US 20180026338A1

(19) **United States**

(12) **Patent Application Publication**

LIN et al.

(10) **Pub. No.: US 2018/0026338 A1**

(43) **Pub. Date: Jan. 25, 2018**

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

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

(72) Inventors: **YEN-HUI LIN**, New Taipei (TW); **YUN-JIAN CHANG**, New Taipei (TW); **JUNG-CHIN LIN**, New Taipei (TW)

(21) Appl. No.: **15/655,906**

(22) Filed: **Jul. 21, 2017**

Related U.S. Application Data

(60) Provisional application No. 62/364,880, filed on Jul. 21, 2016.

(30) **Foreign Application Priority Data**

Jul. 7, 2017 (CN) 201710553028.1

Publication Classification

(51) **Int. Cl.**

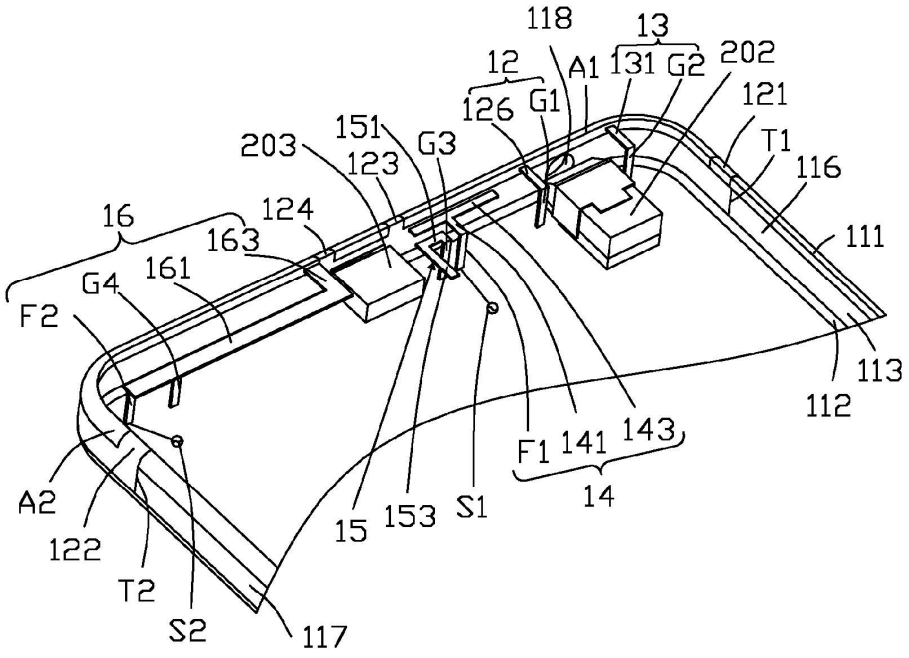
H01Q 1/24	(2006.01)
H01Q 5/50	(2006.01)
H01Q 5/10	(2006.01)
H01Q 1/48	(2006.01)

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

CPC ***H01Q 1/242*** (2013.01); ***H01Q 1/48*** (2013.01); ***H01Q 5/50*** (2015.01); ***H01Q 5/10*** (2015.01); *H04M 1/0266* (2013.01)

(57) **ABSTRACT**

An antenna structure includes a metal housing, a first resonance portion, a second resonance portion, an extending portion, and a signal feed source. The metal housing includes a front frame, a backboard, and a side frame. The side frame defines a slot and the front frame defines a groove and a gap. The metal housing is divided into at least an antenna section by the slot, the groove, and the gap. The first and second resonance portions and the extending portion are spaced apart from each other. The first resonance portion and the extending portion are both directly and electrically connected to the antenna section or are spaced apart and electrically coupled to the antenna section. The second resonance portion is electrically connected to the antenna section. One resonance portion is electrically connected to the signal feed source and the other resonance portion is grounded.



US 20180026340A1

(19) **United States**

(12) **Patent Application Publication**

(10) **Pub. No.: US 2018/0026340 A1**

(43) **Pub. Date: Jan. 25, 2018**

CHIH et al.

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

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

(72) Inventors: **JUNG-SHENG CHIH**, New Taipei (TW); **TE-CHANG LIN**, New Taipei (TW); **WEN-CHANG HSU**, New Taipei (TW)

(21) Appl. No.: **15/655,922**

(22) Filed: **Jul. 21, 2017**

Related U.S. Application Data

(60) Provisional application No. 62/365,342, filed on Jul. 21, 2016, provisional application No. 62/365,391, filed on Jul. 22, 2016.

(30) **Foreign Application Priority Data**

Jul. 20, 2017 (CN) 201710597799.0

Publication Classification

(51) **Int. Cl.**

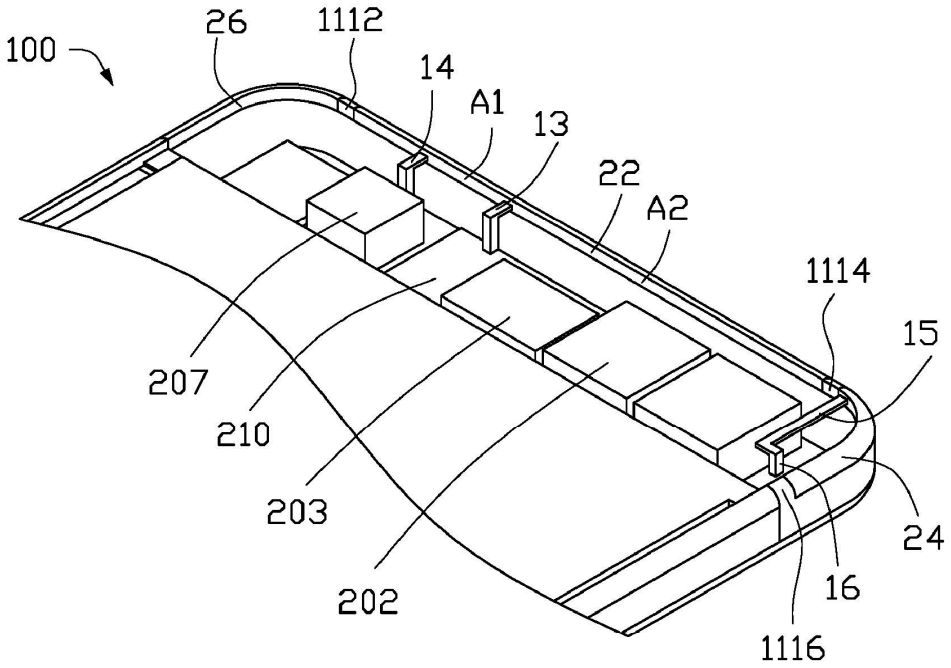
H01Q 1/24	(2006.01)
H01Q 5/20	(2006.01)
H01Q 5/50	(2006.01)
H01Q 13/18	(2006.01)
H01Q 1/48	(2006.01)

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

CPC ***H01Q 1/242*** (2013.01); ***H01Q 13/18*** (2013.01); ***H01Q 1/48*** (2013.01); ***H01Q 5/50*** (2015.01); ***H01Q 5/20*** (2015.01)

(57) **ABSTRACT**

An antenna structure includes a metallic member. The metallic member includes a front frame, a backboard, and a side frame. The side frame defines a slot. The front frame defines a first gap and a second gap. The front frame between the first gap and the second gap forms a radiating section. Current enters the radiating section from the first feed portion, the current flows through the radiating section and towards the first gap and the first radiating portion, thus activating radiating signals in a first frequency band; the current flows through the radiating section and towards the first ground portion, thus activating radiating signals in a second frequency band; the current flows through the radiating section and towards the second gap and the second radiating portion, thus activating radiation signals in a third different frequency band. A wireless communication device using the antenna structure is provided.



US 20180026342A1

(19) **United States**

(12) **Patent Application Publication**

CHEN et al.

