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(19) **United States**

(12) **Patent Application Publication**
ANGUERA PROS et al.

(10) **Pub. No.: US 2017/0214137 A1**

(43) **Pub. Date: Jul. 27, 2017**

(54) **MULTI-STRUCTURE ANTENNA FOR
MULTIBAND OPERATION**

(71) Applicant: **Fractus Antennas, S.L.**, Barcelona
(ES)

(72) Inventors: **Jaume ANGUERA PROS**, Vinaros
(ES); **Aurora ANDUJAR LINARES**,
Barcelona (ES)

(21) Appl. No.: **15/415,557**

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

Related U.S. Application Data

(60) Provisional application No. 62/286,469, filed on Jan.
25, 2016.

Publication Classification

(51) **Int. Cl.**

H01Q 5/50 (2006.01)

H01Q 1/48 (2006.01)

H01Q 1/24 (2006.01)

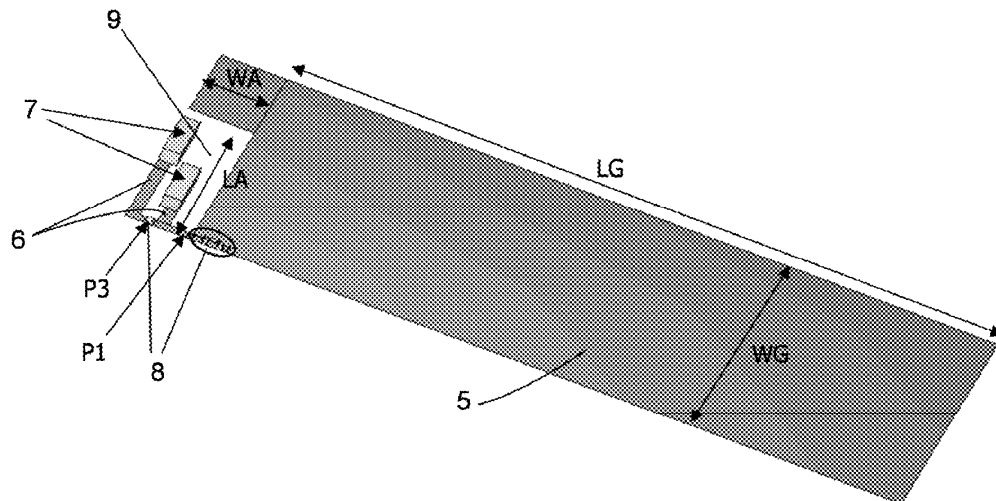
(52) **U.S. Cl.**

CPC **H01Q 5/50** (2015.01); **H01Q 1/241**
(2013.01); **H01Q 1/48** (2013.01)

(57)

ABSTRACT

A wireless device operates in multiple frequency bands via a multi-structure arrangement that optimizes the electromagnetic performance at each frequency range of operation. The device includes a radiating system comprising a ground plane layer, a multi-structure antenna system that comprises at least two structural branches and at least a radiation booster, and a radiofrequency system. The radiofrequency system comprises an element inserted in the branch structure, connected at a point within the structure. The radiofrequency system may include an additional matching network that fine tunes the impedance of the device to match all the frequency ranges of operation.





US 20170214143A1

(19) **United States**(12) **Patent Application Publication**
Choi et al.(10) **Pub. No.: US 2017/0214143 A1**(43) **Pub. Date: Jul. 27, 2017**(54) **ANTENNA RADIATOR, ANTENNA AND
MOBILE TERMINAL**(71) Applicant: **BYD COMPANY LIMITED,**
Shenzhen, Guangdong (CN)(72) Inventors: **Munyong Choi,** Shenzhen (CN);
Mingqian Shao, Shenzhen (CN); **Wei
Zhao,** Shenzhen (CN)(73) Assignee: **BYD COMPANY LIMITED,**
Shenzhen, Guangdong (CN)(21) Appl. No.: **15/328,802**(22) PCT Filed: **Mar. 25, 2015**(86) PCT No.: **PCT/CN2015/075074**

