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(19) **United States**

(12) **Patent Application Publication**

(10) **Pub. No.: US 2023/0086173 A1**

(43) **Pub. Date: Mar. 23, 2023**

LEE et al.

(54) **ELECTRONIC DEVICE COMPRISING ANTENNA**

(71) Applicant: **SAMSUNG ELECTRONICS CO., LTD.**, Suwon-si (KR)

(72) Inventors: **Kyungjae LEE**, Suwon-si (KR); **Sungkoo PARK**, Suwon-si (KR); **Himchan YUN**, Suwon-si (KR); **Soonho HWANG**, Suwon-si (KR); **Jaebong CHUN**, Suwon-si (KR)

(21) Appl. No.: **18/070,470**

(22) Filed: **Nov. 29, 2022**

Related U.S. Application Data

(63) Continuation of application No. PCT/KR2022/006112, filed on Apr. 28, 2022.

(30) **Foreign Application Priority Data**

Apr. 28, 2021 (KR) 10-2021-0055155

Publication Classification

(51) **Int. Cl.**

H04M 1/02 (2006.01)

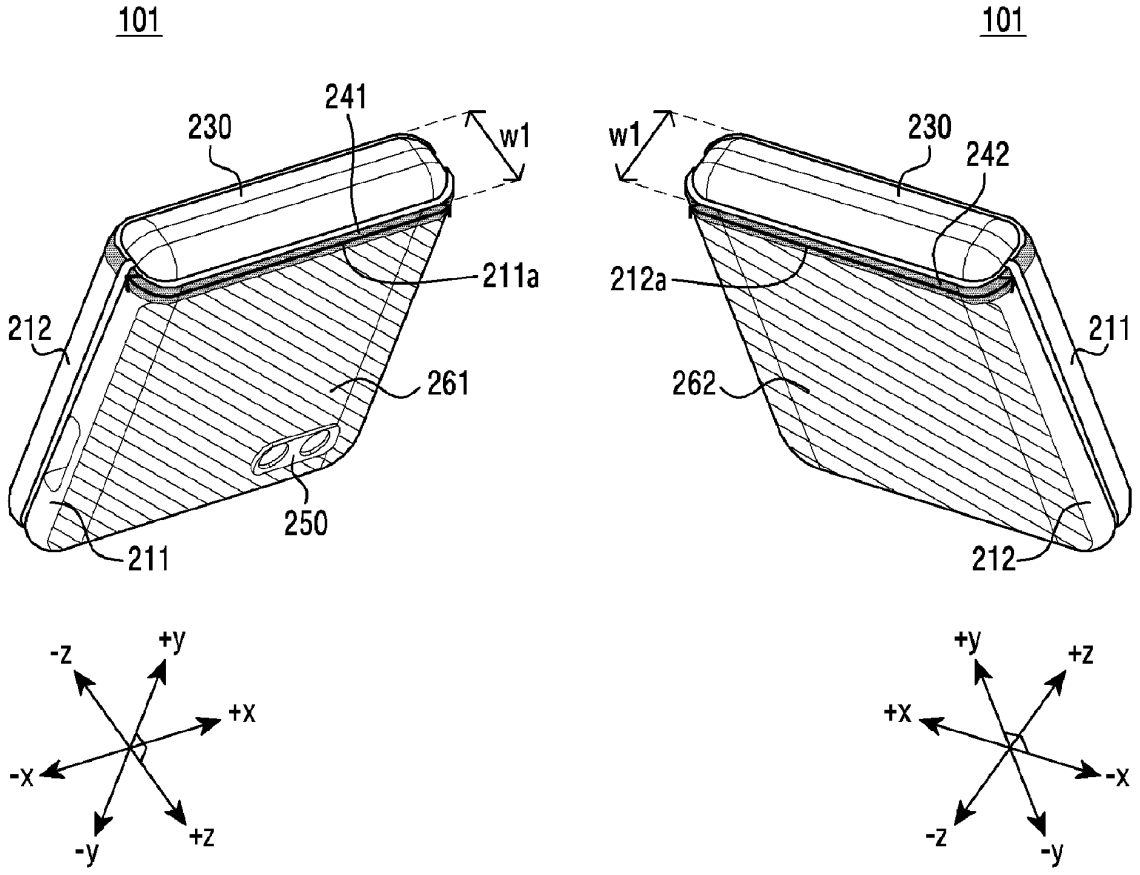
H01Q 1/24 (2006.01)

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

CPC ***H04M 1/0216*** (2013.01); ***H01Q 1/243*** (2013.01); ***H04M 1/0268*** (2013.01)

(57) **ABSTRACT**

An electronic device includes first and second housings, a flexible display, a hinge structure, a hinge cover, and a wireless communication circuit. The first housing includes a first conductive portion, the hinge cover may be positioned opposing the flexible display with respect to the hinge structure when the housings are in a folded state, and the second housing includes a second conductive portion. When the housing are folded, the hinge cover is exposed to the outside of the electronic device by a first width while being disposed between the first edge of the first housing and the second edge of the second housing, and in the folded state, the wireless communication circuit feeds a first point of the hinge cover and transmits and/or receives a signal in a first frequency band, through a first electrical path formed in the first conductive portion and/or the second conductive portion by the feeding.



