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(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2017/0365912 A1**

**Su et al.** (43) **Pub. Date: Dec. 21, 2017**

(54) **COMMUNICATION DEVICE AND ANTENNA ASSEMBLY THEREOF**

**Publication Classification**

(71) Applicant: **KING SLIDE TECHNOLOGY CO.,LTD.**, Kaohsiung City (TW)

(51) **Int. Cl.**  
**H01Q 1/24** (2006.01)  
**H01Q 1/50** (2006.01)  
**H01Q 1/48** (2006.01)

(72) Inventors: **Hsin-Cheng Su**, Kaohsiung City (TW);  
**Chun-Ta Liu**, Kaohsiung City (TW);  
**Shu-Chen Lin**, Kaohsiung City (TW)

(52) **U.S. Cl.**  
CPC ..... **H01Q 1/243** (2013.01); **H01Q 1/48** (2013.01); **H01Q 1/50** (2013.01)

(21) Appl. No.: **15/344,604**

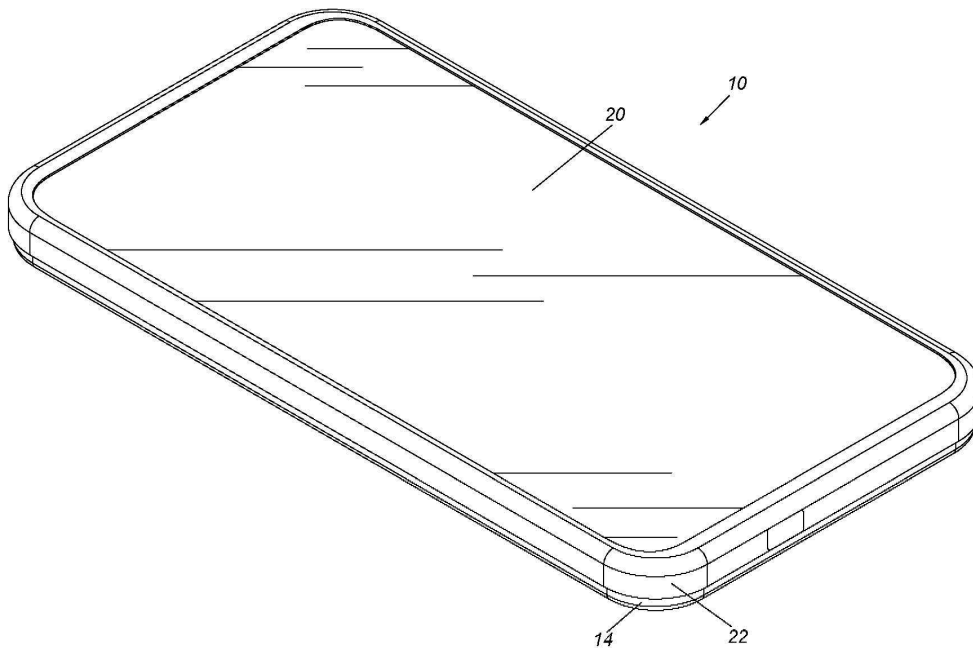
(57) **ABSTRACT**

A communication device includes a main body, a mother board, a housing and a first antenna. The main body is formed with a rim. The mother board is arranged at a first side of the main body. The housing is mounted on the main body and configured to cover the mother board. An orthogonal projection of the housing onto the main body defines a covering range. The first antenna is electrically connected to the mother board and arranged along the rim of the main body. Wherein, at least one portion of the first antenna is located outside the covering range of the housing.

