US 20180241115A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2018/0241115 A1**

CHO et al. (43) **Pub. Date: Aug. 23, 2018**

(54) **ELECTRONIC DEVICE INCLUDING SUPPORT MEMBER HAVING ANTENNA RADIATOR**

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

(72) Inventors: **Bumjin CHO**, Gyeonggi-do (KR); **Yong-Youn KIM**, Gyeonggi-do (KR); **Soon PARK**, Gyeonggi-do (KR); **Kyu-Hyuck KWAK**, Gyeonggi-do (KR); **Han-Jib KIM**, Gyeonggi-do (KR); **Hyo-Seok NA**, Gyeonggi-do (KR); **Chi-Hyun CHO**, Gyeonggi-do (KR)

(21) Appl. No.: **15/902,035**

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

(30) **Foreign Application Priority Data**

Feb. 23, 2017 (KR) 10-2017-0023960

Publication Classification

(51) **Int. Cl.**

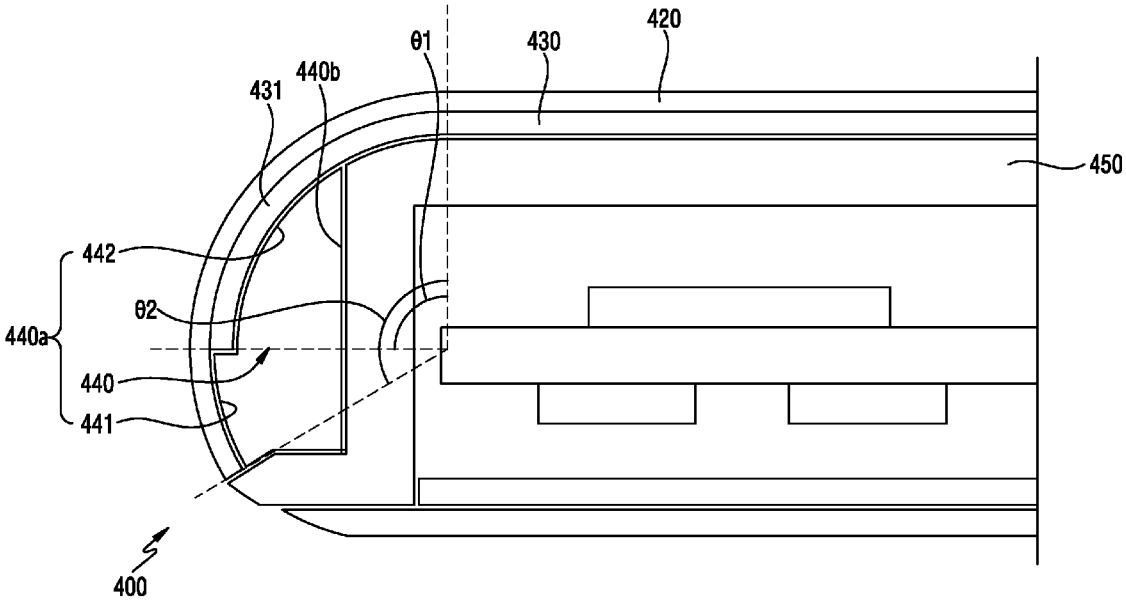
H01Q 1/24	(2006.01)
H04M 1/02	(2006.01)
H05K 5/00	(2006.01)
H05K 5/02	(2006.01)
H05K 5/03	(2006.01)

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

CPC ***H01Q 1/243*** (2013.01); ***H04M 1/0266*** (2013.01); *H01Q 1/2291* (2013.01); ***H05K 5/0217*** (2013.01); ***H05K 5/03*** (2013.01); ***H05K 5/0017*** (2013.01)

(57) **ABSTRACT**

An embodiment disclosed herein relate to an electronic device including a support member on which an antenna radiator is formed. The electronic device may include: a housing including a first face facing in a first direction, a second face facing in a second direction opposite the first direction, a side face facing in a third direction that is perpendicular to both the first and second directions and surrounding at least a part of a space between the first and second faces; a display including a first region disposed in at least a part of the first face and at least one second region extending from the first region, the at least one second region disposed in at least a part of the side face of the housing; a support member disposed in a partial region of the space along the side face and configured to support the at least one second region; a bracket disposed on another partial region of the space and configured to support the display; and at least one antenna radiator disposed on the support member.



US 20180241120A1

(19) United States

(12) Patent Application Publication (10) Pub. No.: US 2018/0241120 A1

LI (43) Pub. Date: Aug. 23, 2018

(54) **ANTENNA DEVICE AND TERMINAL FOR REDUCING ANTENNA CORRELATION OF MIMO SYSTEM**

(71) Applicant: **ZTE CORPORATION**, Guangdong (CN)

(72) Inventor: **Qun LI**, Guangdong (CN)