US 20230089629A1

(19) **United States**

(12) **Patent Application Publication**

OUYANG

(10) **Pub. No.: US 2023/0089629 A1**

(43) **Pub. Date: Mar. 23, 2023**

(54) **ANTENNA**

(71) Applicant: **FUJIFILM Corporation**, Tokyo (JP)

(72) Inventor: **Tianhua OUYANG**, Kanagawa (JP)

(73) Assignee: **FUJIFILM Corporation**, Tokyo (JP)

(21) Appl. No.: **18/054,309**

(22) Filed: **Nov. 10, 2022**

Related U.S. Application Data

(63) Continuation of application No. PCT/JP2021/015567, filed on Apr. 15, 2021.

(30) **Foreign Application Priority Data**

May 13, 2020 (JP) 2020-084819

Publication Classification

(51) **Int. Cl.**

H01Q 1/12 (2006.01)

H01Q 1/48 (2006.01)

H01Q 9/04 (2006.01)

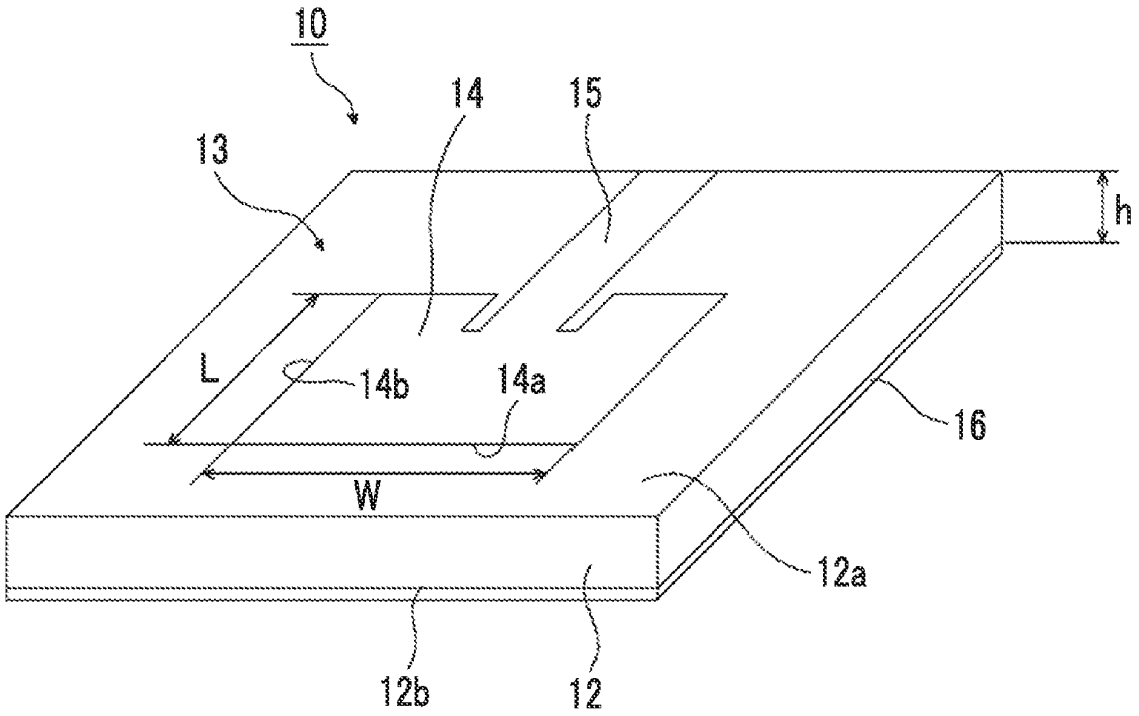
H01Q 1/24 (2006.01)

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

CPC ***H01Q 1/1271*** (2013.01); ***H01Q 1/48*** (2013.01); ***H01Q 9/0407*** (2013.01); ***H01Q 1/243*** (2013.01)

(57) **ABSTRACT**

Provided is an antenna where low transmission loss and visibility are simultaneously achieved. The antenna includes: a transparent film substrate; an antenna element that is provided on one surface among two surfaces of the transparent film substrate; and a ground part that is provided on the other surface among the two surfaces of the transparent film substrate. The antenna element and the ground part are formed of a mesh pattern formed of a fine silver wire, and a line width of the fine wire is 1.0 μm or more and less than 5.0 μm. A thickness of the transparent film substrate is 30 μm or more and 300 μm or less.



US 20230089744A1

(19) **United States**

(12) **Patent Application Publication**

(10) **Pub. No.: US 2023/0089744 A1**

(43) **Pub. Date: Mar. 23, 2023**

Ji et al.

(54) **ANTENNA ASSEMBLY AND WIRELESS ACCESS DEVICE**

(71) Applicant: **HUAWEI TECHNOLOGIES CO., LTD.**, Shenzhen (CN)

(72) Inventors: **Xinghui Ji**, Suzhou (CN); **Bo Yuan**, Suzhou (CN); **Ziliang Yan**, Shenzhen (CN)

(73) Assignee: **HUAWEI TECHNOLOGIES CO., LTD.**, Shenzhen (CN)

(21) Appl. No.: **18/052,578**

(22) Filed: **Nov. 4, 2022**

Related U.S. Application Data

(63) Continuation of application No. PCT/CN2020/119730, filed on Sep. 30, 2020.

