430 A1**

(43) **Pub. Date: Apr. 25, 2019**

(54) **ANTENNA DESIGNS FOR COMMUNICATION BETWEEN A WIRELESSLY POWERED IMPLANT TO AN EXTERNAL DEVICE OUTSIDE THE BODY**

A61N 1/372 (2006.01)
H04B 5/00 (2006.01)
H01Q 1/24 (2006.01)
H01Q 1/22 (2006.01)
H01Q 1/50 (2006.01)

(71) Applicant: **TC1 LLC**, Pleasanton, CA (US)

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

(72) Inventor: **Kevin Gerald Heppell**, Oakland, CA (US)

CPC *H01Q 1/273* (2013.01); *H01Q 1/36* (2013.01); *H02J 50/40* (2016.02); *H02J 50/12* (2016.02); *H01Q 1/50* (2013.01); *A61N 1/37229* (2013.01); *H04B 5/0037* (2013.01); *H01Q 1/24* (2013.01); *H01Q 1/2225* (2013.01); *H01Q 1/526* (2013.01)

(21) Appl. No.: **16/219,327**

(22) Filed: **Dec. 13, 2018**

Related U.S. Application Data

(62) Division of application No. 14/861,977, filed on Sep. 22, 2015, now Pat. No. 10,186,760.

(60) Provisional application No. 62/053,663, filed on Sep. 22, 2014.

Publication Classification

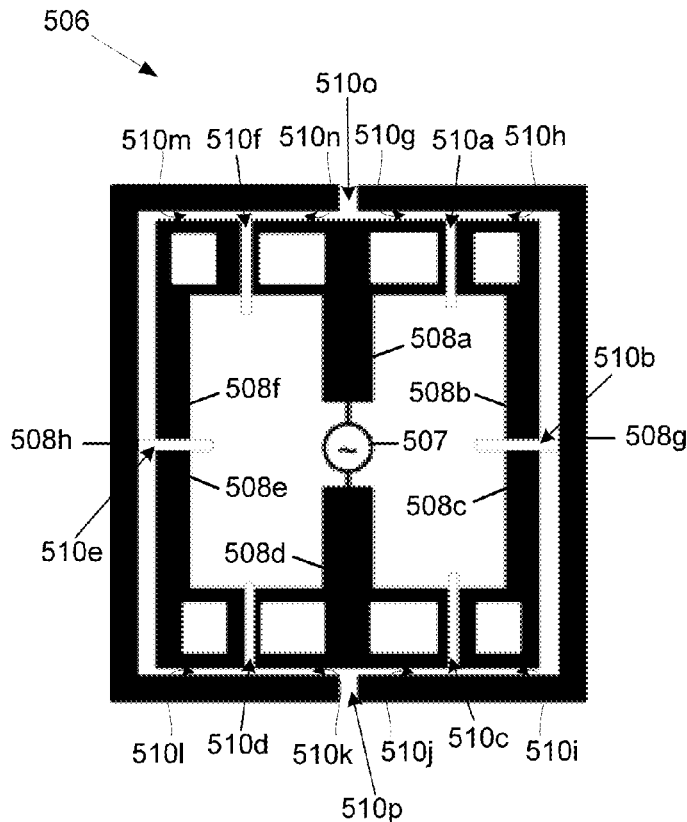
(51) **Int. Cl.**

H01Q 1/27 (2006.01)
H01Q 1/36 (2006.01)
H02J 50/40 (2006.01)
H02J 50/12 (2006.01)
H01Q 1/52 (2006.01)

(57)

ABSTRACT

Methods and apparatus for wireless power transfer and communications are provided. In one embodiment, a wireless power transfer system comprises an external transmit resonator configured to transmit wireless power, an implantable receive resonator configured to receive the transmitted wireless power from the transmit resonator, and communications antenna in the implantable receive resonator configured to send communication information to the transmit resonator. The communications antenna can include a plurality of gaps positioned between adjacent conductive elements, the gaps being configured to prevent or reduce induction of current in the plurality of conductive elements when the antenna is exposed to a magnetic field.





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(19) **United States**

(12) **Patent Application Publication**
UDAGAWA

(10) **Pub. No.: US 2019/0123432 A1**

(43) **Pub. Date: Apr. 25, 2019**

(54) **ANTENNA DEVICE**

Publication Classification

(71) Applicant: **Mitsubishi Electric Corporation**,
Chiyoda-ku, Tokyo (JP)

(72) Inventor: **Shigeo UDAGAWA**, Tokyo (JP)

(73) Assignee: **Mitsubishi Electric Corporation**,
Chiyoda-ku, Tokyo (JP)

(21) Appl. No.: **15/772,632**

(22) PCT Filed: **Dec. 15, 2016**

(86) PCT No.: **PCT/JP2016/087426**

§ 371 (c)(1),

(2) Date: **May 1, 2018**

(30) **Foreign Application Priority Data**

Dec. 17, 2015 (JP) 2015-246664

Jun. 17, 2016 (JP) PCT/JP2016/068160

(51) **Int. Cl.**

H01Q 1/32 (2006.01)

G01S 13/93 (2006.01)

H01Q 21/06 (2006.01)

H01Q 21/08 (2006.01)

H01Q 21/22 (2006.01)

H01Q 3/26 (2006.01)

H01Q 3/28 (2006.01)

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

CPC **H01Q 1/3233** (2013.01); **G01S 13/93**

(2013.01); **H01Q 21/062** (2013.01); **H01Q**

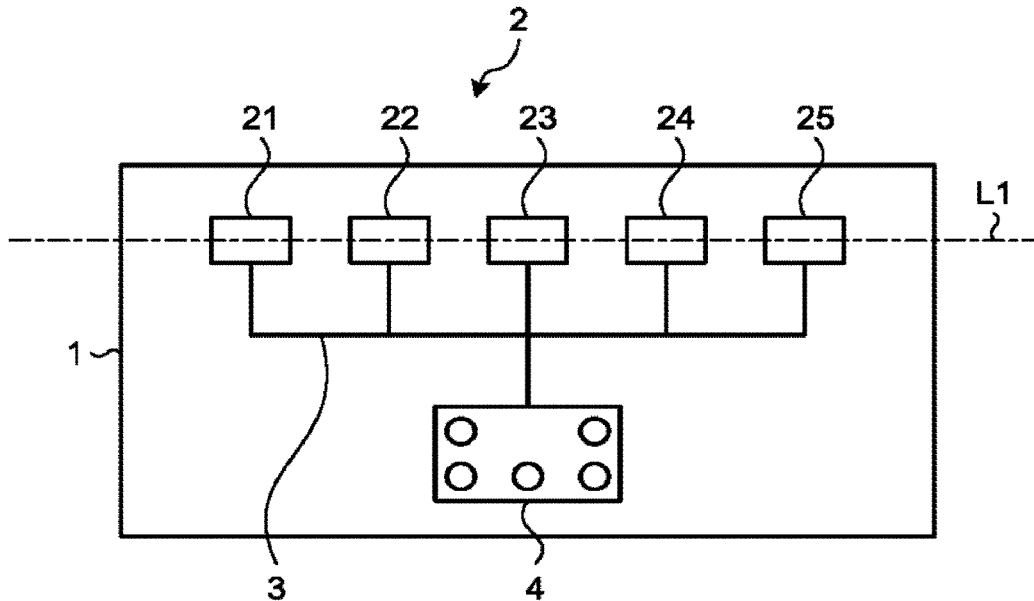
3/28 (2013.01); **H01Q 21/22** (2013.01); **H01Q**

3/2617 (2013.01); **H01Q 21/08** (2013.01)

(57)

ABSTRACT

An antenna device includes an array antenna formed of five radiating elements arrayed on a dielectric substrate, and a feeder circuit that feeds a high frequency signal to the radiating elements making up the array antenna. The five radiating elements are arrayed on a first straight line drawn in a direction horizontal to the ground, and an excitation voltage of the radiating element positioned at the center of the array is set to be 2.2 times or more an average value of excitation voltages of the other radiating elements.