(22) Filed: **Nov. 7, 2016**

(30) **Foreign Application Priority Data**

Jun. 20, 2016 (TW) ..... 105119383





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(19) **United States**

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

(10) **Pub. No.: US 2017/0365914 A1**  
(43) **Pub. Date: Dec. 21, 2017**

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

*H01Q 5/50* (2006.01)  
*H01Q 1/38* (2006.01)  
*H04L 5/14* (2006.01)  
*H04B 7/12* (2006.01)

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

(52) **U.S. Cl.**  
CPC ..... *H01Q 1/243* (2013.01); *H04L 5/14*  
(2013.01); *H04B 7/12* (2013.01); *H01Q 5/50*  
(2015.01); *H01Q 1/38* (2013.01); *H04B 7/0805* (2013.01)

(72) Inventors: **Sang Ho HONG**, Gyeonggi-do (KR);  
**Mu Chang SON**, Gyeonggi-do (KR);  
**Sung Chul PARK**, Seoul (KR)

(73) Assignee: **Samsung Electronics Co., Ltd.**

(57) **ABSTRACT**

(21) Appl. No.: **15/625,425**

Disclosed is an electronic device including a first antenna element configured selectively to receive signals of a first frequency band and a second frequency band or of the first frequency band and a third frequency band, a second antenna element configured to receive a signal of the third frequency band, a transceiver configured to be electrically connected with the first antenna element and the second antenna element, and a processor configured to be electrically connected with the transceiver. The electronic device performs carrier aggregation using the second frequency band and the third frequency band.

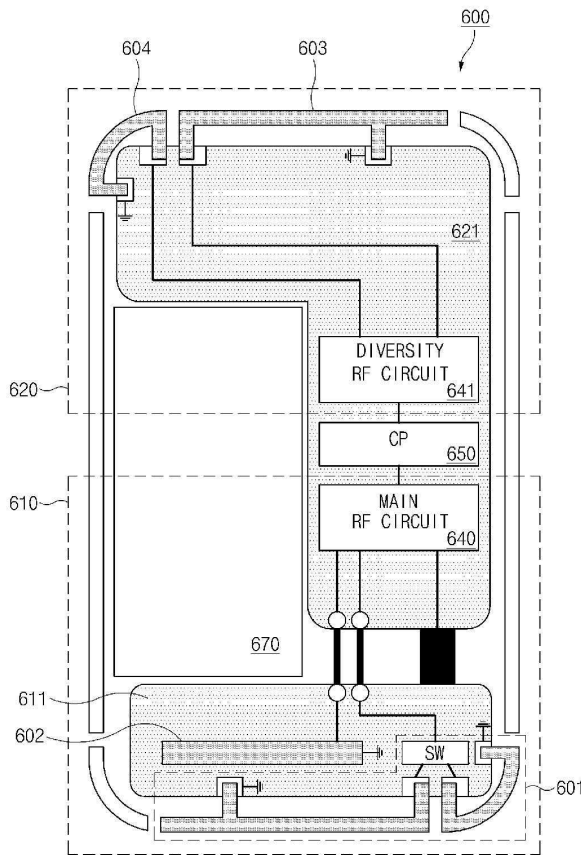
(22) Filed: **Jun. 16, 2017**

(30) **Foreign Application Priority Data**

Jun. 16, 2016 (KR) ..... 10-2016-0075156

**Publication Classification**

(51) **Int. Cl.**  
*H01Q 1/24* (2006.01)  
*H04B 7/08* (2006.01)





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(19) **United States**

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

(10) **Pub. No.: US 2017/0365918 A1**

(43) **Pub. Date: Dec. 21, 2017**

(54) **SUBSTRATE TYPE ANTENNA**

*H01Q 25/00* (2006.01)

*H01Q 1/52* (2006.01)

(71) Applicant: **NISSEI Limited**, Tokyo (JP)

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

(72) Inventors: **Tsutomu KANEKO**, Tokyo (JP);  
**Takahisa KARAKAMA**, Nagano-shi (JP)

CPC ..... *H01Q 1/38* (2013.01); *H01Q 25/00* (2013.01); *H01Q 1/523* (2013.01); *H01Q 3/12* (2013.01); *H01Q 9/27* (2013.01)

(21) Appl. No.: **15/627,483**

(57)

**ABSTRACT**

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

A substrate type antenna for conducting signal transmitting/receiving with using two (2) antennas, each having almost same resonance frequency, wherein each of those two (2) antennas applies therein a spiral antenna having an antenna side coupling pattern, which is positioned to face to a power supply point side coupling patten, and a spiral antenna having a spiral antenna pattern, which is coupled to the antenna side coupling pattern, and wherein those two (2) antennas are positioned in such a manner that extending directions of the facing end portions, being closest to each other in the spiral antenna patterns of those two (2) antennas, are not aligned to each other, but are shifted in different directions.