(30) **Foreign Application Priority Data**

May 22, 2020 (CN) 202010444447.3

Publication Classification

(51) **Int. Cl.**

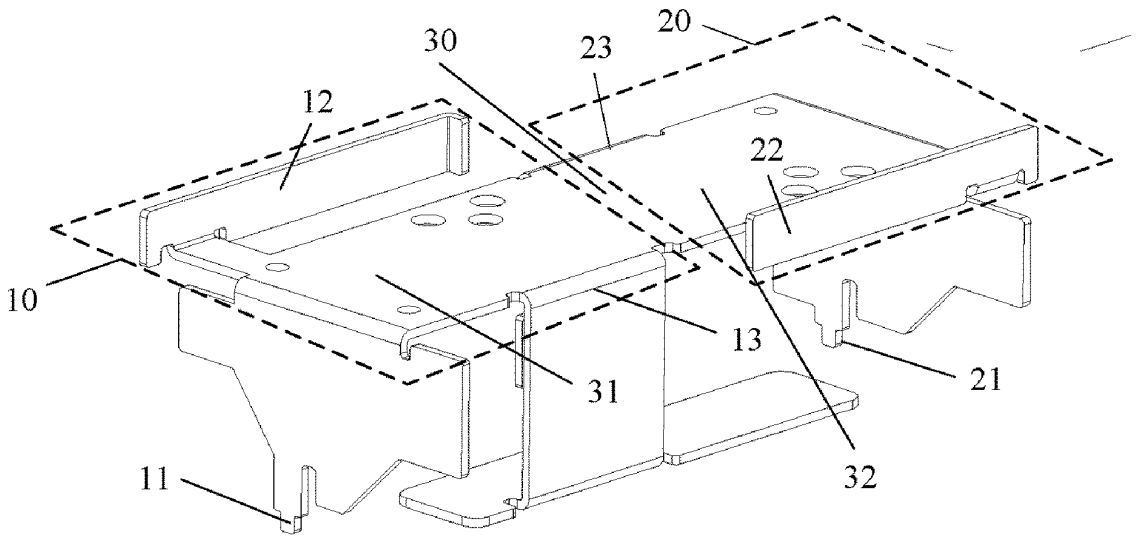
H01Q 1/52	(2006.01)
H01Q 1/50	(2006.01)
H01Q 1/48	(2006.01)
H01Q 1/22	(2006.01)
H01Q 21/00	(2006.01)
H01Q 1/36	(2006.01)

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

CPC ***H01Q 1/521*** (2013.01); ***H01Q 1/50*** (2013.01); ***H01Q 1/48*** (2013.01); ***H01Q 1/22*** (2013.01); ***H01Q 21/00*** (2013.01); ***H01Q 1/36*** (2013.01)

(57) **ABSTRACT**

An antenna assembly and a wireless access device are provided. The antenna assembly includes a first antenna part and a second antenna part. A first port, a first radiation arm, a first ground point, and a first bearing part of a bearing plate form the first antenna part. A second port, a second radiation arm, a second ground point, and a second bearing part of the bearing plate form the second antenna part. The first radiation arm is configured to radiate a radio frequency signal received by the first port, and transmit a received radio frequency signal to the first port. The second radiation arm is configured to radiate a radio frequency signal received by the second port, and transmit a received radio frequency signal to the second port. An anti-interference path passing through the bearing plate exists between the first port and the second port.



US 20230093645A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2023/0093645 A1**

YANG (43) **Pub. Date: Mar. 23, 2023**

(54) **ELECTRONIC DEVICE**

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

(72) Inventor: **Dongxu YANG**, Dongguan (CN)

(21) Appl. No.: **18/057,975**

(22) Filed: **Nov. 22, 2022**

Related U.S. Application Data

(63) Continuation of application No. PCT/CN2021/084402, filed on Mar. 31, 2021.

(30) **Foreign Application Priority Data**

May 25, 2020 (CN) 202010453114.7
May 25, 2020 (CN) 202020899759.9

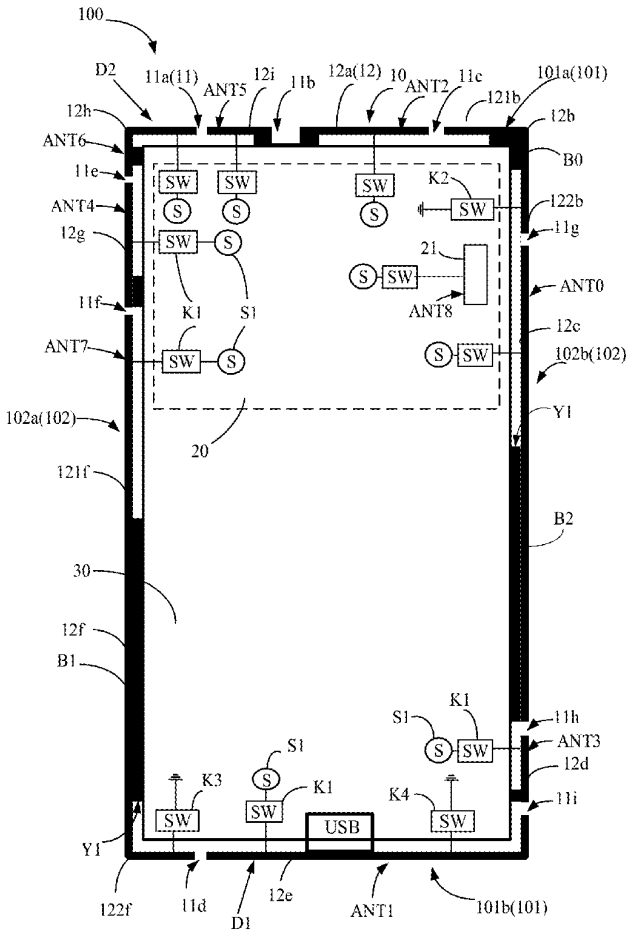
Publication Classification

(51) **Int. Cl.**
H01Q 21/30 (2006.01)
H01Q 1/24 (2006.01)