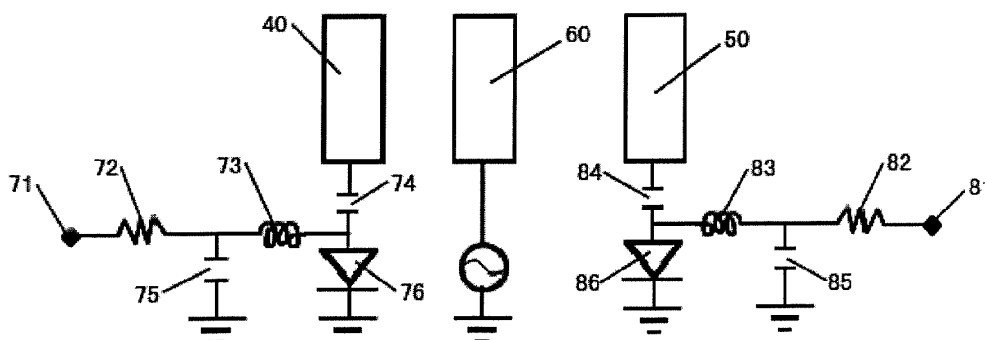
§ 371 (c)(1),

(2) Date: **Jan. 24, 2017**(30) **Foreign Application Priority Data**

Aug. 7, 2014 (CN) 201420445855.0

Publication Classification(51) **Int. Cl.****H01Q 13/16** (2006.01)**H01Q 1/48** (2006.01)**H01Q 1/24** (2006.01)**H01Q 9/04** (2006.01)(52) **U.S. Cl.**CPC **H01Q 13/16** (2013.01); **H01Q 9/0421**
(2013.01); **H01Q 1/48** (2013.01); **H01Q 1/243**
(2013.01)(57) **ABSTRACT**

An antenna comprises: a circuit board; an antenna radiator, wherein the antenna radiator is provided with a first gap, a second gap, a first grounding piece, a second grounding piece and a feed piece, the first gap and the second gap forming a first inverted-F antenna connected to the first grounding piece and a second inverted-F antenna connected to the second grounding piece on the antenna radiator, and the feed piece being respectively connected to the first inverted-F antenna and the second inverted-F antenna; and an antenna frequency reconstruction system, wherein the antenna frequency reconstruction system is provided on the circuit board, the antenna frequency reconstruction system is respectively connected to the first grounding piece and the second grounding piece and is grounded, and the antenna frequency reconstruction system switches one of the first grounding piece and the second grounding piece to be grounded. Also provided are an antenna radiator and a mobile terminal.





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(19) **United States**

(12) **Patent Application Publication**
ANDUJAR LINARES et al.

(10) **Pub. No.: US 2017/0214776 A1**

(43) **Pub. Date: Jul. 27, 2017**

(54) **WIRELESS DEVICE INCLUDING
OPTIMIZED ANTENNA SYSTEM ON METAL
FRAME**

(71) Applicant: **Fractus Antennas, S.L.**, Barcelona
(ES)

(72) Inventors: **Aurora ANDUJAR LINARES**,
Barcelona (ES); **Yolanda COBO**,
Barcelona (ES); **Jaume ANGUERA**
PROS, Vinaros (ES)

(21) Appl. No.: **15/411,414**

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

Related U.S. Application Data

(60) Provisional application No. 62/281,749, filed on Jan.
22, 2016.