(10) **Pub. No.: US 2018/0026342 A1**

(43) **Pub. Date: Jan. 25, 2018**

(54) **ELECTRONIC MODULE**

(71) Applicant: **UNIVERSAL SCIENTIFIC INDUSTRIAL (SHANGHAI) CO., LTD.**, SHANGHAI (CN)

(72) Inventors: **Hsin-Hong CHEN**, Shanghai (CN); **Jui-Kun SHIH**, Shanghai (CN); **Chun-Huang LI**, Shanghai (CN)

(73) Assignee: **UNIVERSAL SCIENTIFIC INDUSTRIAL (SHANGHAI) CO., LTD.**

(21) Appl. No.: **15/243,762**

(22) Filed: **Aug. 22, 2016**

(30) **Foreign Application Priority Data**

Jul. 21, 2016 (CN) 201610578139.3

Publication Classification

(51) **Int. Cl.**

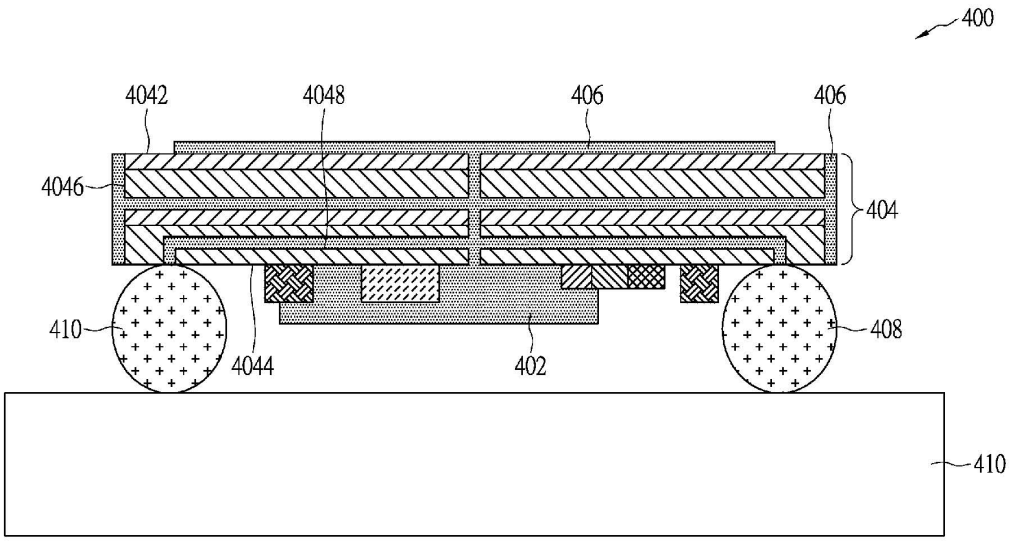
H01Q 1/24 (2006.01)
H01Q 21/00 (2006.01)
H01Q 1/48 (2006.01)

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

CPC ***H01Q 1/243*** (2013.01); ***H01Q 1/48*** (2013.01); ***H01Q 21/00*** (2013.01)

(57) **ABSTRACT**

The present disclosure provides an electronic module. The electronic module comprises an IC, a substrate and an antenna. The substrate has a top surface, a bottom surface and a lateral surface. The IC is electrically connected to the bottom surface. The antenna is disposed on at least two of the top surface, the bottom surface and the lateral surface.



US 20180026343A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2018/0026343 A1**

LEE et al. (43) **Pub. Date: Jan. 25, 2018**

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

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

(72) Inventors: **CHENG-HAN LEE**, New Taipei (TW); **YI-WEN HSU**, New Taipei (TW); **WEI-XUAN YE**, New Taipei (TW)

(21) Appl. No.: **15/647,194**

(22) Filed: **Jul. 11, 2017**

Related U.S. Application Data

(60) Provisional application No. 62/364,303, filed on Jul. 19, 2016.

(30) **Foreign Application Priority Data**

Jun. 27, 2017 (CN) 201710497766.9

Publication Classification

(51) **Int. Cl.**

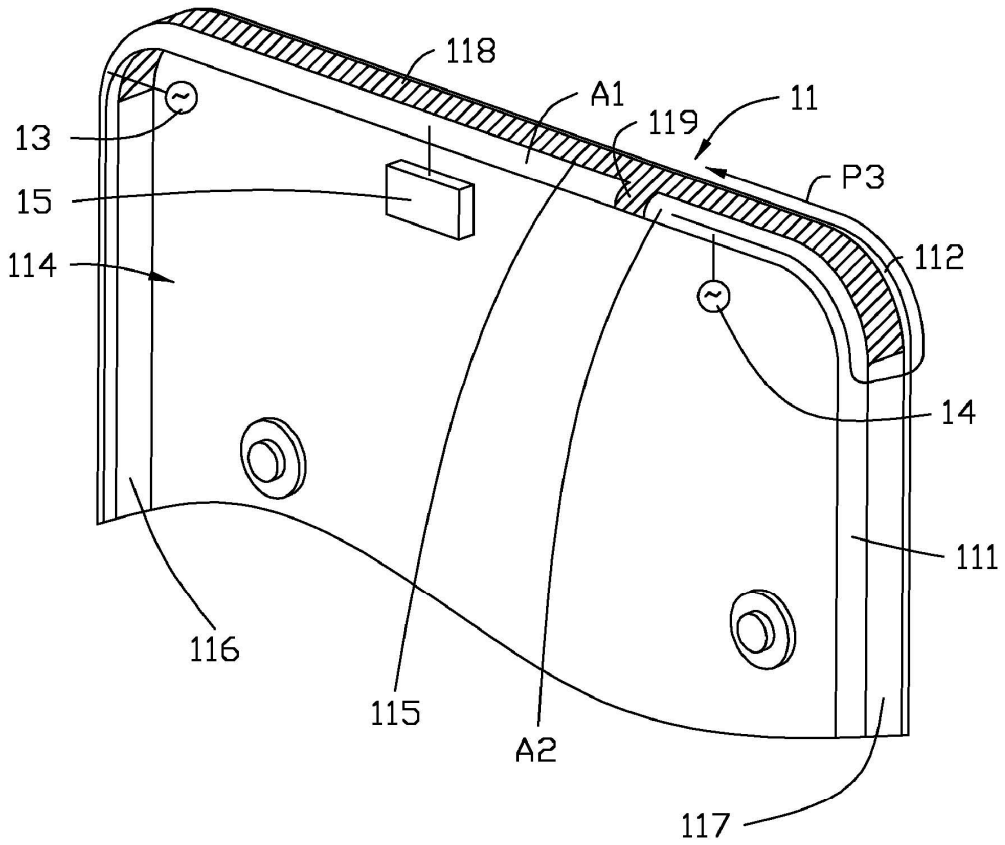
H01Q 1/24 (2006.01)
H01Q 5/50 (2006.01)
H01Q 13/18 (2006.01)

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

CPC ***H01Q 1/243*** (2013.01); ***H01Q 13/18*** (2013.01); ***H01Q 5/50*** (2015.01); *H04M 1/0283* (2013.01)

(57) **ABSTRACT**

An antenna structure includes a metal housing, a first feed source, and a second feed source. The metal housing includes a front frame, a backboard, and a side frame. The side frame is positioned between the front frame and the backboard. The side frame defines a slot and the front frame defines a gap. The gap communicates with the slot and extends across the front frame. The metal housing is divided into at least a long portion and a short portion by the slot and the gap. The first feed source is electrically connected to the long portion and the second feed source is electrically connected to the short portion.



US 20180026349A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2018/0026349 A1**

LEE et al. (43) **Pub. Date: Jan. 25, 2018**

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

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

(72) Inventors: **CHENG-HAN LEE**, New Taipei (TW); **YI-WEN HSU**, New Taipei (TW); **WEI-XUAN YE**, New Taipei (TW)

(21) Appl. No.: **15/651,035**

(22) Filed: **Jul. 17, 2017**

Related U.S. Application Data

(60) Provisional application No. 62/364,298, filed on Jul. 19, 2016.

(30) **Foreign Application Priority Data**

Jun. 27, 2017 (TW) 106121492

Publication Classification

(51) **Int. Cl.**

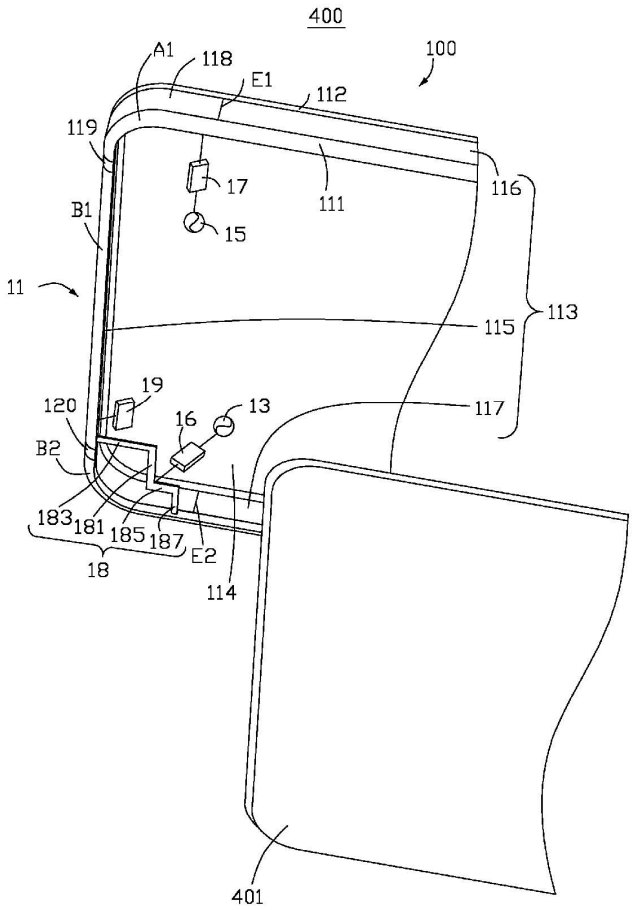
H01Q 1/24	(2006.01)
H01Q 5/10	(2006.01)
H01Q 13/10	(2006.01)
H01Q 5/371	(2006.01)

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

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

(57) **ABSTRACT**

An antenna structure includes a metal housing, a first feed source, and a first switching circuit. The metal housing includes a front frame, a backboard, and a side frame. The side frame defines a slot and the front frame defines a first gap and a second gap. The metal housing is divided into at least a first branch and a second branch by the slot, the first gap, and the second gap. The first feed source is electrically connected to the first branch. One end of the first switching circuit is electrically connected to the first branch. Another end of the first switching circuit is grounded.