(19) **United States**

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

(10) **Pub. No.: US 2019/0131691 A1**

(43) **Pub. Date: May 2, 2019**

(54) **ELECTRONIC DEVICE INCLUDING ANTENNA**

(52) **U.S. Cl.**
CPC **H01Q 1/2283** (2013.01); **H01Q 11/14** (2013.01); **H01Q 5/42** (2015.01); **H01Q 21/062** (2013.01); **H01Q 3/2635** (2013.01); **H01Q 21/245** (2013.01); **H01Q 5/48** (2015.01); **H01Q 1/243** (2013.01)

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

(72) Inventors: **Seong Beom HONG**, Seoul (KR);
Hyung Wook KIM, Gyeonggi-do (KR); **Sung Chul PARK**, Seoul (KR)

(57) **ABSTRACT**

An electronic device is provided. The electronic device may comprise a housing comprising: a front plate facing a first direction, a back plate facing a second direction opposite to the first direction, and a side surface which surrounds the front plate and the back plate, wherein the front plate includes a screen area and a bezel area; a display exposed through the screen area of the front plate; a first circuit board disposed between the display and the back plate and including a first surface facing the display and a second surface facing the back plate; a first antenna array overlaid on the bezel area in the first surface; a second antenna array disposed on the second surface; and a wireless communication circuit disposed on the first circuit board and electrically connected with the first antenna array and the second antenna array, wherein the wireless communication circuit is configured to: form a beam which has directionality in the first direction using the first antenna array and form a beam which has directionality in the second direction using the second antenna array.

(21) Appl. No.: **16/177,535**

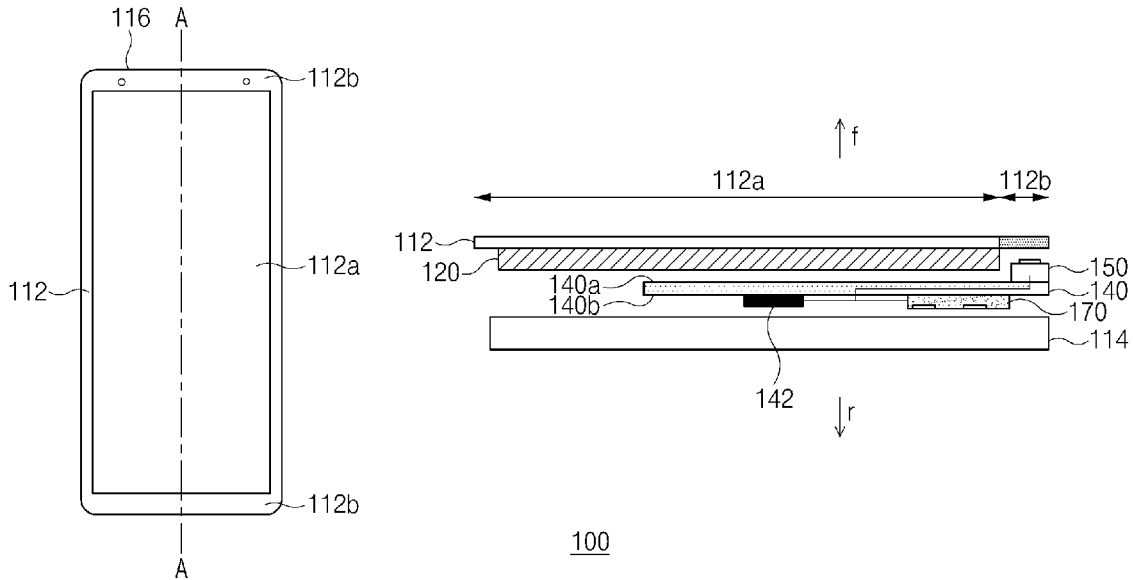
(22) Filed: **Nov. 1, 2018**

(30) **Foreign Application Priority Data**

Nov. 1, 2017 (KR) 10-2017-0144972

Publication Classification

(51) **Int. Cl.**
H01Q 1/22 (2006.01)
H01Q 11/14 (2006.01)
H01Q 5/42 (2006.01)
H01Q 1/24 (2006.01)
H01Q 3/26 (2006.01)
H01Q 21/24 (2006.01)
H01Q 5/48 (2006.01)
H01Q 21/06 (2006.01)



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US 20190131693A1

(19) **United States**

(12) **Patent Application Publication**

LEE et al.

(10) **Pub. No.: US 2019/0131693 A1**

(43) **Pub. Date: May 2, 2019**

(54) **MOBILE DEVICE**

H01Q 1/48 (2006.01)

H01Q 21/00 (2006.01)

(71) Applicant: **Quanta Computer Inc.**, Taoyuan City (TW)

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

CPC **H01Q 1/243** (2013.01); **H01Q 21/0006** (2013.01); **H01Q 1/48** (2013.01); **H01Q 5/371** (2015.01)

(72) Inventors: **Kuan-Hsien LEE**, Taoyuan City (TW); **Chung-Ting HUNG**, Taoyuan City (TW); **Chin-Lung TSAI**, Taoyuan City (TW); **Ching-Hai CHIANG**, Taoyuan City (TW); **Chung-Hung LO**, Taoyuan City (TW); **Ying-Cong DENG**, Taoyuan City (TW); **Yi-Ling TSENG**, Taoyuan City (TW)

(57) **ABSTRACT**

A mobile device includes a nonconductive mechanism element and an antenna structure. The antenna structure is formed over the nonconductive mechanism element. The antenna structure includes a feeding connection element, a first radiation element, a second radiation element, a grounding connection element, and a third radiation element. The feeding connection element is coupled to a feeding point. A first end of the first radiation element is coupled to the feeding connection element, and a second end of the first radiation element is open. A first end of the second radiation element is coupled to the feeding connection element, and a second end of the second radiation element is open. The grounding connection element is coupled to a grounding point. A first end of the third radiation element is coupled to the grounding connection element, and a second end of the third radiation element is open.