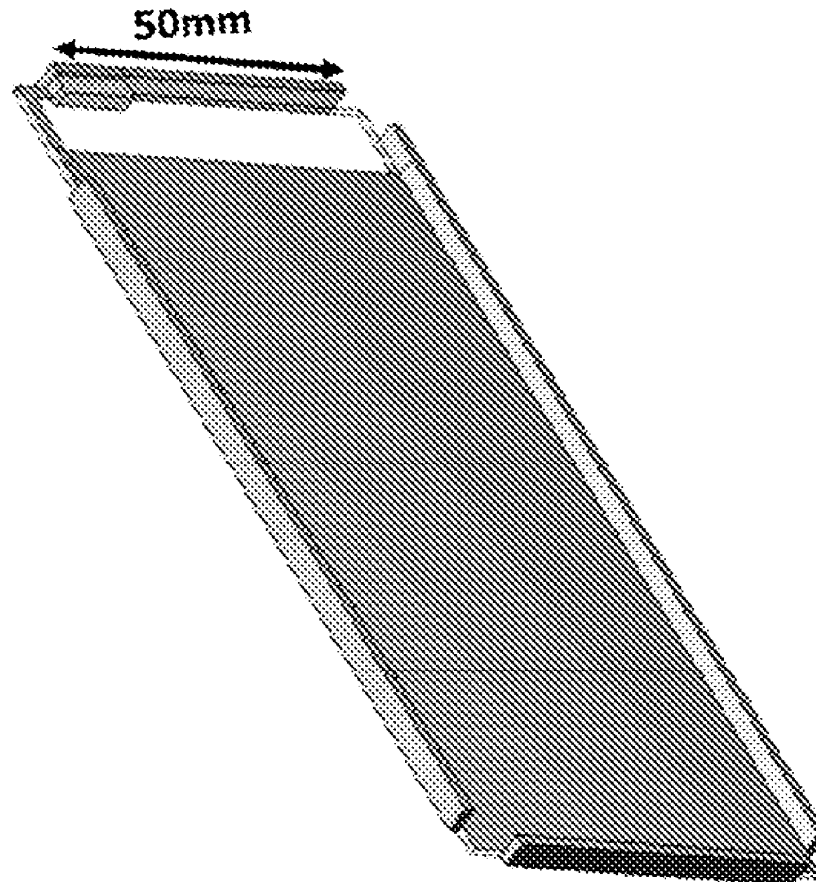
Publication Classification

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

(52) **U.S. Cl.**
CPC **H04M 1/026** (2013.01)

(57) **ABSTRACT**

A wireless device such as a mobile device comprises a metal frame antenna (MFA) solution developed to cover the multiple range of frequencies required in the wireless device. An MFA includes a ground plane layer, at least a single-strip metal frame element spaced apart from an edge of the ground plane layer, and at least a feeding system that connects the at least one single-strip metal frame element to an RF transceiver of the wireless device.





US 20170222305A1

(19) **United States**

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

(10) **Pub. No.: US 2017/0222305 A1**

(43) **Pub. Date: Aug. 3, 2017**

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

Publication Classification

(71) Applicant: **Beijing Xiaomi Mobile Software Co., Ltd.**, Beijing (CN)

(51) **Int. Cl.**
H01Q 1/24 (2006.01)
H01Q 1/38 (2006.01)
H01Q 13/10 (2006.01)

(72) Inventors: **Wendong LIU**, Beijing (CN); **Wei KUANG**, Beijing (CN); **Xu ZHANG**, Beijing (CN)

(52) **U.S. Cl.**
CPC **H01Q 1/243** (2013.01); **H01Q 13/10** (2013.01); **H01Q 1/38** (2013.01)

(73) Assignee: **Beijing Xiaomi Mobile Software Co., Ltd.**, Beijing (CN)