(52) **U.S. Cl.**
CPC ***H01Q 21/30*** (2013.01); ***H01Q 1/241*** (2013.01)

(57) **ABSTRACT**

An electronic device is provided, which includes a metal frame and multiple radio-frequency sources. The metal is divided into multiple separate frame segments by multiple gaps, and the multiple frame segments are served as antenna bodies and support frequency bands of multiple communication standards. Among the multiple frame segments, at least three frame segments support a 5G band, among the at least three frame segments each supporting the 5G band, at least one frame segment further supports a LMHB of LTE, and among frame segments other than the at least three frame segments each supporting the 5G band, at least one frame segment supports the LMHB of the LTE. The at least one frame segment supporting the LMHB of the LTE among the frame segments other than the at least three frame segments and the at least three frame segments are configured for implementing a 5G NSA communication standard.



US 20230094721A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2023/0094721 A1**

HSU et al. (43) **Pub. Date: Mar. 30, 2023**

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

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

(72) Inventors: **CHO-KANG HSU**, New Taipei (TW); **CHIH-HUNG LAI**, New Taipei (TW); **YUN-JIAN CHANG**, Tu-Cheng (TW); **GENG-HONG LIOU**, Tu-Cheng (TW); **YEN-HUI LIN**, New Taipei (TW)

(21) Appl. No.: **17/954,519**

(22) Filed: **Sep. 28, 2022**

Related U.S. Application Data

(60) Provisional application No. 63/249,137, filed on Sep. 28, 2021.

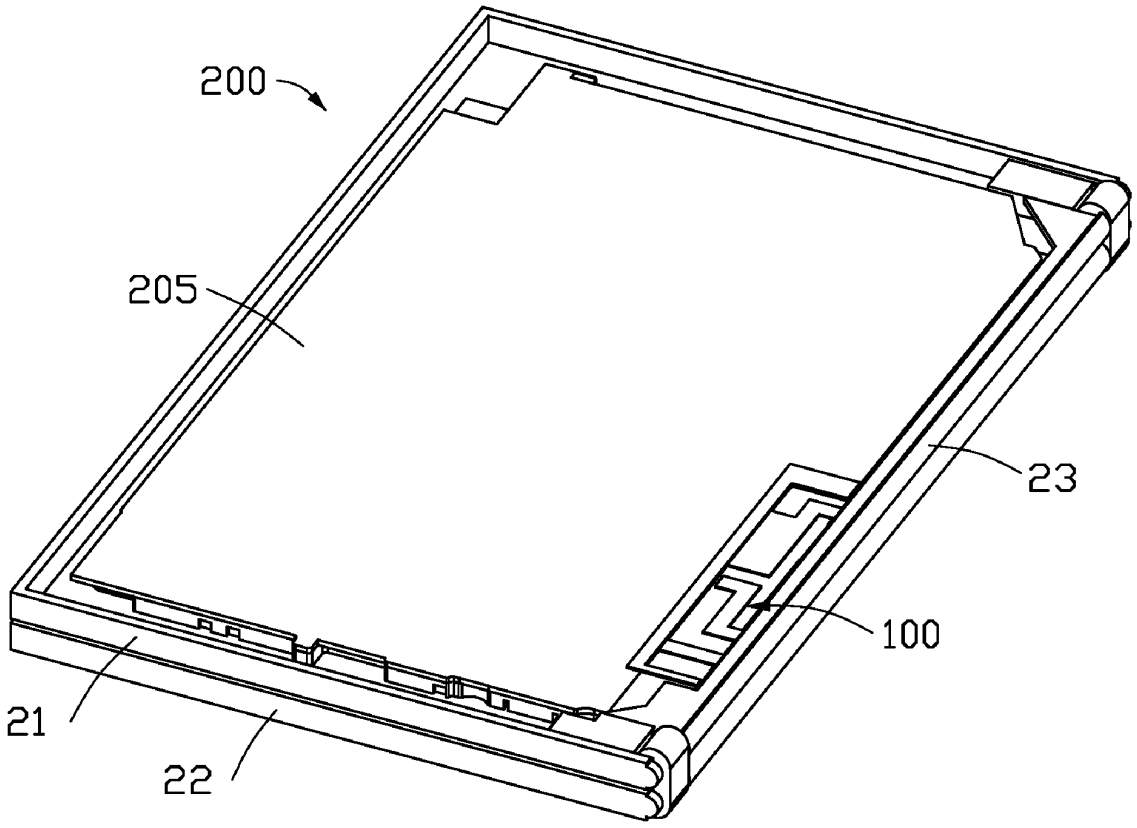
Publication Classification

(51) **Int. Cl.**
H01Q 9/42 (2006.01)

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

(57) **ABSTRACT**

An antenna structure applied in a wireless communication device including a hinge, the antenna structure includes a feed portion, a first radiation portion, and at least one ground portion; an end of the first radiation portion is electrically connected to the feed portion, another end of the first radiation portion is spaced from the hinge with a gap; the antenna structure generates a radiation signal in at least one radiation frequency band when the feed portion feeds electrical current to the first radiation portion and the hinge couples the electrical current from the first radiation portion. A wireless communication device having the antenna structure is also provided.



