US 20190288376A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2019/0288376 A1**

TSAI et al. (43) **Pub. Date: Sep. 19, 2019**

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

(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); **Ying-Chih WANG**, Taoyuan City (TW)

(73) Assignee: **HTC Corporation**, Taoyuan City (TW)

(21) Appl. No.: **16/432,748**

(22) Filed: **Jun. 5, 2019**

Related U.S. Application Data

(63) Continuation of application No. 15/943,067, filed on Apr. 2, 2018, now Pat. No. 10,355,341, which is a continuation of application No. 13/598,317, filed on Aug. 29, 2012, now Pat. No. 10,003,121.

Publication Classification

(51) **Int. Cl.**

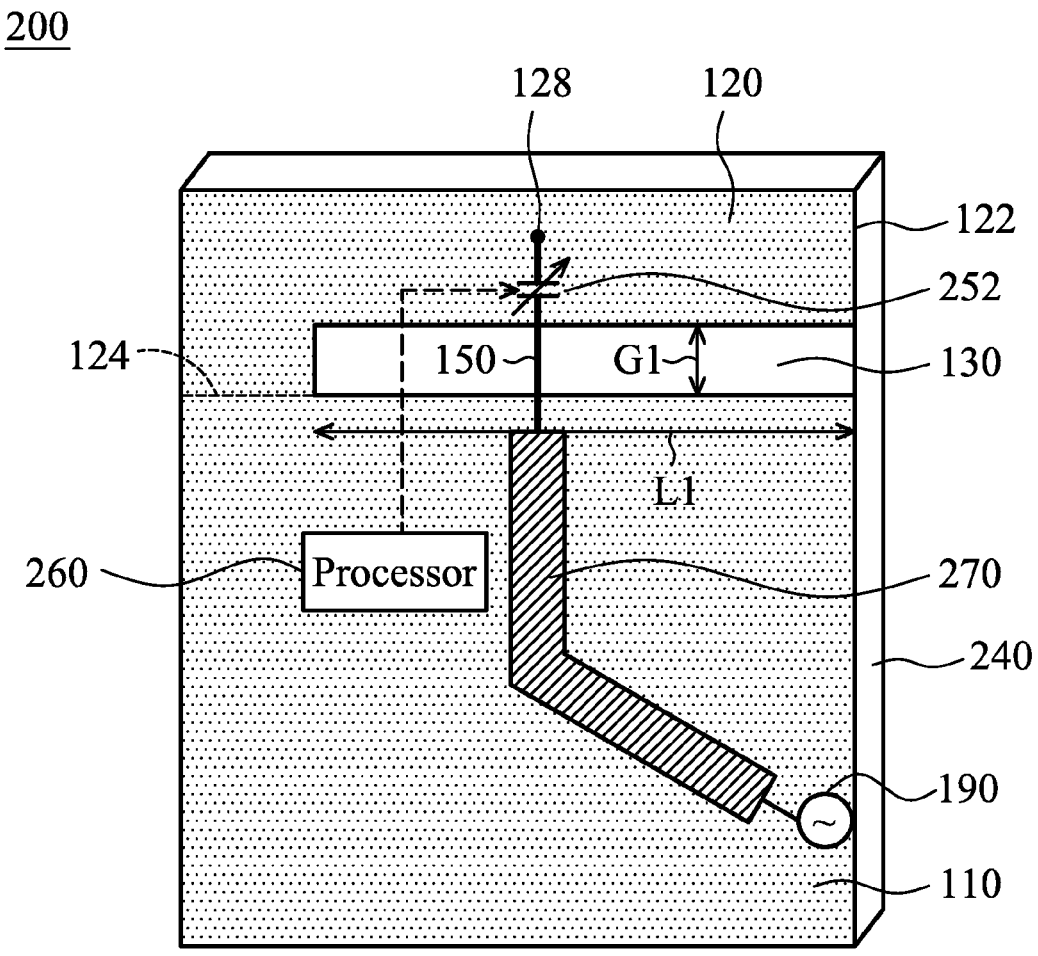
H01Q 1/24	(2006.01)
H01Q 9/42	(2006.01)
H01Q 5/335	(2006.01)
H01Q 5/378	(2006.01)

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

CPC ***H01Q 1/243*** (2013.01); ***H01Q 5/378*** (2015.01); ***H01Q 5/335*** (2015.01); ***H01Q 9/42*** (2013.01)

(57) **ABSTRACT**

A mobile device including a ground plane, a grounding branch, wherein a slot is formed between the ground plane and the grounding branch, a connecting element, wherein the grounding branch is electrically coupled through the connecting element to the ground plane and a feeding element, extending across the slot, and electrically coupled between the grounding branch and a signal source, wherein an antenna structure is formed by the grounding branch and the feeding element.



US 20190288392A1

(19) United States

(12) Patent Application Publication (10) Pub. No.: US 2019/0288392 A1

KIM et al. (43) Pub. Date: Sep. 19, 2019

(54) **ELECTRONIC DEVICE COMPRISING ANTENNA**

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

(72) Inventors: **Jae Hyung KIM**, Yongin-si (KR); **Kyung Bae KO**, Hwaseong-si (KR); **Tae Gyu KIM**, Hwaseong-si (KR); **Je Sun MOON**, Suwon-si (KR); **Jin Kyu BANG**, Suwon-si (KR); **Sang Hoon LEE**, Seoul (KR)