US 20180026350A1

(19) **United States**

(12) **Patent Application Publication**

(10) **Pub. No.: US 2018/0026350 A1**

(43) **Pub. Date: Jan. 25, 2018**

HUNG et al.

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

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

(72) Inventors: **KAI-TING HUNG**, New Taipei (TW); **CHO-KANG HSU**, New Taipei (TW); **MEN-HSUEH TSAI**, New Taipei (TW)

(21) Appl. No.: **15/651,037**

(22) Filed: **Jul. 17, 2017**

Related U.S. Application Data

(60) Provisional application No. 62/364,876, filed on Jul. 21, 2016.

(30) **Foreign Application Priority Data**

Jun. 9, 2017 (TW) 106119261

Publication Classification

(51) **Int. Cl.**

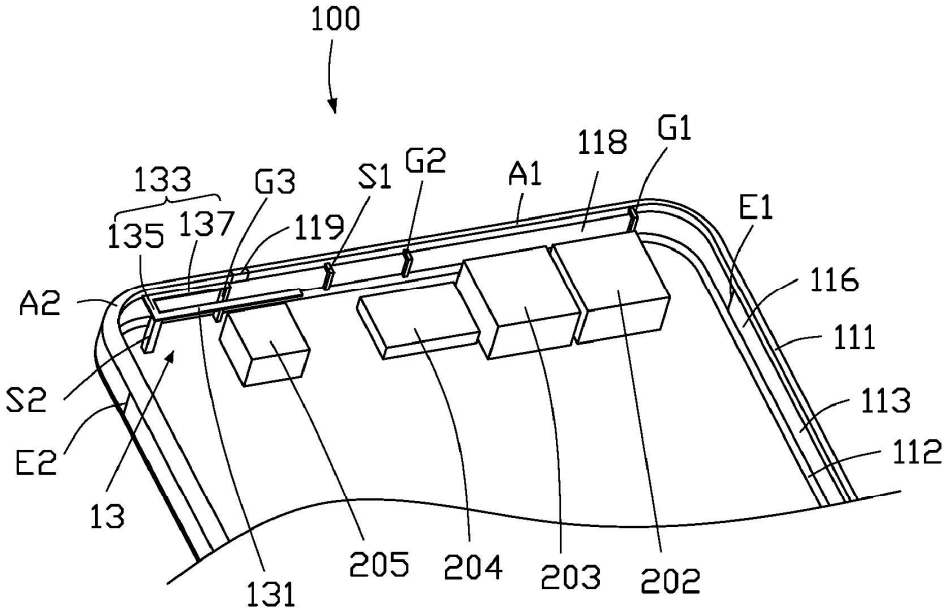
H01Q 1/24 (2006.01)
H01Q 5/10 (2006.01)
H01Q 13/10 (2006.01)
H01Q 5/371 (2006.01)

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

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

(57) **ABSTRACT**

An antenna structure includes a metal housing, a first feed portion, a first ground portion, a second ground portion, and a radiator. The metal housing includes a front frame, a backboard, and a side frame. The side frame defines a slot and the front frame defines a gap. The metal housing is divided into at least a long portion and a short portion by the slot and the gap. One end of the first feed portion is electrically connected to the long portion for feeding current to the long portion and another end of the first feed portion is electrically connected to the backboard. The first and second ground portions are both electrically connected to the long portion for grounding the long portion. The radiator is positioned in the metal housing, electrically connected to the backboard, and is spaced apart from the short portion.



US 20180026353A1

(19) United States

(12) Patent Application Publication (10) Pub. No.: US 2018/0026353 A1

TSENG et al. (43) Pub. Date: Jan. 25, 2018

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

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

(72) Inventors: **YU-KAI TSENG**, New Taipei (TW); **KUO-LUN HUANG**, New Taipei (TW); **MING-YU CHOU**, New Taipei (TW)

(21) Appl. No.: **15/653,679**

(22) Filed: **Jul. 19, 2017**

Related U.S. Application Data

(60) Provisional application No. 62/382,762, filed on Sep. 1, 2016, provisional application No. 62/364,881, filed on Jul. 21, 2016.

(30) **Foreign Application Priority Data**

Jun. 22, 2017 (CN) 201710482507.9

Publication Classification

(51) **Int. Cl.**

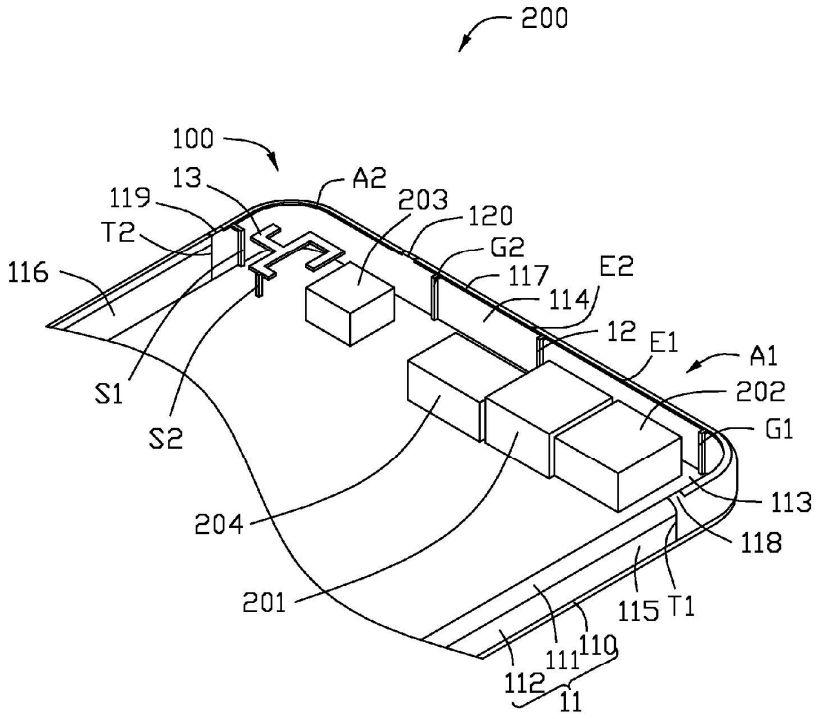
H01Q 1/24 (2006.01)
H01Q 5/10 (2006.01)
H01Q 13/10 (2006.01)
H01Q 5/371 (2006.01)

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

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

(57) **ABSTRACT**

An antenna structure includes a housing, a first feed portion, a first ground portion, and a second ground portion. The housing defines a slot, a first groove, and a gap. The housing is divided into a first portion and a second portion by the slot, the first groove, and the gap. The first portion is further divided into a first radiating portion and a second radiating portion by the first feed portion. A first portion of the housing extending from the first feed portion to the first gap forms the first radiating portion. A second portion of the housing extending from the first feed portion to the groove forms the second radiating portion. The second radiating portion is shorter than the second portion. The second portion is shorter than the first radiating portion. The first portion activates a first operation mode and the second portion activates a second operation mode.



US 20180026355A1

(19) United States

(12) Patent Application Publication (10) Pub. No.: US 2018/0026355 A1

LEE et al. (43) Pub. Date: Jan. 25, 2018

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

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

(72) Inventors: **YI-CHIEH LEE**, New Taipei (TW); **GENG-HONG LIOU**, Tu-Cheng (TW)

(21) Appl. No.: **15/657,053**

(22) Filed: **Jul. 21, 2017**

Related U.S. Application Data

(60) Provisional application No. 62/365,344, filed on Jul. 21, 2016.

