



(19) **United States**

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

(10) **Pub. No.: US 2019/0027810 A1**

(43) **Pub. Date: Jan. 24, 2019**

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

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

(71) Applicant: **Wistron NeWeb Corp.**, Hsinchu (TW)

CPC **H01Q 1/243** (2013.01); **H01Q 1/44**
(2013.01); **H01Q 1/48** (2013.01); **H01Q 21/30**
(2013.01); **H01Q 5/392** (2015.01); **H01Q**
1/245 (2013.01)

(72) Inventors: **Kuan-Hung LI**, Hsinchu (TW);
Cheng-Da YANG, Hsinchu (TW);
Shang-Ching TSENG, Hsinchu (TW);
Yu-Yu CHIANG, Hsinchu (TW)

(57) **ABSTRACT**

(21) Appl. No.: **15/854,045**

An antenna device includes a metal mechanism element, a ground plane, a feeding element, a grounding extension element, and a dielectric substrate. The metal mechanism element has a slot. The feeding element has a feeding point coupled to a signal source. The feeding element extends across the slot. The grounding extension element is coupled to the ground plane. A vertical projection of the grounding extension element at least partially overlaps the slot. An antenna structure is formed by the feeding element, the grounding extension element, and the slot of the metal mechanism element. The antenna structure is capable of covering a low-frequency band and a high-frequency band. The distance between the feeding point and one end of the slot is less than or equal to 0.1 wavelength of a central frequency of the low-frequency band.

(22) Filed: **Dec. 26, 2017**

(30) **Foreign Application Priority Data**

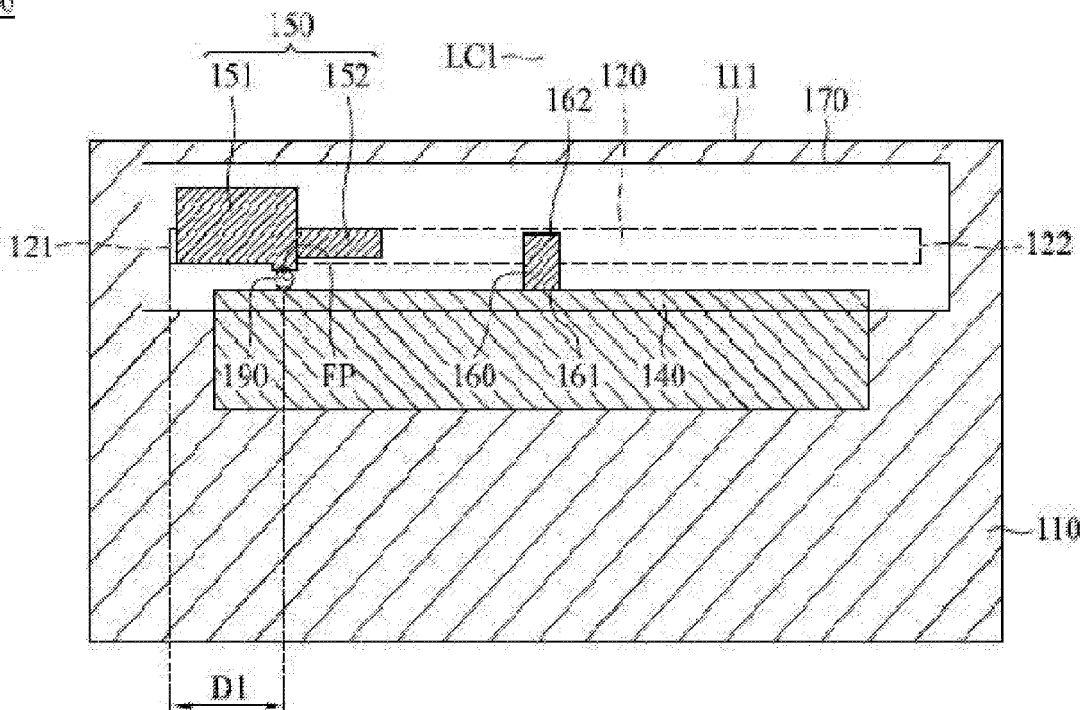
Jul. 24, 2017 (TW) 106124727

Publication Classification

(51) **Int. Cl.**

H01Q 1/24 (2006.01)
H01Q 1/44 (2006.01)
H01Q 21/30 (2006.01)
H01Q 5/392 (2006.01)
H01Q 1/48 (2006.01)

100





(19) **United States**

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

(10) **Pub. No.: US 2019/0027811 A1**

(43) **Pub. Date: Jan. 24, 2019**

(54) **MOBILE DEVICE**

H04M 1/02 (2006.01)

H01Q 5/371 (2006.01)

(71) Applicant: **Wistron NeWeb Corp.**, Hsinchu (TW)

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

(72) Inventors: **Ching-Wen CHEN**, Hsinchu (TW);
Chia-Hao CHANG, Hsinchu (TW)

CPC *H01Q 1/243* (2013.01); *H01Q 5/371*
(2015.01); *H04M 1/0283* (2013.01); *H01Q*
13/10 (2013.01)

(21) Appl. No.: **15/935,347**

(57) **ABSTRACT**

(22) Filed: **Mar. 26, 2018**

Related U.S. Application Data

(60) Provisional application No. 62/534,642, filed on Jul. 19, 2017.

Foreign Application Priority Data

Feb. 26, 2018 (TW) 107106337

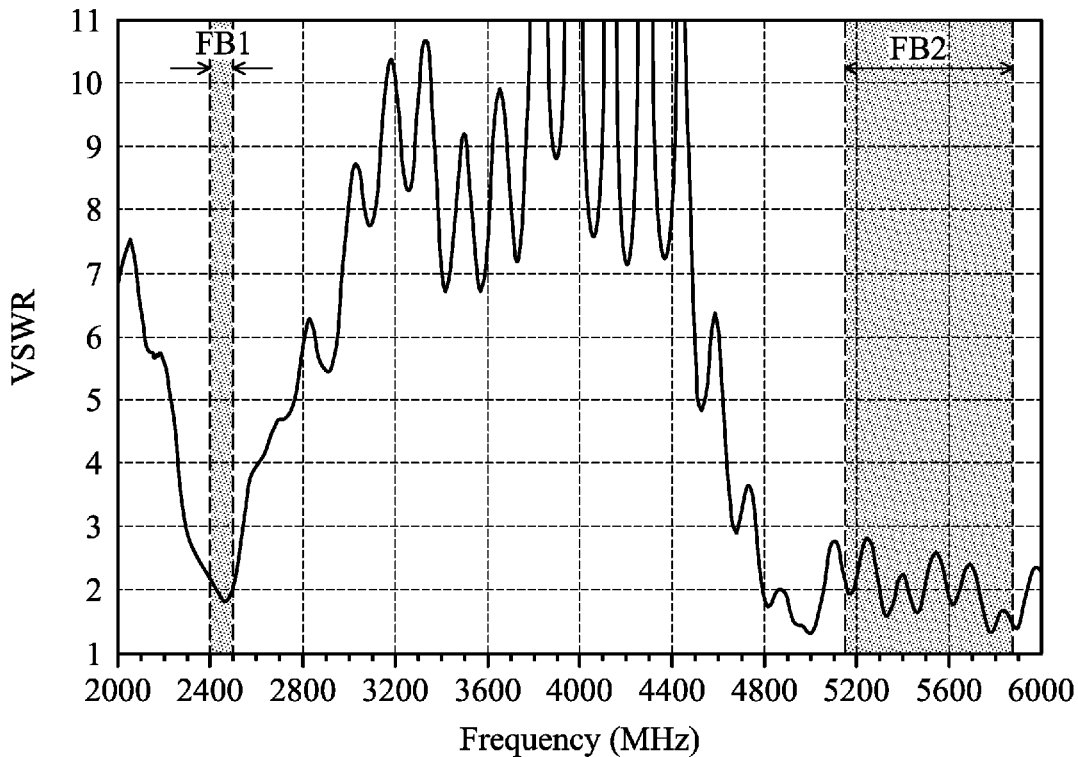
Publication Classification

(51) **Int. Cl.**

H01Q 1/24 (2006.01)

H01Q 13/10 (2006.01)

A mobile device includes a metal back cover, a ground metal element, a feeding radiation element, and a dielectric substrate. The metal back cover has a slot. The feeding radiation element has a feeding point, and includes a first feeding branch, a second feeding branch, and a third feeding branch. The second feeding branch and the first feeding branch extend in opposite directions. The third feeding branch and the first feeding branch extend in the same direction. The feeding radiation element has a vertical projection on the metal back cover, and the vertical projection at least partially overlaps the slot. The dielectric substrate is disposed adjacent to the metal back cover. The ground metal element and the feeding radiation element are disposed on the dielectric substrate. An antenna structure is formed by the feeding radiation element and the slot of the metal back cover.





(19) **United States**

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

(10) **Pub. No.: US 2019/0027830 A1**

(43) **Pub. Date: Jan. 24, 2019**

(54) **MOBILE COMMUNICATIONS TERMINAL**

Publication Classification

(71) Applicant: **Huawei Technologies Co., Ltd.**,
Shenzhen (CN)

(72) Inventors: **Hanyang Wang**, Reading (GB);
Chien-Ming Lee, Shanghai (CN);
Xuefei Zhang, Shenzhen (CN); **Lijun
Ying**, Shanghai (CN); **Liang Xue**,
Shanghai (CN); **Jiaqing You**, Shanghai
(CN); **Lei Wang**, Shanghai (CN); **Yue
Shi**, Shenzhen (CN); **Dong Yu**,
Shanghai (CN); **Guoping Wu**,
Shenzhen (CN); **Bo Huang**, Shanghai
(CN)

(51) **Int. Cl.**
H01Q 13/18 (2006.01)
H01Q 1/50 (2006.01)
H01Q 1/24 (2006.01)

(52) **U.S. Cl.**
CPC **H01Q 13/18** (2013.01); **H01Q 1/243**
(2013.01); **H01Q 1/50** (2013.01)

(73) Assignee: **Huawei Technologies Co., Ltd.**,
Shenzhen (CN)

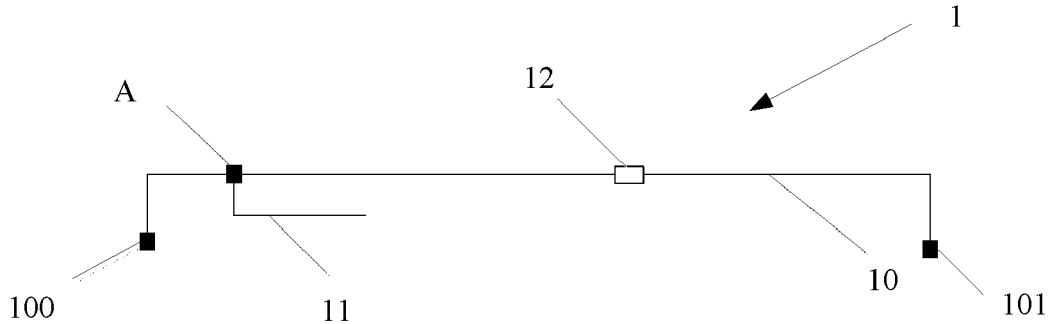
(57) **ABSTRACT**

(21) Appl. No.: **16/067,500**

(22) PCT Filed: **Dec. 31, 2015**

(86) PCT No.: **PCT/CN2015/100065**
§ 371 (c)(1),
(2) Date: **Jun. 29, 2018**

An antenna apparatus and a terminal, where the antenna apparatus includes an antenna body and at least one stub, where a feed terminal is disposed on the antenna body, one end of the stub is electrically coupled to a coupling point between the feed terminal and a first open-circuit end of the antenna body, and the other end of the stub is an open-circuit end, and an antenna body length between the coupling point and the feed terminal is a half of a wavelength corresponding to a specified operating frequency, and a length of the stub is one quarter of the wavelength corresponding to the specified operating frequency.





(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2019/0027833 A1**

Ayala Vazquez et al.