(21) Appl. No.: **15/987,149**

(22) Filed: **May 23, 2018**

(30) **Foreign Application Priority Data**

Oct. 27, 2017 (TW) 106137083

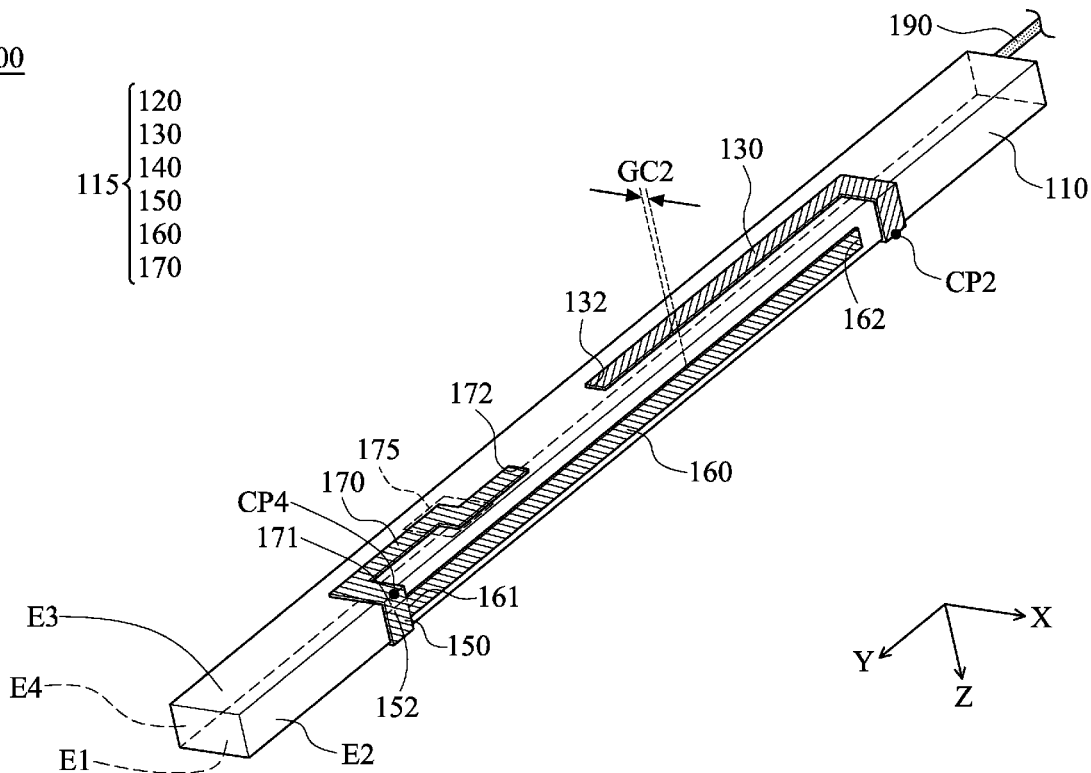
Publication Classification

(51) **Int. Cl.**

H01Q 1/24 (2006.01)

H01Q 5/371 (2006.01)

100





US 20190131694A1

(19) **United States**

(12) **Patent Application Publication**

LEE et al.

(10) **Pub. No.: US 2019/0131694 A1**

(43) **Pub. Date: May 2, 2019**

(54) **ANTENNA ASSEMBLY AND WIRELESS COMMUNICATION DEVICE EMPLOYING SAME**

(52) **U.S. Cl.**
CPC *H01Q 1/243* (2013.01); *H01Q 9/0421* (2013.01); *H01Q 13/10* (2013.01); *H04M 1/0283* (2013.01)

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

(72) Inventors: **YI-CHIEH LEE**, New Taipei (TW);
YEN-HUI LIN, New Taipei (TW);
YUN-JIAN CHANG, Tu-Cheng (TW);
JUNG-CHIN LIN, New Taipei (TW);
GENG-HONG LIOU, Tu-Cheng (TW)

(57) **ABSTRACT**

An antenna assembly includes a side frame, a feed portion, a ground portion, a radiating portion, and a first matching circuit. The side frame defines a first gap to form a first radiating section from the first gap to a side portion. The radiating portion is inside the side frame and connects to the feed portion and the ground portion, the radiating portion is spaced apart from the side frame and connected to the first radiating section. One end of the first matching circuit connects to an end of the first radiating section adjacent to the first gap, another end connects to the ground portion. The feed portion feeds current into the radiating portion, two opposite ends of the first radiating section and the first matching circuit to activate radiating signals in a first frequency band. A wireless communication device employing the antenna assembly is also provided.

(21) Appl. No.: **16/137,567**

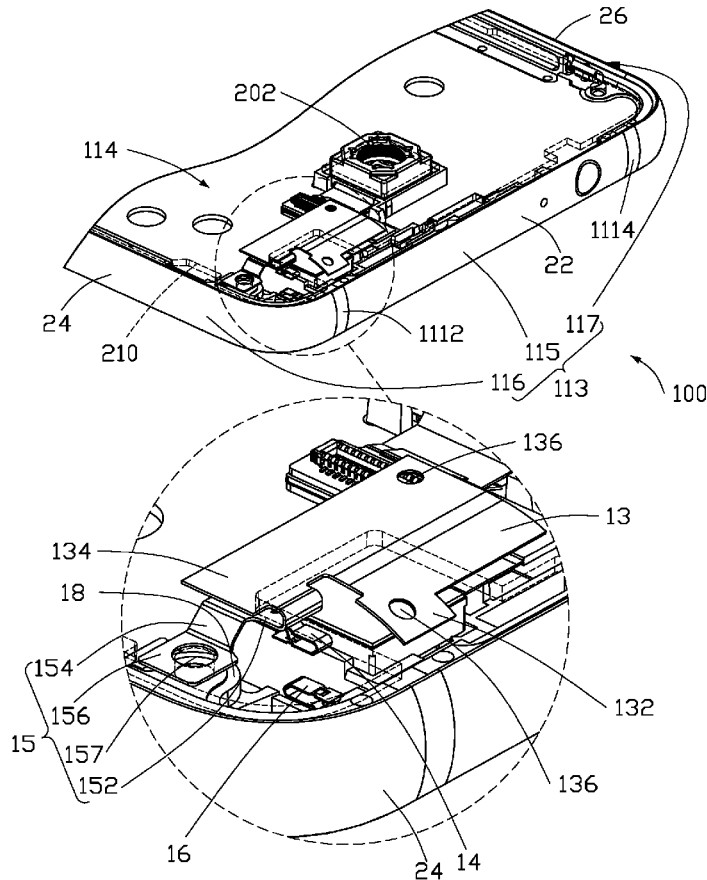
(22) Filed: **Sep. 21, 2018**

(30) **Foreign Application Priority Data**

Oct. 30, 2017 (CN) 201711035888.2

Publication Classification

(51) **Int. Cl.**
H01Q 1/24 (2006.01)
H04M 1/02 (2006.01)
H01Q 13/10 (2006.01)





(19) **United States**

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

(10) **Pub. No.: US 2019/0131705 A1**

(43) **Pub. Date: May 2, 2019**

(54) **USER INSENSITIVE PHASED ANTENNA ARRAY DEVICES, SYSTEMS, AND METHODS**

Publication Classification

(51) **Int. Cl.**
H01Q 3/32 (2006.01)
H01Q 21/00 (2006.01)
(52) **U.S. Cl.**
CPC *H01Q 3/32* (2013.01); *H01Q 21/0006* (2013.01)