(21) Appl. No.: **16/344,172**

(22) PCT Filed: **Nov. 2, 2017**

(86) PCT No.: **PCT/KR2017/012363**

§ 371 (c)(1),
(2) Date: **Apr. 23, 2019**

(30) **Foreign Application Priority Data**

Nov. 7, 2016 (KR) 10-2016-0147315

Publication Classification

(51) **Int. Cl.**

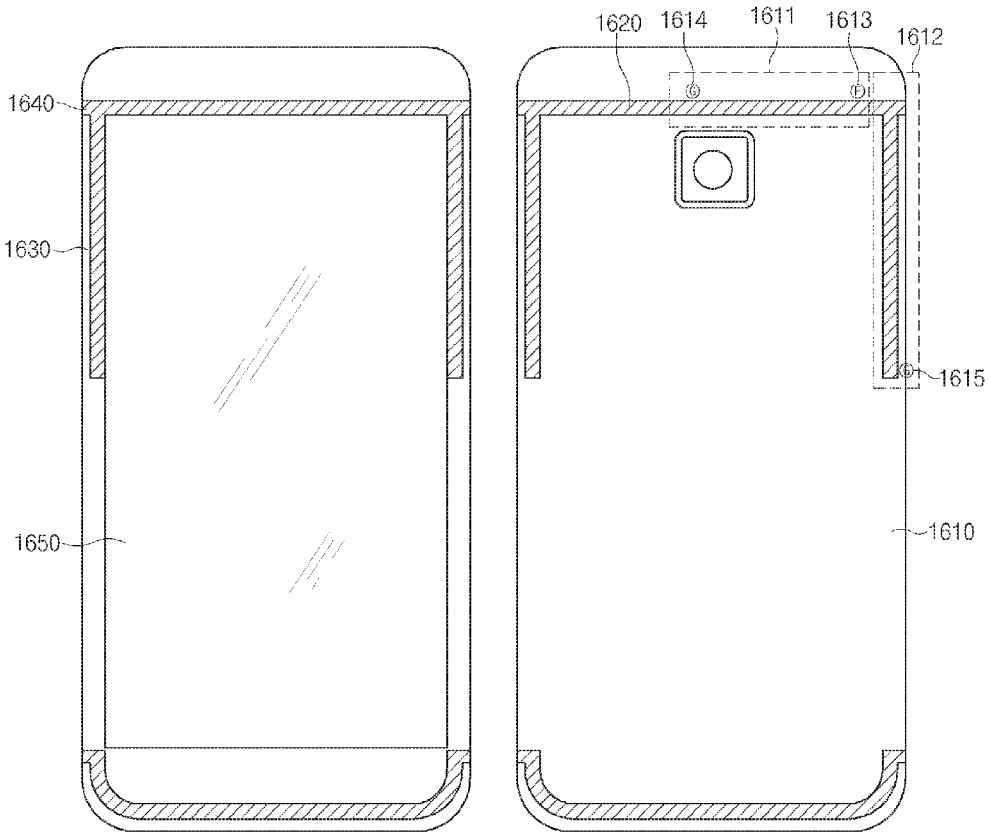
H01Q 5/30	(2006.01)
H05K 7/14	(2006.01)
H05K 5/02	(2006.01)
H05K 5/00	(2006.01)
H04B 1/3827	(2006.01)

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

CPC ***H01Q 5/30*** (2015.01); ***H05K 7/1427*** (2013.01); ***H04B 1/3827*** (2013.01); ***H05K 5/0086*** (2013.01); ***H05K 5/0226*** (2013.01)

(57) **ABSTRACT**

An electronic device according to an embodiment may comprise: a housing including a first slit having a length corresponding to a first frequency and a second slit extending from one point of the first slit in a different direction from the first slit and having a length corresponding to a second frequency, and configured to resonate at the first frequency and the second frequency by the first slit and the second slit; a printed circuit board disposed in the housing and at least partially made of a non-conductive material in regions corresponding to the first slit and the second slit; and a power supply unit for supplying power through one point of the housing, adjacent to the first slit or the second slit. Various other embodiments recognized from the specification are also possible.



US 20190288395A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2019/0288395 A1**

Su (43) **Pub. Date: Sep. 19, 2019**

(54) **LOOP ANTENNA**

(71) Applicant: **ASUSTeK COMPUTER INC.**, Taipei (TW)

(72) Inventor: **Saou-Wen Su**, Taipei (TW)

(21) Appl. No.: **16/244,299**

(22) Filed: **Jan. 10, 2019**

(30) **Foreign Application Priority Data**

Mar. 15, 2018 (TW) 107108923

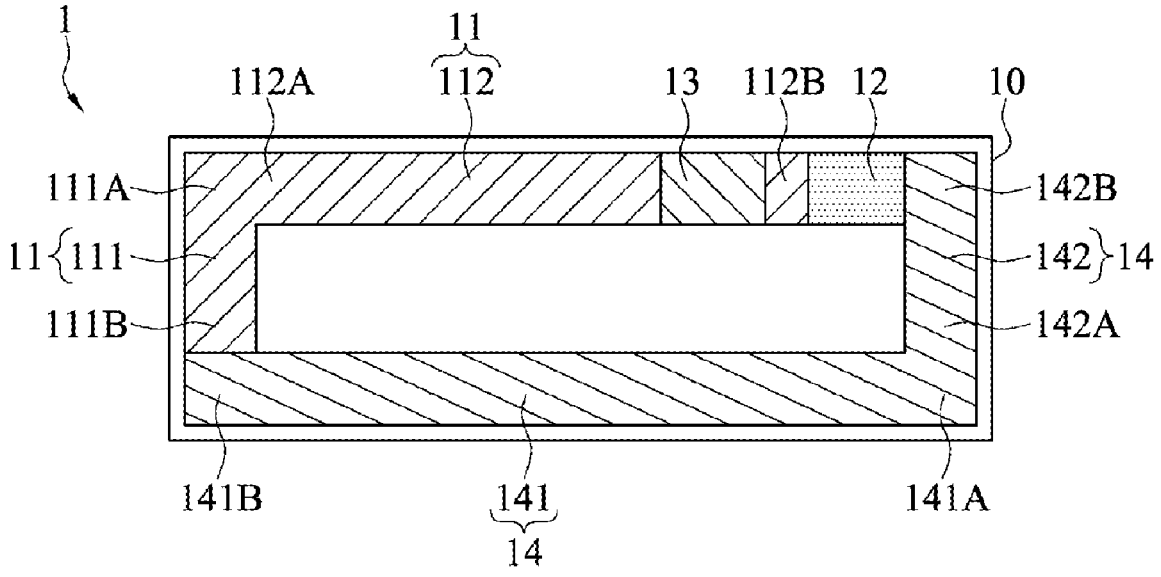
Publication Classification

(51) **Int. Cl.**
H01Q 7/00 (2006.01)
H01Q 5/328 (2006.01)

(52) **U.S. Cl.**
CPC ***H01Q 7/005*** (2013.01); ***H01Q 5/328*** (2015.01)

(57) **ABSTRACT**

The present disclosure provides a loop antenna, including a substrate, and a grounding portion, a radiating portion, a matching portion, and a feeding portion that are located on the substrate. The grounding portion includes a first grounding segment and a second grounding segment. The second grounding segment is perpendicular to the first grounding segment, and a first end of the second grounding segment is connected to a first end of the first grounding segment. The radiating portion includes a first radiating segment and a second radiating segment. The first radiating segment is connected to a second end of the first grounding segment and extending from the first grounding segment towards a direction away from the first grounding segment. The second radiating segment is connected to the first radiating segment and extending from the first radiating segment towards a direction facing the second grounding segment. The matching portion is located at an end of the second radiating segment close to the second grounding segment. The feeding portion is located between the end of the second radiating segment close to the second grounding segment, and is located between the matching portion and the second grounding segment to receive and transmit a feeding signal.