(21) Appl. No.: **15/752,902**

(22) PCT Filed: **Sep. 28, 2015**

(86) PCT No.: **PCT/CN2015/090913**

§ 371 (c)(1),
(2) Date: **Feb. 15, 2018**

(30) **Foreign Application Priority Data**

Aug. 25, 2015 (CN) 201510526740.3

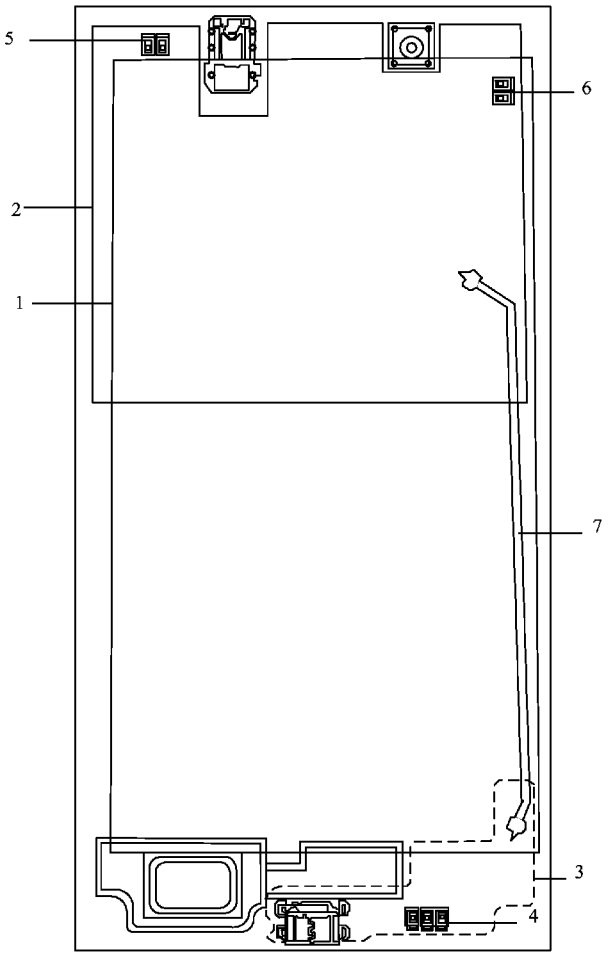
Publication Classification

(51) **Int. Cl.**
H01Q 1/52 (2006.01)
H01Q 21/28 (2006.01)

(52) **U.S. Cl.**
CPC ***H01Q 1/521*** (2013.01); *H01Q 1/243* (2013.01); ***H01Q 21/28*** (2013.01)

(57) **ABSTRACT**

Disclosed are an antenna device and a terminal for reducing antenna correlation of an MIMO system. The antenna device includes a support plate inside a terminal; a primary PCB and a secondary PCB supported by the support plate; a reed of a master antenna disposed on the secondary PCB; a first reed and a second reed of a slave antenna disposed on the primary PCB, respectively; and an RF coaxial cable configured to connect the primary PCB and the secondary PCB. The antenna device further comprises at least one slit formed within a non-PCB area of the support plate. A position and a length of the slit depend on a wavelength of a frequency point of an antenna to be improved and an alignment position and a feed position of the antenna in the entire terminal.



US 20180241127A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2018/0241127 A1**

HWANG et al. (43) **Pub. Date: Aug. 23, 2018**

(54) **MULTI-BAND PATCH ANTENNA MODULE**

(71) Applicant: **AMOTECH CO., LTD.**, Incheon (KR)

(72) Inventors: **Chul HWANG**, Incheon (KR); **In-Jo JEONG**, Incheon (KR); **Sang-O KIM**, Incheon (KR); **Dong-Hwan KOH**, Seoul (KR)

(21) Appl. No.: **15/750,767**

(22) PCT Filed: **Oct. 26, 2016**

(86) PCT No.: **PCT/KR2016/012102**

§ 371 (c)(1),
(2) Date: **Feb. 6, 2018**

(30) **Foreign Application Priority Data**

Oct. 26, 2015 (KR) 10-2015-0149013

Publication Classification

(51) **Int. Cl.**

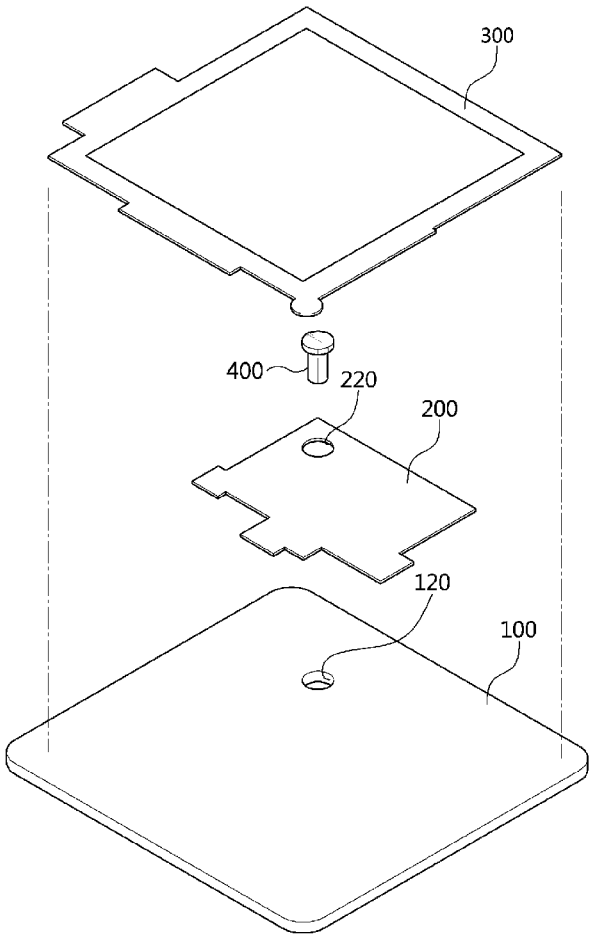
H01Q 9/04	(2006.01)
H01Q 5/30	(2006.01)
H01Q 1/24	(2006.01)
H01Q 9/42	(2006.01)