(71) Applicant: **wiSpry, Inc.**, Irvine, CA (US)

(72) Inventors: **Igor Syrtsin**, Aalborg (DK); **Shuai Zhang**, Aalborg SV (DK); **Gert Frølund Pedersen**, Storvorde (DK)

(73) Assignee: **wiSpry, Inc.**, Irvine, CA (US)

(21) Appl. No.: **16/157,979**

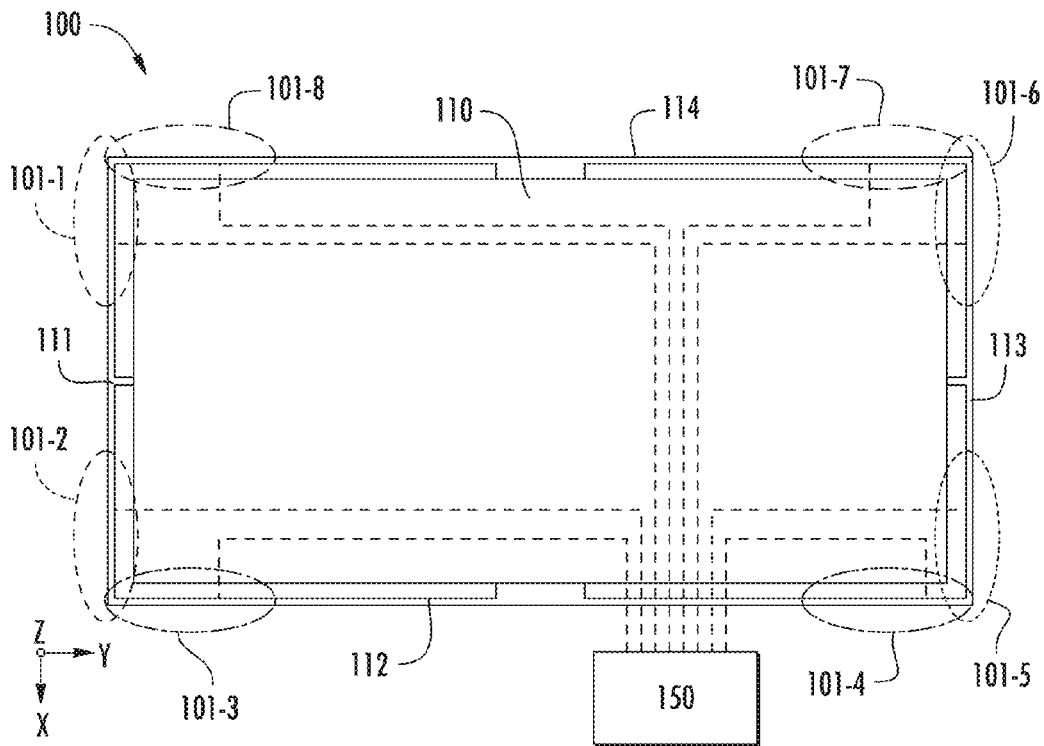
(22) Filed: **Oct. 11, 2018**

Related U.S. Application Data

(60) Provisional application No. 62/570,916, filed on Oct. 11, 2017.

(57) **ABSTRACT**

In some embodiments, a phased antenna array system includes antenna sub-arrays spaced apart from one another about a mobile device chassis, with each of the antenna sub-arrays including one or more antenna element. One or more of the antenna sub-arrays are selectively addressable to generate an aggregate response among a combination of the plurality of antenna sub-arrays to steer one or more signal beam in a desired direction.





US 20190131716A1

(19) **United States**

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

(10) **Pub. No.: US 2019/0131716 A1**
(43) **Pub. Date: May 2, 2019**

(54) **TERMINAL ANTENNA AND TERMINAL**

H01Q 13/10 (2006.01)

(71) Applicant: **HUAWEI TECHNOLOGIES CO., LTD.**, Shenzhen, Guangdong (CN)

H01Q 1/24 (2006.01)

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

(72) Inventors: **Liang XUE**, Shanghai (CN); **Dong YU**, Shanghai (CN); **Hanyang WANG**, Reading (GB); **Jiaqing YOU**, Shanghai (CN); **Lei WANG**, Shanghai (CN); **Fangchao ZHAO**, Shanghai (CN); **Lei ZHAO**, Shenzhen (CN); **Lijun YING**, Shanghai (CN); **Rui ZHANG**, Shanghai (CN)

CPC *H01Q 21/064* (2013.01); *H01Q 1/50* (2013.01); *H04M 1/0283* (2013.01); *H01Q 1/243* (2013.01); *H01Q 13/10* (2013.01)

(57) **ABSTRACT**

(21) Appl. No.: **16/091,137**

Example terminal antennas and terminals are provided. The terminal antenna includes a mainboard, a feedpoint disposed on the mainboard, a metal housing, an adjustable apparatus, and at least two adjustable ground points. The mainboard is located on an inner side of the metal housing, the metal housing is electrically connected to the mainboard, and a slot is disposed in the metal housing. The feedpoint and the at least two adjustable ground points each are disposed on a part of the mainboard facing the slot. The at least two adjustable ground points are each electrically connected to the mainboard by the adjustable apparatus, and the adjustable apparatus is configured to control whether each adjustable ground point is grounded.