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(19) **United States**

(12) **Patent Application Publication**

(10) **Pub. No.: US 2019/0296438 A1**

(43) **Pub. Date: Sep. 26, 2019**

YEN et al.

(54) **MOBILE DEVICE**

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

(72) Inventors: **Ming-Ching YEN**, New Taipei City (TW); **Shih-Ting HUANG**, New Taipei City (TW); **Kun-Sheng CHANG**, New Taipei City (TW); **Ching-Chi LIN**, New Taipei City (TW)

(21) Appl. No.: **16/000,971**

(22) Filed: **Jun. 6, 2018**

(30) **Foreign Application Priority Data**

Mar. 26, 2018 (TW) 107110286

Publication Classification

(51) **Int. Cl.**

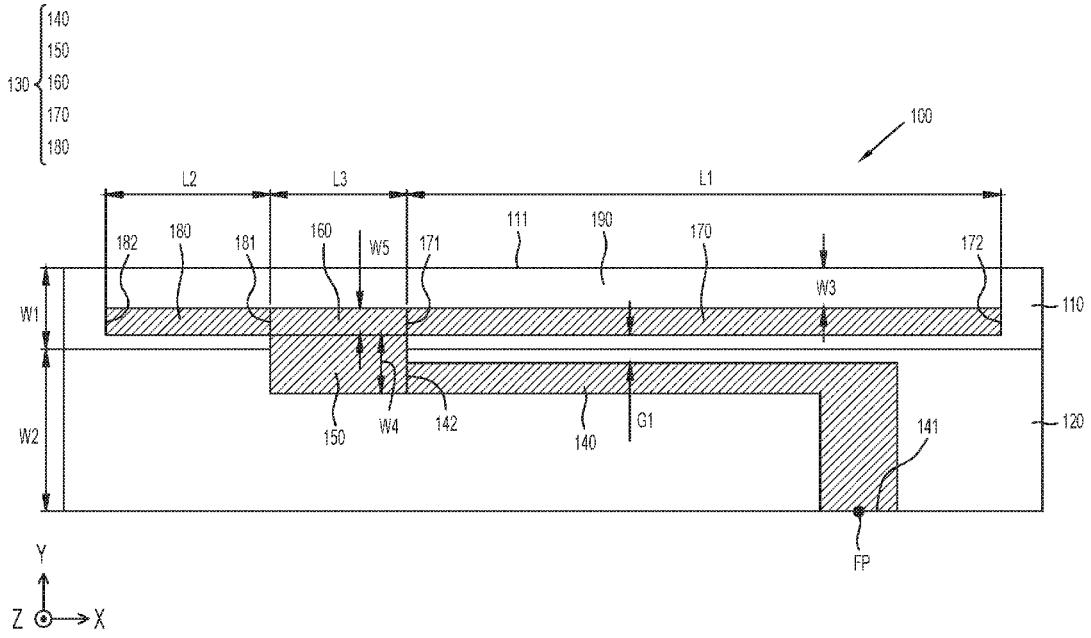
H01Q 5/50	(2006.01)
H01Q 1/38	(2006.01)
H01Q 1/22	(2006.01)

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

CPC ***H01Q 5/50*** (2015.01); ***H01Q 1/2266*** (2013.01); ***H01Q 1/38*** (2013.01)

(57) **ABSTRACT**

A mobile device includes a first nonconductive support member, a second nonconductive support member adjacent to, and lower than, the first nonconductive supporting member, and an antenna structure that includes a first radiating portion disposed on the first nonconductive support member, a second radiating portion disposed on the first nonconductive support member and extending in a direction opposite to the first radiating portion, a feeding element, and a connecting portion disposed on the first nonconductive support member and the second nonconductive support member that couples the first radiating portion and the second radiating portion to each other and to the feeding element, wherein the first nonconductive support member is part of a visible outside edge portion of the mobile device.



US 20190296446A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2019/0296446 A1**

TSENG et al. (43) **Pub. Date: Sep. 26, 2019**

(54) **ANTENNA STRUCTURE HAVING MULTIPLE OPERATING FREQUENCY BANDS**

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

(72) Inventors: **SHIH-HSIEN TSENG**, HSINCHU (TW); **CHENG-PANG CHANG**, HSINCHU (TW)

(21) Appl. No.: **16/208,604**

(22) Filed: **Dec. 4, 2018**

(30) **Foreign Application Priority Data**

Mar. 21, 2018 (TW) 107109659

Publication Classification

(51) **Int. Cl.**

H01Q 19/00 (2006.01)

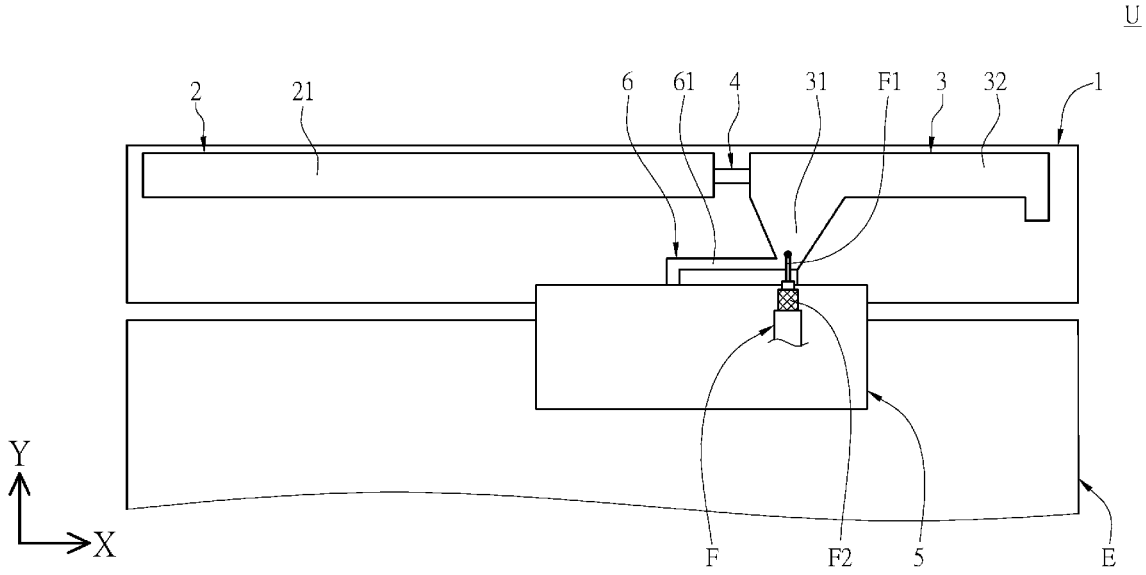
H01Q 7/00 (2006.01)