US 20230096014A1

(19) **United States**

(12) **Patent Application Publication**

CHANG et al.

(10) **Pub. No.: US 2023/0096014 A1**

(43) **Pub. Date: Mar. 30, 2023**

(54) **HYBRID ANTENNA STRUCTURE**

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

(72) Inventors: **Kun-Sheng CHANG**, New Taipei City (TW); **Ching-Chi LIN**, New Taipei City (TW)

(21) Appl. No.: **17/700,112**

(22) Filed: **Mar. 21, 2022**

(30) **Foreign Application Priority Data**

Sep. 24, 2021 (TW) 110135497

Publication Classification

(51) **Int. Cl.**

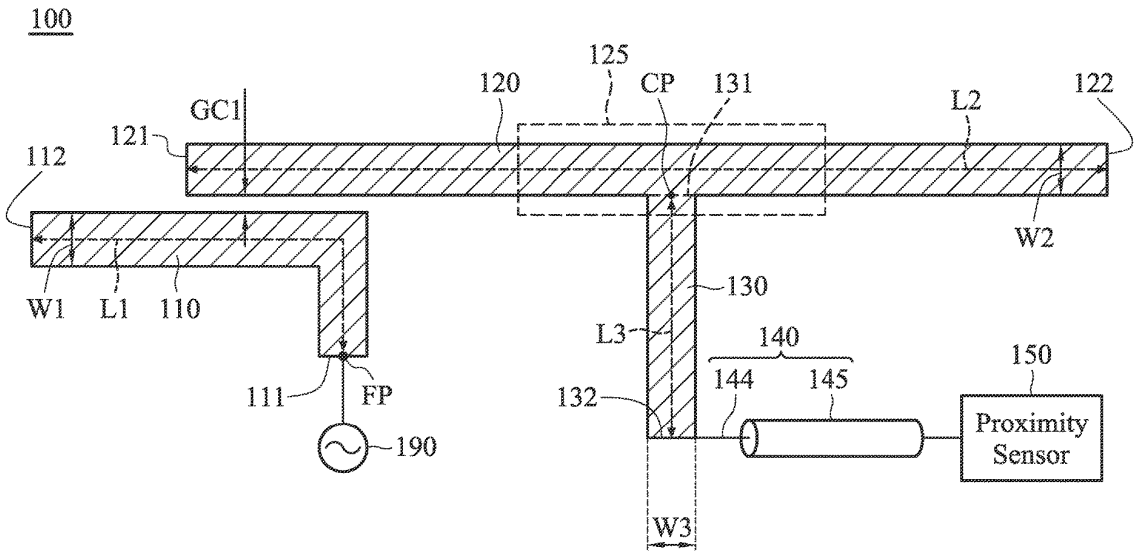
H01Q 19/02 (2006.01)
H01Q 21/28 (2006.01)
H01Q 1/44 (2006.01)
H01Q 1/36 (2006.01)

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

CPC ***H01Q 19/021*** (2013.01); ***H01Q 21/28*** (2013.01); ***H01Q 1/44*** (2013.01); ***H01Q 1/36*** (2013.01); *H01Q 1/241* (2013.01)

(57) **ABSTRACT**

A hybrid antenna structure includes a first metal element, a second metal element, a third metal element, a cable, and a proximity sensor. The first metal element has a feeding point. The second metal element is adjacent to and separate from the first metal element. A coupling gap is formed between the second metal element and the first metal element. The third metal element is coupled to a connection point on the second metal element. The proximity sensor is coupled through the cable to the third metal element. The second metal element and the third metal element are used as both a sensing pad and a radiation element.



US 20230097476A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2023/0097476 A1**

RAMIREZ-SERRANO (43) **Pub. Date: Mar. 30, 2023**

(54) **ANTENNA FOR SENDING AND/OR RECEIVING ELECTROMAGNETIC SIGNALS**

(71) Applicant: **Viessmann Climate Solutions SE**, Allendorf (DE)

(72) Inventor: **Nelson RAMIREZ-SERRANO**, Köln (DE)