(43) **Pub. Date: Jan. 24, 2019**

(54) **ADJUSTABLE MULTIPLE-INPUT AND MULTIPLE-OUTPUT ANTENNA STRUCTURES**

Publication Classification

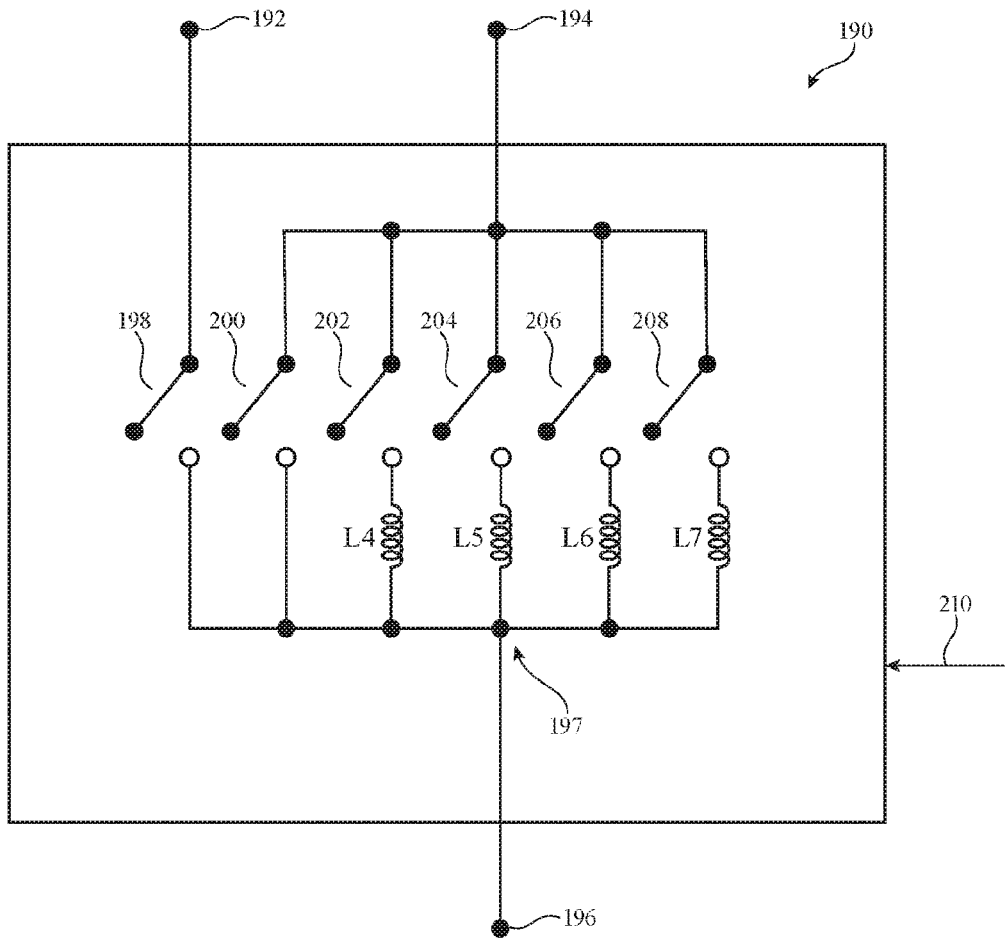
(51) **Int. Cl.**
H01Q 21/00 (2006.01)
H01Q 5/35 (2006.01)
(52) **U.S. Cl.**
CPC *H01Q 21/0006* (2013.01); *H01Q 1/243* (2013.01); *H01Q 5/35* (2015.01)

(71) Applicant: **Apple Inc.**, Cupertino, CA (US)
(72) Inventors: **Enrique Ayala Vazquez**, Watsonville, CA (US); **Nanbo Jin**, Milpitas, CA (US); **Hongfei Hu**, Santa Clara, CA (US); **Han Wang**, Cupertino, CA (US); **Erdinc Irci**, Sunnyvale, CA (US); **Erica J. Tong**, Pacifica, CA (US); **Matthew A. Mow**, Los Altos, CA (US); **Ming-Ju Tsai**, Sunnyvale, CA (US); **Liang Han**, Sunnyvale, CA (US); **Georgios Atmatzakis**, Cupertino, CA (US); **Mattia Pascolini**, San Francisco, CA (US)

(57) **ABSTRACT**
An electronic device may include antennas, a ground, and a housing. First and second gaps in the housing may define a segment that forms a resonating element for a first antenna. First, second, third, and fourth antenna feeds may be coupled between the segment and ground. Control circuitry may control adjustable components to place the device in first, second, third, or fourth modes. In the first and second modes, the first and fourth feeds convey signals at the same frequency using a multiple-input and multiple-output scheme while the second and third feeds are inactive. In the third mode, the second feed is active and the first, third, and fourth feeds are inactive. In the fourth mode, the third feed is active and the first, second, and fourth antenna feeds are inactive. Isolating return paths may be coupled between the segment and ground in the first and second modes.

(21) Appl. No.: **15/655,660**

(22) Filed: **Jul. 20, 2017**





US 20190027838A1

(19) **United States**

(12) **Patent Application Publication**

Paulotto et al.

(10) **Pub. No.: US 2019/0027838 A1**

(43) **Pub. Date: Jan. 24, 2019**

(54) **MILLIMETER WAVE ANTENNAS HAVING DUAL PATCH RESONATING ELEMENTS**

(52) **U.S. Cl.**
CPC *H01Q 21/065* (2013.01); *H01Q 21/0025* (2013.01); *H01Q 5/335* (2015.01); *H01Q 1/48* (2013.01)

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

(72) Inventors: **Simone Paulotto**, Redwood City, CA (US); **Basim H. Noori**, San Jose, CA (US); **Matthew A. Mow**, Los Altos, CA (US)

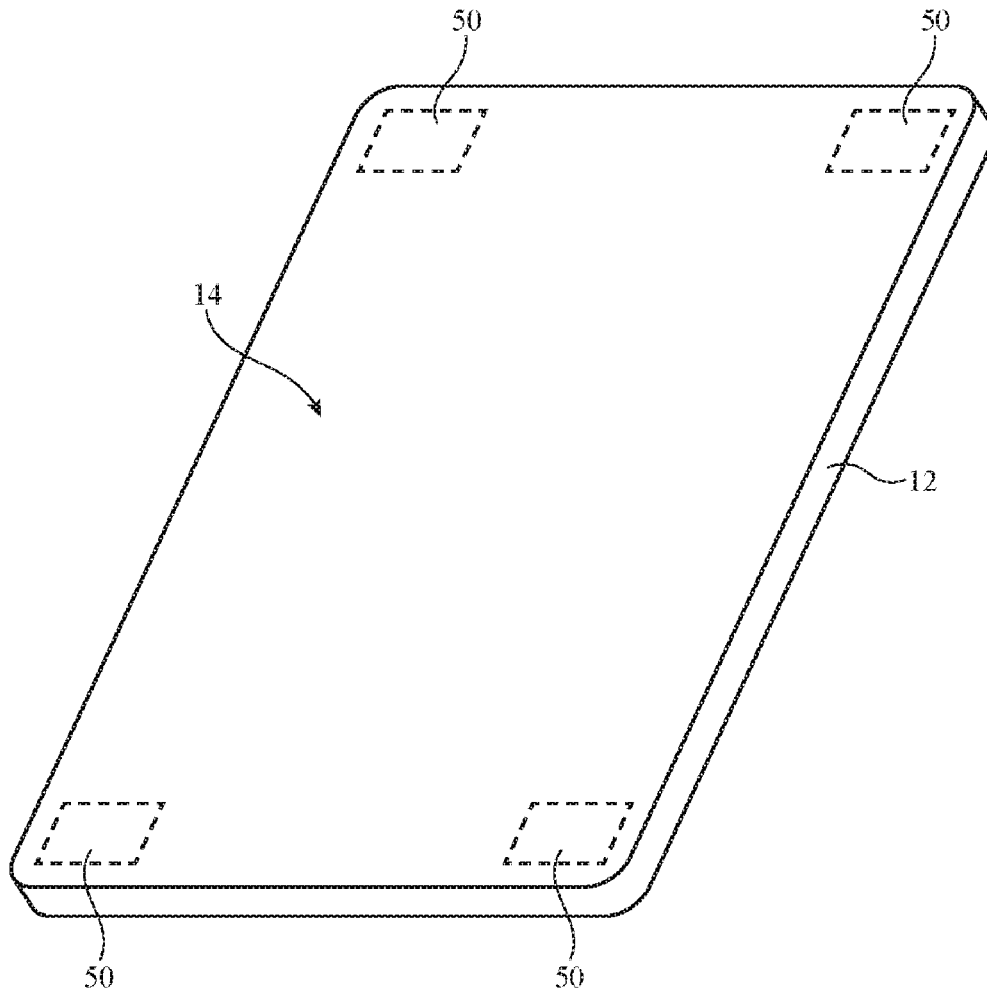
(21) Appl. No.: **15/658,141**

(22) Filed: **Jul. 24, 2017**

Publication Classification

(51) **Int. Cl.**
H01Q 21/06 (2006.01)
H01Q 1/48 (2006.01)
H01Q 5/335 (2006.01)

(57) **ABSTRACT**
An electronic device may be provided with millimeter wave transceiver circuitry and an antenna having a ground and a resonating element. The resonating element may include first and second patches symmetrically distributed about an axis. The antenna may be fed using an antenna feed having a first feed terminal coupled to both the first and second patches and a second feed terminal coupled to the ground. The first feed terminal may be coupled to the first patch at a side closest to the second patch and may be coupled to the second patch at a side closest to the first patch. The first and second patches may be shorted to the ground if desired. Antenna currents on the first patch may be 180 degrees out of phase with antenna currents on the second patch. The antenna may be arranged in an array of antennas with different polarizations.





US 20190027839A1

(19) **United States**

(12) **Patent Application Publication**
DORSEY

(10) **Pub. No.: US 2019/0027839 A1**

(43) **Pub. Date: Jan. 24, 2019**

(54) **FLEXIBLE POLYMER ANTENNA WITH
MULTIPLE GROUND RESONATORS**

H01Q 1/38 (2006.01)

H01Q 1/48 (2006.01)

H01Q 1/24 (2006.01)

(71) Applicant: **TAOGLAS GROUP HOLDINGS
LIMITED**, Enniscorthy (IE)

H01Q 1/36 (2006.01)

H01Q 5/30 (2006.01)

(72) Inventor: **Jason Philip DORSEY**, Oceanside, CA
(US)

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

CPC *H01Q 21/20* (2013.01); *H01Q 5/371*

(2015.01); *H01Q 1/38* (2013.01); *H01Q 1/48*

(2013.01); *H01Q 1/36* (2013.01); *H01Q 1/241*

(2013.01); *H01Q 5/30* (2015.01); *H01Q 1/242*

(2013.01)

(73) Assignee: **TAOGLAS GROUP HOLDINGS
LIMITED**, Enniscorthy (IE)

(21) Appl. No.: **16/140,977**

(57)

ABSTRACT

(22) Filed: **Sep. 25, 2018**

Related U.S. Application Data

(63) Continuation of application No. 15/351,263, filed on
Nov. 14, 2016, now Pat. No. 10,103,451.

(60) Provisional application No. 62/254,140, filed on Nov.
11, 2015.

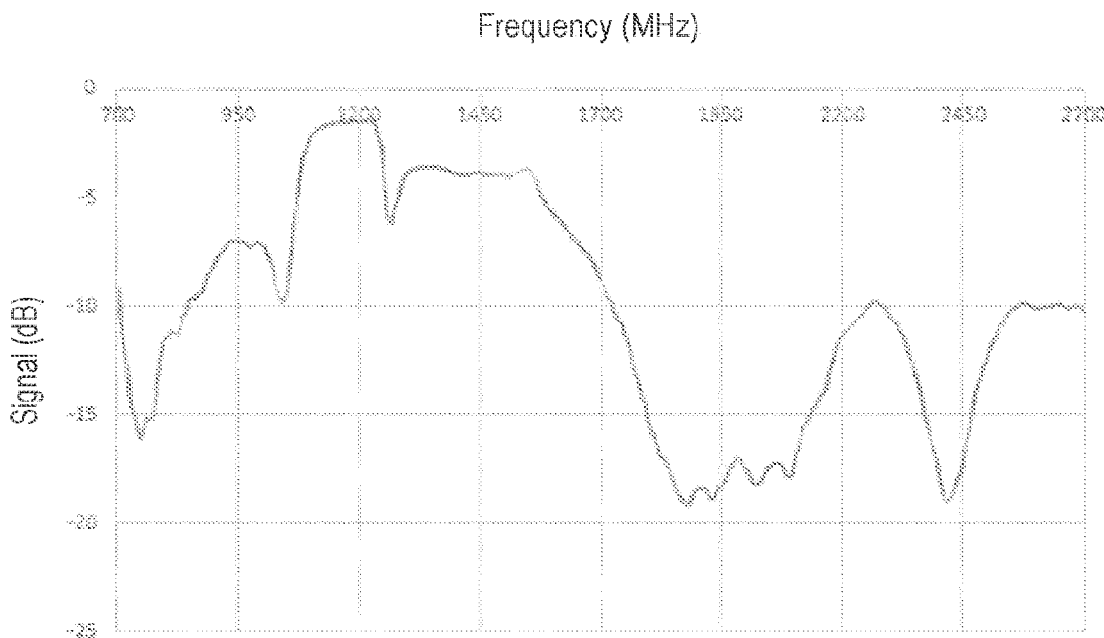
The disclosure concerns an antenna assembly having a substrate with an antenna radiating element and a ground conductor disposed on the substrate, the ground conductor further characterized by a plurality of ground resonators, wherein a length associated with each of the ground resonators increases as the ground resonators are distanced from the antenna radiating element. Additionally, a coaxial cable is routed around the antenna assembly for configuring the coaxial cable as an additional ground resonator associated with the antenna assembly. The resulting antenna provides wide band performance between 700 MHz and 2700 MHz with improved efficiency compared with conventional antennas.