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

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

(57) **ABSTRACT**

An antenna structure includes a substrate, a first radiating element, a second radiating element, a first inductor, a ground element, a first conducting element and a feeding element. The first radiating element is disposed on the substrate. The second radiating element is disposed on the substrate. The second radiating element includes a feed receiving portion. The first inductor is coupled between the first radiating element and the second radiating element. The first conducting element is coupled between the feed receiving portion and the ground element. The feeding element is coupled between the feed receiving portion and the ground element and for feeding in a signal.



US 20190305403A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2019/0305403 A1**

WANG et al. (43) **Pub. Date: Oct. 3, 2019**

(54) **ELECTRONIC DEVICE, MOBILE TERMINAL AND ANTENNA ASSEMBLY**

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

(72) Inventors: **Xinbao WANG**, Dongguan (CN); **Ning Zhao**, Dongguan (CN); **Liang Gu**, Dongguan (CN); **Tianping Liang**, Dongguan (CN); **Yantao Li**, Dongguan (CN)

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

(21) Appl. No.: **16/265,499**

(22) Filed: **Feb. 1, 2019**

(30) **Foreign Application Priority Data**

Mar. 31, 2018 (CN) 201810278705.8
Mar. 31, 2018 (CN) 201810282842.9

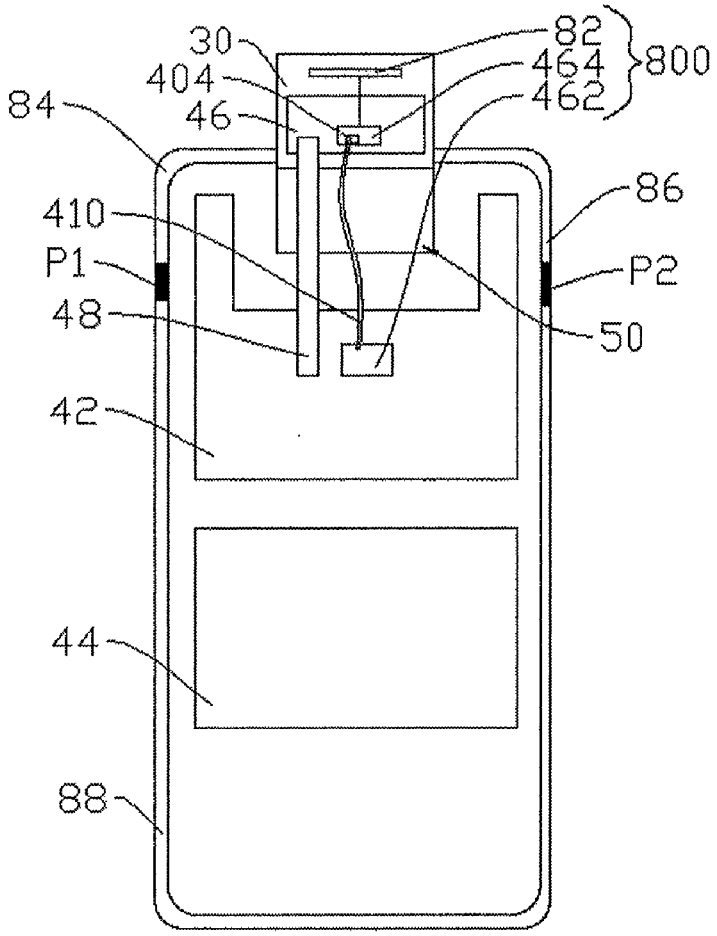
Publication Classification

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

(52) **U.S. Cl.**
CPC ***H01Q 1/243*** (2013.01); ***H04M 1/0264*** (2013.01); ***H04M 1/0237*** (2013.01)

(57) **ABSTRACT**

The present disclosure provides an electronic device, a mobile terminal and an antenna assembly. The electronic device includes: a case defining an accommodating groove; a movable support slidably connected to the case, and capable of moving out of or retracting into the accommodating groove; and a first antenna installed on the movable support. Since the first antenna may be ejected out of the accommodating groove along with the movable support, influence of other components disposed inside the electronic device on the first antenna may be reduced. Thus, the implementation of the present disclosure may improve antenna performance of the electronic device.



US 20190305404A1

(19) United States

(12) Patent Application Publication (10) Pub. No.: US 2019/0305404 A1

LI (43) Pub. Date: Oct. 3, 2019

(54) ELECTRONICAL DEVICE

(71) Applicant: **Lenovo (Beijing) Co., Ltd.**, Beijing (CN)

(72) Inventor: **Shichao LI**, Beijing (CN)