(21) Appl. No.: **17/909,381**

(22) PCT Filed: **Mar. 11, 2021**

(86) PCT No.: **PCT/EP2021/056199**

§ 371 (c)(1),
(2) Date: **Sep. 4, 2022**

(30) **Foreign Application Priority Data**

Apr. 9, 2020 (EP) 20168944.5

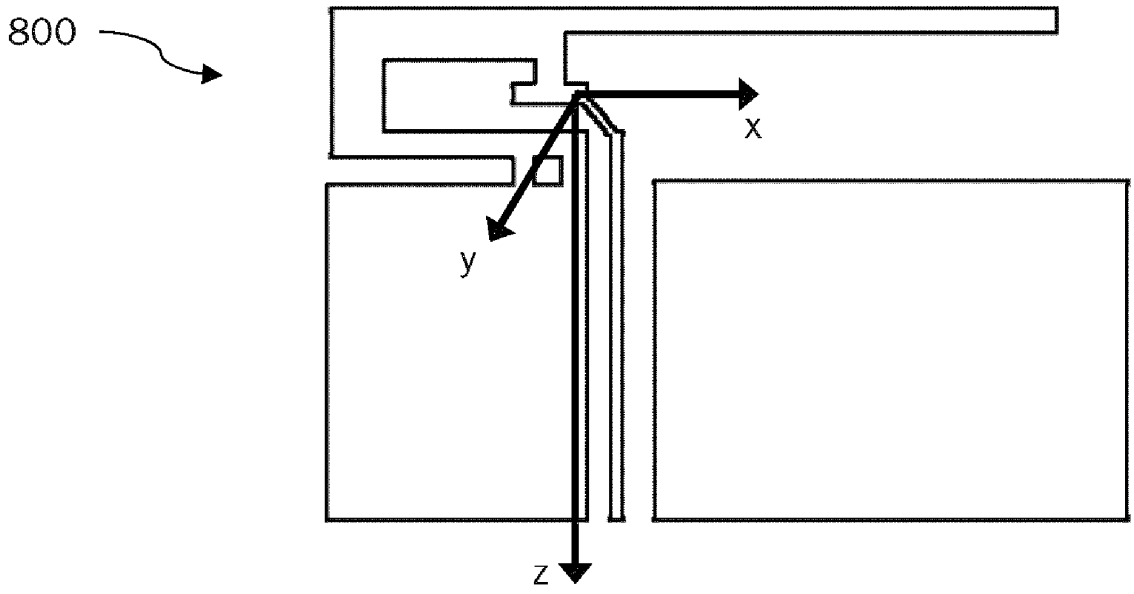
Publication Classification

(51) **Int. Cl.**
H01Q 9/43 (2006.01)
H01Q 1/48 (2006.01)

(52) **U.S. Cl.**
CPC ***H01Q 9/43*** (2013.01); ***H01Q 1/48*** (2013.01)

(57) **ABSTRACT**

An antenna for sending and/or receiving electromagnetic signals and a method for using an antenna for sending and/or receiving electromagnetic signals. The antenna comprises an electrically conducting ground structure extending along a plane; a first structure forming a radiator, being electrically conducting; a second structure, being electrically conducting; and a feed point for connecting the antenna with a signal line. A first end of the first structure and a first end of the second structure are in electrical contact with each other at the feed point. Further, the ground structure is separated from the feed point by a gap and a second end of the second structure is connected to the ground structure. The second structure comprises a bending portion such that the second structure together with a portion of the ground structure surround an area when seen from a direction orthogonal to the plane of the ground structure.



US 20230097532A1

(19) **United States**

(12) **Patent Application Publication**

(10) **Pub. No.: US 2023/0097532 A1**

(43) **Pub. Date: Mar. 30, 2023**

LEE et al.

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

(71) Applicants: **DONGWOO FINE-CHEM CO., LTD.**, Jeollabuk-do (KR); **POSTECH RESEARCH AND BUSINESS DEVELOPMENT FOUNDATION**, Gyeongsangbuk-do (KR)

(72) Inventors: **Jae Hyun LEE**, Gyeonggi-do (KR); **Dong Pil PARK**, Incheon (KR); **Won Hee LEE**, Incheon (KR); **Hee Jun PARK**, Gyeonggi-do (KR); **Won Bin HONG**, Seoul (KR)

(21) Appl. No.: **18/077,320**

(22) Filed: **Dec. 8, 2022**

Related U.S. Application Data

(63) Continuation of application No. PCT/KR2021/007066, filed on Jun. 7, 2021.

(30) **Foreign Application Priority Data**

Jun. 8, 2020 (KR) 10-2020-0068911

Publication Classification

(51) **Int. Cl.**

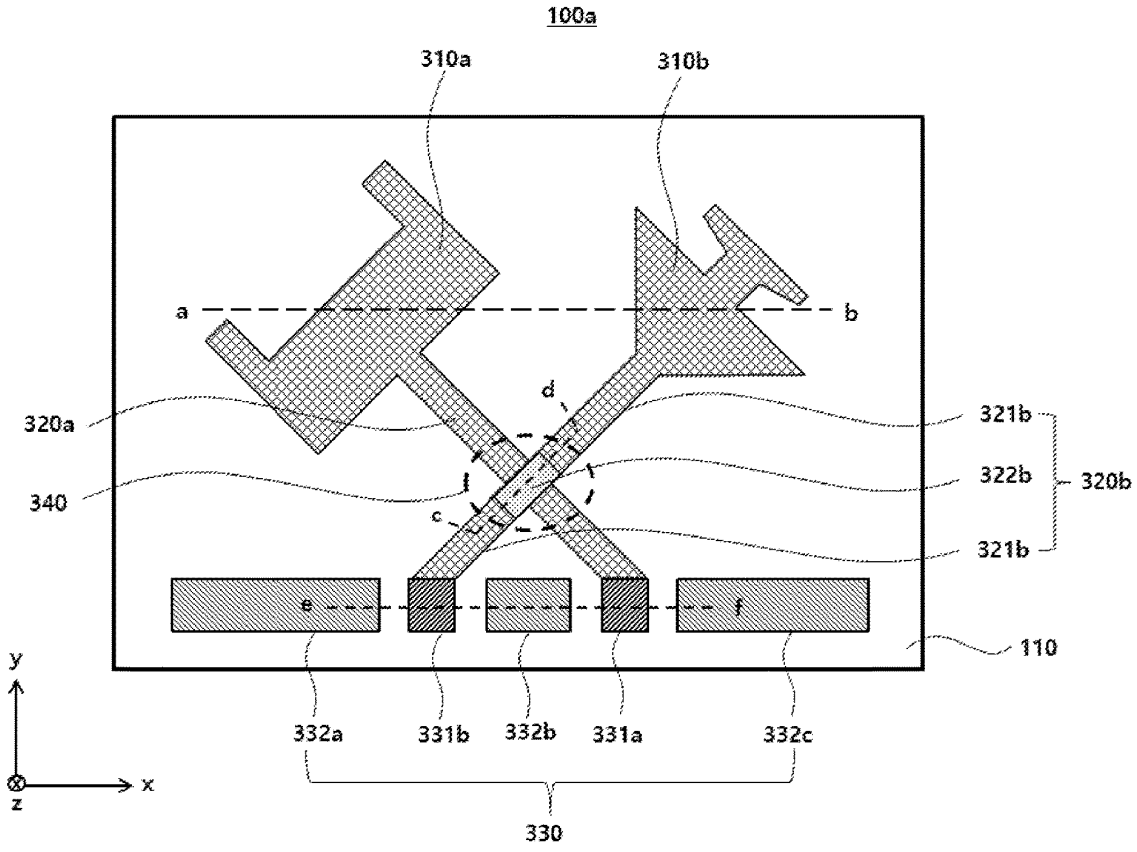
H01Q 21/06 (2006.01)
H01Q 1/36 (2006.01)
H01Q 13/20 (2006.01)