Publication Classification

(51) **Int. Cl.**

H01Q 21/20 (2006.01)

H01Q 5/371 (2006.01)





US 20190028125A1

(19) **United States**

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

(10) **Pub. No.: US 2019/0028125 A1**

(43) **Pub. Date: Jan. 24, 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.: **16/139,107**

(22) Filed: **Sep. 24, 2018**

Related U.S. Application Data

(62) Division of application No. 15/821,777, filed on Nov. 23, 2017.

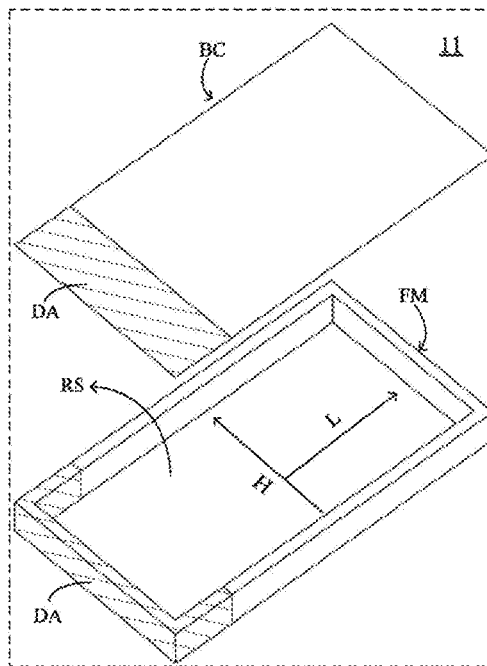
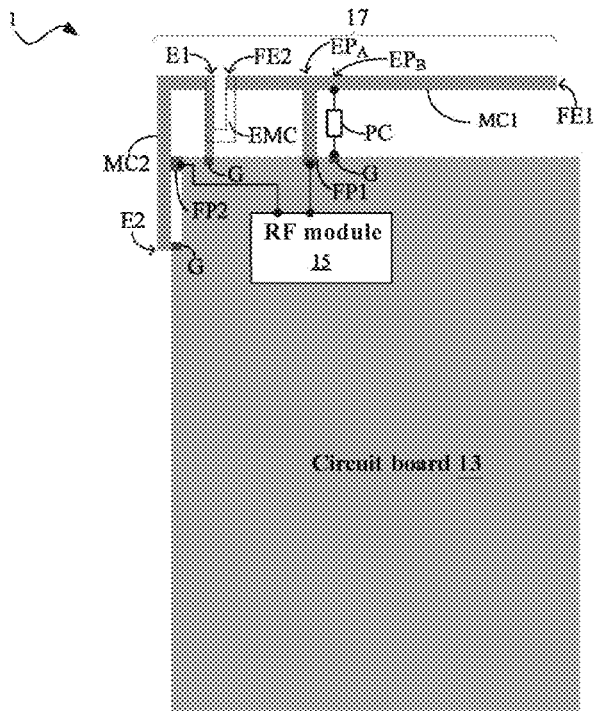
(60) Provisional application No. 62/428,183, filed on Nov. 30, 2016.

Publication Classification

(51) **Int. Cl.**
H04B 1/00 (2006.01)
H04B 1/40 (2015.01)
H04W 88/06 (2009.01)
(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.





(19) **United States**

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

(10) **Pub. No.: US 2019/0036210 A1**
(43) **Pub. Date: Jan. 31, 2019**

(54) **MOBILE TERMINAL**
(71) Applicant: **LG ELECTRONICS INC.**, Seoul (KR)
(72) Inventors: **Dongjin KIM**, Seoul (KR); **Yunmo KANG**, Seoul (KR); **Youngbae KWON**, Seoul (KR); **Kangjae JUNG**, Seoul (KR); **Hanphil RHYU**, Seoul (KR)
(73) Assignee: **LG ELECTRONICS INC.**, Seoul (KR)

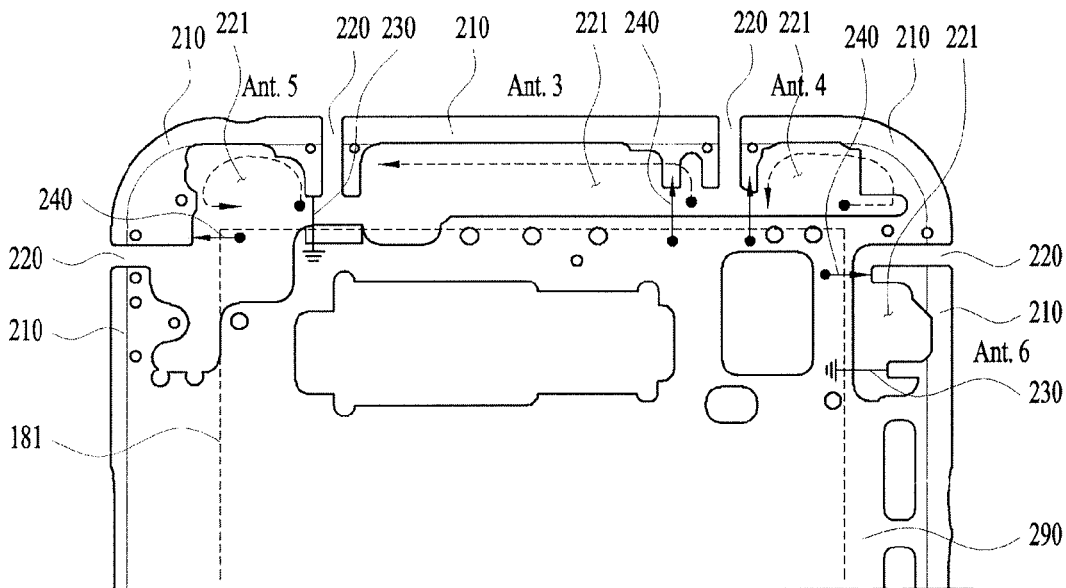
H05K 7/20 (2006.01)
H03K 17/96 (2006.01)
H01Q 1/24 (2006.01)
H01Q 13/10 (2006.01)
(52) **U.S. Cl.**
CPC **H01Q 1/52** (2013.01); **H04B 1/3827** (2013.01); **H04B 1/40** (2013.01); **H05K 5/0017** (2013.01); **H03K 17/945** (2013.01); **H05K 7/20963** (2013.01); **H03K 17/962** (2013.01); **H01Q 1/243** (2013.01); **H01Q 13/10** (2013.01); **H05K 1/028** (2013.01)

(21) Appl. No.: **15/847,395**
(22) Filed: **Dec. 19, 2017**
(30) **Foreign Application Priority Data**
Jul. 28, 2017 (KR) 10-2017-0096367

(57) **ABSTRACT**
A mobile terminal can include a frame including a middle portion and an edge portion that includes conductive members and is located outside of the middle portion; a slot antenna including a slot with an open end, at least one of the conductive members, a ground unit and the middle portion of the frame; a display unit on a front surface of the middle portion; and a heat radiation sheet between a back surface of the display unit and the front surface of the middle portion, in which the back surface includes a first region overlapping the middle portion of the frame, a second region located outside of an edge of the middle portion of the frame without overlapping the middle portion, a third region overlapping the heat radiation sheet, and a fourth region including part of the second region that overlaps the slot without overlapping the heat radiation sheet.

Publication Classification

(51) **Int. Cl.**
H01Q 1/52 (2006.01)
H04B 1/3827 (2006.01)
H04B 1/40 (2006.01)
H05K 5/00 (2006.01)
H05K 1/02 (2006.01)





(19) **United States**

(12) **Patent Application Publication**
CHANG

(10) **Pub. No.: US 2019/0036211 A1**

(43) **Pub. Date: Jan. 31, 2019**

(54) **ANTENNA DEVICE**

(71) Applicant: **AMBIT MICROSYSTEMS (SHANGHAI) LTD.**, Shanghai (CN)

(72) Inventor: **WEI-JEN CHANG**, New Taipei (TW)

(21) Appl. No.: **15/665,444**

(22) Filed: **Aug. 1, 2017**

(30) **Foreign Application Priority Data**

Jul. 27, 2017 (CN) 201710625385.4

Publication Classification

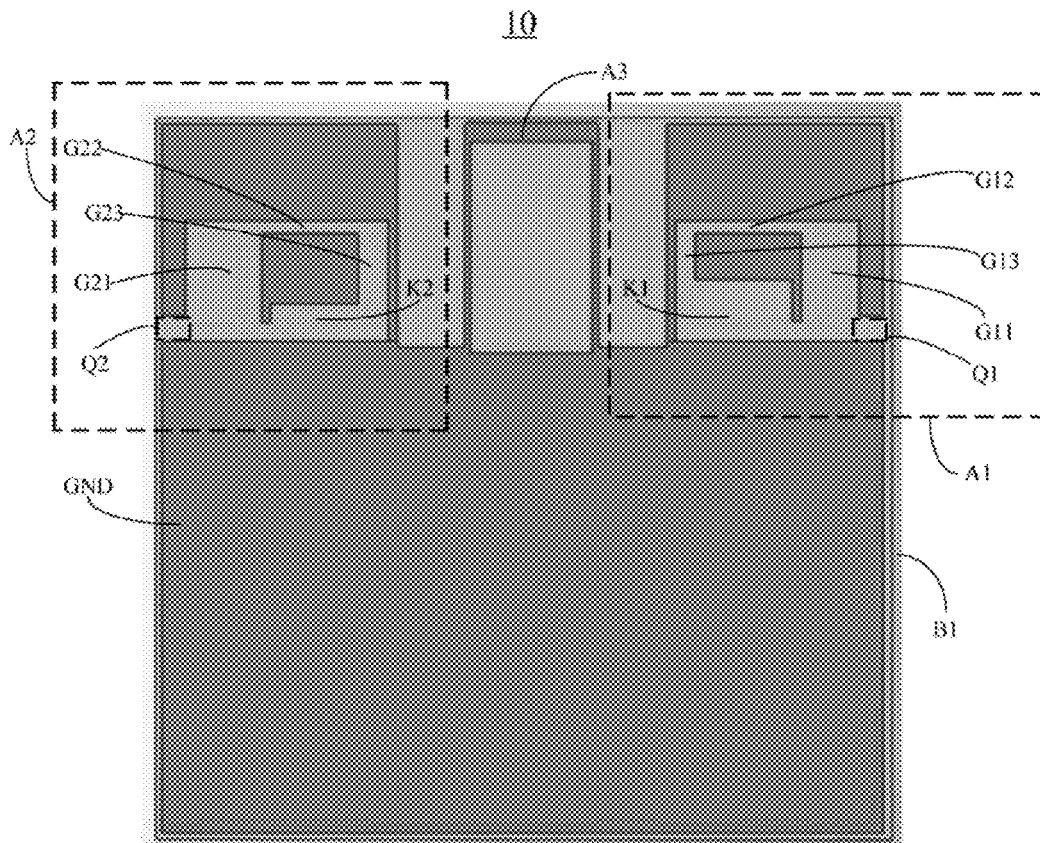
(51) **Int. Cl.**
H01Q 1/52 (2006.01)
H01Q 1/38 (2006.01)
H01Q 1/48 (2006.01)

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

CPC **H01Q 1/521** (2013.01); **H01Q 1/48** (2013.01); **H01Q 1/38** (2013.01)

(57) **ABSTRACT**

An antenna device includes a first antenna, a second antenna, a main short portion and a grounding portion. The first antenna and the second antenna are disposed in a PCB to radiate signals. The main short portion is disposed between the first antenna and the second antenna. The main short portion is further electrically coupled to the grounding portion. The main short portion adjusts current between the first antenna and the second antenna. Thus, the main short portion reduces interference between the first antenna and the second antenna. The first antenna includes a first feeding portion, a first short portion and a first coupling portion. A first end of the first feeding portion is suspended in the air. The first coupling portion is disposed in a first storage space. The first coupling portion is electrically insulated from the first short portion and the grounding portion.





(19) **United States**

(12) **Patent Application Publication**

Wu et al.

(10) **Pub. No.: US 2019/0036223 A1**

(43) **Pub. Date: Jan. 31, 2019**

(54) **ELECTRONIC DEVICE**

H01Q 1/22 (2006.01)

H01Q 1/50 (2006.01)

H01Q 1/48 (2006.01)

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

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

CPC *H01Q 13/10* (2013.01); *G06F 1/1656*
(2013.01); *H01Q 1/48* (2013.01); *H01Q 1/50*
(2013.01); *H01Q 1/2258* (2013.01)

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

(57) **ABSTRACT**

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

An electronic device includes a first body and a feed device. A conductive housing of the first body includes a first closed slot, a second closed slot, a feed point and a ground point. The feed device includes a circuit substrate, a feed portion, a ground portion, a first connection portion and a second connection portion. The circuit substrate includes a first surface, a second surface, first conductive holes and second conductive holes, and the first surface faces the conductive housing. The feed portion and the ground portion are disposed on the second surface. The feed portion is electrically connected to the feed point, and the ground portion is electrically connected to the ground point. The feed device and the conductive housing form an antenna. The antenna operates in first and second bands through first and second paths formed by the first and the second closed slots.