(22) PCT Filed: **Apr. 5, 2016**

(86) PCT No.: **PCT/CN2016/078499**

§ 371 (c)(1),

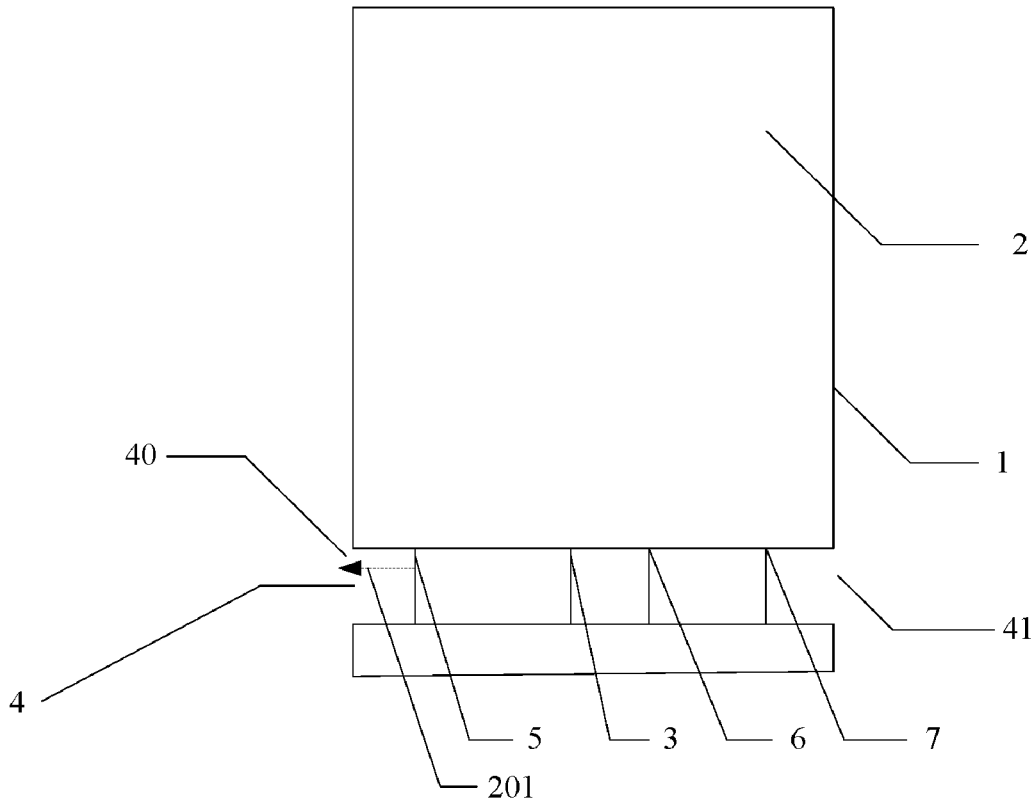
(2) Date: **Oct. 4, 2018**

Publication Classification

(51) **Int. Cl.**

H01Q 21/06 (2006.01)

H01Q 1/50 (2006.01)





(19) **United States**

(12) **Patent Application Publication**

Ma et al.

(10) **Pub. No.: US 2019/0140341 A1**

(43) **Pub. Date: May 9, 2019**

(54) **MOBILE DEVICE**

(71) Applicant: **Acer Incorporated**, New Taipei City (TW)

(72) Inventors: **Pei-Chi Ma**, New Taipei City (TW); **Hsien-Chang Lin**, New Taipei City (TW); **Hsin-Wu Chiang**, New Taipei City (TW); **Wan-Chu Wei**, New Taipei City (TW)

(73) Assignee: **Acer Incorporated**, New Taipei City (TW)

(21) Appl. No.: **15/986,826**

(22) Filed: **May 23, 2018**

(30) **Foreign Application Priority Data**

Nov. 9, 2017 (TW) 106138763

Publication Classification

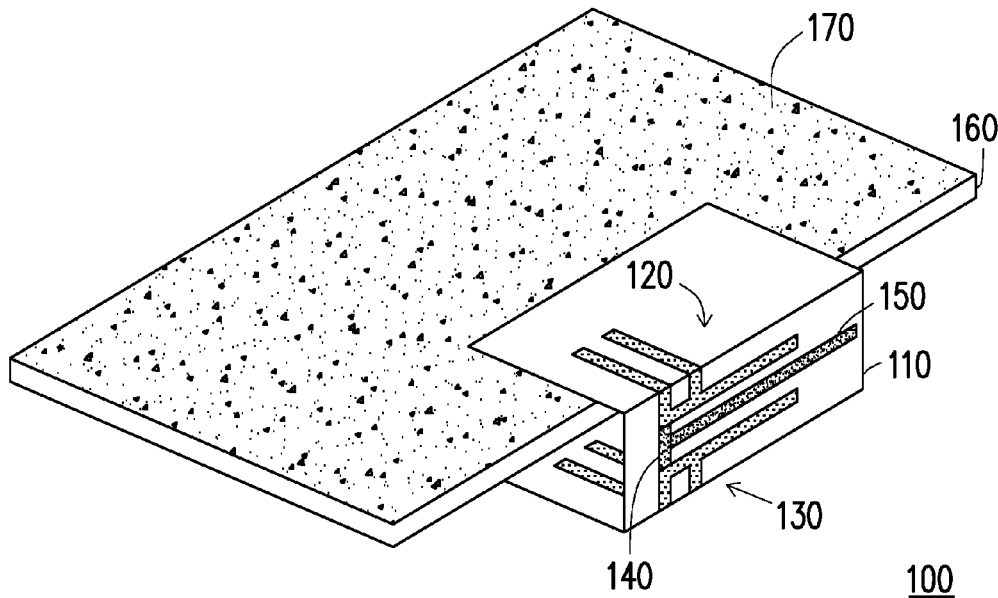
(51) **Int. Cl.**
H01Q 1/24 (2006.01)
H04B 1/40 (2006.01)
H01Q 1/52 (2006.01)

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

CPC **H01Q 1/243** (2013.01); **H01Q 1/521** (2013.01); **H04B 1/40** (2013.01)

(57) **ABSTRACT**

A mobile device includes a carrying element, a first antenna, a second antenna, a connection element, and an extension element. The first antenna and the second antenna are disposed on the carrying element. The first antenna operates in a first frequency band through a first resonance path. The second antenna operates in the first frequency band through a second resonance path. The connection element is electrically connected to the first antenna and the second antenna. The connection element, the first antenna and the second antenna form a connection path, and the connection path, the first resonance path and the second resonance path do not overlap one another. The extension element is electrically connected to the connection element. The extension element, the connection element and the first antenna form a third resonance path, and the first antenna operates in a second frequency band through the third resonance path.





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(19) **United States**

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

(10) **Pub. No.: US 2019/0140342 A1**

(43) **Pub. Date: May 9, 2019**

(54) **ANTENNA AND ELECTRONIC DEVICE
COMPRISING SAME**

Publication Classification

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

(51) **Int. Cl.**
H01Q 1/24 (2006.01)
H01Q 5/335 (2006.01)
H01Q 1/48 (2006.01)

(72) Inventors: **Jae-Ho LIM**, Gyeonggi-do (KR);
Kyung-Jong LEE, Gyeonggi-do (KR);
Hosaeng KIM, Gyeonggi-do (KR);
Seunghwan KIM, Seoul (KR)

(52) **U.S. Cl.**
CPC *H01Q 1/243* (2013.01); *H04M 1/0202*
(2013.01); *H01Q 1/48* (2013.01); *H01Q 5/335*
(2015.01)