(30) **Foreign Application Priority Data**

Jun. 21, 2016 (JP) ..... 2016-122365

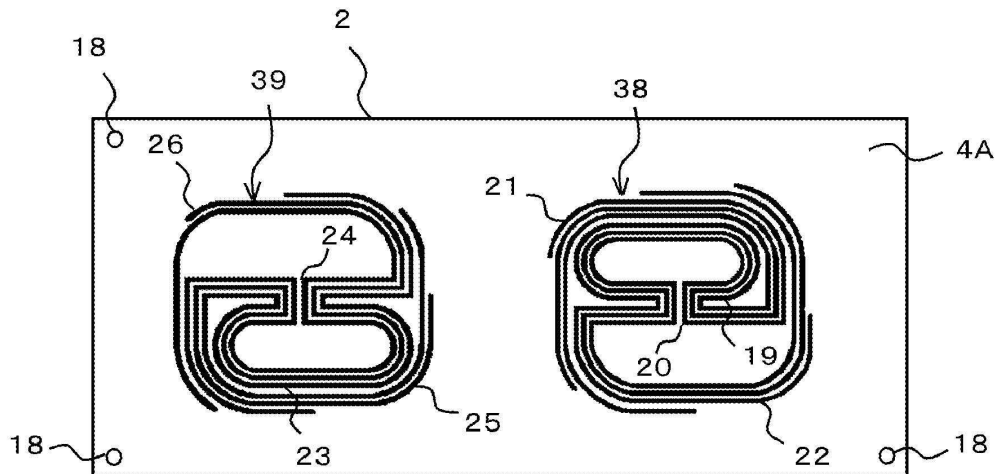
**Publication Classification**

(51) **Int. Cl.**

*H01Q 1/38* (2006.01)

*H01Q 9/27* (2006.01)

*H01Q 3/12* (2006.01)





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(19) **United States**

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

(10) **Pub. No.: US 2017/0365927 A1**

(43) **Pub. Date: Dec. 21, 2017**

(54) **SQUARE SHAPED MULTI-SLOTTED  
2.45GHZ WEARABLE ANTENNA**

**Publication Classification**

(71) Applicant: **COMSATS Institute of Information  
Technology, Wah (PK)**

(51) **Int. Cl.**  
*H01Q 9/04* (2006.01)  
*H01Q 1/27* (2006.01)  
*H01Q 1/24* (2006.01)

(72) Inventors: **Muhammad Toaha Raza Khan, Wah  
(PK); Nadia Nawaz Qadri, Wah (PK);  
Hassan Iftikhar, Wah (PK)**

(52) **U.S. Cl.**  
CPC ..... *H01Q 9/0407* (2013.01); *H01Q 1/245*  
(2013.01); *H01Q 1/273* (2013.01)