(57) **ABSTRACT**

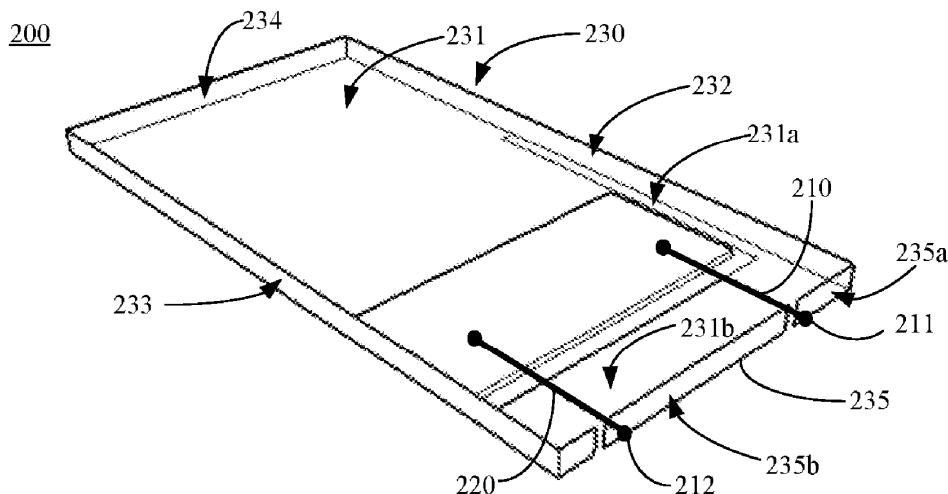
The present disclosure relates to an antenna assembly and an electronic device in the field of antennas. The antenna assembly includes: a first antenna, a second antenna and a metal frame. The metal frame includes: a metal plate; and a first side frame, a second side frame, a top frame and a bottom frame which enclose the metal plate. The first antenna is connected to a first radiation part of the bottom frame via a first connection point, the first radiation part being connected to the first side frame which is separated from the metal plate by a slot. The second antenna is connected to a second radiation part of the bottom frame via a second connection point, the second radiation part being disconnected from the first radiation part and the second side frame.

(21) Appl. No.: **15/414,943**

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

(30) **Foreign Application Priority Data**

Jan. 29, 2016 (CN) 201610064948.2





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(19) **United States**

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

(10) **Pub. No.: US 2017/0229759 A1**

(43) **Pub. Date: Aug. 10, 2017**

(54) **ANTENNA MODULE**

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

(72) Inventors: **Chien-Yi WU**, TAIPEI CITY (TW);
Ya-Jyun LI, TAIPEI CITY (TW);
Chao-Hsu WU, TAIPEI CITY (TW);
Shih-Keng HUANG, TAIPEI CITY
(TW); **Cheng-Hsiung WU**, TAIPEI
CITY (TW)

(21) Appl. No.: **15/401,110**

(22) Filed: **Jan. 9, 2017**

(30) **Foreign Application Priority Data**

Feb. 5, 2016 (TW) 105104106

Publication Classification

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

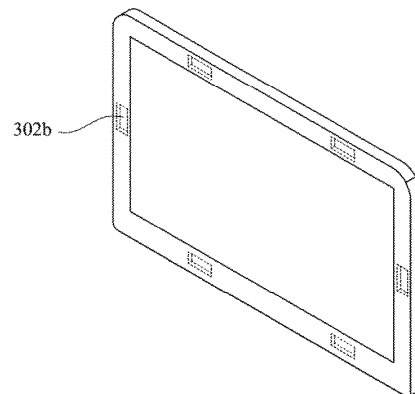
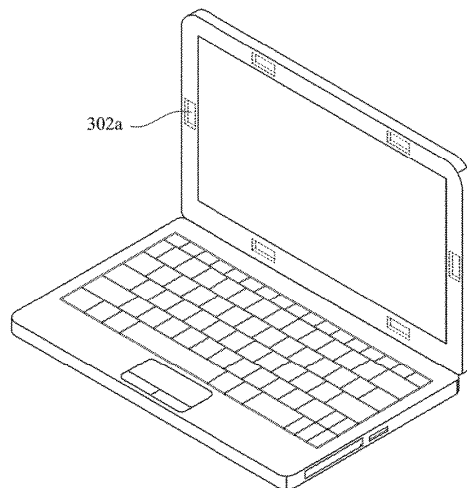
(52) **U.S. Cl.**

CPC **H01Q 1/2266** (2013.01); **H01Q 1/48**
(2013.01)

(57)

ABSTRACT

An antenna module connected to a system ground of an electronic device includes a substrate, a coaxial-transmission line, a first radiator and a second radiator. The coaxial-transmission line includes a power feed-in terminal and a ground terminal. The first radiator is electrically connected to the power feed-in terminal. The second radiator is electrically connected to the ground terminal. One side of the second radiator is connected to the system ground, and the second radiator includes a first terminal and a second terminal. An opening is formed between the first terminal and the second terminal, so that the second radiator be partially surrounding to the first radiator. The first radiator and the second radiator are coplanarly disposed on the substrate.