(21) Appl. No.: **16/095,618**

(22) PCT Filed: **Jan. 26, 2017**

(86) PCT No.: **PCT/KR2017/000984**

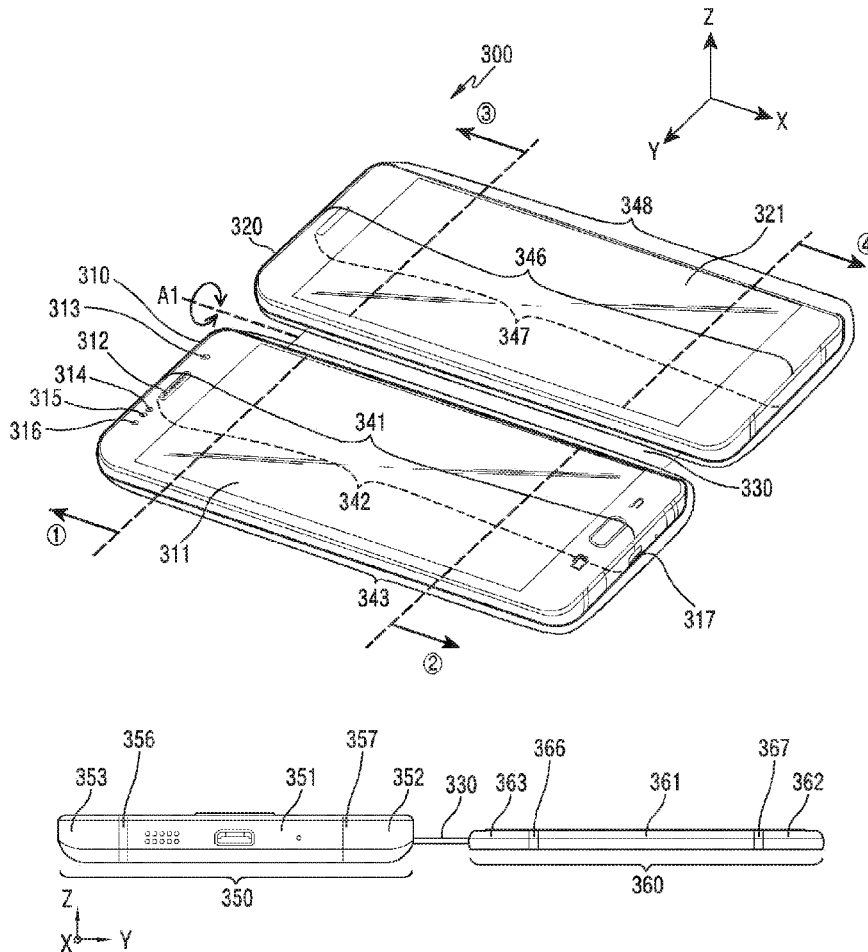
§ 371 (c)(1),
(2) Date: **Oct. 22, 2018**

(57) **ABSTRACT**

Provided is an electronic device that includes first and second housings, a display, a connecting member connecting the first and second housings, first and second conductive members, and a wireless communication circuit. The first housing includes a first side facing a first direction, a second side facing a second direction opposite to the first direction, and a first lateral side surrounding at least part of a space between the first side and the second side. The second housing includes a third side facing a third direction, a fourth side facing a fourth direction opposite to the third direction, and a second lateral side surrounding at least part of a space between the third side and the fourth side. The connecting member connects the first and second housings such that folding of the first and second housings results in the first and second lateral sides abutting against each other.

(30) **Foreign Application Priority Data**

Apr. 22, 2016 (KR) 10-2016-0049632





US 20190140671A1

(19) **United States**

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

(10) **Pub. No.: US 2019/0140671 A1**
(43) **Pub. Date: May 9, 2019**

(54) **WIRELESS COMMUNICATION DEVICE**

(71) Applicant: **HTC CORPORATION**, Taoyuan City (TW)
(72) Inventors: **Tiao-Hsing TSAI**, TAOYUAN CITY (TW); **Chien-Pin CHIU**, TAOYUAN CITY (TW); **Hsiao-Wei WU**, TAOYUAN CITY (TW); **Yi-Hsiang KUNG**, TAOYUAN CITY (TW); **Shen-Fu TZENG**, TAOYUAN CITY (TW); **Li-Yuan FANG**, TAOYUAN CITY (TW)

(21) Appl. No.: **16/239,710**

(22) Filed: **Jan. 4, 2019**

Related U.S. Application Data

(60) Continuation of application No. 16/139,107, filed on Sep. 24, 2018, now Pat. No. 10,211,858, which is a division of application No. 15/821,777, filed on Nov. 23, 2017, now Pat. No. 10,158,381.

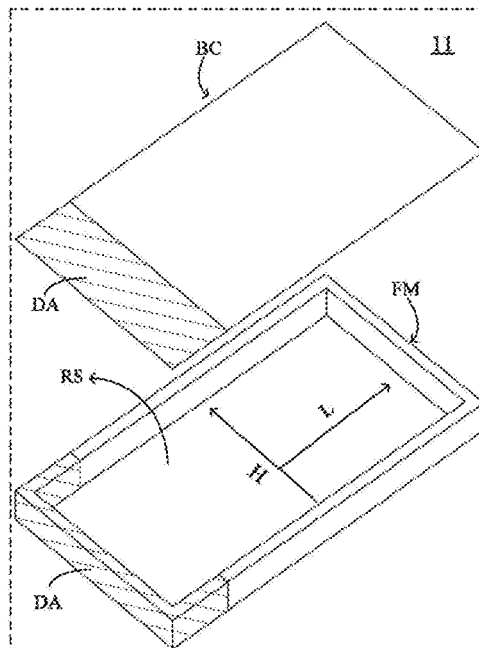
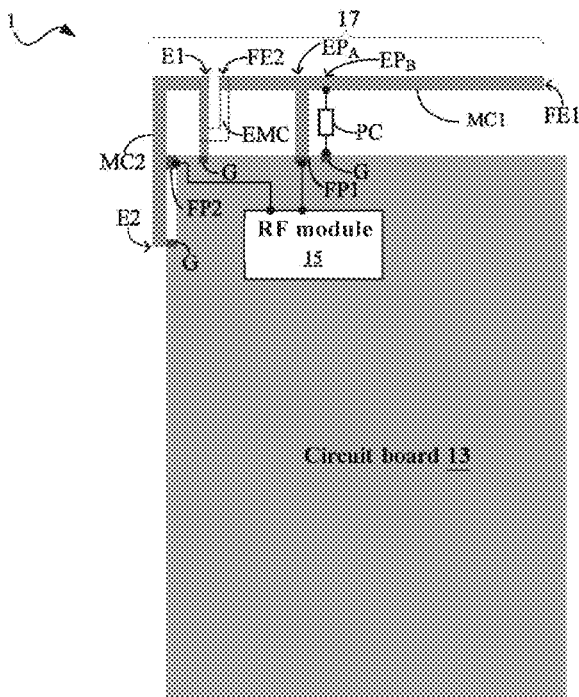
(60) Provisional application No. 62/428,183, filed on Nov. 30, 2016.

Publication Classification

(51) **Int. Cl.**
H04B 1/00 (2006.01)
H04B 1/40 (2006.01)
(52) **U.S. Cl.**
CPC *H04B 1/006* (2013.01); *H04W 88/06* (2013.01); *H04B 1/40* (2013.01)

(57) **ABSTRACT**

A wireless communication device is provided. The wireless communication device includes a housing, a circuit board, a radio frequency module and an antenna. The housing has a frame and a back cover to define a receiving space. The circuit board is disposed in the receiving space, and defines a clearance area from the housing in the receiving space. The circuit board includes a ground terminal, a first feeding point, and a second feeding point. The antenna includes at least one metal conductor coupled to the first feeding point and the second feeding point, respectively, to provide a low frequency resonant path, a first middle frequency resonant path, a second middle frequency resonant path and a high frequency resonant path.





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(19) **United States**

(12) **Patent Application Publication**

CHEN et al.