(21) Appl. No.: **15/626,536**

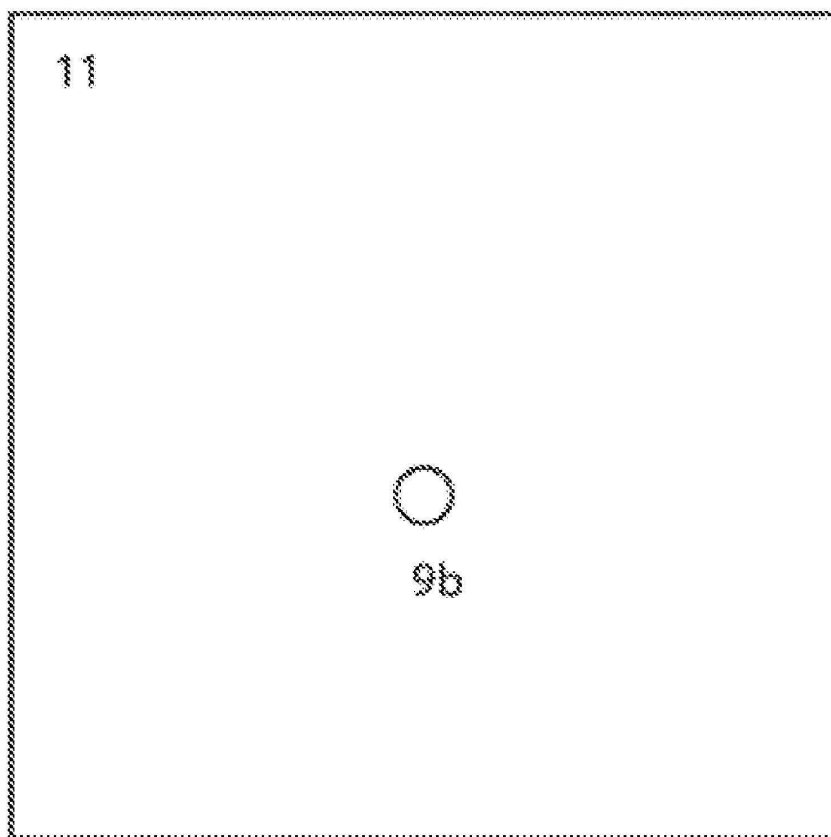
(57) **ABSTRACT**

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

A microstrip antenna including: a substrate; a radiating slotted patch; a square plate; and a coaxial feed, wherein the coaxial feed further comprises an inner central conducting pin; wherein the substrate is sandwiched between the radiating slotted patch and the square plate, and wherein the coaxial feed is connected to the square plate, and the inner central conducting pin of coaxial feed passes through the substrate and is connected to the radiating slotted patch.

(30) **Foreign Application Priority Data**

Jun. 20, 2016 (PK) ..... 370/2016





US 20170373388A1

(19) **United States**

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

(10) **Pub. No.: US 2017/0373388 A1**

(43) **Pub. Date: Dec. 28, 2017**

(54) **HANDHELD DEVICE**

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

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

CPC ..... **H01Q 1/50** (2013.01); **H01Q 5/328**  
(2015.01); **H01Q 1/242** (2013.01)

(72) Inventors: **Hanyang Wang**, Reading (GB); **Liang Xue**, Shanghai (CN); **Lei Wang**, Shanghai (CN); **Jiaqing You**, Shanghai (CN); **Meng Hou**, Shanghai (CN)