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

CPC ***H01Q 9/0421*** (2013.01); ***H01Q 9/42*** (2013.01); ***H01Q 1/24*** (2013.01); ***H01Q 5/30*** (2015.01)

(57) **ABSTRACT**

Disclosed is a multi-band patch antenna module, which forms an inner radiation patch having different horizontal and vertical lengths and an outer radiation patch spaced from the inner radiation patch on one surface of a dielectric layer, and transmits and receives signals of a 2.4 GHz band and a 5 GHz band. The multi-band patch antenna module disclosed includes the dielectric layer, the outer radiation patch formed with an insertion hole and formed on one surface of the dielectric layer, and the inner radiation patch inserted into the insertion hole and formed on one surface of the dielectric layer; and a horizontal length of the inner radiation patch is different from a vertical length of the inner radiation patch.



US 20180241430A1

(19) **United States**

(12) **Patent Application Publication**

(10) **Pub. No.: US 2018/0241430 A1**

(43) **Pub. Date: Aug. 23, 2018**

YOUN et al.

(54) **MOBILE TERMINAL**

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

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

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

(21) Appl. No.: **15/961,227**

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

Related U.S. Application Data

(63) Continuation of application No. 15/783,873, filed on Oct. 13, 2017, now Pat. No. 9,985,679, which is a continuation of application No. 15/498,210, filed on Apr. 26, 2017, now Pat. No. 9,819,383, which is a 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

Publication Classification

(51) **Int. Cl.**

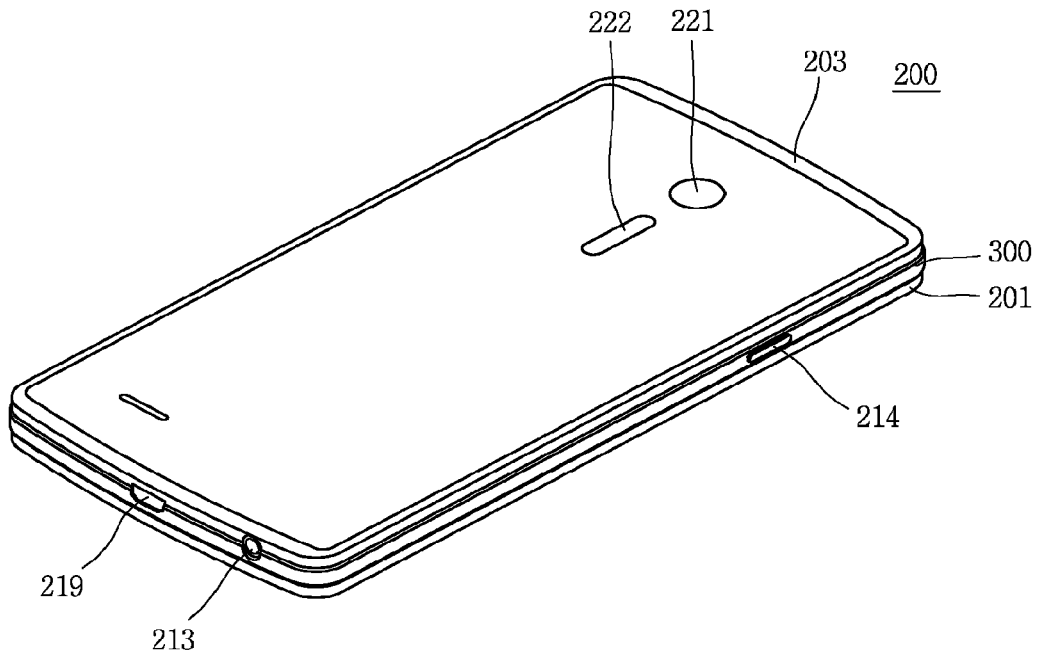
H04B 1/3888	(2015.01)
H01Q 5/30	(2015.01)
G06F 1/16	(2006.01)
H01Q 1/24	(2006.01)
H04M 1/18	(2006.01)
H04M 1/02	(2006.01)
G06F 1/20	(2006.01)
H01Q 1/44	(2006.01)
H04B 1/38	(2015.01)

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

CPC ***H04B 1/3888*** (2013.01); ***H01Q 5/30*** (2015.01); ***G06F 1/1698*** (2013.01); ***H01Q 1/243*** (2013.01); ***G06F 1/1656*** (2013.01); *H04B 2001/3894* (2013.01); ***H04M 1/0249*** (2013.01); ***G06F 1/203*** (2013.01); ***G06F 1/1626*** (2013.01); ***H01Q 1/44*** (2013.01); ***H04M 1/0202*** (2013.01); ***H04M 1/18*** (2013.01)

(57) **ABSTRACT**

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.



US 20180248252A1

(19) United States

(12) Patent Application Publication

(10) Pub. No.: US 2018/0248252 A1

(43) Pub. Date: Aug. 30, 2018

HU et al.