(10) **Pub. No.: US 2019/0148816 A1**

(43) **Pub. Date: May 16, 2019**

(54) **MIDDLE FRAME ASSEMBLY AND ELECTRONIC DEVICE**

Publication Classification

(71) Applicant: **GUANGDONG OPPO MOBILE TELECOMMUNICATIONS CORP., LTD.**, Dongguan (CN)

(51) **Int. Cl.**
H01Q 1/24 (2006.01)
H01Q 1/22 (2006.01)
(52) **U.S. Cl.**
CPC *H01Q 1/243* (2013.01); *G06F 1/1698* (2013.01); *H01Q 1/2266* (2013.01)

(72) Inventors: **Qianqiang CHEN**, Dongguan (CN); **Jing Yang**, Dongguan (CN); **Yongdong Zeng**, Dongguan (CN); **Wei Tan**, Dongguan (CN)

(57) **ABSTRACT**

(73) Assignee: **GUANGDONG OPPO MOBILE TELECOMMUNICATIONS CORP., LTD.**, Dongguan (CN)

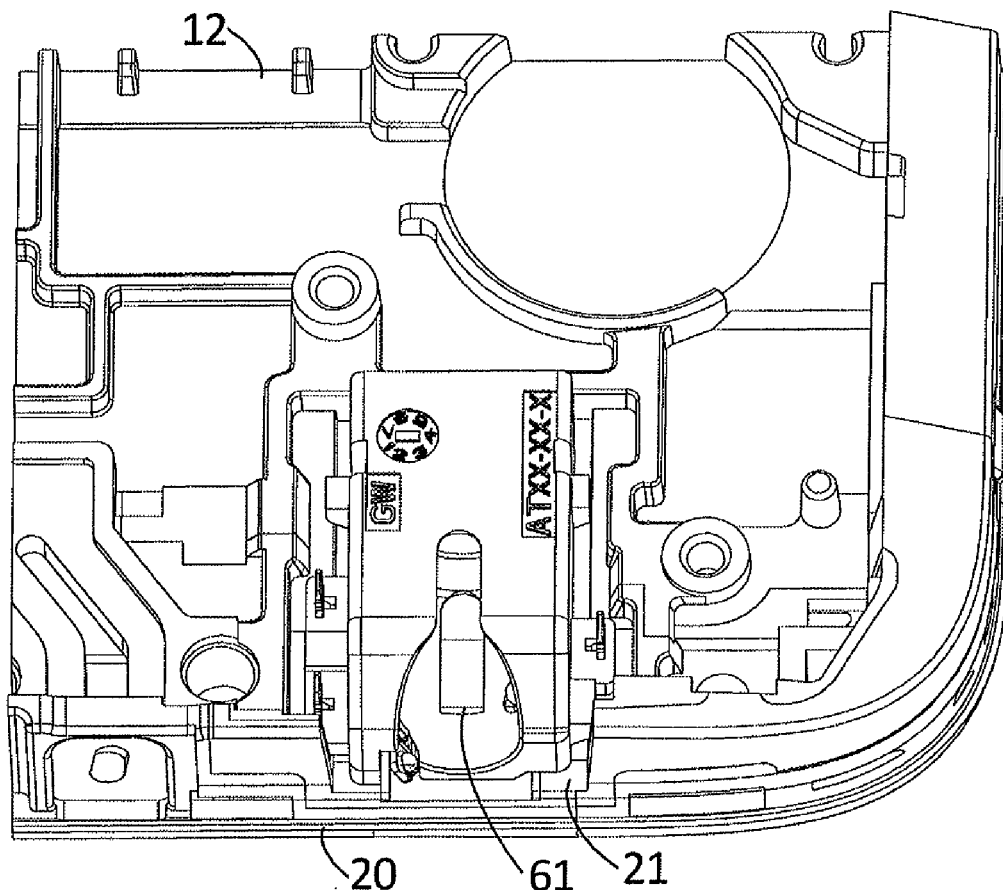
The present disclosure provides a middle frame assembly and an electronic device. The middle frame assembly includes a middle frame and an antenna radiator. The middle frame includes a metal substrate. The antenna radiator is disposed at a fringe of the metal substrate. The antenna radiator defines an escape space through the antenna radiator and configured to receive a functional component. According to the present disclosure, the antenna radiator may be disposed at the fringe of the middle frame such that the middle frame assembly may be a continuous and integral structure.

(21) Appl. No.: **16/183,331**

(22) Filed: **Nov. 7, 2018**

(30) **Foreign Application Priority Data**

Nov. 10, 2017 (CN) 201711105665.9





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(19) **United States**

(12) **Patent Application Publication**
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(10) **Pub. No.: US 2019/0148817 A1**

(43) **Pub. Date: May 16, 2019**

(54) **ANTENNA DEVICE**

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

(71) Applicant: **HTC CORPORATION**, Taoyuan City (TW)

CPC **H01Q 1/243** (2013.01); **H01Q 5/392** (2015.01); **H01Q 5/50** (2015.01)

(72) Inventors: **Tiao-Hsing TSAI**, Taoyuan City (TW);
Chien-Pin CHIU, Taoyuan City (TW);
Hsiao-Wei WU, Taoyuan City (TW);
Li-Yuan FANG, Taoyuan City (TW);
Yi-Hsiang KUNG, Taoyuan City (TW)

(57)

ABSTRACT

An antenna device, including a circuit board, electronic components, a functional component module, an antenna module and a feed line, is provided. The electronic components are disposed on the circuit board and include a microprocessor and a wireless communication chip. The functional component module includes a carrier and a metal member disposed on the carrier. The antenna module includes a feed point, a ground point and a radiator, the feed and ground points are disposed on the carrier and electrically connected to both sides of the metal member respectively, and the ground point is electrically connected to the ground layer of the circuit board. The radiator includes at least a part of the metal member, while the feed line can transmit a wireless signal to the feed point to feed into the radiator. Therefore, the metal member can serve as the radiator to conserve the space of accommodating another radiator.