(30) **Foreign Application Priority Data**

Jul. 18, 2017 (CN) 201710586519.6

Publication Classification

(51) **Int. Cl.**

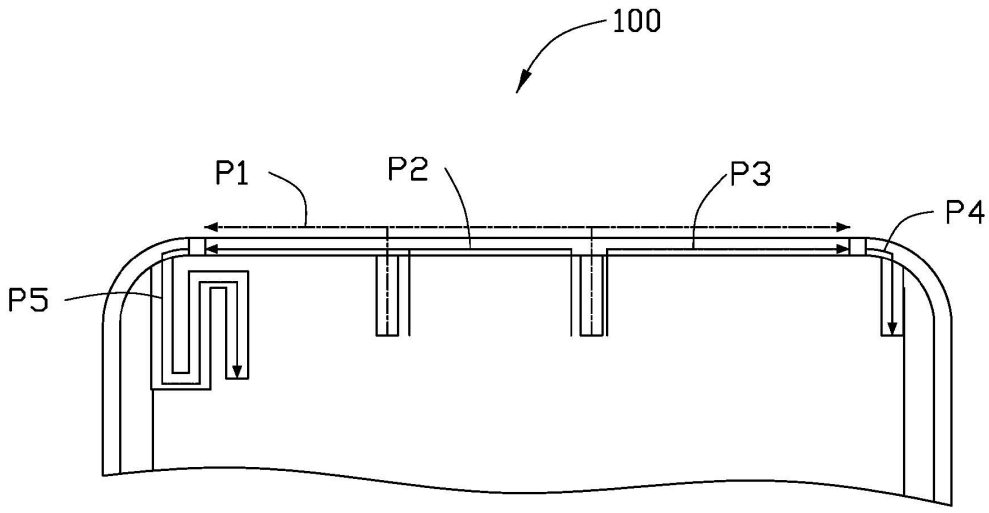
H01Q 1/24	(2006.01)
H01Q 13/10	(2006.01)
H01Q 5/335	(2006.01)

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

CPC ***H01Q 1/243*** (2013.01); ***H01Q 5/335*** (2015.01); ***H01Q 13/10*** (2013.01); *H04M 1/0264* (2013.01)

(57) **ABSTRACT**

An antenna structure includes a metallic member, a feed portion, a ground portion and a radiating portion. The metallic member includes a front frame, a backboard, and a side frame. The side frame defines a slot. The front frame defines a first gap and a second gap, which are in communication with the slot and extend across the front frame. A straight portion of the front frame between the first gap and the second gap forms a radiating section. The feed portion and the ground portion are electrically connected to the radiating section. Current enters the radiating section from the feed portion. The current flows through the radiating section and towards the second gap. The radiating portion obtains current from the radiating section by coupling. The radiating section and the radiating portion generate radiation signals in two different frequency bands. A wireless communication device using the antenna structure is provided.



US 20180026359A1

(19) **United States**

(12) **Patent Application Publication**

Desclos et al.

(10) **Pub. No.: US 2018/0026359 A1**

(43) **Pub. Date: Jan. 25, 2018**

(54) **ANTENNA SYSTEM COUPLED TO AN EXTERNAL DEVICE**

(71) Applicant: **Ethertronics, Inc.**, San Diego, CA (US)

(72) Inventors: **Laurent Desclos**, San Diego, CA (US); **Sebastian Rowson**, San Diego, CA (US); **Jeffrey Shamblin**, San Marcos, CA (US)

(73) Assignee: **Ethertronics, Inc.**, San Diego, CA (US)

(21) Appl. No.: **15/677,996**

(22) Filed: **Aug. 15, 2017**

Related U.S. Application Data

(63) Continuation of application No. 13/295,979, filed on Nov. 14, 2011, now abandoned.

(60) Provisional application No. 61/412,473, filed on Nov. 11, 2010.

Publication Classification

(51) **Int. Cl.**

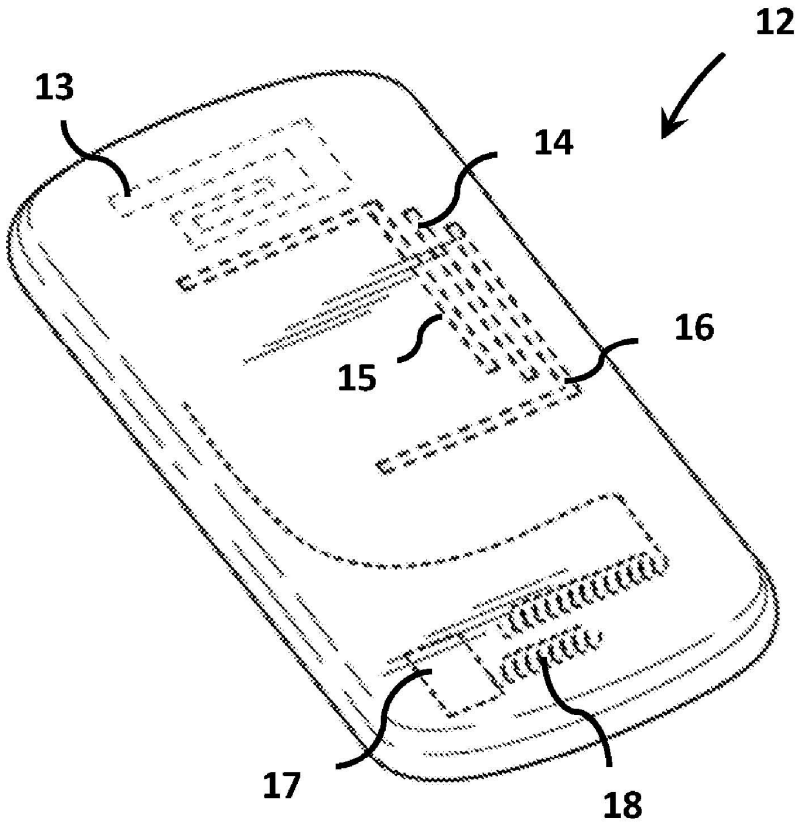
H01Q 1/40	(2006.01)
H01Q 1/52	(2006.01)
H01Q 1/24	(2006.01)

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

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

(57) **ABSTRACT**

An antenna system is integrated into a cover or accessory and adapted to couple to an antenna in a host device to improve transmission and reception of signals. The antenna system can be passive or active, with the active antenna system designed to amplify coupled signals on the integrated antenna elements in the cover or accessory. Single or multiple frequency bands can be improved with the integrated antenna system, and multiple antennas in the host device can be coupled to and improved. The antenna system can couple to the existing antennas in the host device by capacitive coupling, i.e. no physical contact required, or a connector can be designed into the cover or accessory containing the integrated antenna system that makes contact to electrical ground of the host device or power supply signals or other control signals.



US 20180026360A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2018/0026360 A1**

LEE et al. (43) **Pub. Date: Jan. 25, 2018**

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

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

(72) Inventors: **CHENG-HAN LEE**, New Taipei (TW); **YI-WEN HSU**, New Taipei (TW); **WEI-XUAN YE**, New Taipei (TW)

(21) Appl. No.: **15/626,160**

(22) Filed: **Jun. 18, 2017**

Related U.S. Application Data

(60) Provisional application No. 62/364,303, filed on Jul. 19, 2016.

(30) **Foreign Application Priority Data**

Aug. 31, 2016 (CN) 201610774244.4

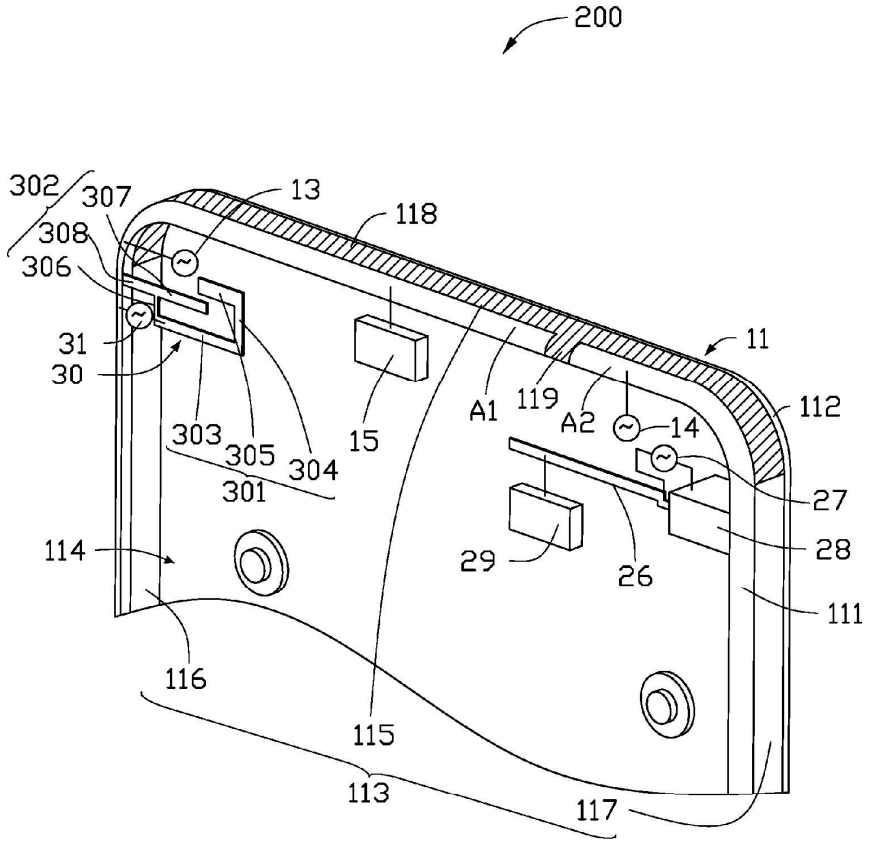
Publication Classification

(51) **Int. Cl.**
H01Q 1/42 (2006.01)

(52) **U.S. Cl.**
CPC ***H01Q 1/42*** (2013.01); *H01Q 9/065* (2013.01)

(57) **ABSTRACT**

An antenna structure includes a metallic member, a first radiator, and an isolating portion. The metallic member includes a front frame, a backboard, and a side frame. The side frame includes at least a top portion, a first side portion, and a second side portion. The isolating portion is electrically connected to the first radiator. The side frame defines a slot and the slot is defined on the top portion. The front frame defines a gap. The gap communicates with the slot and extends across the front frame. The first portion of the front frame from a first side of the gap to a first end of the slot forms a short portion. The first radiator is positioned adjacent to the short portion and the isolation portion improves isolation between the short portion and the first radiator.