(21) Appl. No.: **16/006,735**

(22) Filed: **Jun. 12, 2018**

(30) **Foreign Application Priority Data**

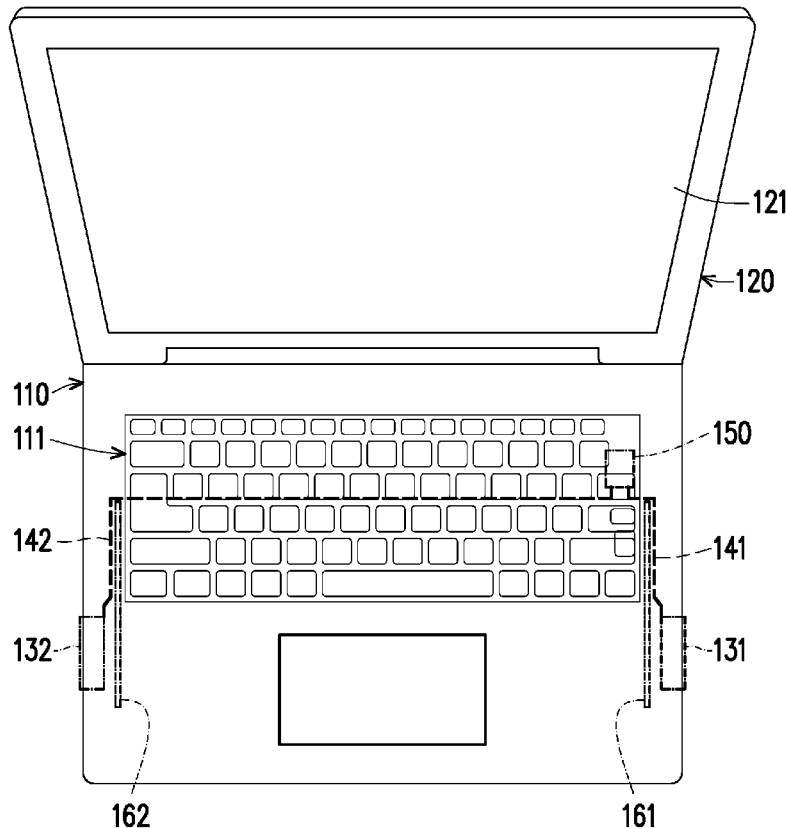
Jul. 25, 2017 (TW) 106124894

Publication Classification

(51) **Int. Cl.**

H01Q 13/10 (2006.01)

G06F 1/16 (2006.01)





(19) **United States**

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

(10) **Pub. No.: US 2019/0036231 A1**

(43) **Pub. Date: Jan. 31, 2019**

(54) **ARRAY ANTENNA AND MOBILE TERMINAL**

H01Q 5/20 (2015.01)

H01Q 5/307 (2015.01)

(71) Applicant: **LG ELECTRONICS INC.**, Seoul (KR)

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

CPC *H01Q 21/065* (2013.01); *H01Q 5/307* (2015.01); *H01Q 5/20* (2015.01); *H01Q 1/242* (2013.01)

(72) Inventors: **Seungwoo RYU**, Seoul (KR); **Joohee LEE**, Seoul (KR)

(73) Assignee: **LG ELECTRONICS INC.**, Seoul (KR)

(57) **ABSTRACT**

(21) Appl. No.: **15/889,038**

(22) Filed: **Feb. 5, 2018**

Related U.S. Application Data

(60) Provisional application No. 62/536,480, filed on Jul. 25, 2017.

Foreign Application Priority Data

Oct. 17, 2017 (KR) 10-2017-0134805

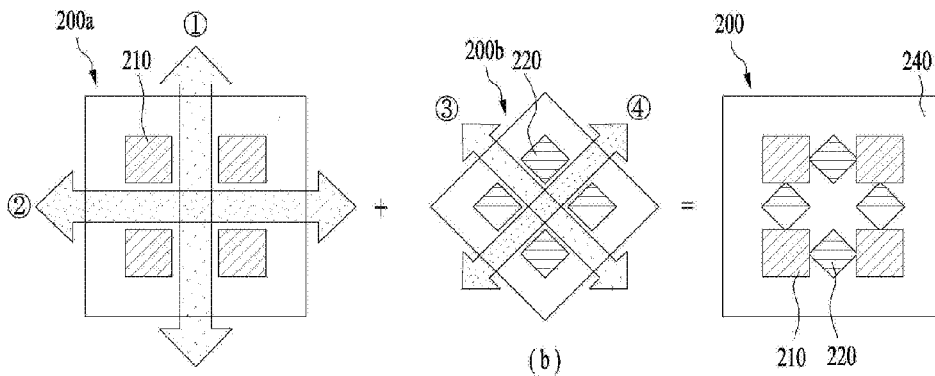
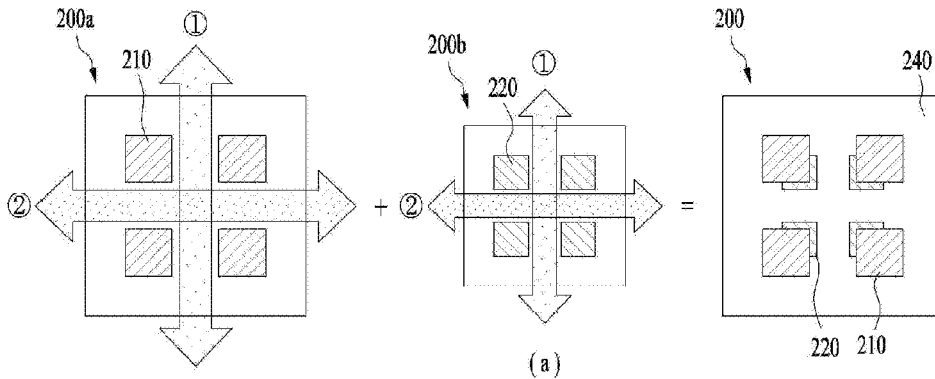
Publication Classification

(51) **Int. Cl.**

H01Q 21/06 (2006.01)

H01Q 1/24 (2006.01)

An array antenna includes a substrate, first radiation elements disposed at the substrate at equal intervals, second radiation elements disposed at the substrate at equal intervals, the second radiation elements being located between the first radiation elements, a first power supply unit located at the end of each first radiation element in a first direction for supplying power to the first radiation element, a second power supply unit located at the end of each first radiation element in a second direction, which is perpendicular to the first direction, for supplying power to the first radiation element, a third power supply unit located at the end of each second radiation element in a third direction for supplying power to the second radiation element, and a fourth power supply unit located at the end of each second radiation element in a fourth direction, which is perpendicular to the third direction.





US 20190044214A1

(19) **United States**

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

(10) **Pub. No.: US 2019/0044214 A1**

(43) **Pub. Date: Feb. 7, 2019**

(54) **ANTENNA STRUCTURE OF A COMMUNICATIONS DEVICE**

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

(72) Inventors: **Hui LIN**, Taoyuan City (TW); **Chun-I Lin**, Taoyuan City (TW); **Hung-Ren Hsu**, Taoyuan City (TW); **Jun-Yu Lu**, Taoyuan City (TW)

(21) Appl. No.: **15/830,300**

(22) Filed: **Dec. 4, 2017**

(30) **Foreign Application Priority Data**

Aug. 3, 2017 (TW) 106126208

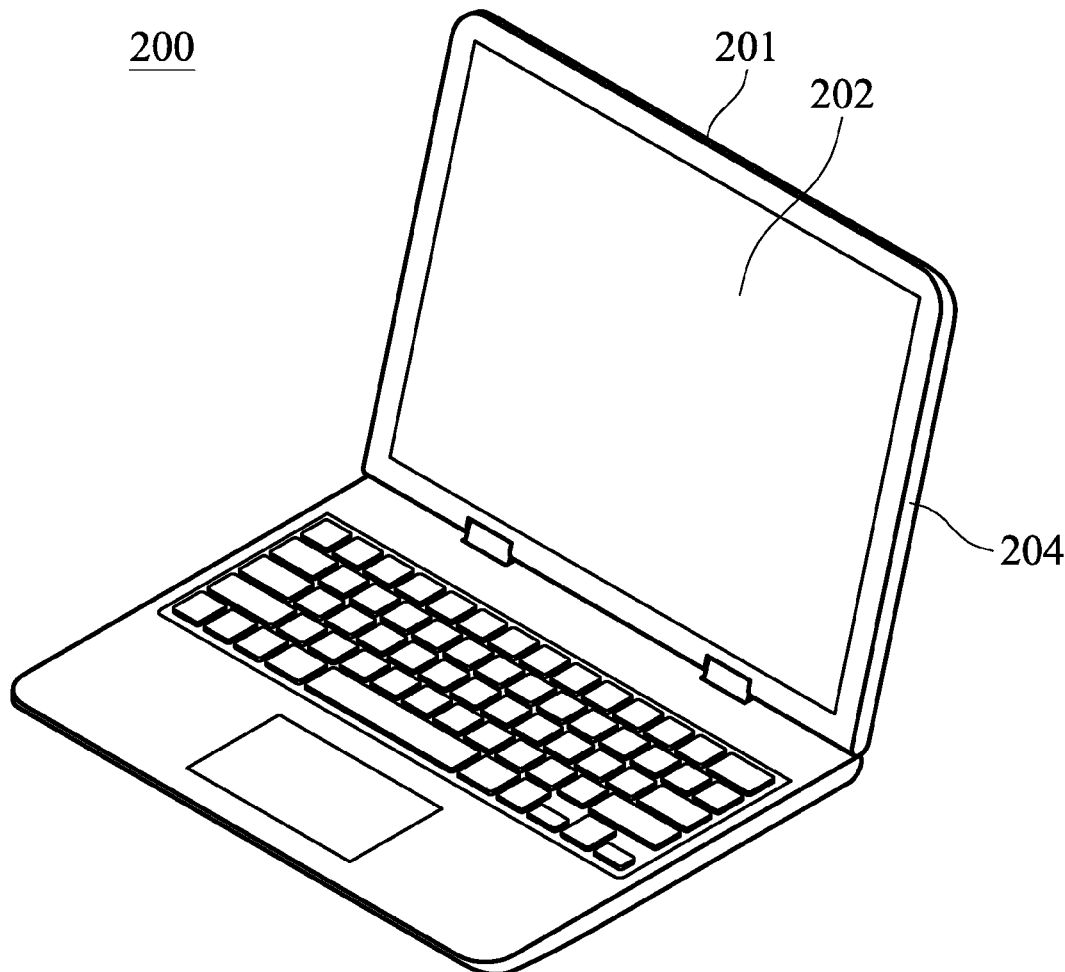
Publication Classification

(51) **Int. Cl.**
H01Q 1/22 (2006.01)
H01Q 1/48 (2006.01)
H01Q 1/40 (2006.01)

(52) **U.S. Cl.**
 CPC *H01Q 1/2258* (2013.01); *H01Q 1/40* (2013.01); *H01Q 1/48* (2013.01)

(57) **ABSTRACT**

A communications device includes a ground plane, a signal source, a filling material and an antenna. The signal source is electrically connected to the ground plane. The antenna has a predetermined metal pattern and is coupled to the signal source. The filling material is a non-conductive material and the filling material and the predetermined metal pattern are bonded heterogeneously via a surface-mount technology.