(21) Appl. No.: **16/246,806**

(22) Filed: **Jan. 14, 2019**

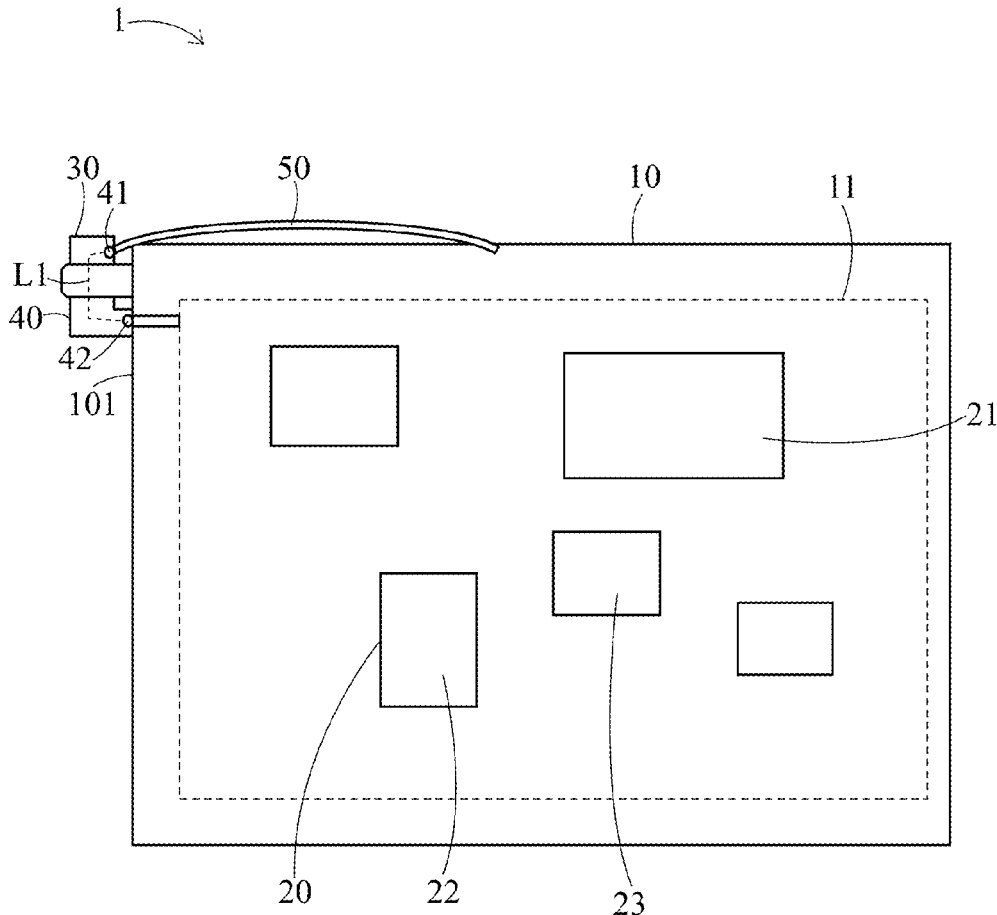
Related U.S. Application Data

(63) Continuation of application No. 14/854,531, filed on Sep. 15, 2015, now Pat. No. 10,218,053.

Publication Classification

(51) **Int. Cl.**

H01Q 1/24 (2006.01)
H01Q 5/50 (2006.01)
H01Q 5/392 (2006.01)





US 20190148818A1

(19) **United States**

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

(10) **Pub. No.: US 2019/0148818 A1**

(43) **Pub. Date: May 16, 2019**

(54) **HEAD-HAND CAPACITANCE
COMPENSATION WITH DIGITAL
VARIABLE CAPACITOR**

Publication Classification

(51) **Int. Cl.**
H01Q 1/24 (2006.01)
H01Q 1/48 (2006.01)
H01Q 7/00 (2006.01)
H01Q 9/04 (2006.01)
H01Q 9/42 (2006.01)

(52) **U.S. Cl.**
 CPC *H01Q 1/245* (2013.01); *H01Q 1/48*
 (2013.01); *H01Q 9/42* (2013.01); *H01Q*
9/0421 (2013.01); *H01Q 7/005* (2013.01)

(71) Applicant: **CAVENDISH KINETICS, INC.**, San Jose, CA (US)

(72) Inventors: **Ray PARKHURST**, Santa Clara, CA (US); **Paul Anthony TORNATTA, JR.**, Bend, OR (US)

(21) Appl. No.: **16/247,529**

(22) Filed: **Jan. 14, 2019**

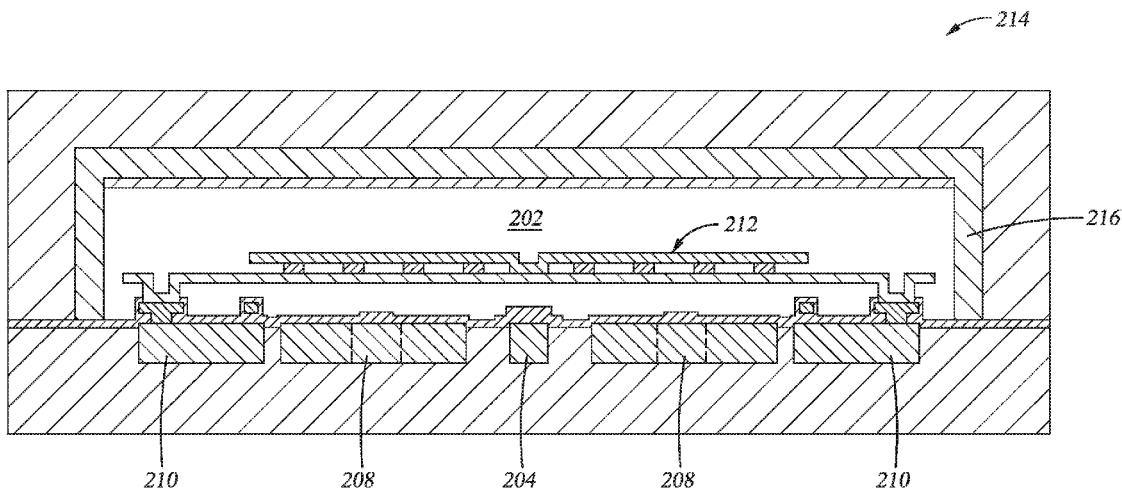
(57) **ABSTRACT**

Related U.S. Application Data

(62) Division of application No. 15/301,277, filed on Sep. 30, 2016, now Pat. No. 10,224,614, filed as application No. PCT/US2015/024107 on Apr. 2, 2015.

(60) Provisional application No. 61/976,469, filed on Apr. 7, 2014.

The present disclosure generally relates to a device having a capacitance sensor that detects a change in capacitance that occurs in the antenna whenever the antenna is in close proximity to a user's hand and/or head. Following detection of the capacitance change, the capacitance of the antenna may be changed by using a variable capacitor that is coupled to the sensor through a controller.





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(19) **United States**

(12) **Patent Application Publication**
TSAI

(10) **Pub. No.: US 2019/0148830 A1**

(43) **Pub. Date: May 16, 2019**

(54) **COMMUNICATION DEVICE**

H01Q 5/45 (2006.01)

H01Q 1/22 (2006.01)

(71) Applicant: **Quanta Computer Inc.**, Taoyuan City (TW)

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

CPC *H01Q 5/28* (2015.01); *H01Q 9/285*

(2013.01); *H01Q 1/2283* (2013.01); *H01Q*

5/35 (2015.01); *H01Q 5/45* (2015.01); *H01Q*

1/38 (2013.01)

(72) Inventor: **Ming-Che TSAI**, Taoyuan City (TW)

(21) Appl. No.: **15/860,999**

(22) Filed: **Jan. 3, 2018**

(57)

ABSTRACT

(30) **Foreign Application Priority Data**

Nov. 16, 2017 (TW) 106139668

A communication device includes a dielectric substrate, a housing, a first antenna, a second antenna, a third antenna, a fourth antenna, a fifth antenna, a sixth antenna, a seventh antenna, and an eighth antenna. The dielectric substrate has a top surface and a bottom surface. The housing has an outer surface and an inner surface. The first antenna and the third antenna are disposed on the top surface of the dielectric substrate. The second antenna and the fourth antenna are disposed on the bottom surface of the dielectric substrate. The fifth antenna, the sixth antenna, the seventh antenna, and the eighth antenna are disposed on the inner surface of the housing.

Publication Classification

(51) **Int. Cl.**

H01Q 5/28 (2006.01)

H01Q 9/28 (2006.01)

H01Q 1/38 (2006.01)

H01Q 5/35 (2006.01)