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

CPC ***H01Q 21/067*** (2013.01); ***H01Q 1/362*** (2013.01); ***H01Q 13/206*** (2013.01); *H01Q 21/065* (2013.01)

(57) **ABSTRACT**

An antenna device according to an embodiment of the present invention includes a dielectric layer, a first radiator disposed on the dielectric layer in a first direction, a second radiator formed in a shape different from that of the first radiator and disposed on the dielectric layer in a second direction, a first transmission line which extends in the first direction to be connected to the first radiator, and a second transmission line which extends in the second direction to be connected to the second radiator, and intersects the first transmission line with being physically or electrically spaced apart therefrom.



US 20230098428A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2023/0098428 A1**

Koga et al. (43) **Pub. Date: Mar. 30, 2023**

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

(71) Applicant: **FCNT LIMITED**, Yamato-shi (JP)

(72) Inventors: **Yohei Koga**, Yamato-shi (JP); **Yasumitsu Ban**, Yamato-shi (JP); **Manabu Yoshikawa**, Yamato-shi (JP)

(73) Assignee: **FCNT LIMITED**, Yamato-shi (JP)

(21) Appl. No.: **18/075,571**

(22) Filed: **Dec. 6, 2022**

Related U.S. Application Data

(63) Continuation of application No. PCT/JP2020/022732, filed on Jun. 9, 2020.

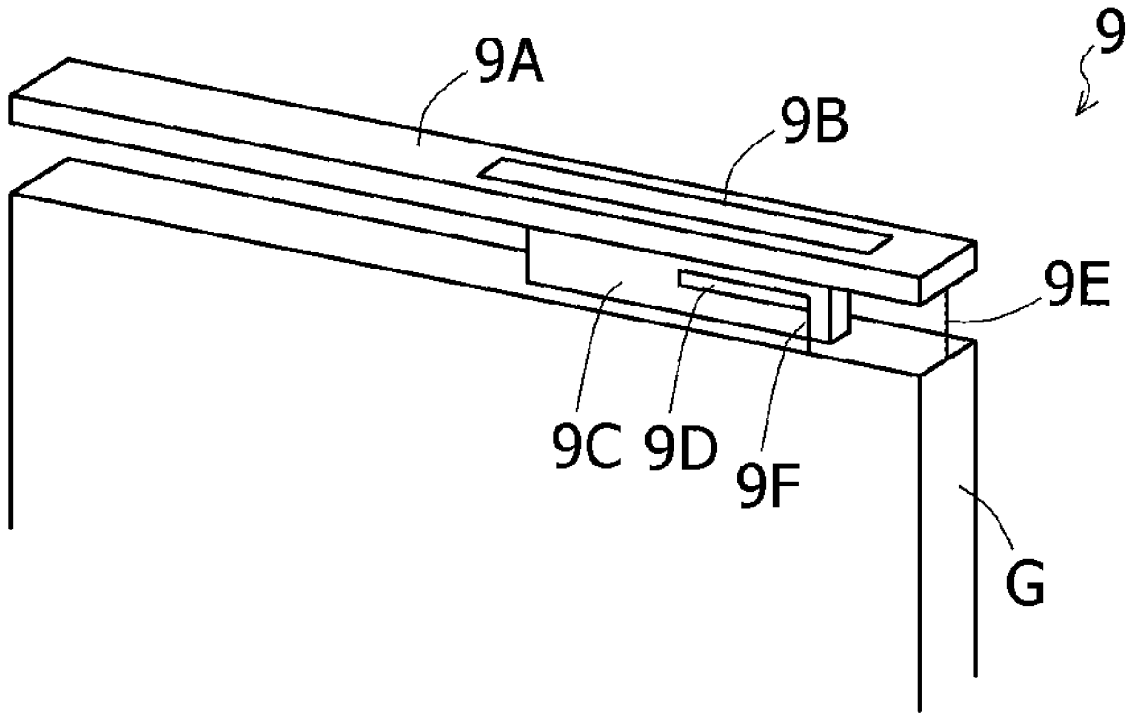
Publication Classification

(51) **Int. Cl.**
H01Q 21/00 (2006.01)
H01Q 13/08 (2006.01)