US 20180026361A1

(19) **United States**

(12) **Patent Application Publication**

(10) **Pub. No.: US 2018/0026361 A1**

(43) **Pub. Date: Jan. 25, 2018**

SAKONG et al.

(54) **ANTENNA FOR WIRELESS COMMUNICATION AND ELECTRONIC DEVICE INCLUDING THE SAME**

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

(72) Inventors: **Min SAKONG**, Gyeongsangbuk-do (KR); **Dong Ryul Shin**, Daegu (KR); **Yoon Jae Lee**, Seoul (KR); **Seong Tae Jeong**, Gyeonggi-do (KR); **Jin Woo Jung**, Seoul (KR)

(21) Appl. No.: **15/656,669**

(22) Filed: **Jul. 21, 2017**

(30) **Foreign Application Priority Data**

Jul. 21, 2016 (KR) 10-2016-0092871
Mar. 28, 2017 (KR) 10-2017-0039558

Publication Classification

(51) **Int. Cl.**

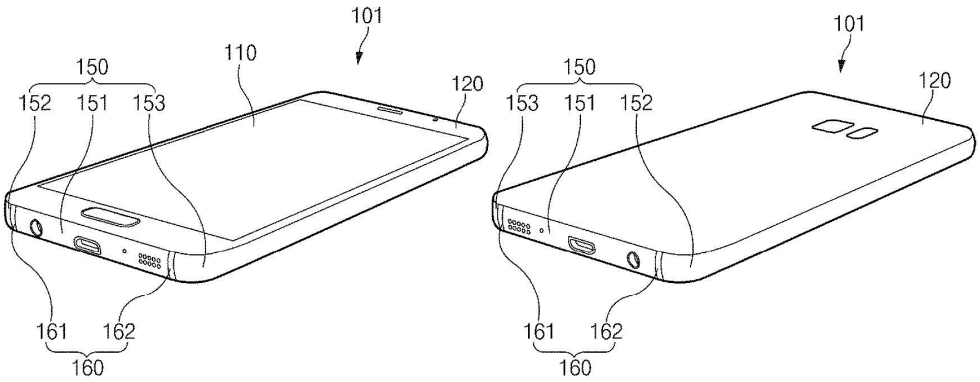
H01Q 3/00	(2006.01)
H04B 1/3827	(2006.01)
H01Q 1/48	(2006.01)
H01Q 1/24	(2006.01)

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

CPC ***H01Q 3/00*** (2013.01); ***H01Q 1/245*** (2013.01); ***H04B 1/3838*** (2013.01); ***H01Q 1/48*** (2013.01)

(57) **ABSTRACT**

A communication method performed in an electronic device including a conductive pattern and the electronic device are provided. The electronic device includes a conductive pattern used as a radiator for wireless communication, a feeding unit connected with the conductive pattern, a ground unit connected with the conductive pattern, a first impedance matching circuit disposed in a first area adjacent to the feeding unit and connected to the conductive pattern, a second impedance matching circuit disposed in a second area adjacent to the conductive pattern and connected to the conductive pattern, and a control unit that matches impedance by controlling at least one of the first impedance matching circuit and the second impedance matching circuit by a closed-loop scheme.



US 20180026370A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2018/0026370 A1**

LEE et al. (43) **Pub. Date: Jan. 25, 2018**

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

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

(72) Inventors: **CHENG-HAN LEE**, New Taipei (TW); **YI-WEN HSU**, New Taipei (TW); **WEI-XUAN YE**, New Taipei (TW)

(21) Appl. No.: **15/626,159**

(22) Filed: **Jun. 18, 2017**

Related U.S. Application Data

(60) Provisional application No. 62/364,303, filed on Jul. 19, 2016.

(30) **Foreign Application Priority Data**

Aug. 6, 2016 (CN) 201610636898.0

Publication Classification

(51) **Int. Cl.**

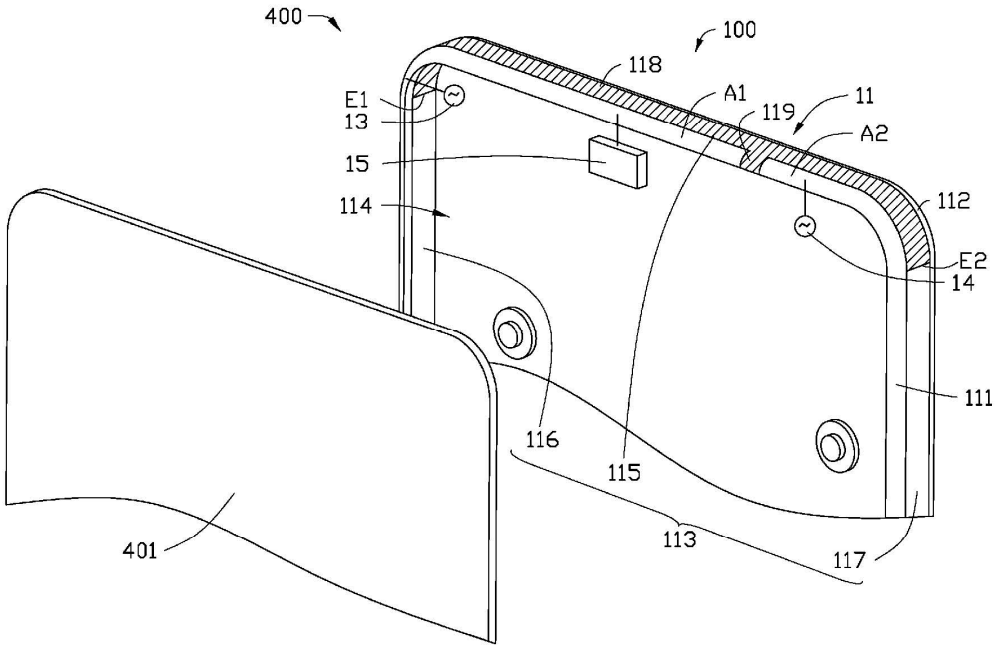
H01Q 5/371	(2006.01)
H01Q 5/378	(2006.01)
H01Q 5/50	(2006.01)

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

CPC ***H01Q 5/371*** (2015.01); ***H01Q 5/50*** (2015.01); ***H01Q 5/378*** (2015.01); *H01Q 21/0006* (2013.01)

(57) **ABSTRACT**

An antenna structure includes a metallic member and a first feed source. The metallic member includes a front frame, a backboard, and a side frame. The side frame is positioned between the front frame and the backboard. The first feed source is electrically connected to the front frame. The side frame includes at least a top portion, a first side portion, and a second side portion. The first side portion and the second side portion are respectively connected to two ends of the top portion. The side frame defines a slot and the slot is defined on the top portion. The front frame defines a gap. The gap communicates with the slot and extends across the front frame.



US 20180034132A1

(19) **United States**

(12) **Patent Application Publication**

TAKAHASHI

(10) **Pub. No.: US 2018/0034132 A1**

(43) **Pub. Date: Feb. 1, 2018**

(54) **ELECTRONIC DEVICE**

(71) Applicant: **KYOCERA Corporation**, Kyoto (JP)

(72) Inventor: **Junya TAKAHASHI**, Yokohama-shi (JP)

(73) Assignee: **KYOCERA Corporation**, Kyoto (JP)

(21) Appl. No.: **15/658,828**

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

(30) **Foreign Application Priority Data**

Jul. 27, 2016 (JP) 2016-147553

Publication Classification

(51) **Int. Cl.**

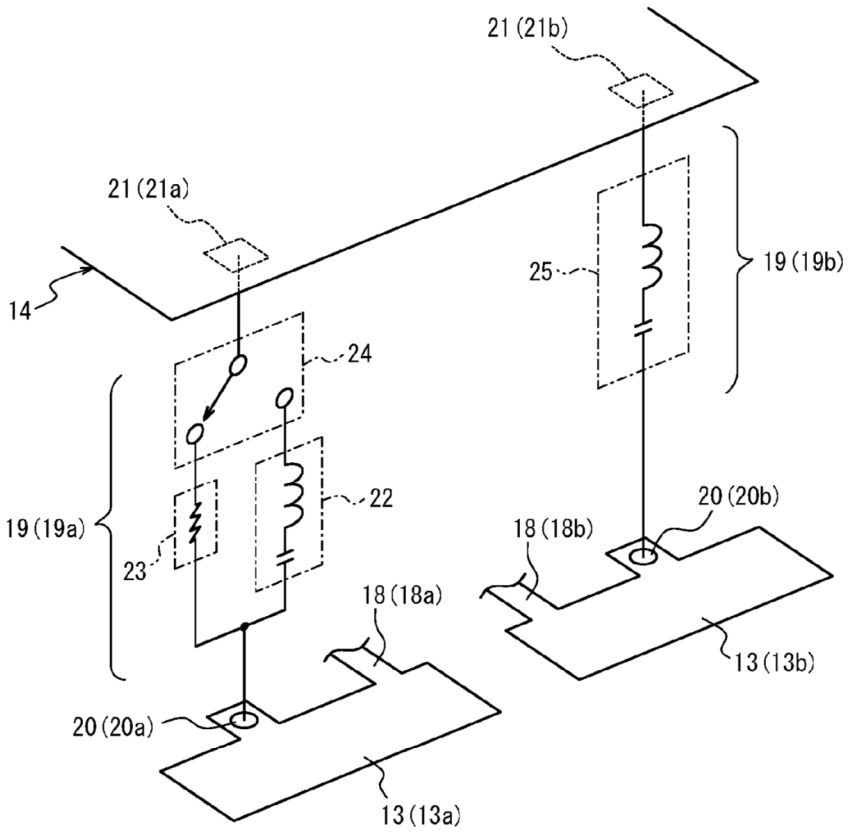
H01Q 1/24 (2006.01)
H01Q 9/00 (2006.01)
H01Q 5/30 (2006.01)
H01Q 1/48 (2006.01)