(21) Appl. No.: **16/370,876**

(22) Filed: **Mar. 29, 2019**

(30) **Foreign Application Priority Data**

Mar. 30, 2018 (CN) 201810298316.1

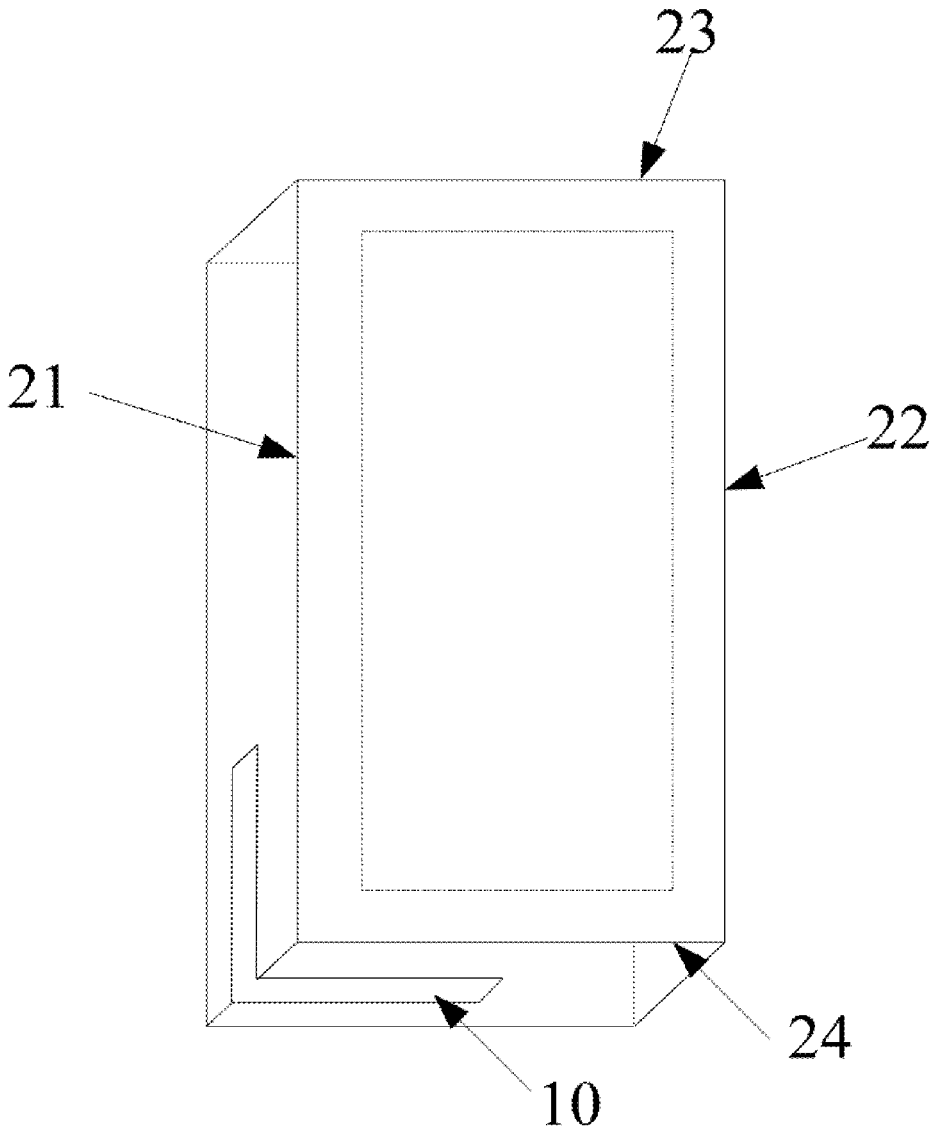
Publication Classification

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

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

(57) **ABSTRACT**

The present disclosure discloses an electronic device having a first slot disposed along a side surface of the electronic device; and a first metal portion disposed on the side surface corresponding to the first slot being used as a radiator of a first antenna of the electronic device.



US 20190305405A1

(19) United States

(12) Patent Application Publication (10) Pub. No.: US 2019/0305405 A1

IM et al. (43) Pub. Date: Oct. 3, 2019

(54) **COMMUNICATION DEVICE AND ELECTRONIC DEVICE**

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

(72) Inventors: **Hoyoung IM**, Gyeonggi-do (KR); **Seunggil JEON**, Gyeonggi-do (KR)

(21) Appl. No.: **16/372,684**

(22) Filed: **Apr. 2, 2019**

(30) **Foreign Application Priority Data**

Apr. 3, 2018 (KR) 10-2018-0038436

Publication Classification

(51) **Int. Cl.**

H01Q 1/24 (2006.01)

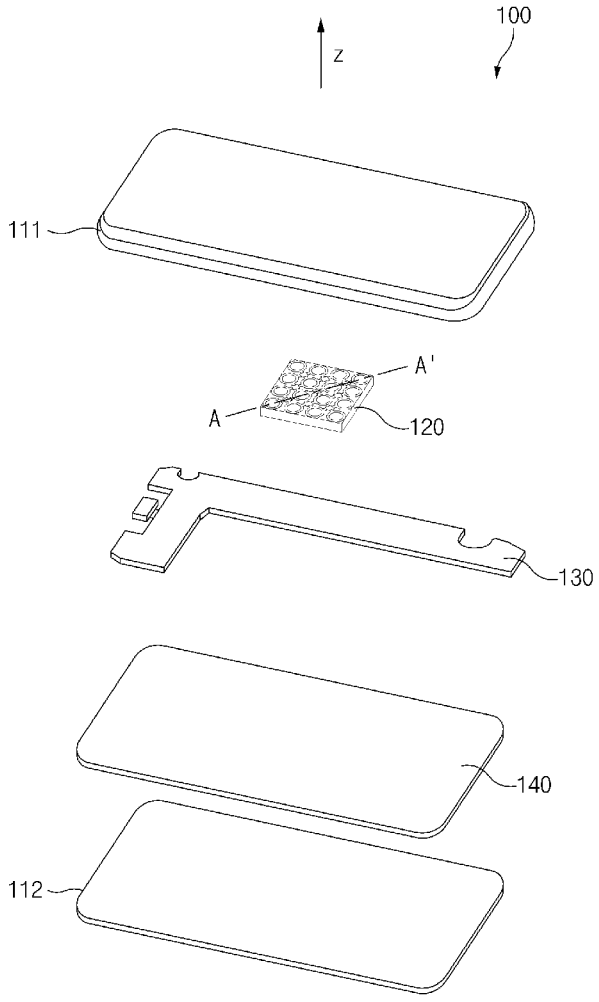
H01Q 9/04 (2006.01)

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

CPC ***H01Q 1/243*** (2013.01); ***H01Q 9/0407*** (2013.01)

(57) **ABSTRACT**

An electronic device according to an embodiment disclosed in the disclosure includes a rear cover, a cover glass that faces the rear cover, and a communication device disposed between the rear cover and the cover glass. The communication device includes a printed circuit board including a first surface, a second surface and a side surface that surrounds a space between the first surface and the second surface, a communication circuit disposed in the printed circuit board or on the first surface, and at least one antenna unit disposed in the printed circuit board or on the second surface.