US 20190044215A1

(19) **United States**

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

(10) **Pub. No.: US 2019/0044215 A1**

(43) **Pub. Date: Feb. 7, 2019**

(54) **ANTENNA STRUCTURE OF A COMMUNICATIONS DEVICE**

Publication Classification

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

(51) **Int. Cl.**
H01Q 1/22 (2006.01)
H05K 5/02 (2006.01)

(72) Inventors: **Hui LIN**, Taoyuan City (TW); **Chun-I LIN**, Taoyuan City (TW); **Hung-Ren HSU**, Taoyuan City (TW); **Jun-Yu LU**, Taoyuan City (TW)

(52) **U.S. Cl.**
CPC *H01Q 1/2266* (2013.01); *H05K 5/0247* (2013.01)

(21) Appl. No.: **15/792,999**

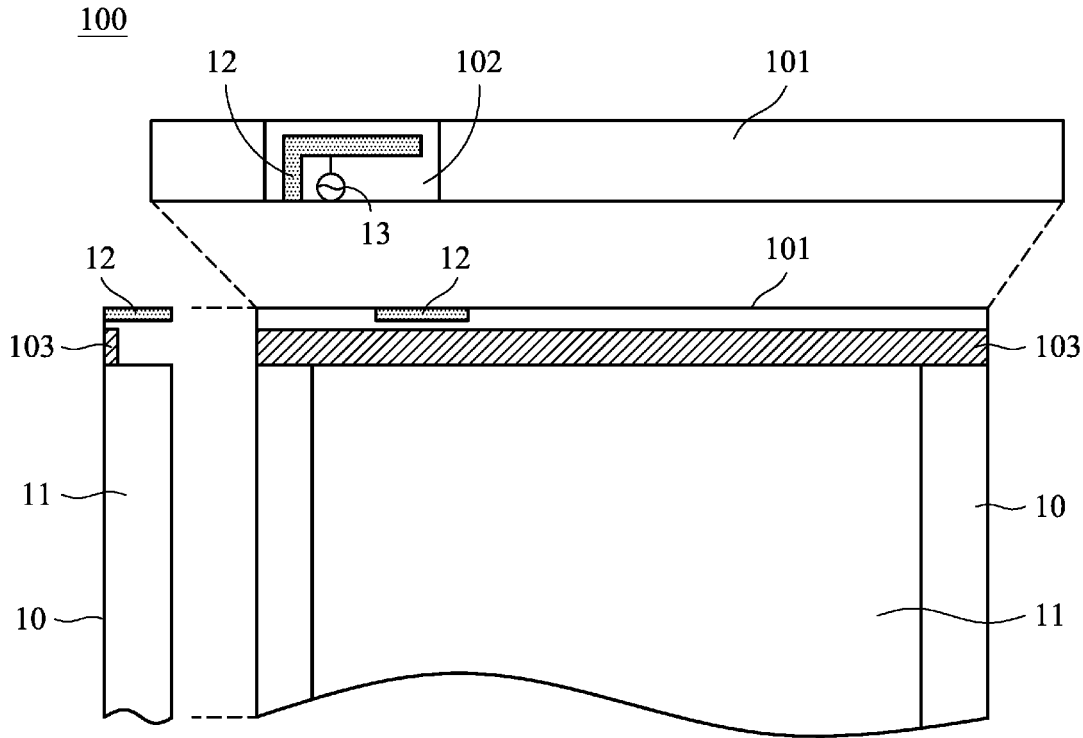
(57) **ABSTRACT**

(22) Filed: **Oct. 25, 2017**

A communications device includes a system ground plane, a signal source, a device frame, a magnetic conductive material and an antenna. The signal source is electrically coupled to the system ground plane. The device frame is perpendicular to the system ground plane. The antenna is electrically coupled to the signal source and is disposed on the device frame. The magnetic conductive material is disposed adjacent to the antenna but spaced apart by a first predetermined distance from the antenna. The magnetic line of force induced by the antenna is directed in a predetermined direction by the magnetic conductive material.

(30) **Foreign Application Priority Data**

Aug. 3, 2017 (TW) 106126207





(19) **United States**

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

(10) **Pub. No.: US 2019/0044216 A1**

(43) **Pub. Date: Feb. 7, 2019**

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

H01Q 5/50 (2006.01)

H01Q 9/04 (2006.01)

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

H01Q 21/00 (2006.01)

H01Q 1/38 (2006.01)

(72) Inventors: **Jun-Yu LU**, Taoyuan City (TW);
Hung-Ren HSU, Taoyuan City (TW);
Chun-I LIN, Taoyuan City (TW); **Hui LIN**, Taoyuan City (TW)

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

CPC *H01Q 1/243* (2013.01); *H01Q 7/00* (2013.01); *H01Q 5/50* (2015.01); *H04M 1/0283* (2013.01); *H01Q 21/0006* (2013.01); *H01Q 1/38* (2013.01); *H01Q 9/0421* (2013.01)

(21) Appl. No.: **15/800,715**

(57)

ABSTRACT

(22) Filed: **Nov. 1, 2017**

A dual-band antenna structure includes a ground plane, a signal source, a coupling gap, a first feeding arm, a second feeding arm, a first radiation arm, and a second radiation arm. The first and second feeding arms are electrically coupled to the signal source. The first radiation arm has a first open end and a first grounding point. The second radiation arm has a second open end and a second grounding point. The first and second open ends are opposite each other. The first and second grounding points are electrically connected to the ground plane.

(30) **Foreign Application Priority Data**

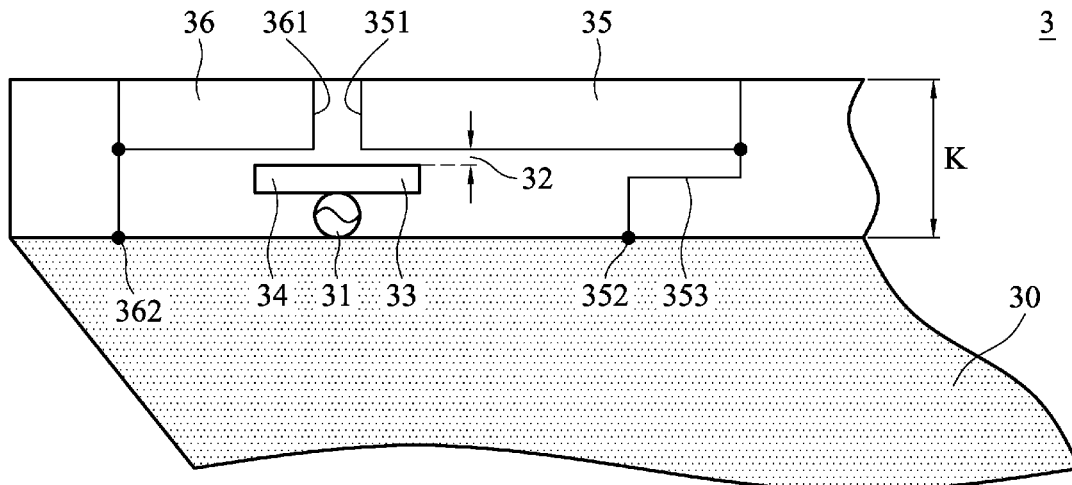
Aug. 3, 2017 (TW) 106126209

Publication Classification

(51) **Int. Cl.**

H01Q 1/24 (2006.01)

H01Q 7/00 (2006.01)





US 20190044218A1

(19) **United States**

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

(10) **Pub. No.: US 2019/0044218 A1**

(43) **Pub. Date: Feb. 7, 2019**

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

H01Q 1/22 (2006.01)

H04W 88/06 (2006.01)

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

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

CPC *H01Q 1/243* (2013.01); *H04W 88/06*

(2013.01); *H01Q 1/2291* (2013.01); *H01Q*

5/35 (2015.01)

(72) Inventors: **WEI-XUAN YE**, New Taipei (TW);
WEN-CHANG HSU, New Taipei (TW);
TE-CHANG LIN, New Taipei (TW)

(57)

ABSTRACT

An antenna structure includes a housing, a first feed source, a first radiator, a second radiator, and a second feed source. The housing includes a first radiating portion. The first feed source feeds current to the first radiating portion and the first radiating portion activates a first mode to generate radiation signals in a first frequency band. The first radiator is positioned in the housing. The first radiating portion further couples the current to the first radiator and the first radiator activates a second mode to generate radiation signals in a second frequency band. The second radiator is positioned in a space formed by the first radiator. The second feed source feeds current to the second radiator and the second radiator activates a third mode to generate radiation signals in a third frequency band.

(21) Appl. No.: **16/006,815**

(22) Filed: **Jun. 12, 2018**

(30) **Foreign Application Priority Data**

Aug. 5, 2017 (CN) 201710663431.X

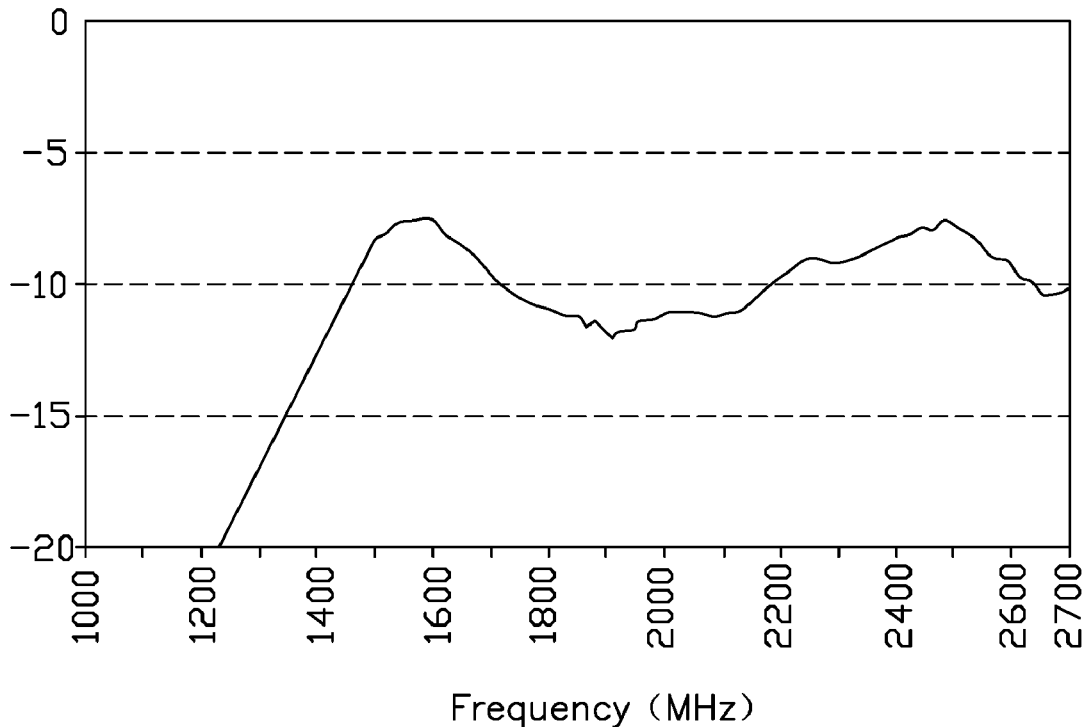
Publication Classification

(51) **Int. Cl.**

H01Q 1/24 (2006.01)

H01Q 5/35 (2006.01)

Radiating efficiency (dB)





(19) **United States**

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

(10) **Pub. No.: US 2019/0044232 A1**

(43) **Pub. Date: Feb. 7, 2019**

(54) **ANTENNA STRUCTURE**

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

(71) Applicant: **WISTRON NEWEB CORPORATION, HSINCHU (TW)**

CPC **H01Q 5/342** (2015.01); **H01Q 1/245** (2013.01); **H01Q 5/328** (2015.01); **H01Q 1/38** (2013.01)

(72) Inventors: **SHIH-HSIEN TSENG, HSINCHU (TW); CHIH-MING WANG, HSINCHU (TW)**

(57) **ABSTRACT**

(21) Appl. No.: **15/869,959**

The instant disclosure provides an antenna structure including a substrate, a first radiation element, a second radiation element, a coupling element, a grounding element, and a feeding element. The first radiation element is disposed on the substrate, including a first radiation portion, a second radiation portion, and a feeding portion connected between the first radiation portion and the second radiation portion. The second radiation element is disposed on the substrate, including a third radiation portion and a coupling portion connected with the third radiation portion. A gap is formed between the first radiation portion and the third radiation portion. The coupling element is disposed on the substrate. The coupling element is separated from the coupling portion and coupled to the coupling portion. The grounding element is coupled with the coupling element. The feeding element is coupled with the feeding portion and the grounding element.