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

CPC ***H01Q 1/242*** (2013.01); ***H01Q 1/48*** (2013.01); ***H01Q 9/00*** (2013.01); ***H01Q 5/30*** (2015.01)

(57) **ABSTRACT**

An electronic device that reduces deterioration of the antenna characteristics of an antenna corresponding to a plurality of communication bands is provided. An electronic device includes an antenna corresponding to a plurality of communication bands, a conductive member, a GND terminal, a first circuit, a second circuit having an impedance lower than that of the first circuit and a switching circuit. The first circuit and the second circuit can each connect the conductive member and the GND terminal. The switching circuit switches a circuit connecting the conductive member and the GND terminal between the first circuit and the second circuit depending on the communication band for use.



US 20180034135A1

(19) **United States**

(12) **Patent Application Publication**

KWAK et al.

(10) **Pub. No.: US 2018/0034135 A1**

(43) **Pub. Date: Feb. 1, 2018**

(54) **ELECTRONIC DEVICE COMPRISING ANTENNA**

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

(72) Inventors: **Yong Soo KWAK**, Seoul (KR); **Gyu Sub KIM**, Seoul (KR); **Hae Yeon KIM**, Suwon-si (KR); **Se Hyun PARK**, Suwon-si (KR); **Kyung Il SEO**, Daegu (KR); **Jung Hoon SEO**, Hwaseong-si (KR); **Dong Min SHIN**, Yongin-si (KR); **Ui Chul JEONG**, Anyang-si (KR); **Jin Woo JUNG**, Seoul (KR); **Young Jun CHO**, Seoul (KR)

(21) Appl. No.: **15/665,933**

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

(30) **Foreign Application Priority Data**

Aug. 1, 2016 (KR) 10-2016-0098238

Publication Classification

(51) **Int. Cl.**

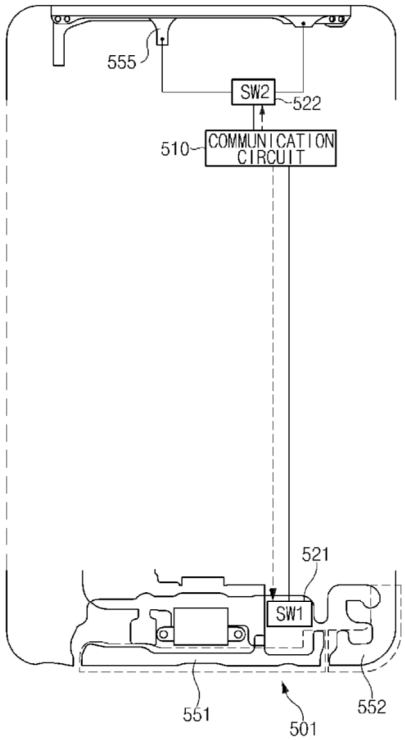
H01Q 1/24 (2006.01)
H01Q 21/30 (2006.01)
H01Q 5/35 (2006.01)
H01Q 1/48 (2006.01)

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

CPC ***H01Q 1/243*** (2013.01); ***H01Q 1/48*** (2013.01); ***H01Q 21/30*** (2013.01); ***H01Q 5/35*** (2015.01)

(57) **ABSTRACT**

An electronic device is provided. The electronic device includes a housing, a wireless communication circuit, a first antenna radiator electrically connected with a first ground, a second antenna radiator electrically connected with a second ground, a feeding unit that feeds at least one of the first antenna radiator or the second antenna radiator, and a first switch that operates at a first connection state where the feeding unit and the first antenna radiator are electrically connected to each other, at a second connection state where the feeding unit and the second antenna are electrically connected to each other, or at a third connection state where the feeding unit and the first antenna radiator are connected to each other and the feeding unit and the second antenna radiator are electrically connected to each other, based on a first control signal from the wireless communication circuit.



US 20180034148A1

(19) **United States**

(12) **Patent Application Publication**

NAM et al.

(10) **Pub. No.: US 2018/0034148 A1**

(43) **Pub. Date: Feb. 1, 2018**

(54) **ELECTRONIC DEVICE INCLUDING MULTIPLE ANTENNAS**

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

(72) Inventors: **Ho Jung NAM**, Gyeonggi-do (KR); **Min Cheol Seo**, Seoul (KR); **Hae Yeon Kim**, Gyeonggi-do (KR); **Se Hyun Park**, Gyeonggi-do (KR)

(21) Appl. No.: **15/664,772**

(22) Filed: **Jul. 31, 2017**

(30) **Foreign Application Priority Data**

Jul. 29, 2016 (KR) 10-2016-0097564

Publication Classification

(51) **Int. Cl.**

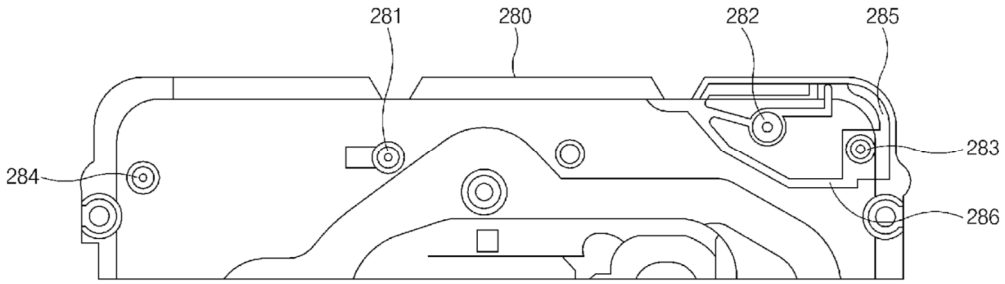
H01Q 1/52 (2006.01)
H01Q 1/50 (2006.01)
H01Q 1/24 (2006.01)
H01Q 5/35 (2006.01)

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

CPC ***H01Q 1/523*** (2013.01); ***H01Q 5/35*** (2015.01); ***H01Q 1/50*** (2013.01); ***H01Q 1/243*** (2013.01)

(57) **ABSTRACT**

An electronic device is provided. The electronic device includes a first antenna configured to transmit and receive signals of a plurality of frequency bands, and a second antenna disposed at an area adjacent to the first antenna. The first antenna includes a first wireless communication circuit, a first radiator, a first feeding part configured to connect the first wireless communication circuit to the first radiator, a first ground part configured to be connected to one end of the first radiator, a switching circuit configured to be connected to the first radiator in an area adjacent to the second antenna, at least one frequency band element in which a first end is connected to the switching circuit and a second end is connected to the first ground part, and at least one isolation element configured to connect the first radiator to the ground part in the area adjacent to the second antenna.



US 20180034157A1

(19) **United States**

(12) **Patent Application Publication**

SHAH et al.