(54) METAL HOUSING, ANTENNA DEVICE, AND MOBILE TERMINAL

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

(72) Inventors: **Shasha HU**, Dongguan (CN); **Tianping LIANG**, Dongguan (CN); **Liang GU**, Dongguan (CN)

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

(21) Appl. No.: **15/753,330**

(22) PCT Filed: **Jun. 13, 2016**

(86) PCT No.: **PCT/CN2016/085548**

§ 371 (c)(1),
(2) Date: **Feb. 18, 2018**

(30) **Foreign Application Priority Data**

Mar. 18, 2016 (CN) 201610161287.5
Mar. 18, 2016 (CN) 201610161288.X
Apr. 20, 2016 (CN) 201610248724.7

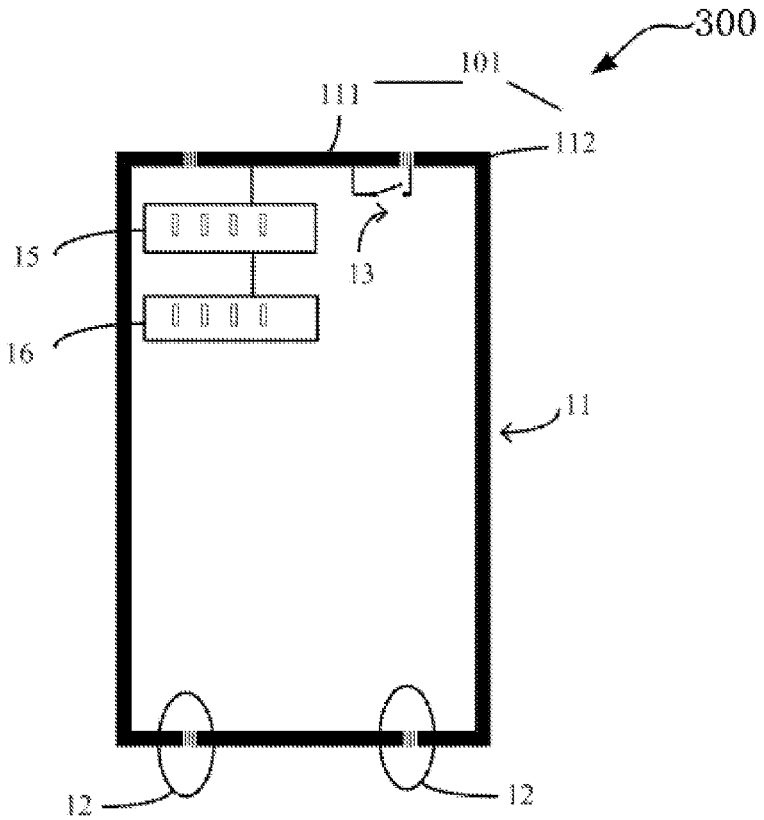
Publication Classification

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

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

(57) **ABSTRACT**

The present disclosure provides a metal housing; the metal housing includes a first edge and a second edge arranged opposite to each other, and a third edge and a fourth edge arranged opposite to each other. The third edge and the fourth edge are connected between the first edge and the second edge. A partitioning seam is provided in the metal housing so that at least one radiating part is formed in the metal housing. In the antenna device provided by embodiments of the present disclosure, the metal housing is enabled to be a radiator through a combination of the partitioning seam and a radiating circuit. The present disclosure further provides an antenna device and a mobile terminal.



US 20180248258A9

(19) **United States**

(12) **Patent Application Publication**

Lu et al.

(10) **Pub. No.: US 2018/0248258 A9**

(48) **Pub. Date: Aug. 30, 2018**

CORRECTED PUBLICATION

(54) **COUPLING REDUCTION METHOD FOR ANTENNAS IN PACKAGE**

(71) Applicant: **MediaTek Inc.**, Hsin-Chu (TW)

(72) Inventors: **Yen-Ju Lu**, New Taipei City (TW); **Yi-Chieh Lin**, Kaohsiung City (TW); **Wen-Chou Wu**, Hsinchu City (TW)

(73) Assignee: **MediaTek Inc.**, Hsin-Chu (TW)

(21) Appl. No.: **15/685,885**

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

Prior Publication Data

(15) Correction of US 2018/0069307 A1 Mar. 8, 2018
See Claim 14.

(65) US 2018/0069307 A1 Mar. 8, 2018

Related U.S. Application Data

(60) Provisional application No. 62/506,637, filed on May 16, 2017, provisional application No. 62/384,769, filed on Sep. 8, 2016.