(57) **ABSTRACT**

(21) Appl. No.: **15/541,467**

(22) PCT Filed: **Jan. 4, 2015**

(86) PCT No.: **PCT/CN2015/070062**

§ 371 (c)(1),

(2) Date: **Jul. 3, 2017**

**Publication Classification**

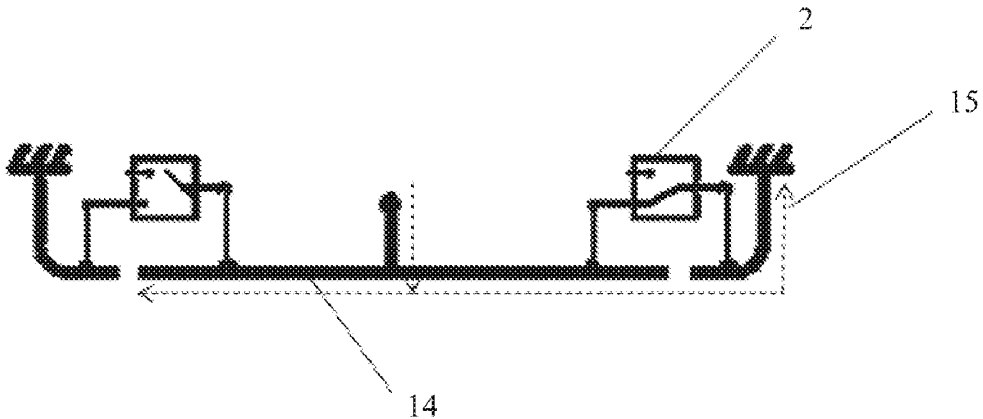
(51) **Int. Cl.**

**H01Q 1/50** (2006.01)

**H01Q 1/24** (2006.01)

**H01Q 5/328** (2006.01)

A handheld device includes a metal frame, two switches, and an antenna feedpoint, where two slits are disposed at the metal frame; the slits divide the metal frame into a left frame, a middle frame, and a right frame; two sides of each slit are bridged by one switch, where one of the switches is in a connected state, the other of the switches is in a disconnected state, and the two switches perform state switching when a user's finger connects a slit corresponding to the switch in a disconnected state; and the antenna feedpoint is electrically connected to the middle frame, and the left frame and the right frame are grounded, to form an antenna.





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(19) **United States**

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

(10) **Pub. No.: US 2017/0373393 A1**

(43) **Pub. Date: Dec. 28, 2017**

(54) **FREQUENCY RECONFIGURABLE  
ANTENNA DECOUPLING FOR WIRELESS  
COMMUNICATION**

*H01Q 1/48* (2006.01)

*H04W 72/04* (2009.01)

*H01Q 1/24* (2006.01)

(71) Applicant: **Intel IP Corporation**, Santa Clara, CA  
(US)

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

CPC ..... *H01Q 5/328* (2015.01); *H04W 72/042*

(2013.01); *H04W 72/0413* (2013.01); *H01Q*

*1/243* (2013.01); *H01Q 1/48* (2013.01); *H01Q*

*21/00* (2013.01)

(72) Inventors: **Alexandru Daniel Tatomirescu**,  
Aalborg (DK); **Simon Stanev**, Aalborg  
(DK); **Emil Busgaard**, Aalborg (DK);  
**Gert F. Pedersen**, Storvorde (DK);  
**Pevand Bahramzy**, Norresundby (DK);  
**Simon Svendsen**, Aalborg (DK); **Boyan**  
**Yanakiev**, Aalborg (DK); **Ole Jagielski**,  
Frederikshavn (DK)

(57)

**ABSTRACT**

Cellular antennas having a mutual coupling can be isolated by the generation of an additional current path along a ground plane. A first antenna element can resonate at a resonance that interferes with and is mutually coupled to a second antenna element operating in a same frequency range, such as a low band frequency range. One or more parasitic scattering elements can generate the additional current path between the two antennas and isolate the two antennas from one another. A parasitic scattering element can comprise two capacitors that alter a radiation pattern of one of the antennas and decrease a correlation between both antennas.