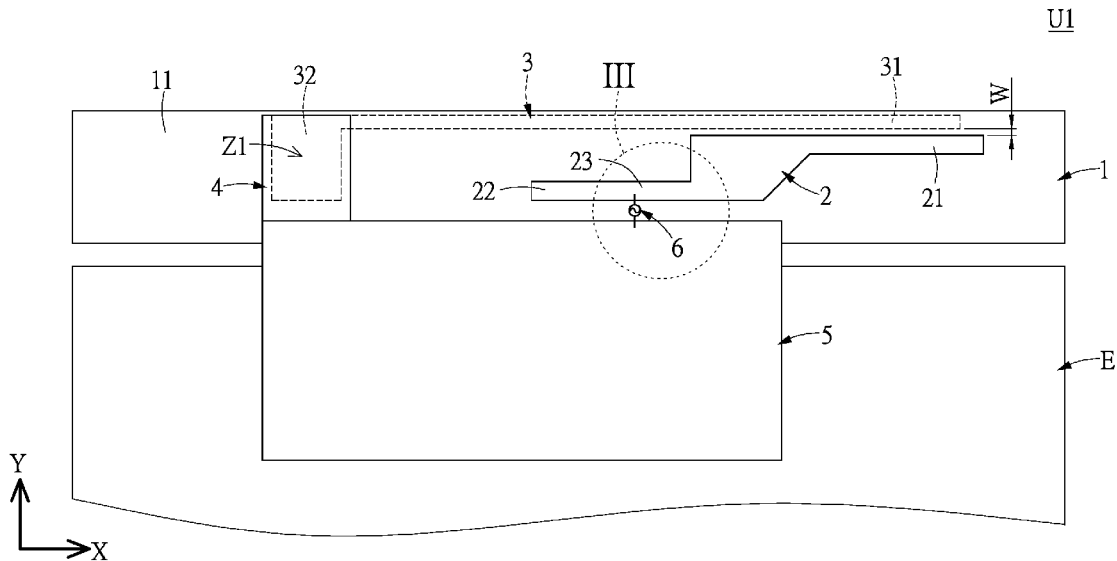
(22) Filed: **Jan. 12, 2018**

(30) **Foreign Application Priority Data**

Aug. 2, 2017 (TW) 106126080

Publication Classification

(51) **Int. Cl.**
H01Q 5/342 (2015.01)
H01Q 1/38 (2006.01)
H01Q 5/328 (2015.01)
H01Q 1/24 (2006.01)





US 20190044233A1

(19) **United States**

(12) **Patent Application Publication**
SHINKAWA

(10) **Pub. No.: US 2019/0044233 A1**

(43) **Pub. Date: Feb. 7, 2019**

(54) **ANTENNA**

(71) Applicant: **YAMAHA CORPORATION**,
Hamamatsu-shi (JP)

(72) Inventor: **Tomohiro SHINKAWA**,
Hamamatsu-shi (JP)

(21) Appl. No.: **16/135,518**

(22) Filed: **Sep. 19, 2018**

Related U.S. Application Data

(63) Continuation of application No. PCT/JP2017/
010646, filed on Mar. 16, 2017.

Foreign Application Priority Data

Mar. 22, 2016 (JP) 2016-057137

Publication Classification

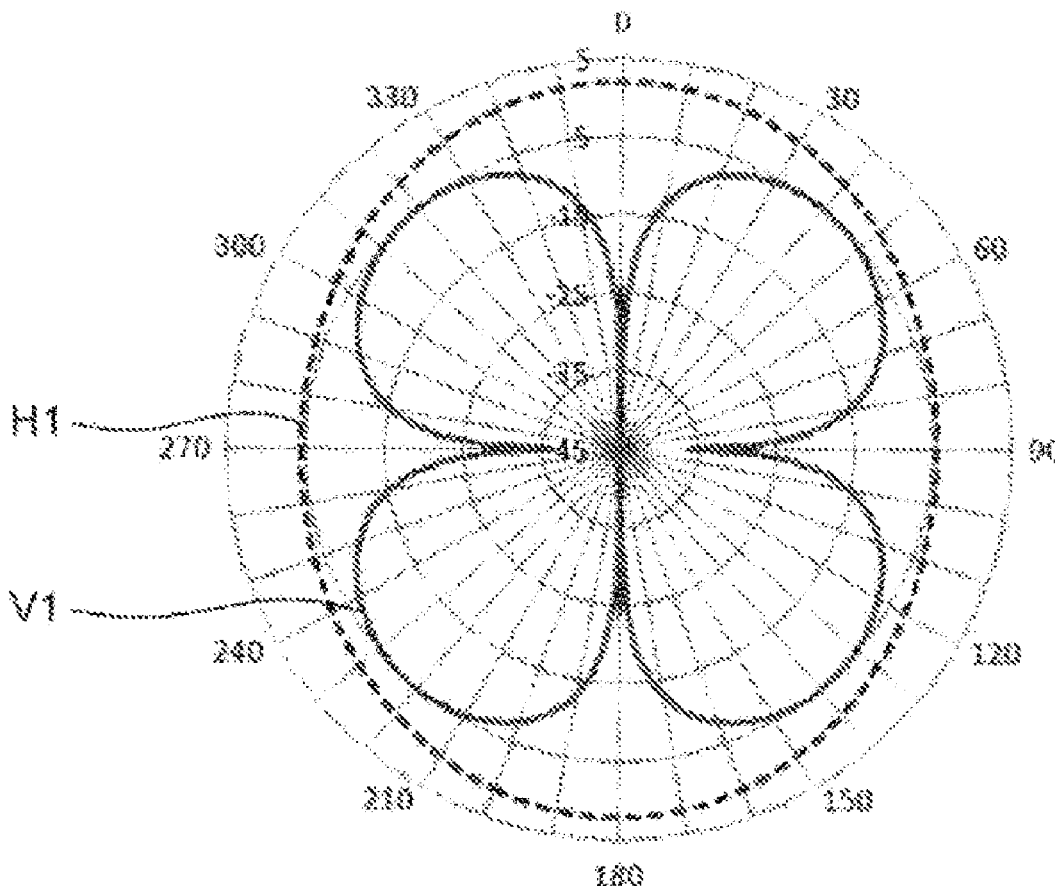
(51) **Int. Cl.**
H01Q 5/378 (2006.01)
H01Q 1/48 (2006.01)
H01Q 1/38 (2006.01)

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

CPC **H01Q 5/378** (2015.01); **H01Q 1/38**
(2013.01); **H01Q 1/48** (2013.01)

(57) **ABSTRACT**

Provided is a lower-profile multi-band antenna. According to one embodiment of the present invention, there is provided an antenna including a linear first antenna portion, a conductive portion that connects the first antenna portion with a power feeding point, grounding regions where opposite ends of the first antenna portion are short-circuited and grounded, and a second antenna portion, at least a part of which overlaps with the conductive portion with a dielectric substance interposed between the conductive portion and the second antenna portion. The second antenna portion is disposed in a region surrounded by the grounding regions and the first antenna portion. The conductive portion may be connected to the first antenna portion at a middle point between the opposite ends of the first antenna portion.





(19) **United States**

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

(10) **Pub. No.: US 2019/0044239 A1**

(43) **Pub. Date: Feb. 7, 2019**

(54) **ANTENNA**

Publication Classification

(71) Applicant: **AGC Inc.**, Chiyoda-ku (JP)

(51) **Int. Cl.**
H01Q 9/04 (2006.01)
H01Q 1/48 (2006.01)
H01Q 1/38 (2006.01)

(72) Inventors: **Ryuta SONODA**, Chiyoda-ku (JP);
Toshiki SAYAMA, Chiyoda-ku (JP);
Koji IKAWA, Chiyoda-ku (JP)

(52) **U.S. Cl.**
CPC **H01Q 9/0485** (2013.01); **H01Q 1/38**
(2013.01); **H01Q 1/48** (2013.01)

(73) Assignee: **AGC Inc.**, Chiyoda-ku (JP)

(21) Appl. No.: **16/157,539**

(57) **ABSTRACT**

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

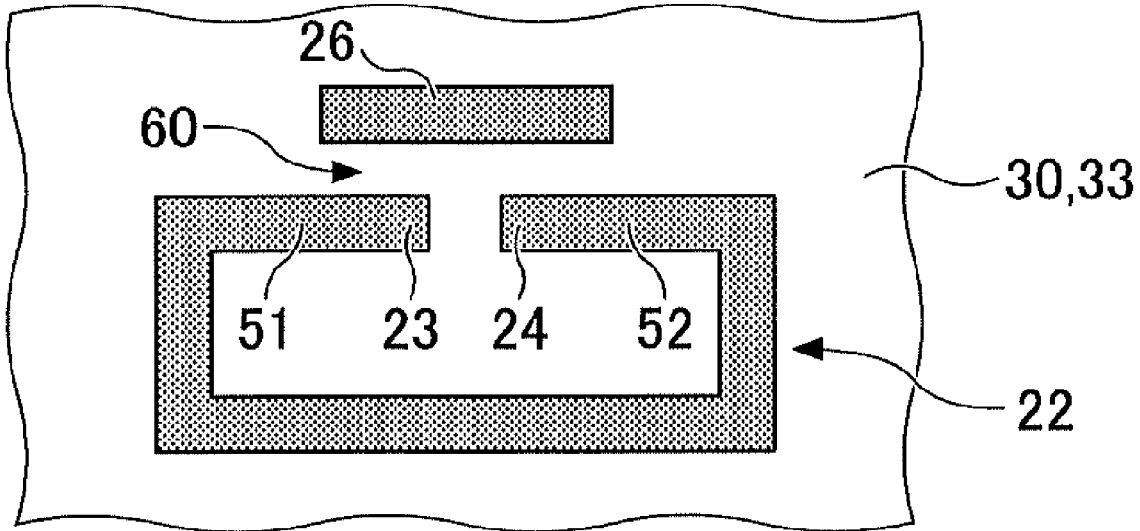
An antenna includes a ground plane; a first resonator connected to a feeding point with reference to the ground plane; and a second resonator that is fed power by the first resonator according to an electromagnetic field coupling with no contact. The second resonator includes a first conductor part, and a second conductor part capacitively-coupled to the first conductor part through a gap. A dielectric loss tangent of a substrate part, on which the second resonator is formed, is greater than zero and less than or equal to 0.01.

Related U.S. Application Data

(63) Continuation of application No. PCT/JP2017/015201, filed on Apr. 13, 2017.

Foreign Application Priority Data

(30) Apr. 15, 2016 (JP) 2016-081706





US 20190044247A1

(19) **United States**

(12) **Patent Application Publication**
Daniel

(10) **Pub. No.: US 2019/0044247 A1**

(43) **Pub. Date: Feb. 7, 2019**

(54) **META-ANTENNA**

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

(71) Applicant: **Palo Alto Research Center Incorporated**, Palo Alto, CA (US)

CPC **H01Q 19/005** (2013.01); **H01Q 7/00** (2013.01); **H01Q 9/0407** (2013.01)

(72) Inventor: **George W. Daniel**, Mountain View, CA (US)

(57) **ABSTRACT**

(73) Assignee: **Palo Alto Research Center Incorporated**, Palo Alto, CA (US)

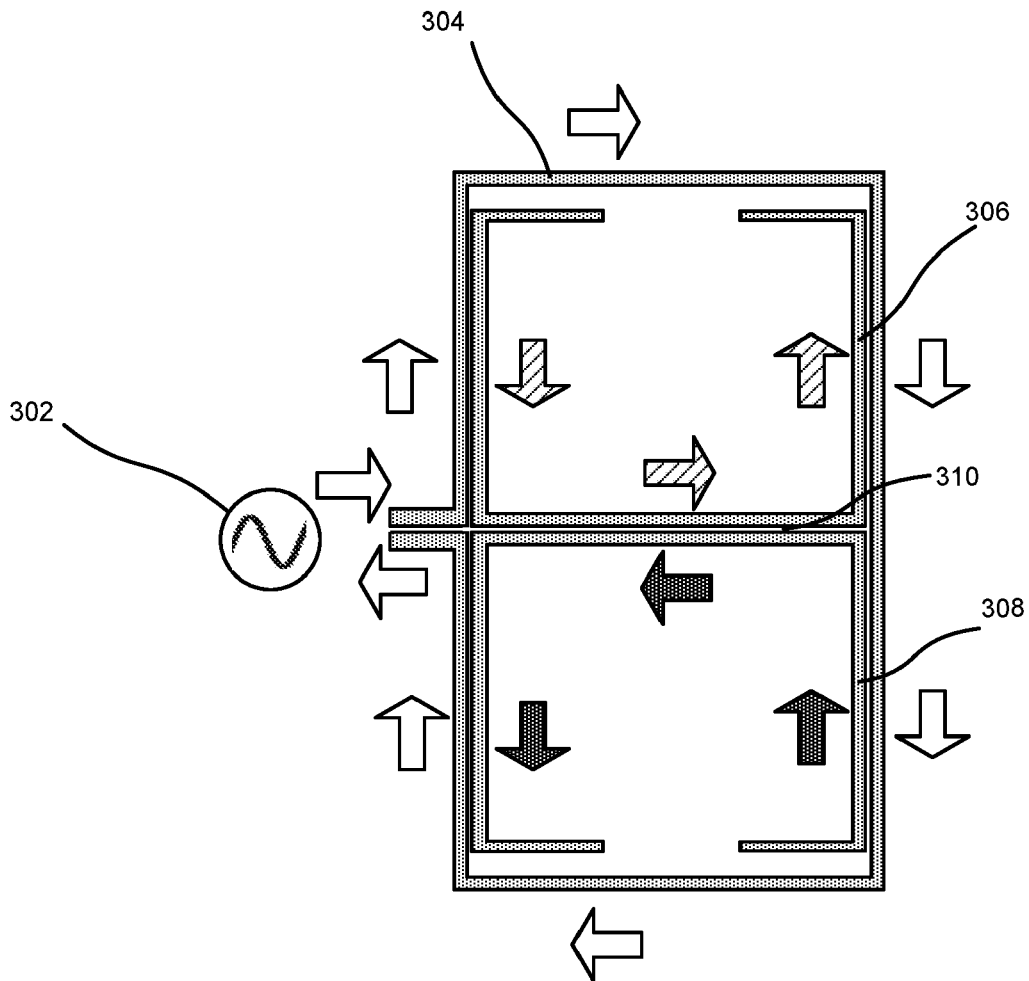
(21) Appl. No.: **15/669,725**

(22) Filed: **Aug. 4, 2017**

A small, inexpensive, printable meta-antenna system is described. In addition to being smaller than existing antennas, the meta-antenna improves over them by being omnidirectional, and having a broader gain function and better efficiency. Some embodiments include a main element with a shape of a loop and two parasitic elements enclosed by the main element. Each parasitic element may be shaped as a loop with an opening. The openings of the two parasitic elements may be positioned adjacent to opposing sides of the main element, respectively.