Publication Classification

(51) **Int. Cl.**

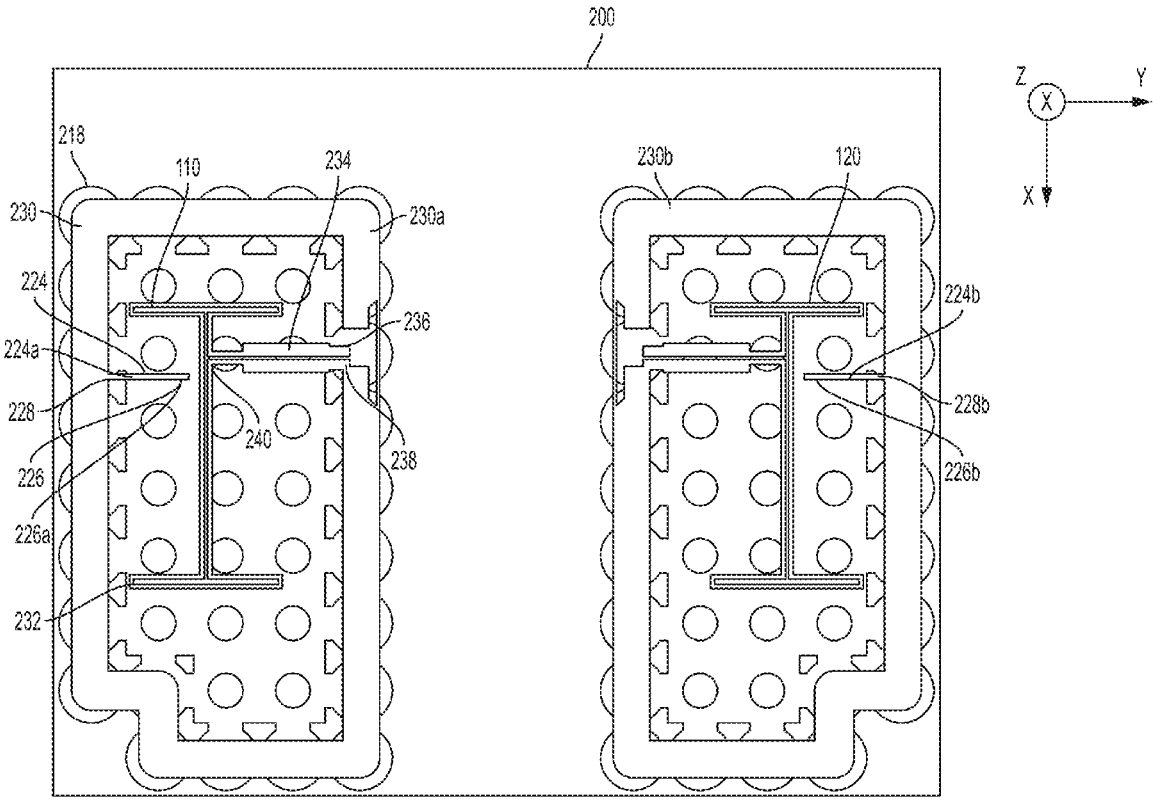
H01Q 1/52	(2006.01)
H01Q 1/38	(2006.01)
H01Q 21/24	(2006.01)
H01Q 21/08	(2006.01)
H01Q 21/06	(2006.01)
H01Q 5/30	(2006.01)

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

CPC ***H01Q 1/523*** (2013.01); ***H01Q 1/38*** (2013.01); ***H01Q 5/30*** (2015.01); ***H01Q 21/08*** (2013.01); ***H01Q 21/062*** (2013.01); ***H01Q 21/24*** (2013.01)

(57) **ABSTRACT**

A Radio Frequency (RF) device may include a plurality of antennas and one or more conductive traces configured to trap a portion of energy transmitted from at least one of the plurality of antennas. The one or more conductive traces are sized and positioned such that undesired coupling between the plurality of antennas may be suppressed while maintaining performance parameters of at least one of the plurality of antennas. The plurality of antennas and the one or more conductive traces may be formed using a redistribution layer coupled to a chip embedded in a molding layer.



US 20180248264A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2018/0248264 A1**

CHEN et al. (43) **Pub. Date: Aug. 30, 2018**

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

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

(72) Inventors: **CHANG-JE CHEN**, New Taipei (TW); **SHU-CHENG LU**, New Taipei (TW); **YI-TING CHEN**, New Taipei (TW); **YEN-JUNG TSENG**, New Taipei (TW); **YI-TE CHOU**, New Taipei (TW)

(21) Appl. No.: **15/870,884**

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

Related U.S. Application Data

(60) Provisional application No. 62/462,941, filed on Feb. 24, 2017.

(30) **Foreign Application Priority Data**

Nov. 15, 2017 (CN) 201711133054.5

Publication Classification

(51) **Int. Cl.**

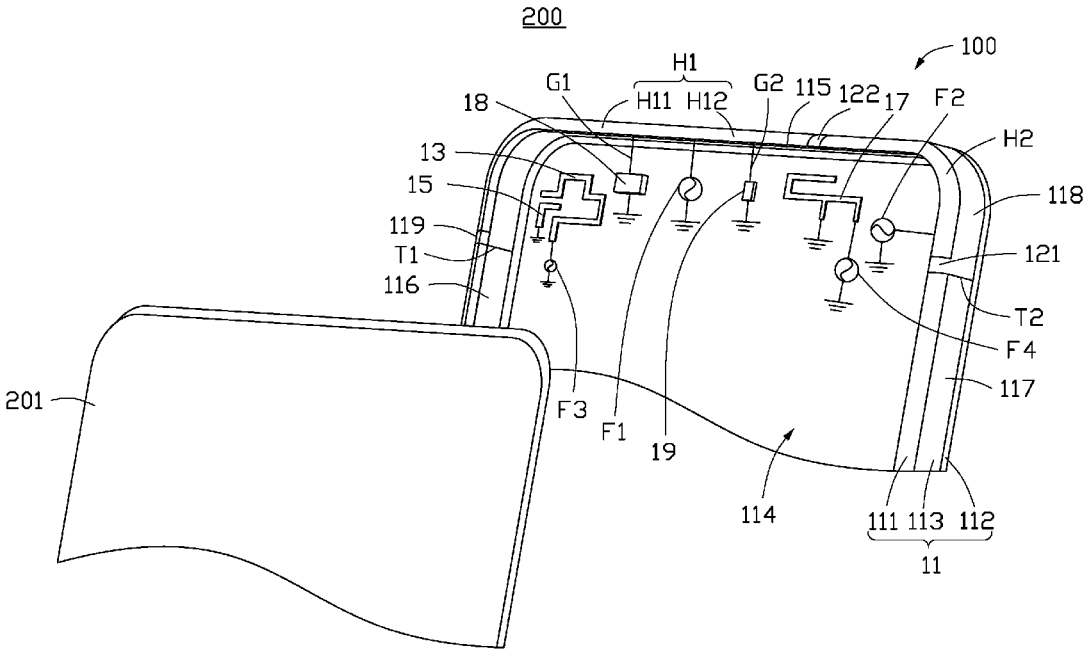
H01Q 5/45	(2015.01)
H01Q 9/04	(2006.01)
H01Q 5/50	(2015.01)
H01Q 1/24	(2006.01)