US 20190305824A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2019/0305824 A1**

ANTONETTI (43) **Pub. Date: Oct. 3, 2019**

(54) **NFC ANTENNA IN A MOBILE DEVICE**

(71) Applicant: **STMicroelectronics Austria GmbH**, Graz (AT)

(72) Inventor: **Francesco ANTONETTI**, Graz (AT)

(73) Assignee: **STMicroelectronics Austria GmbH**, Graz (AT)

(21) Appl. No.: **16/371,622**

(22) Filed: **Apr. 1, 2019**

(30) **Foreign Application Priority Data**

Apr. 3, 2018 (EP) 18165496.3

Publication Classification

(51) **Int. Cl.**

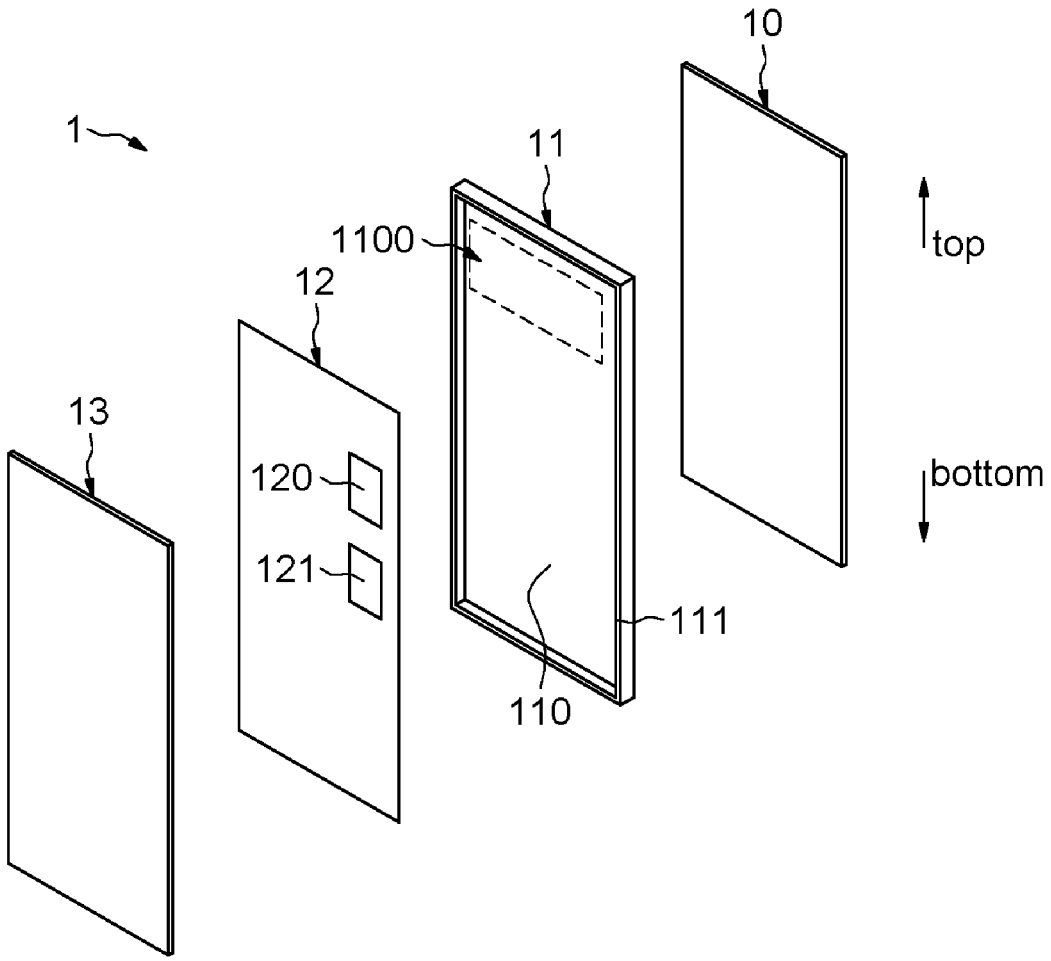
H04B 5/00 (2006.01)
H01Q 1/38 (2006.01)
H01Q 7/00 (2006.01)

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

CPC ***H04B 5/0031*** (2013.01); ***H01Q 1/38*** (2013.01); ***H01Q 7/00*** (2013.01); *H01Q 1/243* (2013.01); ***H04B 5/0081*** (2013.01); ***H04B 5/0087*** (2013.01); ***H04B 5/0056*** (2013.01)

(57) **ABSTRACT**

An electronic device includes a back cover, a display, a middle frame sandwiched between the display and the back cover, and a near field communications (NFC) antenna incorporated within the middle frame. An electronic board is positioned within the middle frame, and includes an NFC controller and a matching network coupled to the NFC controller. The matching network is configured to match impedances between the NFC antenna and the NFC controller.



US 20190312333A1

(19) **United States**

(12) **Patent Application Publication**

KIM et al.

(10) **Pub. No.: US 2019/0312333 A1**

(43) **Pub. Date: Oct. 10, 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); **Yeomin YOUN**, Seoul (KR); **Jihun HA**, Seoul (KR)

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

(21) Appl. No.: **16/020,925**

(22) Filed: **Jun. 27, 2018**

Related U.S. Application Data

(60) Provisional application No. 62/653,548, filed on Apr. 5, 2018.

(30) **Foreign Application Priority Data**

May 3, 2018 (KR) 10-2018-0051313

Publication Classification

(51) **Int. Cl.**

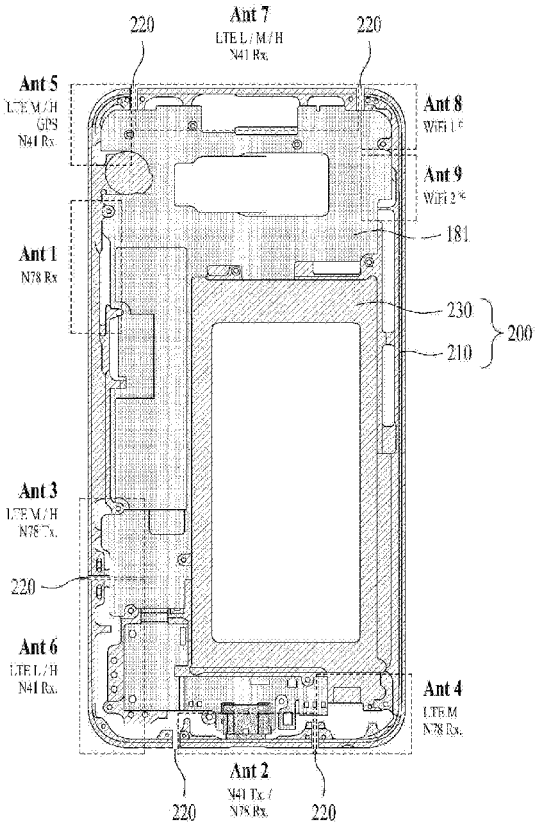
H01Q 1/24	(2006.01)
H01Q 21/30	(2006.01)
H04B 1/401	(2006.01)
H04M 1/02	(2006.01)
H01Q 13/10	(2006.01)

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

CPC ***H01Q 1/242*** (2013.01); ***H01Q 21/30*** (2013.01); ***H01Q 13/10*** (2013.01); ***H04M 1/0266*** (2013.01); ***H04B 1/401*** (2013.01)

(57) **ABSTRACT**

A mobile terminal is provided including a display unit; a middle frame including a supporting unit that supports a rear surface of the display unit with a side portion around the supporting portion; a main board at a rear surface of the middle frame including a ground; a first wireless communication unit in the main board to transceive a first signal; a second wireless communication unit in the main board to transceive a second signal; and a rear case covering a rear surface of the main board, where the side portion includes a plurality of conductive members with ends divided into slits and the plurality of the conductive members includes a common antenna electrically connectable with the first and second wireless communication units to receive the first and second signals such that the mobile terminal receives different signals with antennas for LTE and 5G communication arranged in a limited space.