(21) Appl. No.: **15/193,958**

(22) Filed: **Jun. 27, 2016**

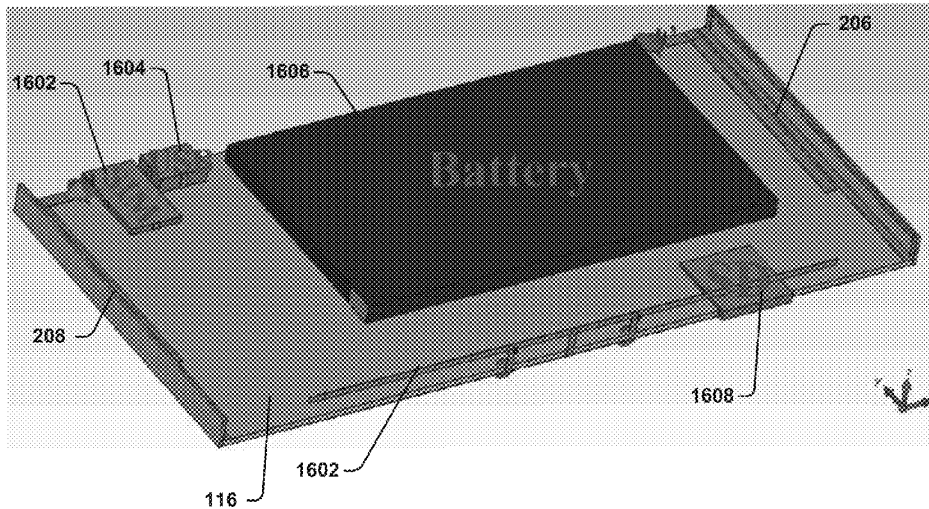
**Publication Classification**

(51) **Int. Cl.**

*H01Q 5/328* (2006.01)

*H01Q 21/00* (2006.01)

1600





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(19) **United States**

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

(10) **Pub. No.: US 2017/0374182 A1**

(43) **Pub. Date: Dec. 28, 2017**

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

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

(72) Inventors: **Hyung Joo LEE**, Seongnam-si (KR);  
**Gyu Sub KIM**, Seoul (KR); **Dong Yeon KIM**,  
Suwon-si (KR); **Chae Up YOO**, Seoul (KR)

(21) Appl. No.: **15/673,097**

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

**H04B 1/3827** (2006.01)

**H04B 1/48** (2006.01)

**H04W 84/12** (2009.01)

**H04W 4/00** (2009.01)

**H04W 84/04** (2009.01)

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

CPC ..... **H04M 1/0202** (2013.01); **H04B 1/3833**  
(2013.01); **H01Q 5/328** (2015.01); **H01Q 5/35**  
(2015.01); **H01Q 1/243** (2013.01); **H04B 1/48**  
(2013.01); **H01Q 5/314** (2015.01); **H01Q**  
**1/521** (2013.01); **H01Q 1/48** (2013.01); **H04B**  
**2001/485** (2013.01); **H04W 4/008** (2013.01);  
**H04W 84/042** (2013.01); **H04W 84/12**  
(2013.01)

**Related U.S. Application Data**

(63) Continuation of application No. 15/234,547, filed on  
Aug. 11, 2016, now Pat. No. 9,762,710.

(30) **Foreign Application Priority Data**

Aug. 13, 2015 (KR) ..... 10-2015-0114638

**Publication Classification**

(51) **Int. Cl.**

**H04M 1/02** (2006.01)

**H01Q 5/328** (2006.01)

**H01Q 5/35** (2006.01)

**H01Q 1/24** (2006.01)

**H01Q 5/314** (2006.01)

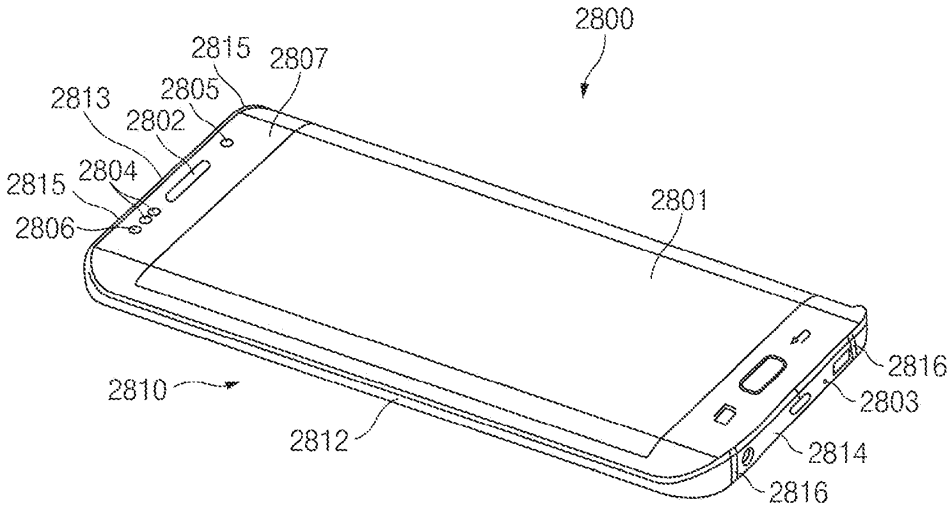
**H01Q 1/52** (2006.01)