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(19) **United States**

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

(10) **Pub. No.: US 2017/0229762 A1**

(43) **Pub. Date: Aug. 10, 2017**

(54) **MOBILE COMPUTING DEVICE ANTENNA**

Publication Classification

(71) Applicant: **HEWLETT-PACKARD
DEVELOPMENT COMPANY, LP,**
HOUSTON, TX (US)

(51) **Int. Cl.**
H01Q 1/24 (2006.01)
G01S 3/06 (2006.01)
G01S 3/08 (2006.01)
H01Q 9/42 (2006.01)

(72) Inventors: **TIANJI ZHENG, SAN DIEGO, CA**
(US); **MINJIA XU, SANTA CLARA,**
CA (US)

(52) **U.S. Cl.**
CPC **H01Q 1/243** (2013.01); **H01Q 9/42**
(2013.01); **G01S 3/065** (2013.01); **G01S 3/085**
(2013.01); **H01Q 1/48** (2013.01)

(21) Appl. No.: **15/501,225**

(22) PCT Filed: **Oct. 24, 2014**

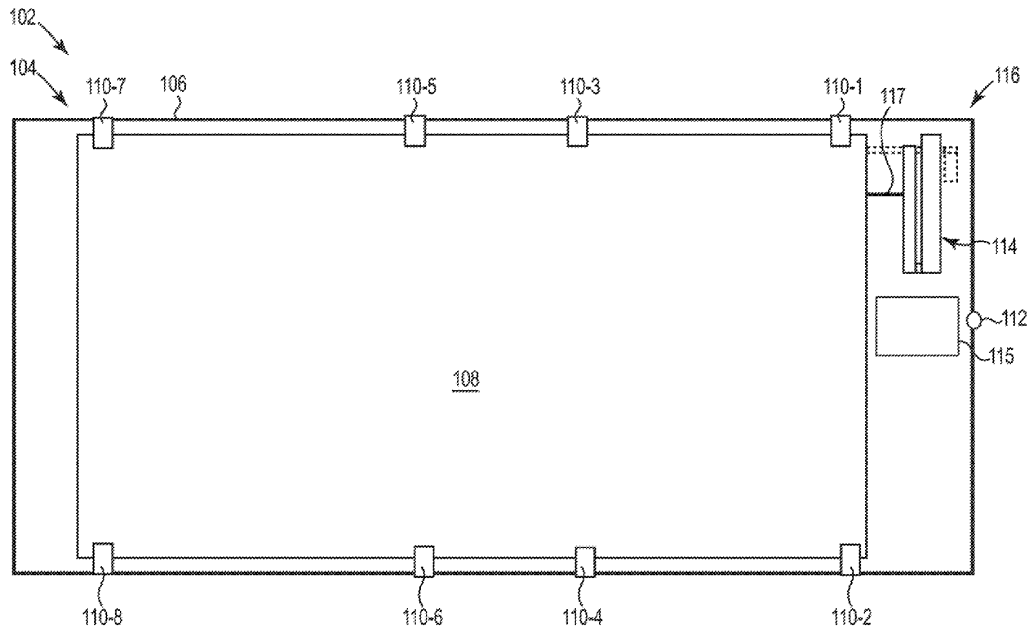
(86) PCT No.: **PCT/US2014/062156**

§ 371 (c)(1),

(2) Date: **Feb. 2, 2017**

(57) **ABSTRACT**

A mobile computing device antenna according to one example includes a folded monopole element, a ground plane coupled to the folded monopole element by an antenna feed, a parasitic element that couples the folded monopole element to the ground plane, and a metal frame that encompasses the folded monopole element, the ground plane, and the parasitic element, where the metal frame is coupled to the ground plane by a plurality of ground points.