(10) **Pub. No.: US 2018/0034157 A1**

(43) **Pub. Date: Feb. 1, 2018**

(54) **ANTENNA SYSTEM FOR MATCHING AN IMPEDANCE**

(71) Applicant: **RELIANCE JIO INFOCOMM LIMITED**, Mumbai (IN)

(72) Inventors: **Brijesh Ishvarlal SHAH**, Navi Mumbai (IN); **Kailash KASHYAP**, Navi Mumbai (IN); **Praveen Kumar PENTA**, Navi Mumbai (IN); **Vijay Mohan VERMA**, Navi Mumbai (IN)

(73) Assignee: **RELIANCE JIO INFOCOMM LIMITED**, Mumbai (IN)

(21) Appl. No.: **15/659,416**

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

(30) **Foreign Application Priority Data**

Jul. 26, 2016 (IN) 201621025573

Publication Classification

(51) **Int. Cl.**

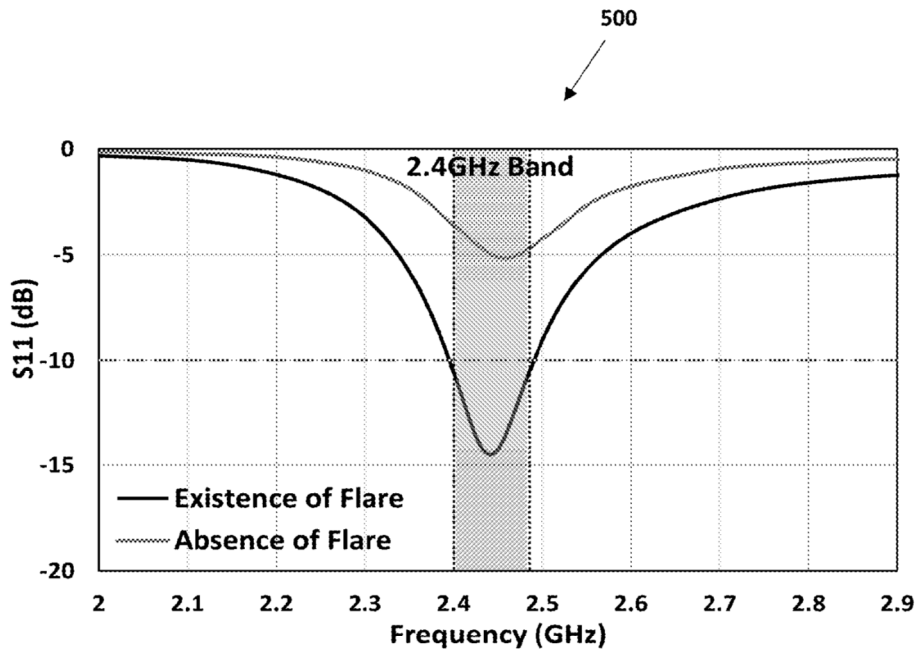
H01Q 9/04	(2006.01)
H01Q 5/335	(2006.01)
H01Q 1/52	(2006.01)
H01Q 1/38	(2006.01)

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

CPC ***H01Q 9/0421*** (2013.01); ***H01Q 1/38*** (2013.01); ***H01Q 5/335*** (2015.01); ***H01Q 1/52*** (2013.01)

(57) **ABSTRACT**

Embodiments of the present invention relate to an antenna [**100**] for matching an impedance between a feed point [**140**] and a radiator [**110**], comprising: the radiator [**110**] mounted, over a printed circuit board, has a first end and a second end; a flare [**130**] for matching the impedance, wherein the flare [**130**] has a first end and a second end, and the flare [**130**] is taper-shaped from the first end to the second end of the flare [**130**]; the feed point [**140**] comprises a first end and a second end, wherein the first end of the feed point [**140**] is connected to the second end of the flare [**130**], and the second end of the feed point [**140**] is connected to the printed circuit board; and a shorting stub [**150**] placed between the flare [**130**] and the printed circuit board for grounding a capacitance induced by the antenna [**100**].



US 20180035532A1

(19) **United States**

(12) **Patent Application Publication**

(10) **Pub. No.: US 2018/0035532 A1**

(43) **Pub. Date: Feb. 1, 2018**

CHEN

(54) **ELECTRONIC TERMINAL**

(71) Applicant: **Wuhan China Star Optoelectronics Technology Co., Ltd.**, Wuhan, Hubei (CN)

(72) Inventor: **Gui CHEN**, Shenzhen, Guangdong (CN)

(73) Assignee: **Wuhan China Star Optoelectronics Technology Co., Ltd.**, Wuhan, Hubei (CN)

(21) Appl. No.: **14/914,156**

(22) PCT Filed: **Feb. 1, 2016**

(86) PCT No.: **PCT/CN2016/073030**

§ 371 (c)(1),
(2) Date: **Feb. 24, 2016**

(30) **Foreign Application Priority Data**

Dec. 31, 2015 (CN) 201511027947.2

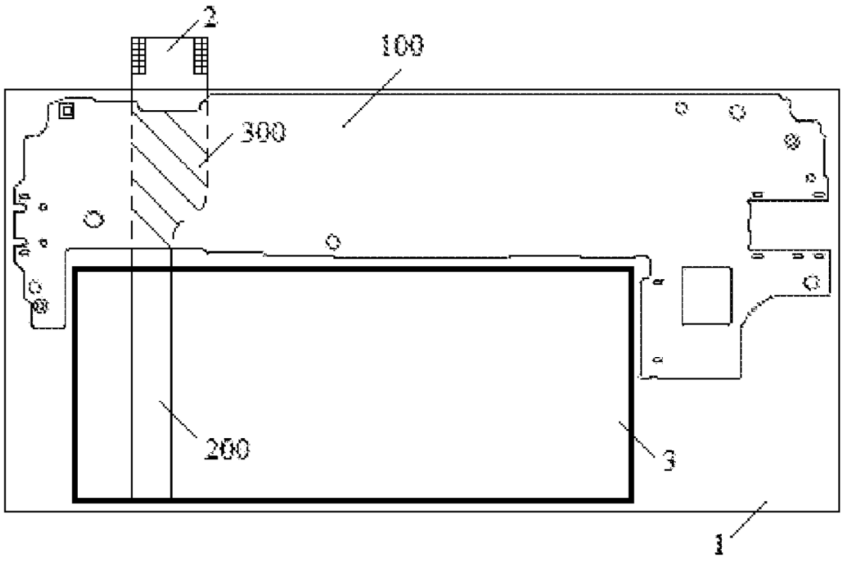
Publication Classification

(51) **Int. Cl.**
H05K 1/02 (2006.01)
H05K 5/00 (2006.01)

(52) **U.S. Cl.**
CPC ***H05K 1/028*** (2013.01); ***H05K 5/0017*** (2013.01); ***H05K 1/0213*** (2013.01)

(57) **ABSTRACT**

An electronic terminal includes a display panel, a printed circuit board and a flexible printed circuit board. A portion of the flexible printed circuit board is located below the printed circuit board, a terminal of the flexible printed circuit board is connected with the display panel, and the other terminal is connected with a port of a driving circuit of the printed circuit board. At a location of a ground wire disposed inside an overlapping region of the flexible printed circuit board and the printed circuit board and disposed on the flexible printed circuit board, a first copper-exposed region is provided. At a location of a ground wire inside the overlapping region and on the printed circuit board, a second copper-exposed region is provided. A length of the ground wire in the printed circuit board is matched with a length of an antenna in the electronic terminal.



US 20180040940A1

(19) **United States**

(12) **Patent Application Publication**

Bologna et al.

(10) **Pub. No.: US 2018/0040940 A1**

(43) **Pub. Date: Feb. 8, 2018**

(54) **ANTENNA SOLUTION FOR NARROW BEZEL SYSTEM**

(71) Applicant: **Dell Products L.P.**, Round Rock, TX (US)

(72) Inventors: **Benny J. Bologna**, Austin, TX (US); **Mark Andrew Schwager**, Cedar Park, TX (US); **Julian Spencer**, Cedar Park, TX (US)

(21) Appl. No.: **15/226,023**

(22) Filed: **Aug. 2, 2016**

Publication Classification

(51) **Int. Cl.**

H01Q 1/22 (2006.01)

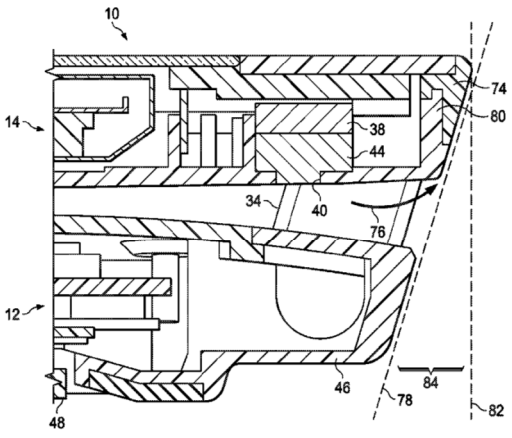
H01Q 1/50 (2006.01)

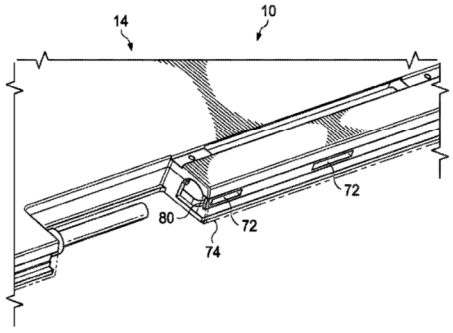
(52) **U.S. Cl.**

CPC ***H01Q 1/2266*** (2013.01); ***H01Q 1/50*** (2013.01)

(57) **ABSTRACT**

Systems and methods are disclosed for positioning an antenna in a portable information handling system. A portable information handling system includes a housing having a first housing portion and a second housing portion. The portable information handling system also includes a hinge assembly rotationally coupling the first and second housing portions. The portable information handling system also includes an antenna disposed within the first housing portion, the antenna operable to transmit radio waves. The portable information handling system further includes an antenna aperture formed within the first housing portion. The second housing portion comprises a radio frequency (RF) permeable region comprising RF permeable material, the RF permeable region located in proximity to the antenna aperture when the portable information handling system is in tablet mode, tablet mode representing the first housing portion rotated approximately 360 degrees from the second housing portion.