**H01Q 1/48** (2006.01)

(57)

**ABSTRACT**

An electronic device is provided. The electronic device includes a housing including a first surface, a second surface disposed facing an opposite side of the first surface, and a side surface configured to surround at least a portion of a space between the first surface and the second surface, a first elongated metal member configured to form a first portion of the side surface and including a first end and a second end, at least one communication circuit electrically connected to a first point of the first elongated metal member through a capacitive element, at least one ground member disposed in an interior of the housing, and a first conductive member configured to electrically connect a second point of the first elongated metal member to the ground member. The second point of the first elongated metal member is disposed closer to the second end than to the first point.





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(19) **United States**

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

(10) **Pub. No.: US 2018/0006361 A1**

(43) **Pub. Date: Jan. 4, 2018**

(54) **MOBILE PHONE ANTENNA STRUCTURE WITH FULL SPECTRUM BAND**

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

CPC ..... **H01Q 1/243** (2013.01); **H01Q 1/38** (2013.01); **H01Q 1/48** (2013.01)

(71) Applicants: **Jianchun Mai**, Shenzhen (CN); **Renkai Li**, Shenzhen (CN)

(72) Inventors: **Jianchun Mai**, Shenzhen (CN); **Renkai Li**, Shenzhen (CN)

(57) **ABSTRACT**

(73) Assignee: **AAC Technologies Pte. Ltd.**, Singapore City (SG)

(21) Appl. No.: **15/358,735**

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

(30) **Foreign Application Priority Data**

Jul. 1, 2016 (CN) ..... 201620689131.X

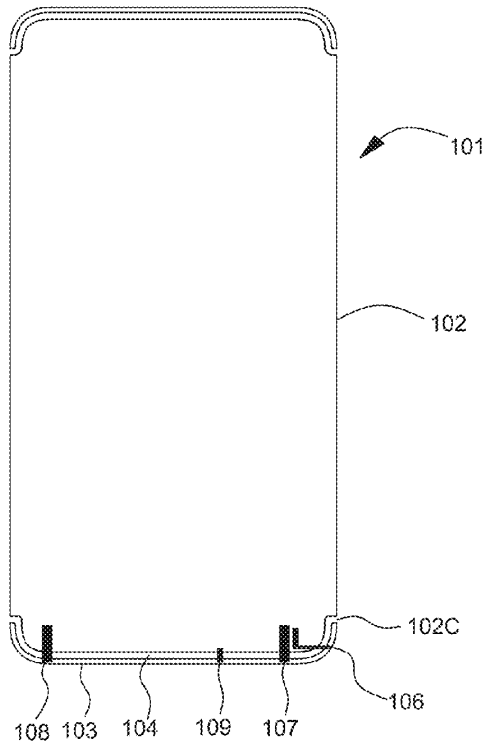
**Publication Classification**

(51) **Int. Cl.**

**H01Q 1/24** (2006.01)  
**H01Q 1/48** (2006.01)  
**H01Q 1/38** (2006.01)

An antenna structure includes a metal shell including a grounded middle frame provided with a main body and sides bent and extending from two sides of the main body and a radiating part serving as an antenna radiating body. The radiating part forms an insulation filled gap with the middle frame. Two ends of the radiating part are arranged opposed to each other for forming an insulation filled breaking joint. A circuit board is arranged below the metal shell, and one side of the circuit board adjacent to the radiating part forms a clearance zone between the circuit board and the radiating part. The antenna further includes a feeding point, at least one ground point, and a tuning circuit. The feeding point is close to the breaking joint, and the ground point includes a first ground point and a second ground point.