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(19) **United States**

(12) **Patent Application Publication**
Wang

(10) **Pub. No.: US 2017/0229776 A1**

(43) **Pub. Date: Aug. 10, 2017**

(54) **PRINTED CIRCUIT BOARD ANTENNA AND
TERMINAL**

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

(72) Inventor: **Hanyang Wang**, Shenzhen (CN)

(21) Appl. No.: **15/461,297**

(22) Filed: **Mar. 16, 2017**

Related U.S. Application Data

(63) Continuation of application No. 14/517,418, filed on
Oct. 17, 2014, now Pat. No. 9,666,951, which is a
continuation of application No. PCT/CN2013/
081193, filed on Aug. 9, 2013.

Publication Classification

(51) **Int. Cl.**
H01Q 5/357 (2006.01)
H01Q 1/24 (2006.01)
H01Q 1/38 (2006.01)
H01Q 7/00 (2006.01)

H01Q 9/04 (2006.01)

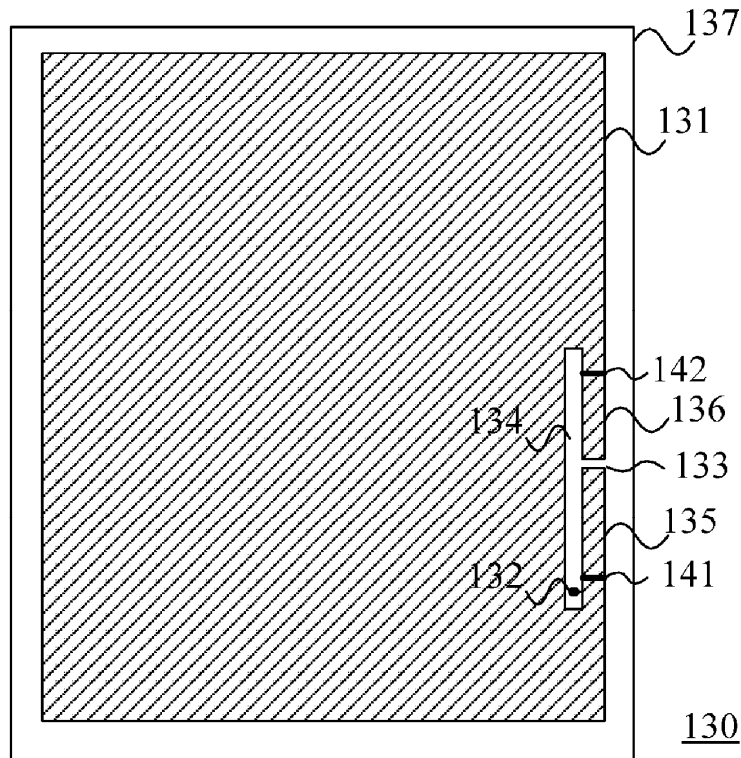
H01Q 21/30 (2006.01)

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

CPC **H01Q 5/357** (2015.01); **H01Q 9/0421**
(2013.01); **H01Q 21/30** (2013.01); **H01Q 1/38**
(2013.01); **H01Q 7/00** (2013.01); **H01Q 7/005**
(2013.01); **H01Q 1/242** (2013.01)

(57) **ABSTRACT**

A printed circuit board antenna includes a printed circuit board and a feedpoint that is disposed on the printed circuit board. A copper coating is disposed on the printed circuit board. A split is disposed on the copper coating on the printed circuit board. The split is connected to a board edge of the printed circuit board. A slot perpendicular to the split is disposed on the copper coating on the printed circuit board. The slot is connected to the split. The copper coating at two sides of the split forms a first antenna and a second antenna. The feedpoint is configured to, together with the first antenna and the second antenna, form a first resonance loop and a second resonance loop. Resonance frequencies of the first resonance loop and the second resonance loop are different.