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

CPC ***H01Q 5/45*** (2015.01); ***H01Q 1/243*** (2013.01); ***H01Q 5/50*** (2015.01); ***H01Q 9/0407*** (2013.01)

(57) **ABSTRACT**

An antenna structure includes a housing, four feed sources, a first radiator, a second radiator, and a third radiator. The housing includes a first radiating portion and a second radiating portion. The first to third radiators are positioned in the housing. The first radiator is spaced apart from the second radiator. The four feed sources respectively connect to the first radiating portion, the second radiating portion, the first radiator, and the third radiator. The first radiating portion activates a first operation mode and a second operation mode. The second radiating portion activates a third operation mode. The first to third radiators activate a fourth operation mode, a fifth operation mode, and a sixth operation mode.



US 20180254540A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2018/0254540 A1**

YOO et al. (43) **Pub. Date: Sep. 6, 2018**

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

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

(72) Inventors: **Jang-Sun YOO**, Seoul (KR); **Ji-Hye MOON**, Hwaseong-si (KR); **Myeong-Gil LEE**, Suwon-si (KR); **Chee-Hwan YANG**, Yongin-si (KR); **Kwang-Yong LEE**, Hwaseong-si (KR)

(21) Appl. No.: **15/911,768**

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

(30) **Foreign Application Priority Data**

Mar. 2, 2017 (KR) 10-2017-0027009

Publication Classification

(51) **Int. Cl.**

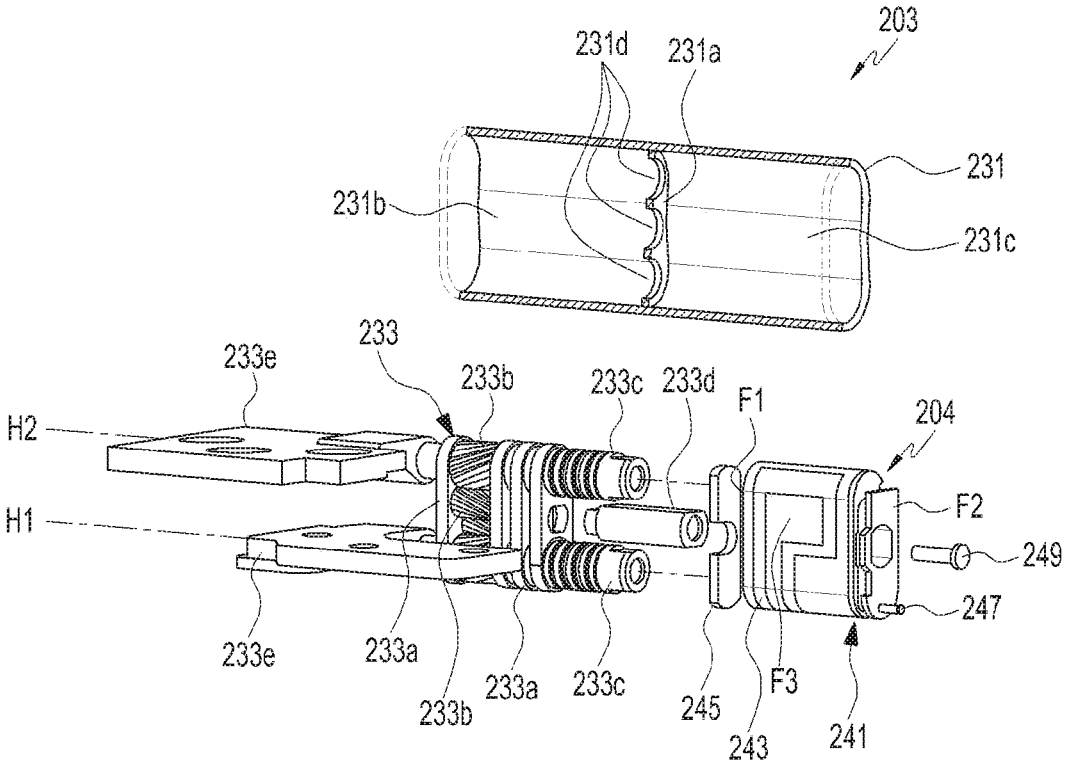
H01Q 1/24	(2006.01)
G06F 1/16	(2006.01)
H01Q 1/08	(2006.01)
H01Q 1/22	(2006.01)
H01Q 9/04	(2006.01)
H01Q 7/00	(2006.01)