Publication Classification

(51) **Int. Cl.**
H01Q 19/00 (2006.01)
H01Q 9/04 (2006.01)





US 20190051967A1

(19) **United States**

(12) **Patent Application Publication**

RYU et al.

(10) **Pub. No.: US 2019/0051967 A1**

(43) **Pub. Date: Feb. 14, 2019**

(54) **MOBILE TERMINAL**

Publication Classification

(71) Applicant: **LG ELECTRONICS INC.**, Seoul (KR)
(72) Inventors: **Seungwoo RYU**, Seoul (KR); **Joohee LEE**, Seoul (KR); **Junyoung JUNG**, Seoul (KR); **Youngryoul KIM**, Seoul (KR); **Wonwoo LEE**, Seoul (KR)
(73) Assignee: **LG ELECTRONICS INC.**, Seoul (KR)

(51) **Int. Cl.**
H01Q 1/02 (2006.01)
H01Q 1/24 (2006.01)
H01Q 21/06 (2006.01)
H05K 1/02 (2006.01)
H05K 1/18 (2006.01)
H05K 7/20 (2006.01)
H02J 7/02 (2006.01)
H05K 9/00 (2006.01)
(52) **U.S. Cl.**
CPC *H01Q 1/02* (2013.01); *H01Q 1/243* (2013.01); *H01Q 21/065* (2013.01); *H05K 1/0243* (2013.01); *H04W 88/02* (2013.01); *H05K 1/181* (2013.01); *H05K 7/2039* (2013.01); *H02J 7/025* (2013.01); *H05K 9/0026* (2013.01); *H05K 2201/10371* (2013.01)

(21) Appl. No.: **16/165,423**

(22) Filed: **Oct. 19, 2018**

Related U.S. Application Data

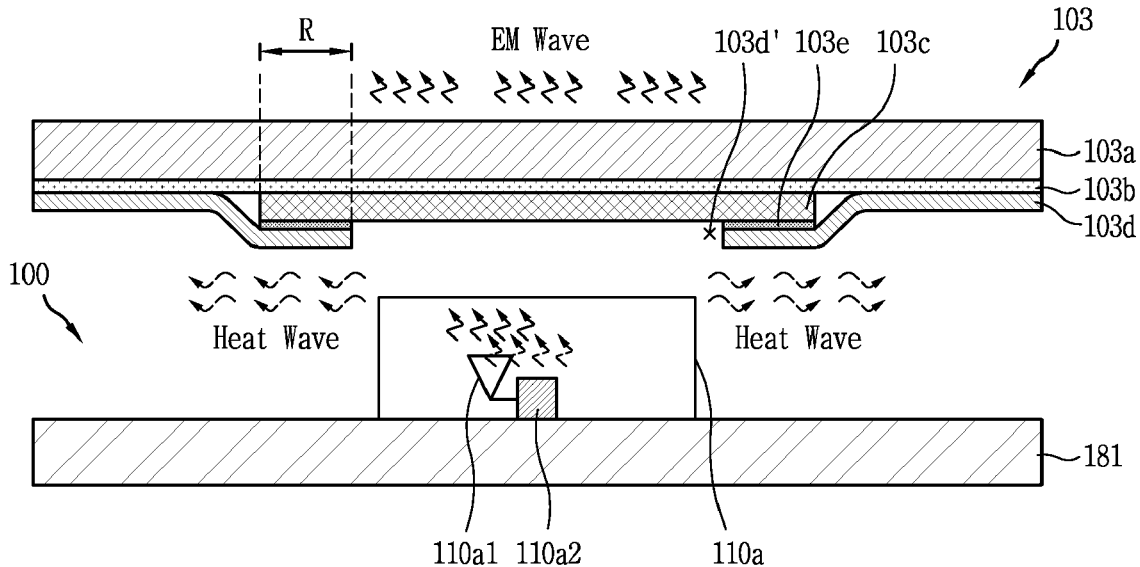
(63) Continuation of application No. 15/957,583, filed on Apr. 19, 2018, now Pat. No. 10,141,625.
(60) Provisional application No. 62/531,890, filed on Jul. 13, 2017.

Foreign Application Priority Data

Jan. 5, 2018 (KR) 10-2018-0001941

(57) **ABSTRACT**

A mobile terminal includes patch antennas forming an array, an integrated circuit (IC) controlling transmission and reception of radio signals of the patch antennas, and a case disposed to cover the IC, wherein the case includes: a base forming an appearance, a heat dissipation sheet attached to an inner surface of the base to dissipate heat generated in the IC and having an opening corresponding to the patch antennas, and a dielectric disposed to cover the opening and formed of a dielectric material to allow radio signals from the patch antennas to be radiated to the outside of the case.





(19) **United States**

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

(10) **Pub. No.: US 2019/0051971 A1**

(43) **Pub. Date: Feb. 14, 2019**

(54) **MOBILE DEVICE AND ANTENNA THEREFOR**

H04B 1/3827 (2006.01)

H01Q 1/24 (2006.01)

H01Q 9/42 (2006.01)

H01Q 9/04 (2006.01)

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

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

CPC *H01Q 1/2266* (2013.01); *H01Q 21/30* (2013.01); *H04B 1/3838* (2013.01); *H01Q 5/357* (2015.01); *H01Q 9/42* (2013.01); *H01Q 9/0421* (2013.01); *H01Q 1/243* (2013.01)

(72) Inventors: **Cheng-Yu Hsieh**, New Taipei City (TW); **Kun-Sheng Chang**, New Taipei City (TW); **Ching-Chi Lin**, New Taipei City (TW)

(21) Appl. No.: **15/832,825**

(57)

ABSTRACT

(22) Filed: **Dec. 6, 2017**

A mobile device includes a housing including a metal case and an antenna mounted inside the housing. The antenna includes a first radiation portion disposed on a first surface of a substrate, a second radiation portion disposed on an opposing surface of the substrate, and a ground element, wherein the second radiation portion includes a first grounding point and a second grounding point that are each electrically connected to the metal case via the ground element.

(30) **Foreign Application Priority Data**

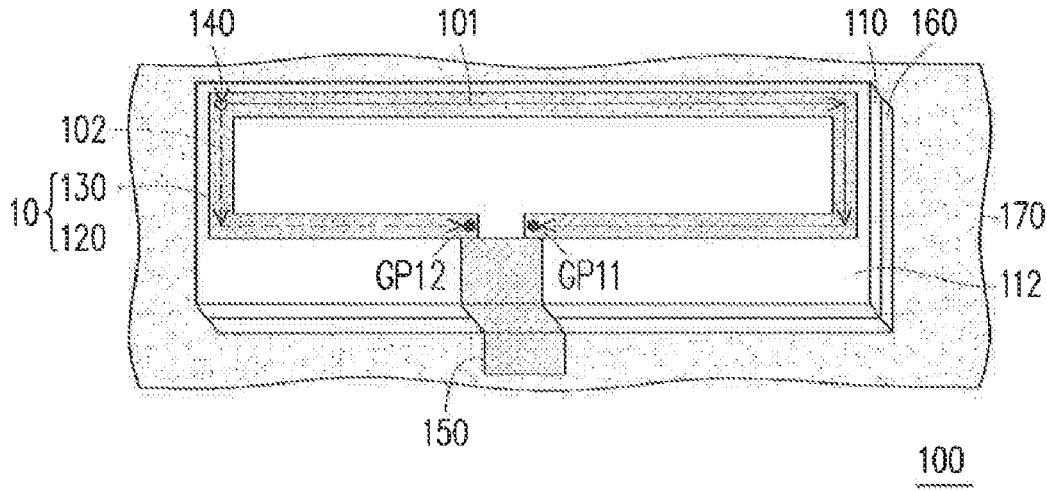
Aug. 9, 2017 (TW) 106126826

Publication Classification

(51) **Int. Cl.**

H01Q 1/22 (2006.01)

H01Q 21/30 (2006.01)





US 20190051973A1

(19) **United States**

(12) **Patent Application Publication**
HO

(10) **Pub. No.: US 2019/0051973 A1**

(43) **Pub. Date: Feb. 14, 2019**

(54) **ANTENNA STRUCTURE**

H01Q 1/36 (2006.01)

H04B 1/44 (2006.01)

(71) Applicant: **HON HAI PRECISION INDUSTRY CO., LTD.**, New Taipei (TW)

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

CPC *H01Q 1/2291* (2013.01); *H01Q 21/24* (2013.01); *H04B 1/44* (2013.01); *H01Q 21/0006* (2013.01); *H01Q 1/36* (2013.01); *H01Q 21/28* (2013.01)

(72) Inventor: **CHAO-WEI HO**, New Taipei (TW)

(21) Appl. No.: **15/690,284**

(57)

ABSTRACT

(22) Filed: **Aug. 30, 2017**

An antenna structure of the present disclosure includes a base plate, a supporting portion and an antenna mounted on the supporting portion. The base plate has a signal source thereon. The antenna has an input end. The antenna comprises a first antenna, a second antenna and a connecting portion coupled with the first antenna and the second antenna, the antenna also has a first switch portion, a second switch portion and a third switch portion, the base plate has a first circuit and a second circuit. The input end is mounted on the connecting portion, the first switch portion is mounted between the signal source and the input end, the second switch portion is mounted on the first antenna, the third switch portion is mounted on the second antenna.

(30) **Foreign Application Priority Data**

Aug. 8, 2017 (CN) 201710673234.6

Publication Classification

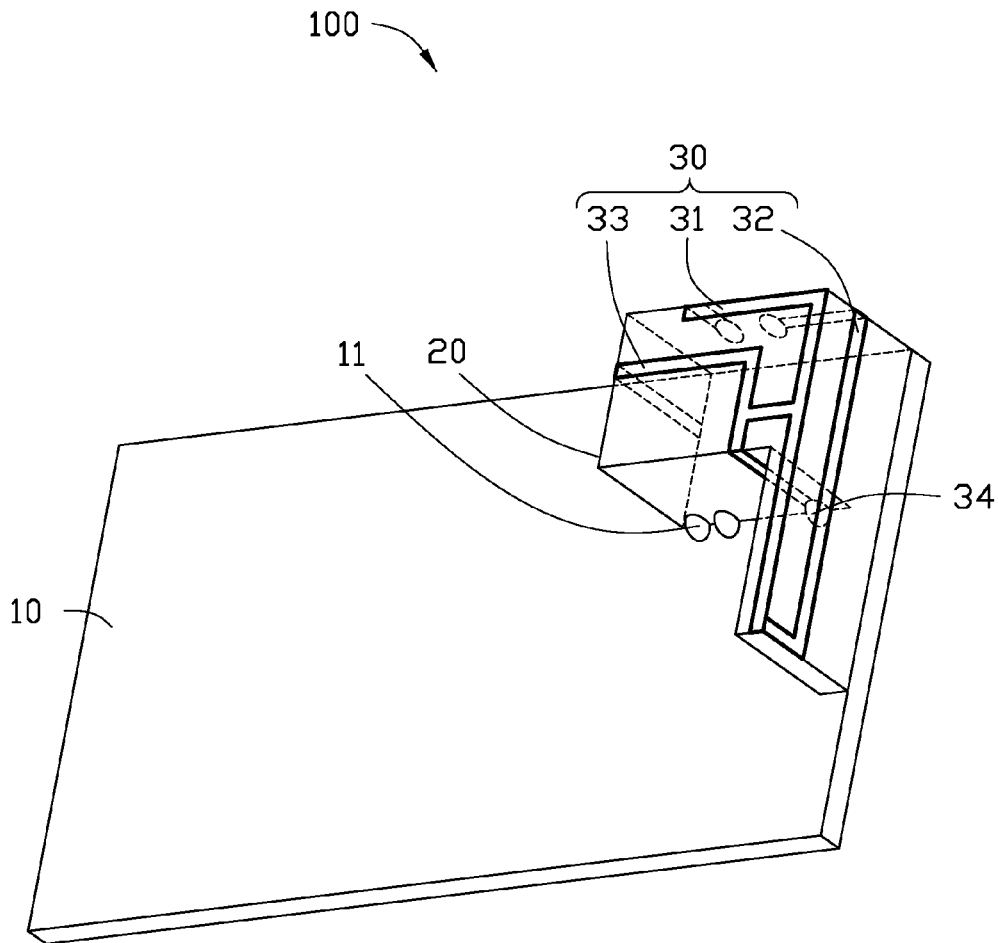
(51) **Int. Cl.**

H01Q 1/22 (2006.01)