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(19) **United States**

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

(10) **Pub. No.: US 2017/0230073 A1**

(43) **Pub. Date: Aug. 10, 2017**

(54) **MOBILE TERMINAL**

Publication Classification

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

(51) **Int. Cl.**
H04B 1/3888 (2006.01)
H01Q 1/44 (2006.01)
H04M 1/18 (2006.01)
H01Q 5/30 (2006.01)
H04M 1/02 (2006.01)
H01Q 1/24 (2006.01)

(72) Inventors: **Yeomin YOUN**, Seoul (KR); **Jaehyun CHOI**, Seoul (KR); **Jungsun AHN**, Seoul (KR); **Changil KIM**, Seoul (KR); **Kangjae JUNG**, Seoul (KR)

(52) **U.S. Cl.**
CPC **H04B 1/3888** (2013.01); **H04M 1/0202** (2013.01); **H01Q 1/243** (2013.01); **H04M 1/18** (2013.01); **H01Q 5/30** (2015.01); **H01Q 1/44** (2013.01); **H04B 2001/3894** (2013.01)

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

(21) Appl. No.: **15/498,210**

(57) **ABSTRACT**

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

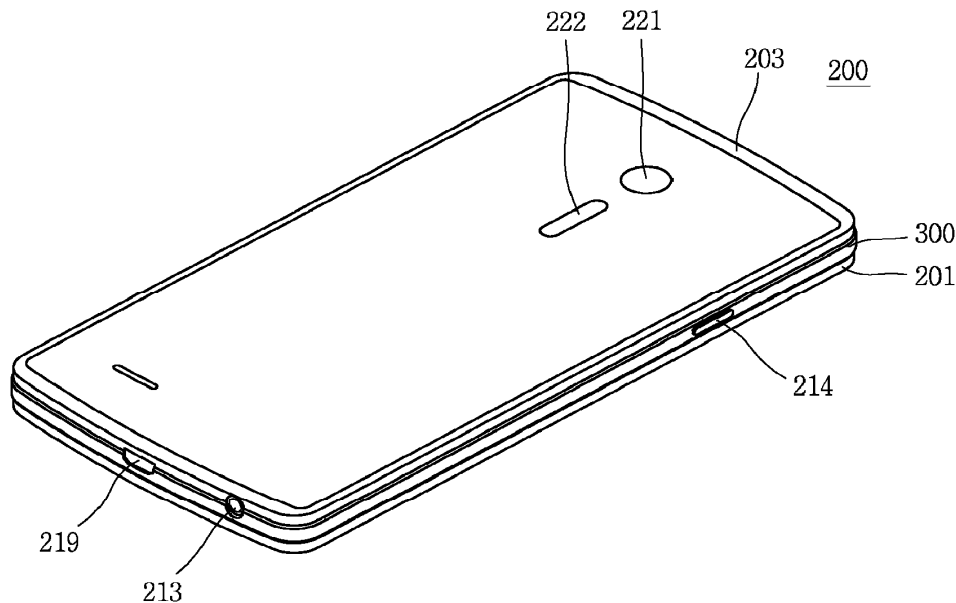
A mobile terminal includes a metal frame including a base portion and an edge portion formed along the outer edge of the base portion, first and second cases bonded to the front and back sides of the metal frame so as to expose the edge portion to the outside, first and second waterproof layers formed between the cases and the metal frame, conductive members that operate a radiator for antennas, together with the edge portion, and are formed on one side of the second case, and feeding portions for feeding the conductive members, the feeding portions being disposed in an enclosed space formed by the waterproof layers.

Related U.S. Application Data

(63) Continuation of application No. 14/480,149, filed on Sep. 8, 2014, now Pat. No. 9,680,206.