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

CPC ***H01Q 1/243*** (2013.01); ***G06F 1/1616*** (2013.01); ***G06F 1/1698*** (2013.01); ***H01Q 7/00*** (2013.01); ***H01Q 1/2266*** (2013.01); ***H01Q 9/0421*** (2013.01); ***H01Q 1/084*** (2013.01)

(57) **ABSTRACT**

An electronic device including an antenna is provided. The electronic device includes a first housing, a second housing for rotatably combining with the first housing, at least one hinge assembly configured to at least partially include an electric conductor portion, the at least one hinge assembly for rotatably coupling the second housing to the first housing, and at least one antenna device coupled to the at least one hinge assembly, in which the at least one antenna device includes a radiating conductor pattern and a ground patch, and the ground patch is electrically connected to the electric conductor portion of the at least one hinge assembly.



US 20180254541A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2018/0254541 A1**

XIONG (43) **Pub. Date: Sep. 6, 2018**

(54) **ANTENNA MODULE AND ELECTRONIC DEVICE INCLUDING THE SAME**

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

(72) Inventor: **Xiaofeng XIONG**, Beijing (CN)

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

(21) Appl. No.: **15/912,289**

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

(30) **Foreign Application Priority Data**

Mar. 6, 2017 (CN) 201710129121.X

Publication Classification

(51) **Int. Cl.**

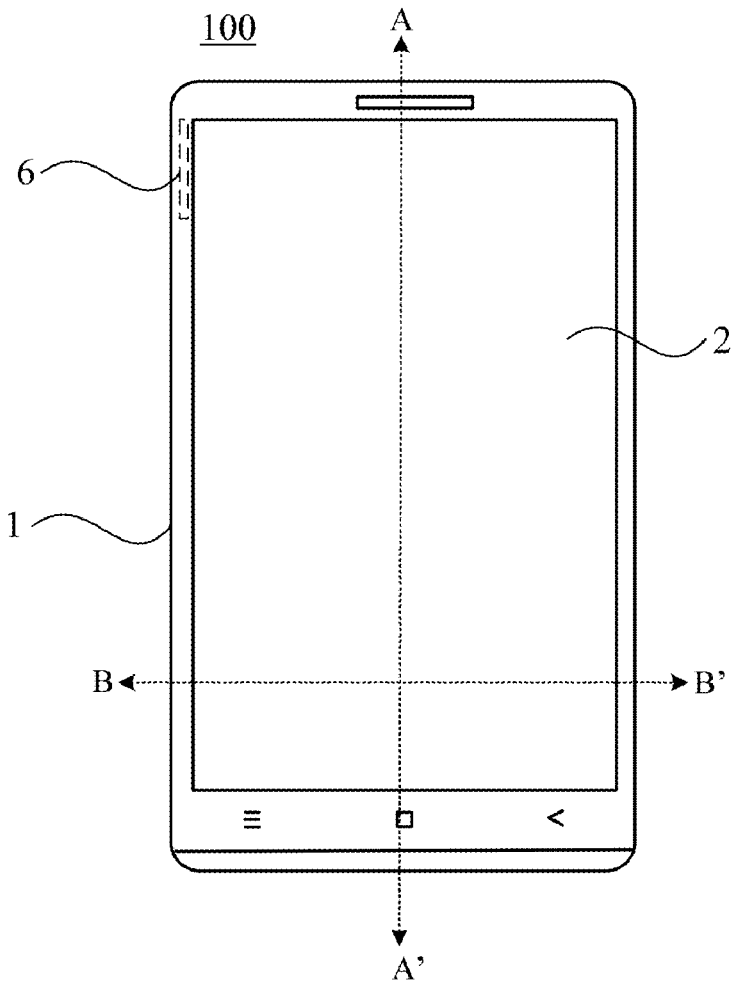
H01Q 1/24	(2006.01)
H01Q 9/04	(2006.01)
H01Q 1/38	(2006.01)

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

CPC ***H01Q 1/243*** (2013.01); *H01Q 1/44* (2013.01); ***H01Q 1/38*** (2013.01); ***H01Q 9/0421*** (2013.01)

(57) **ABSTRACT**

An antenna module and electronic device are provided. The antenna module includes a metal side frame and feed coupling stub with a long side spaced from an inner side of the metal side frame. The feed coupling stub and a middle frame are arranged in parallel between a display module and main board. First end of the feed coupling stub is electrically connected with a grounding part of the main board to form first grounding point. The feed coupling stub is electrically connected with a radiofrequency module of the main board through a contact point to form a feed point. A middle frame connecting part, adjacent to second end of the feed coupling stub, forms second grounding point. A slot is opened between the inner side and a side of the display module substantially paralleled to the long side of the feed coupling stub.



US 20180254542A1

(19) United States

(12) Patent Application Publication (10) Pub. No.: US 2018/0254542 A1

HU et al. (43) Pub. Date: Sep. 6, 2018

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

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

(72) Inventors: **Shasha HU**, Dongguan (CN); **Tianping LIANG**, Dongguan (CN); **Liang GU**, Dongguan (CN)

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

(21) Appl. No.: **15/973,201**

(22) Filed: **May 7, 2018**

Related U.S. Application Data

(63) Continuation of application No. 15/753,330, filed on Feb. 18, 2018, filed as application No. PCT/CN2016/085548 on Jun. 13, 2016.