H01Q 21/24 (2006.01)

H01Q 21/28 (2006.01)

H01Q 21/00 (2006.01)





US 20190051986A1

(19) **United States**

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

(10) **Pub. No.: US 2019/0051986 A1**

(43) **Pub. Date: Feb. 14, 2019**

(54) **ANTENNA AND TERMINAL**

Publication Classification

(71) Applicant: **HUAWEI DEVICE (DONGGUAN) CO., LTD.**, Dongguan (CN)

(51) **Int. Cl.**
H01Q 5/328 (2006.01)
H01Q 5/335 (2006.01)
H01Q 9/04 (2006.01)
H01Q 1/48 (2006.01)

(72) Inventors: **Jianming Li**, Shanghai (CN); **Hanyang Wang**, Reading (GB); **Kun Feng**, Shanghai (CN); **Xiaoju Zhang**, Shanghai (CN)

(52) **U.S. Cl.**
CPC *H01Q 5/328* (2015.01); *H01Q 5/335* (2015.01); *H01Q 1/48* (2013.01); *H01Q 9/0421* (2013.01)

(21) Appl. No.: **16/165,256**

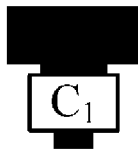
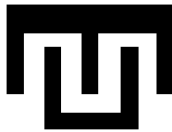
(57) **ABSTRACT**

(22) Filed: **Oct. 19, 2018**

The present invention discloses an antenna and a terminal, which can extend antenna bandwidth. The antenna includes a capacitor component and at least one radiator, where one end of each radiator of the at least one radiator is connected to form a first node, the first node is connected to one end of the capacitor component to form a second node, and the second node is grounded; and the other end of the capacitor component receives a feed signal.

Related U.S. Application Data

(63) Continuation of application No. 15/186,123, filed on Jun. 17, 2016, which is a continuation of application No. PCT/CN2013/090144, filed on Dec. 20, 2013.





(19) **United States**

(12) **Patent Application Publication**

KIM et al.

(10) **Pub. No.: US 2019/0051989 A1**

(43) **Pub. Date: Feb. 14, 2019**

(54) **ANTENNA MODULE**

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

(71) Applicant: **Samsung Electro-Mechanics Co., Ltd.**,
Suwon-si (KR)

CPC **H01Q 15/08** (2013.01); **H01Q 1/243**
(2013.01); **H01L 23/66** (2013.01); **H01Q 1/38**
(2013.01)

(72) Inventors: **DOO IL KIM**, Suwon-si (KR); **Yong Ho BAEK**, Suwon-si (KR); **Jin Seon PARK**, Suwon-si (KR); **Young Sik HUR**, Suwon-si (KR)

(57) **ABSTRACT**

(73) Assignee: **Samsung Electro Mechanics Co., Ltd.**,
Suwon-si (KR)

An antenna module includes: a connection member including at least one wiring layer and at least one insulating layer; an integrated circuit (IC) disposed on a first surface of the connection member and electrically connected to the at least one wiring layer; an antenna package including antenna members configured to transmit or receive a radio frequency (RF) signal, a feed vias each having one end electrically connected to a respective one of the antenna members and another end electrically connected to the at least one wiring layer, and a dielectric layer having a height greater than a height of the at least one insulating layer, and having a first surface facing a second surface of the connection member; and dielectric members disposed in positions corresponding to the antenna members on the second surface of the antenna package.

(21) Appl. No.: **16/005,951**

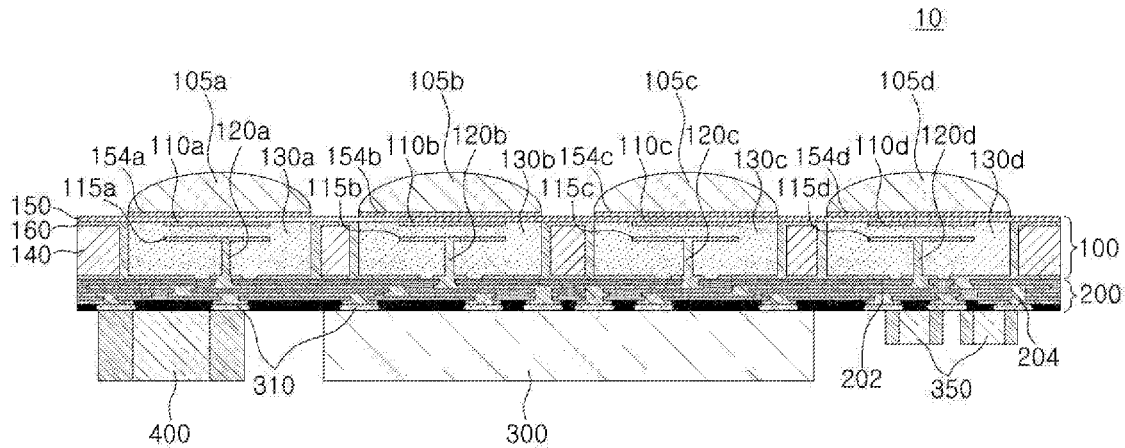
(22) Filed: **Jun. 12, 2018**

(30) **Foreign Application Priority Data**

Aug. 11, 2017 (KR) 10-2017-0102556
Nov. 9, 2017 (KR) 10-2017-0148912

Publication Classification

(51) **Int. Cl.**
H01Q 15/08 (2006.01)
H01Q 1/38 (2006.01)
H01L 23/66 (2006.01)





US 20190051992A1

(19) **United States**

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

(10) **Pub. No.: US 2019/0051992 A1**

(43) **Pub. Date: Feb. 14, 2019**

(54) **ISOLATED GROUND FOR WIRELESS DEVICE ANTENNA**

(22) Filed: **Sep. 16, 2016**

(71) Applicant: **Galtronics Corporation Ltd.**, Tempe, AZ (US)

Publication Classification

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

(72) Inventors: **Matti Martiskainen**, Industrial Zone (IL); **Eun-Gyu Bae**, Suwon-Si (KR); **Sharon Harel**, Industrial Zone (IL); **Jongmin Na**, Suwon-si (KR); **Taihong Kim**, Busan (KR); **Jaeyun Hwang**, Suwon-si (KR); **Bumjin Kim**, Suwon-si (KR); **Yeonhyeon Song**, Suwon-si (KR); **Suhyun Kim**, Suwon-si (KR); **Sangyup Kim**, Suwon-si (KR)

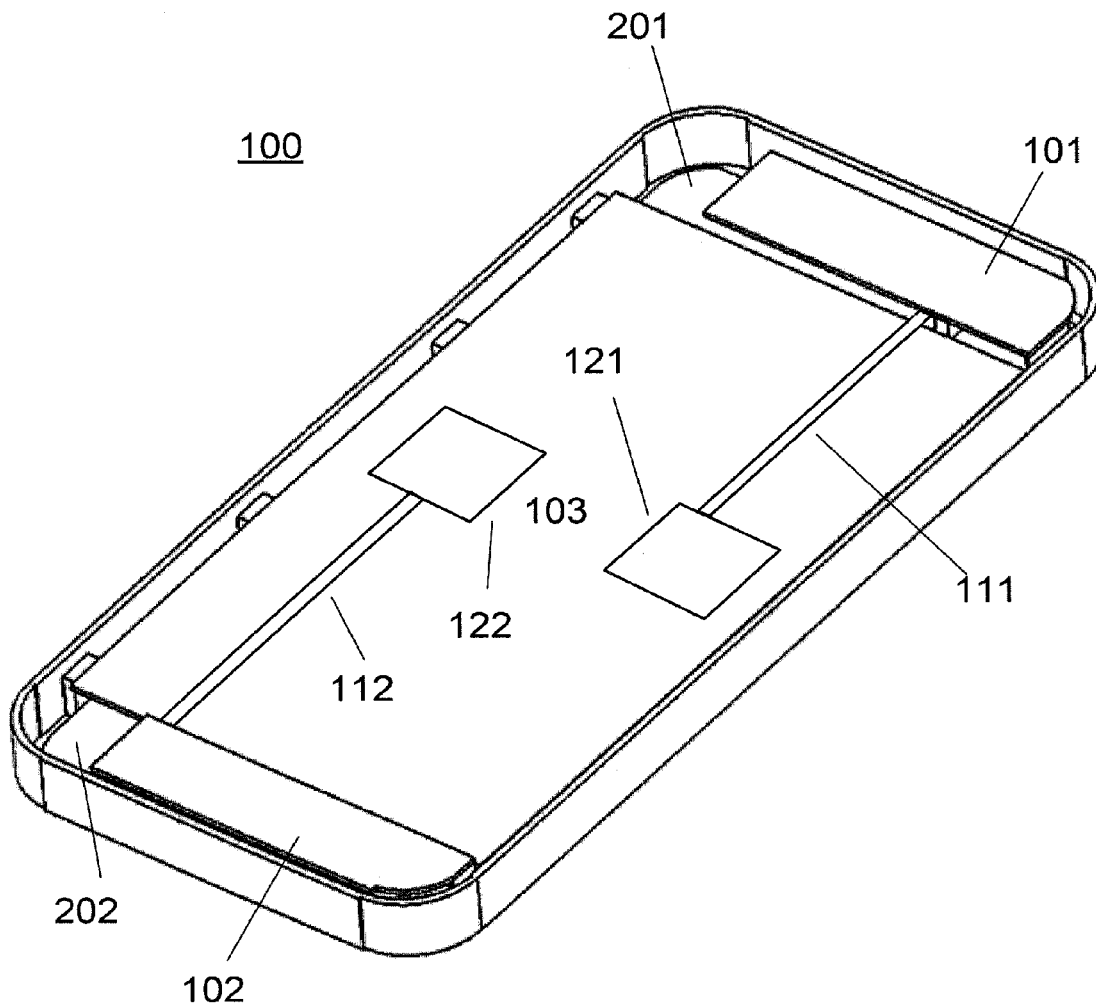
(52) **U.S. Cl.**
CPC **H01Q 21/30** (2013.01); **H01Q 1/243** (2013.01)

(73) Assignee: **Galtronics Corporation Ltd.**, Tempe, AZ (US)

(57) **ABSTRACT**

(21) Appl. No.: **15/126,715**

A wireless device including multiple counterpoises or ground planes is provided. The wireless device may provide improved multiple input multiple output (MIMO) communication capability through the use of the multiple counterpoises. Multiple counterpoises of the wireless device may be galvanically isolated from one another. Multiple counterpoises may each be coupled to separate antenna elements.





US 20190052292A1

(19) **United States**

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

(10) **Pub. No.: US 2019/0052292 A1**

(43) **Pub. Date: Feb. 14, 2019**

(54) **METHOD AND ELECTRONIC DEVICE FOR DYNAMICALLY CHANGING GROUND POINTS OF A PLURALITY OF ANTENNAS OF THE ELECTRONIC DEVICE**

H01Q 5/378 (2006.01)
H01Q 21/00 (2006.01)
(52) **U.S. Cl.**
CPC *H04B 1/0064* (2013.01); *H01Q 21/0025* (2013.01); *H01Q 5/378* (2015.01); *H01Q 1/48* (2013.01)

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

(72) Inventors: **Min Cheol SEO**, Seou (KR); **Him Chan YUN**, Gyeonggi-do (KR); **Ho Jung NAM**, Gyeonggi-do (KR); **Joon Ho BYUN**, Gyeonggi-do (KR); **Yoon Jae LEE**, Gyeonggi-do (KR); **Jong Hyuck LEE**, Gyeonggi-do (KR)

(21) Appl. No.: **16/103,440**

(22) Filed: **Aug. 14, 2018**

(30) **Foreign Application Priority Data**

Aug. 14, 2017 (KR) 10-2017-0102872

Publication Classification

(51) **Int. Cl.**
H04B 1/00 (2006.01)
H01Q 1/48 (2006.01)

(57) **ABSTRACT**

An electronic device is provided and includes a housing, a support member including a first ground region, a printed circuit board including a second ground region, a plurality of switches electrically connecting the first ground region and the second ground region, a first antenna element including at least a portion of a first edge of the housing and electrically connected with the first ground region of the support member, a second antenna element including at least a portion of a second edge of the housing and electrically connected with the second ground region of the printed circuit board, and a wireless communication circuit configured to transmit/receive in a first frequency band based on a first electrical path, transmit/receive in a second frequency band based on a second electrical path, set ON/OFF states of the plurality of switches to a first arrangement and a second arrangement, wherein at least one switch of the plurality of switches is set to an ON state in each of the first arrangement and the second arrangement.