(30) **Foreign Application Priority Data**

Dec. 3, 2013 (KR) 10-2013-0149413





US 20170237150A1

(19) **United States**

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

(10) **Pub. No.: US 2017/0237150 A1**

(43) **Pub. Date: Aug. 17, 2017**

(54) **ELECTRONIC DEVICE INCLUDING ANTENNA**

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

(72) Inventors: **Minho SOH**, Suwon-si (KR); **Sangmin JUNG**, Anyang-si (KR); **Gwangun OH**, Suwon-si (KR)

(21) Appl. No.: **15/427,429**

(22) Filed: **Feb. 8, 2017**

(30) **Foreign Application Priority Data**

Feb. 17, 2016 (KR) 10-2016-0018443

Publication Classification

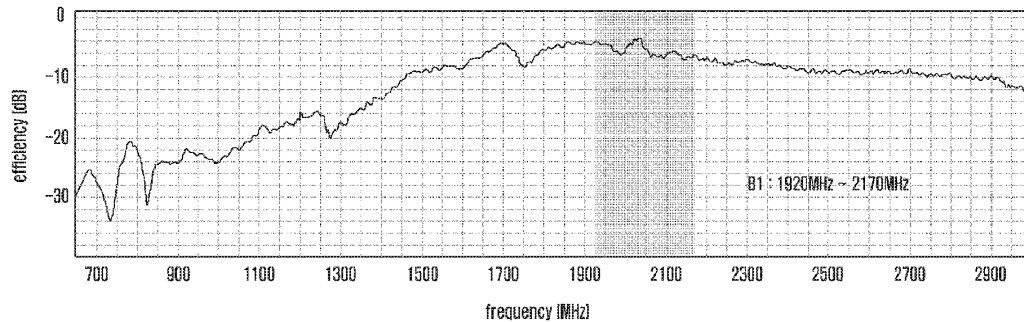
(51) **Int. Cl.**
H01Q 1/24 (2006.01)
H01Q 1/38 (2006.01)
H01Q 5/30 (2006.01)

(52) **U.S. CL.**

CPC **H01Q 1/243** (2013.01); **H01Q 5/30**
(2015.01); **H01Q 1/38** (2013.01)

(57) **ABSTRACT**

An electronic device including an antenna is provided. The electronic device includes a housing, a radio frequency (RF) circuit located within the housing and configured to output a first RF signal and a second RF signal, at least one processor located within the housing and configured to electrically connect to the RF circuit, a first radiating body electrically connected to the RF circuit, a second radiating body electrically connected to the first radiating body, and an RF switch located within the housing and electrically connected to the processor and the second radiating body, wherein the at least one processor is further configured to control the RF switch to emit at least one of the first RF signal and the second RF signal output from the RF circuit to at least one of the first radiating body and the second radiating body.





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(19) **United States**

(12) **Patent Application Publication**
Wu

(10) **Pub. No.: US 2017/0237166 A1**

(43) **Pub. Date: Aug. 17, 2017**

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

(52) **U.S. CL.**

CPC **H01Q 5/307** (2015.01); **H01Q 1/241**
(2013.01); **H01Q 9/0414** (2013.01)

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

(72) Inventor: **Jian Rong Wu**, New Taipei City (TW)

(21) Appl. No.: **15/177,278**

(22) Filed: **Jun. 8, 2016**

(30) **Foreign Application Priority Data**

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Publication Classification

(51) **Int. Cl.**

H01Q 5/307 (2006.01)

H01Q 9/04 (2006.01)

H01Q 1/24 (2006.01)

(57) **ABSTRACT**

An antenna is provided. The antenna includes a first radiator, a second radiator, a third radiator, a ground portion and a short structure. The first radiator extends in a first direction. The second radiator extends in a second direction. The first direction is opposite to the second direction. The short structure is coupled to the ground portion. The first radiator, the second radiator and the third radiator are connected to the short structure. The short structure defines an L-shaped groove.