(30) **Foreign Application Priority Data**

Mar. 18, 2016 (CN) 201610161287.5
Mar. 18, 2016 (CN) 201610161288.X
Apr. 20, 2016 (CN) 201610248724.7

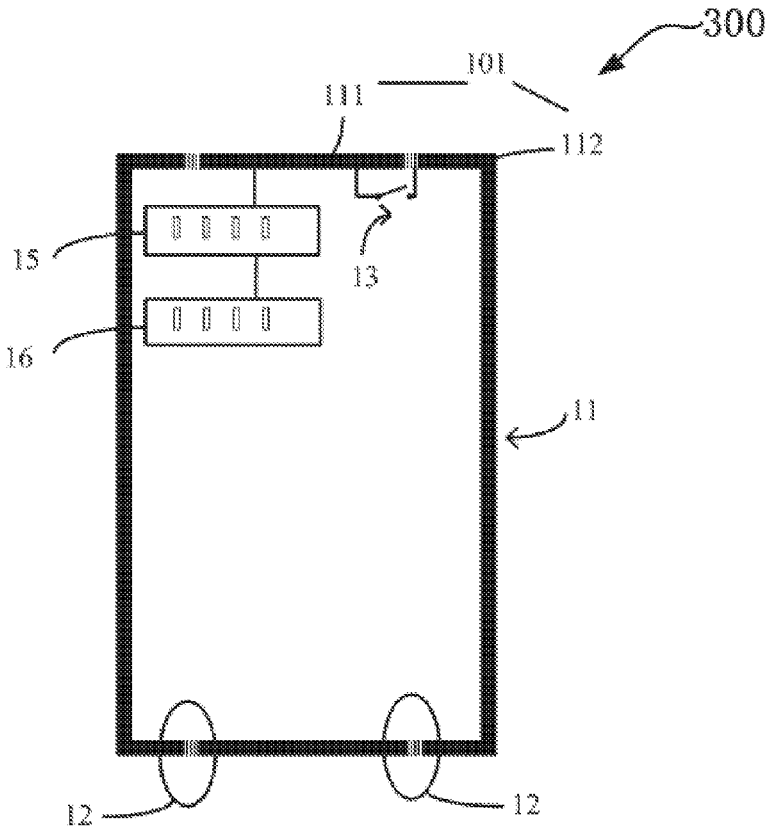
Publication Classification

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

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

(57) **ABSTRACT**

The present disclosure provides an antenna device including: a peripheral frame made of a signal shielding material and provided with at least two micro seam bands which partition the peripheral frame into at least two frame bodies, the frame bodies including a first antenna, the micro seam band having at least one micro seam; a first matching circuit electrically coupled to the first antenna; and a first radio-frequency receiving and emitting circuit electrically coupled to the first matching circuit. The frame bodies further includes a second antenna including a second matching circuit and a second radio-frequency receiving and emitting circuit, the second matching circuit is electrically coupled between the second antenna and the second radio-frequency receiving and emitting circuit, and the two radio-frequency receiving and emitting circuits deal with different radio-frequency signals. The micro seam band further includes a frame strip. The present disclosure further provides a mobile terminal.



US 20180254543A1

(19) United States

(12) Patent Application Publication (10) Pub. No.: US 2018/0254543 A1

WANG et al. (43) Pub. Date: Sep. 6, 2018

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

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

(72) Inventors: **Xinbao WANG**, Dongguan (CN); **Ning ZHAO**, Dongguan (CN); **Shengzhao XIANG**, Dongguan (CN)

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

(21) Appl. No.: **15/974,092**

(22) Filed: **May 8, 2018**

Related U.S. Application Data

(63) Continuation of application No. 15/749,047, filed on Jan. 30, 2018, filed as application No. PCT/CN2017/077163 on Mar. 18, 2017.

(30) **Foreign Application Priority Data**

Mar. 18, 2016 (CN) 201610161254.0

Publication Classification

(51) **Int. Cl.**

H01Q 1/24	(2006.01)
H01Q 1/38	(2006.01)
H01Q 1/50	(2006.01)
H04B 1/48	(2006.01)
H01Q 23/00	(2006.01)

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

CPC ***H01Q 1/243*** (2013.01); ***H01Q 1/38*** (2013.01); ***H01Q 1/50*** (2013.01); ***H01Q 23/00*** (2013.01); ***H04B 1/48*** (2013.01)

(57) **ABSTRACT**

The present disclosure provides an antenna device including a radio frequency transceiving circuit; a matching circuit electrically coupled to the radio frequency transceiving circuit; and a metal housing provided with at least one micro-seam band, an edge of the metal housing including an arc-shaped section, the at least one micro-seam including an arc-shaped part matching the arc-shaped section. The radio frequency transceiving circuit is electrically coupled to the metal housing through the matching circuit, such that the metal housing is used as a radiating body of the antenna device. The metal housing is grounded through a grounding wire provided with an on-off switch configured to control the grounding wire. The micro-seam band includes three to twenty arc-shaped micro-seams, a metal strip is formed between the adjacent micro-seams, and the metal strip has the same material as the metal housing. The present disclosure further provides a mobile terminal.