US 20180040942A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2018/0040942 A1**

Lepe et al. (43) **Pub. Date: Feb. 8, 2018**

(54) **WIRELESS COMMUNICATION DEVICE HAVING A MULTI-BAND SLOT ANTENNA WITH A PARASITIC ELEMENT**

(71) Applicant: **TYCO ELECTRONICS CORPORATION**, Berwyn, PA (US)

(72) Inventors: **Hilario Lepe**, Gilroy, CA (US); **Bruce Foster Bishop**, Aptos, CA (US)

(21) Appl. No.: **15/228,641**

(22) Filed: **Aug. 4, 2016**

Publication Classification

(51) **Int. Cl.**

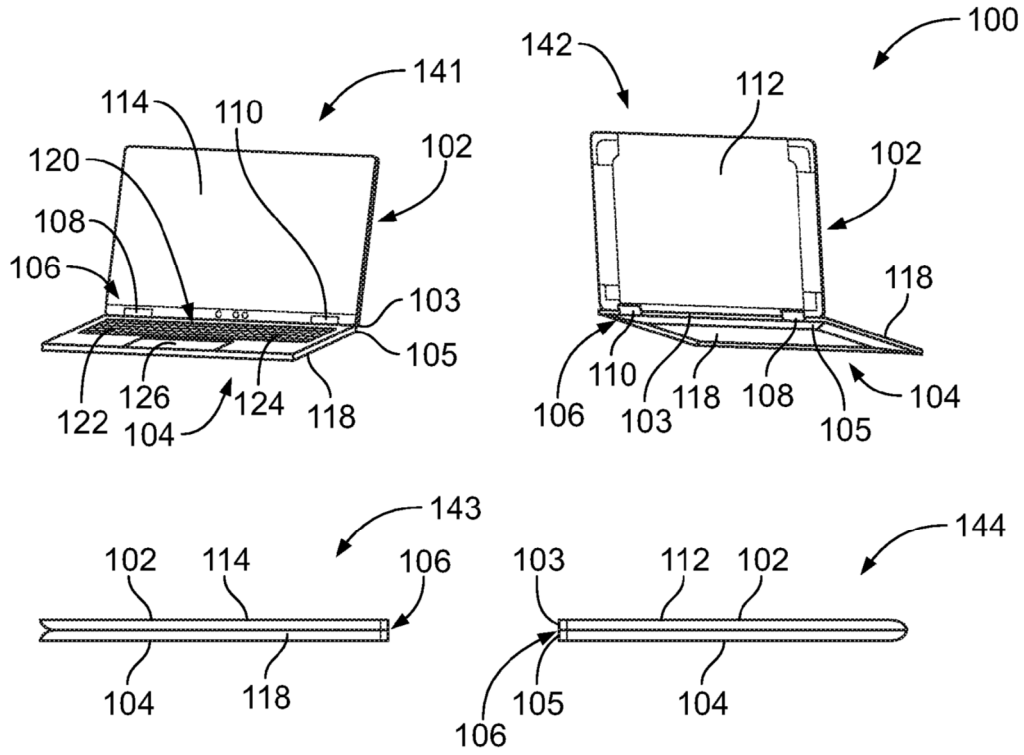
H01Q 1/24	(2006.01)
H01Q 1/50	(2006.01)
H01Q 5/10	(2006.01)
H01Q 13/10	(2006.01)

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

CPC ***H01Q 1/243*** (2013.01); ***H01Q 13/106*** (2013.01); ***H01Q 1/50*** (2013.01); ***H01Q 5/10*** (2015.01)

(57) **ABSTRACT**

Wireless communication device includes a conductive wall having an antenna slot. The wireless communication device also includes an antenna sub-assembly positioned relative to the antenna slot to form a multi-band slot antenna. The multi-band slot antenna includes a dielectric body and a feed trace coupled to the dielectric body. The feed trace is operably aligned with the antenna slot. The multi-band slot antenna also includes a parasitic trace coupled to the dielectric body. The parasitic trace is operably aligned with the antenna slot and spaced apart from the feed trace. The feed trace is configured to communicate at a first frequency band and the parasitic trace enables the multi-band slot antenna to communicate at a second frequency band. The first frequency band is based on a size and shape of the parasitic trace.



US 20180040943A1

(19) **United States**

(12) **Patent Application Publication**

Hobson et al.

(10) **Pub. No.: US 2018/0040943 A1**

(43) **Pub. Date: Feb. 8, 2018**

(54) **WIRELESS HANDHELD ELECTRONIC DEVICE**

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

(72) Inventors: **Phillip M. Hobson**, Menlo Park, CA (US); **Stephen P. Zadesky**, Portola Valley, CA (US); **Erik L. Wang**, Redwood City, CA (US); **Tang Yew Tan**, Palo Alto, CA (US); **Richard Hung Minh Dinh**, San Jose, CA (US); **Adam D. Mittleman**, San Francisco, CA (US); **Kenneth A. Jenks**, Capitola, CA (US); **Robert J. Hill**, Salinas, CA (US); **Robert W. Schlub**, Cupertino, CA (US)

(21) Appl. No.: **15/784,814**

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

Related U.S. Application Data

(63) Continuation of application No. 14/612,187, filed on Feb. 2, 2015, now Pat. No. 9,793,598, which is a continuation of application No. 13/773,010, filed on Feb. 21, 2013, now Pat. No. 8,952,853, which is a continuation of application No. 13/008,586, filed on Jan. 18, 2011, now Pat. No. 8,395,555, which is a continuation of application No. 12/142,552, filed on Jun. 19, 2008, now Pat. No. 7,876,274.

(60) Provisional application No. 60/936,796, filed on Jun. 21, 2007.

Publication Classification

(51) **Int. Cl.**

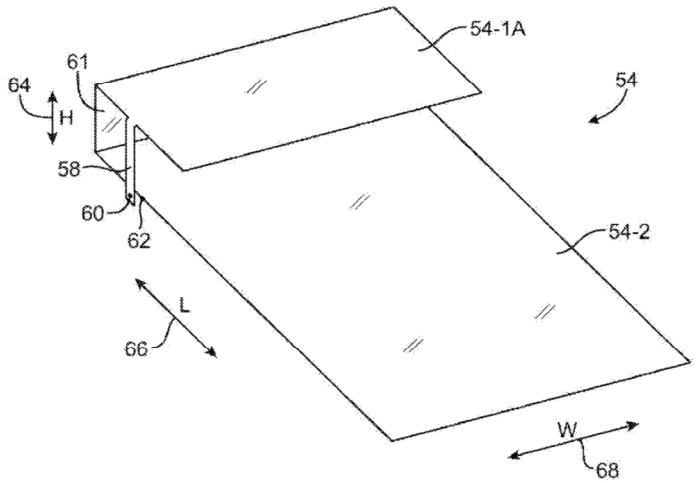
H01Q 1/24	(2006.01)
H01Q 13/10	(2006.01)
H01Q 9/42	(2006.01)
H01Q 9/04	(2006.01)
H01Q 1/50	(2006.01)
H01Q 1/38	(2006.01)
H01Q 21/28	(2006.01)
H01Q 1/48	(2006.01)
H01Q 7/00	(2006.01)
H01Q 1/27	(2006.01)
H01Q 1/46	(2006.01)

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

CPC ***H01Q 1/243*** (2013.01); ***H01Q 21/28*** (2013.01); ***H01Q 13/10*** (2013.01); ***H01Q 9/42*** (2013.01); ***H01Q 9/0421*** (2013.01); ***H01Q 1/48*** (2013.01); ***H01Q 5/40*** (2015.01); ***H01Q 1/24*** (2013.01); ***H01Q 1/50*** (2013.01); ***H01Q 5/371*** (2015.01); ***H01Q 1/38*** (2013.01); *H01Q 1/273* (2013.01); *H01Q 1/46* (2013.01); *H01Q 7/00* (2013.01)

(57) **ABSTRACT**

A handheld electronic device may be provided that contains a conductive housing and other conductive elements. The conductive elements may form an antenna ground plane. One or more antennas for the handheld electronic device may be formed from the ground plane and one or more associated antenna resonating elements. Transceiver circuitry may be connected to the resonating elements by transmission lines such as coaxial cables. Ferrules may be crimped to the coaxial cables. A bracket with extending members may be crimped over the ferrules to ground the coaxial cables to the housing and other conductive elements in the ground plane. The ground plane may contain an antenna slot. A dock connector and flex circuit may overlap the slot in a way that does not affect the resonant frequency of the slot. Electrical components may be isolated from the antenna using isolation elements such as inductors and resistors.



US 20180041239A1

(19) **United States**

(12) **Patent Application Publication**

YOUN et al.

(10) **Pub. No.: US 2018/0041239 A1**

(43) **Pub. Date: Feb. 8, 2018**

(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.: **15/783,873**

(22) Filed: **Oct. 13, 2017**

Related U.S. Application Data

(63) 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.**

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

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

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