US 20190312334A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2019/0312334 A1**

SHIN et al. (43) **Pub. Date: Oct. 10, 2019**

(54) **MOBILE TERMINAL**

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

(72) Inventors: **Minchul SHIN**, Seoul (KR); **Dongjun CHOI**, Seoul (KR); **Hangseok KIM**, Seoul (KR)

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

(21) Appl. No.: **16/047,849**

(22) Filed: **Jul. 27, 2018**

Related U.S. Application Data

(60) Provisional application No. 62/655,218, filed on Apr. 9, 2018.

(30) **Foreign Application Priority Data**

May 2, 2018 (KR) 10-2018-0050825

Publication Classification

(51) **Int. Cl.**

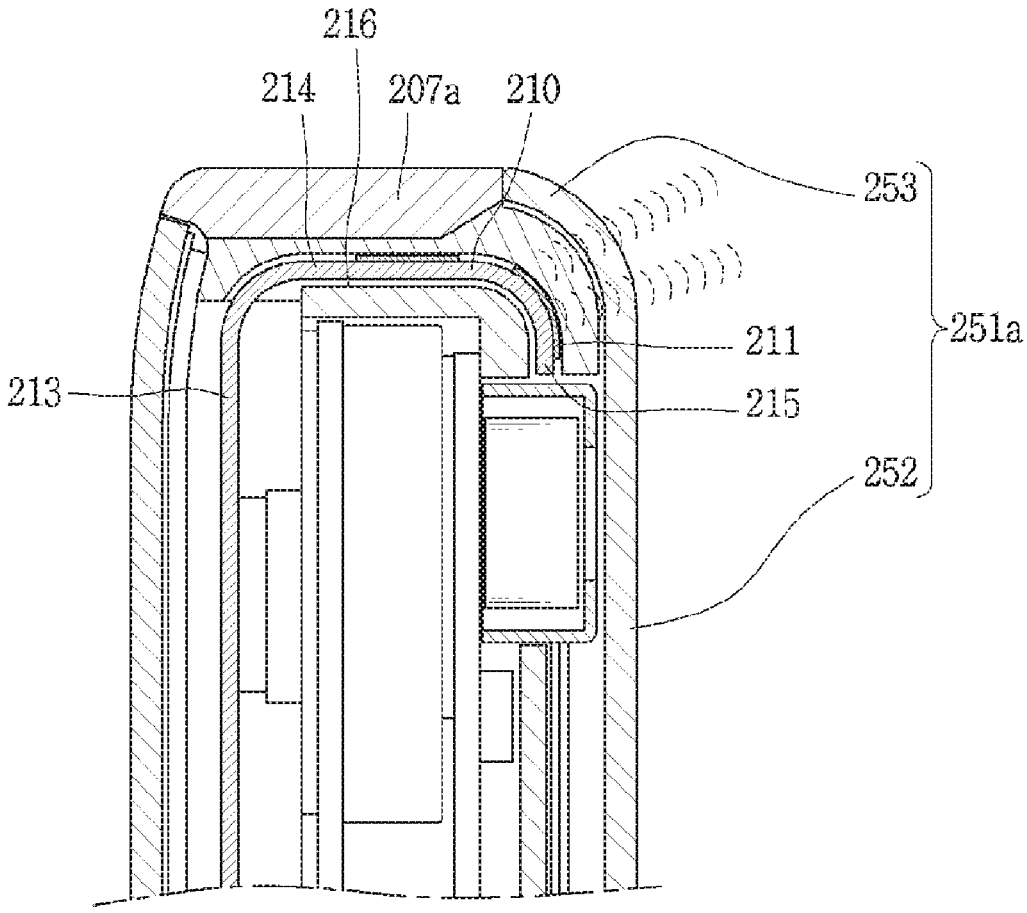
H01Q 1/24	(2006.01)
H04M 1/02	(2006.01)
H01Q 21/06	(2006.01)

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

CPC ***H01Q 1/242*** (2013.01); ***H01Q 21/065*** (2013.01); ***H04M 1/0202*** (2013.01)

(57) **ABSTRACT**

A mobile terminal having a front surface, a rear surface, and side surfaces includes a cover glass allowing an electromagnetic wave to be transmitted therethrough, a case having a metal rim forming an appearance of the top or the bottom of the mobile terminal, and an antenna having a plurality of arrayed antenna patterns to radiate a beamformed transmission signal, wherein the antenna is disposed such that at least a portion thereof is adjacent to the metal rim, and the cover glass includes a planar portion disposed on the front surface or the rear surface and a bent portion bent from at least one end of the planar portion such that the transmission signal is radiated through the cover glass.



US 20190312960A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2019/0312960 A1**

HWANG et al. (43) **Pub. Date: Oct. 10, 2019**

(54) **MOBILE TERMINAL**

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

(72) Inventors: **Kyoungsun HWANG**, Seoul (KR); **Moonsoo SONG**, Seoul (KR); **Yoonjae WON**, Seoul (KR); **Deuksu CHOI**, Seoul (KR); **Chisang YOU**, Seoul (KR)

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

(21) Appl. No.: **16/383,399**

(22) Filed: **Apr. 12, 2019**

Related U.S. Application Data

(63) Continuation of application No. 16/022,512, filed on Jun. 28, 2018, now Pat. No. 10,306,029.

(60) Provisional application No. 62/653,550, filed on Apr. 5, 2018.