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(19) **United States**

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

(10) **Pub. No.: US 2018/0013190 A1**

(43) **Pub. Date: Jan. 11, 2018**

(54) **MOBILE DEVICE**

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

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

CPC ..... **H01Q 1/24** (2013.01); **H01Q 1/36** (2013.01); **H01Q 1/48** (2013.01)

(72) Inventors: **Chun-I CHEN**, Taoyuan City (TW);  
**Chi-Hsuan LEE**, Taoyuan City (TW);  
**Chung-Ting HUNG**, Taoyuan City (TW)

(57) **ABSTRACT**

(21) Appl. No.: **15/286,893**

(22) Filed: **Oct. 6, 2016**

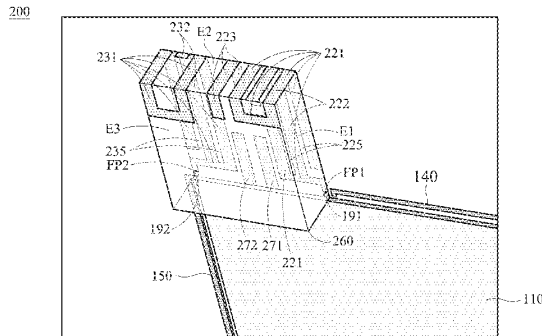
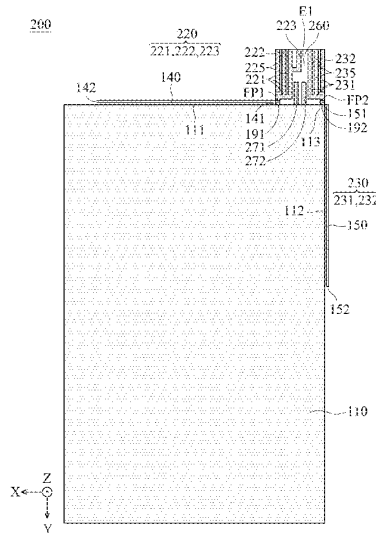
(30) **Foreign Application Priority Data**

Jul. 6, 2016 (TW) ..... 105121329

**Publication Classification**

(51) **Int. Cl.**  
**H01Q 1/24** (2006.01)  
**H01Q 1/48** (2006.01)  
**H01Q 1/36** (2006.01)

A mobile device includes a ground plane, a first antenna, a second antenna, a first metal element, and a second metal element. The first antenna has a first feeding point coupled to a first signal source. The second antenna has a second feeding point coupled to a second signal source. The first metal element has a connection end and an open end. The connection end of the first metal element is coupled to the ground plane, and is adjacent to the first feeding point. The second metal element has a connection end and an open end. The connection end of the second metal element is coupled to the ground plane, and is adjacent to the second feeding point.





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(19) **United States**

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

(10) **Pub. No.: US 2018/0019515 A1**

(43) **Pub. Date: Jan. 18, 2018**

(54) **MIMO ANTENNA HAVING ADJUSTABLE DECOUPLING STRUCTURE**

*H01Q 1/38* (2006.01)

*H01Q 21/28* (2006.01)

*H01Q 1/24* (2006.01)

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

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

CPC ..... *H01Q 1/521* (2013.01); *H01Q 21/28*

(2013.01); *H01Q 1/243* (2013.01); *H01Q 1/38*

(2013.01); *H01Q 9/42* (2013.01)

(72) Inventors: **Ming Zhang**, Hangzhou (CN); **Bin Wang**, Hangzhou (CN)

(21) Appl. No.: **15/706,373**

(57)

**ABSTRACT**

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

**Related U.S. Application Data**

(63) Continuation of application No. PCT/CN2015/074304, filed on Mar. 16, 2015.

**Publication Classification**

(51) **Int. Cl.**

*H01Q 1/52* (2006.01)

*H01Q 9/42* (2006.01)

A MIMO antenna is disclosed, including: a first antenna, a second antenna, and an adjustable decoupling structure. The adjustable decoupling structure is disposed between the first antenna and the second antenna, and is configured to reduce coupling between the first antenna and the second antenna. The adjustable decoupling structure includes a first adjustable capacitor and a second adjustable capacitor that are connected in series and a first adjustable inductor and a second adjustable inductor that are connected in parallel.