(30) **Foreign Application Priority Data**

May 3, 2018 (KR) 10-2018-0051314

Publication Classification

(51) **Int. Cl.**

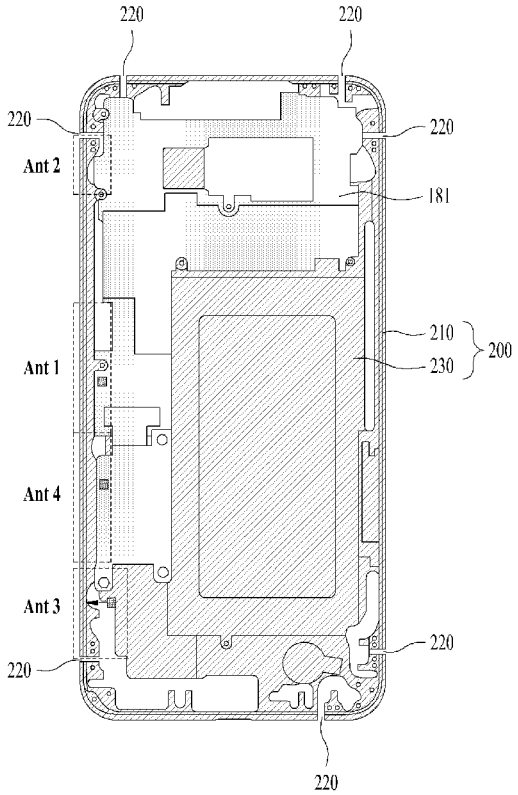
H04M 1/02	(2006.01)
H04B 1/3827	(2006.01)
H01Q 13/10	(2006.01)
H01Q 1/24	(2006.01)

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

CPC ***H04M 1/0202*** (2013.01); ***H04B 1/3833*** (2013.01); *H04W 88/02* (2013.01); ***H01Q 1/243*** (2013.01); ***H01Q 13/10*** (2013.01)

(57) **ABSTRACT**

There is disclosed a mobile terminal including: a display; a middle frame including a supporting portion and a side portion provided around the supporting portion to define a lateral external appearance; a main board including a ground; a first wireless communication unit configured to transceive a first signal; a second wireless communication unit configured to transceive a second signal; and a rear case configured to cover a rear surface of the main board, wherein the side portion includes a plurality of conductive members of which ends are divided into slits, and the plurality of the conductive members includes a common antenna electrically connectable with the first wireless communication unit and the second wireless communication unit and configured to receive the first signal and the second signal; and an independent antenna electrically connectable with the first wireless communication unit and configured to receive the first signal.



US 20190319342A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2019/0319342 A1**

Apostolos et al. (43) **Pub. Date: Oct. 17, 2019**

(54) **SUPER DIRECTIVE ARRAY OF VOLUMETRIC ANTENNA ELEMENTS FOR WIRELESS DEVICE APPLICATIONS**

(71) Applicant: **AMI Research & Development, LLC**, Windham, NH (US)

(72) Inventors: **John T. Apostolos**, Lyndeborough, NH (US); **William Mouyos**, Windham, NH (US)

(21) Appl. No.: **16/161,177**

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

Related U.S. Application Data

(63) Continuation of application No. 15/362,988, filed on Nov. 29, 2016, now Pat. No. 10,135,122.

Publication Classification

(51) **Int. Cl.**

H01Q 1/24	(2006.01)
H01Q 25/00	(2006.01)
H01Q 21/28	(2006.01)
H01Q 21/26	(2006.01)
H01Q 21/24	(2006.01)
H01Q 5/48	(2006.01)
H01Q 21/08	(2006.01)
H01Q 19/00	(2006.01)
H01Q 1/22	(2006.01)
H01Q 1/36	(2006.01)
H01Q 21/20	(2006.01)

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

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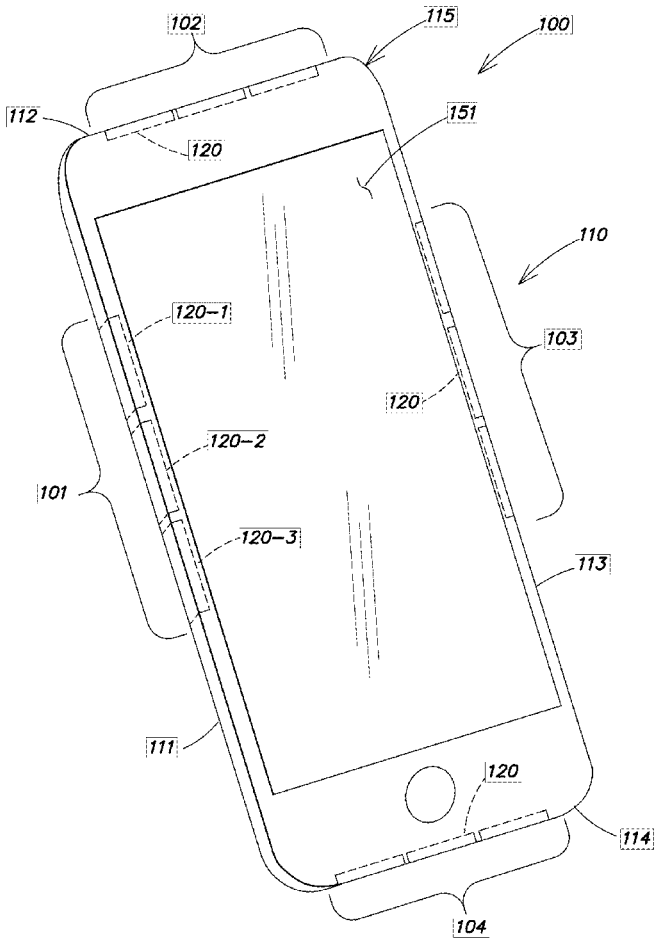
(57) **ABSTRACT**

Antenna arrays that use volumetric elements to provide directive radiation over multiple frequencies, multiple polarizations, and/or operate in modes that reduce unnecessary radiation into a nearby human body. The arrays are particularly adapted for use with handheld wireless devices, such as smartphones, tablets, and cellular phones.



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(54) **CIRCUIT BOARD ANTENNA STRUCTURES AND SYSTEMS**

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(57) **ABSTRACT**

Circuit board antenna structures and systems are described herein. One circuit board antenna structure, includes a circuit board, a u-shaped antenna body having a first elongate portion and a second elongate portion separated by a short portion and arranged such that the first elongate portion is positioned closer to the circuit board, the second elongate portion being longer than the first elongate portion and having a feeding probe extending from the second elongate portion and attached to the circuit board, and the second elongate portion also having a grounding probe extending from the second elongate portion and attached to the circuit board.