(52) **U.S. Cl.**
CPC ***H01Q 21/0075*** (2013.01); ***H01Q 13/085*** (2013.01)

(57) **ABSTRACT**

An antenna device includes a first antenna having a length corresponding to a first frequency, and arranged along a ground, a second antenna formed by a slot penetrating metal constituting the first antenna, and having a slot length corresponding to a second frequency higher than the first frequency, a first feeder wire for the first frequency, connected from the ground to the first antenna, a metal element for electromagnetic field coupling, arranged in a non-contact state relative to the second antenna, between the slot and the ground; and a second feeder wire for the second frequency, connected from the ground to the metal element.



US 20230099917A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2023/0099917 A1**

LIU et al. (43) **Pub. Date: Mar. 30, 2023**

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

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

(72) Inventors: **Huanhong LIU**, Dongguan (CN); **Haijun TANG**, Dongguan (CN)

(21) Appl. No.: **18/058,449**

(22) Filed: **Nov. 23, 2022**

Related U.S. Application Data

(63) Continuation of application No. PCT/CN2021/084046, filed on Mar. 30, 2021.

(30) **Foreign Application Priority Data**

May 25, 2020 (CN) 202010453115.1
May 25, 2020 (CN) 202020902357.X

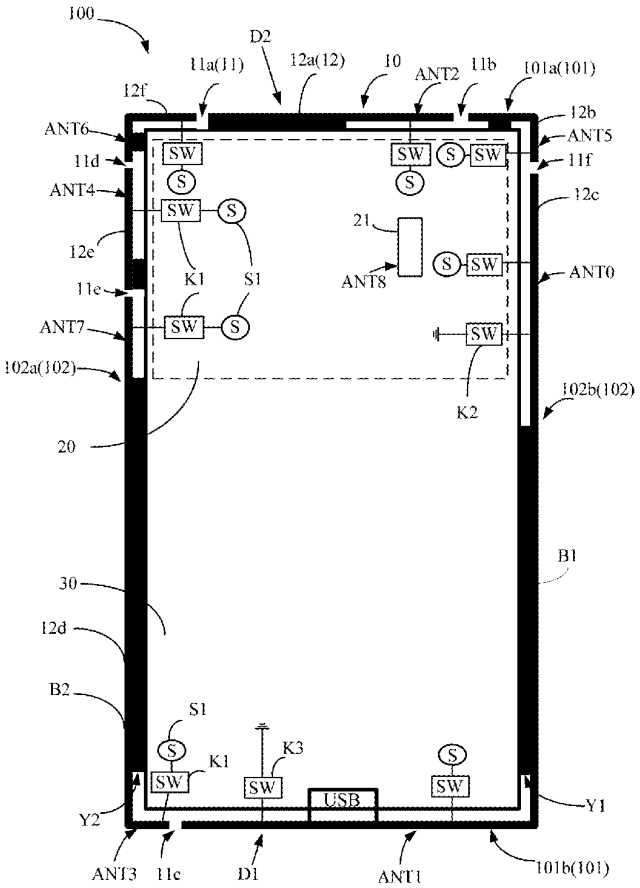
Publication Classification

(51) **Int. Cl.**
H01Q 21/28 (2006.01)
H01Q 21/29 (2006.01)

(52) **U.S. Cl.**
CPC ***H01Q 21/28*** (2013.01); ***H01Q 21/29*** (2013.01)

(57) **ABSTRACT**

An electronic device and an antenna device are provided. The electronic device includes a metal frame defined with multiple gaps, and the multiple gaps divide the metal frame into multiple independent frame segments used as antenna bodies supporting frequency bands of communication standards. At least three frame segments of the multiple frame segments support a 5G frequency band, at least one frame segment of the at least three frame segments further supports an MHB frequency band of LTE, and at least one frame segment except the at least three frame segments of the multiple frame segments supports the MHB frequency band of LTE. At least one frame segment supporting the MHB frequency band of LTE except the at least three frame segments supporting the 5G frequency band is used for achieving a 5G NSA communication standard together with the at least three frame segments supporting the 5G frequency band.



US 20230101080A1

(19) United States

(12) Patent Application Publication

(10) Pub. No.: US 2023/0101080 A1

(43) Pub. Date: Mar. 30, 2023

LEE et al.

(54) **ELECTRONIC DEVICE INCLUDING ANTENNA**

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

(72) Inventors: **Hyunjeong LEE**, Suwon-si (KR); **Himchan YUN**, Suwon-si (KR); **Bomyoung KIM**, Suwon-si (KR); **Sewoong KIM**, Suwon-si (KR); **Soonho HWANG**, Suwon-si (KR); **Jin KIM**, Suwon-si (KR); **Jongoh LIM**, Suwon-si (KR)

(21) Appl. No.: **17/975,085**

(22) Filed: **Oct. 27, 2022**

Related U.S. Application Data

(63) Continuation of application No. PCT/KR2022/014457, filed on Sep. 27, 2022.

(30) **Foreign Application Priority Data**

Sep. 30, 2021 (KR) 10-2021-0130409
Oct. 29, 2021 (KR) 10-2021-0146313

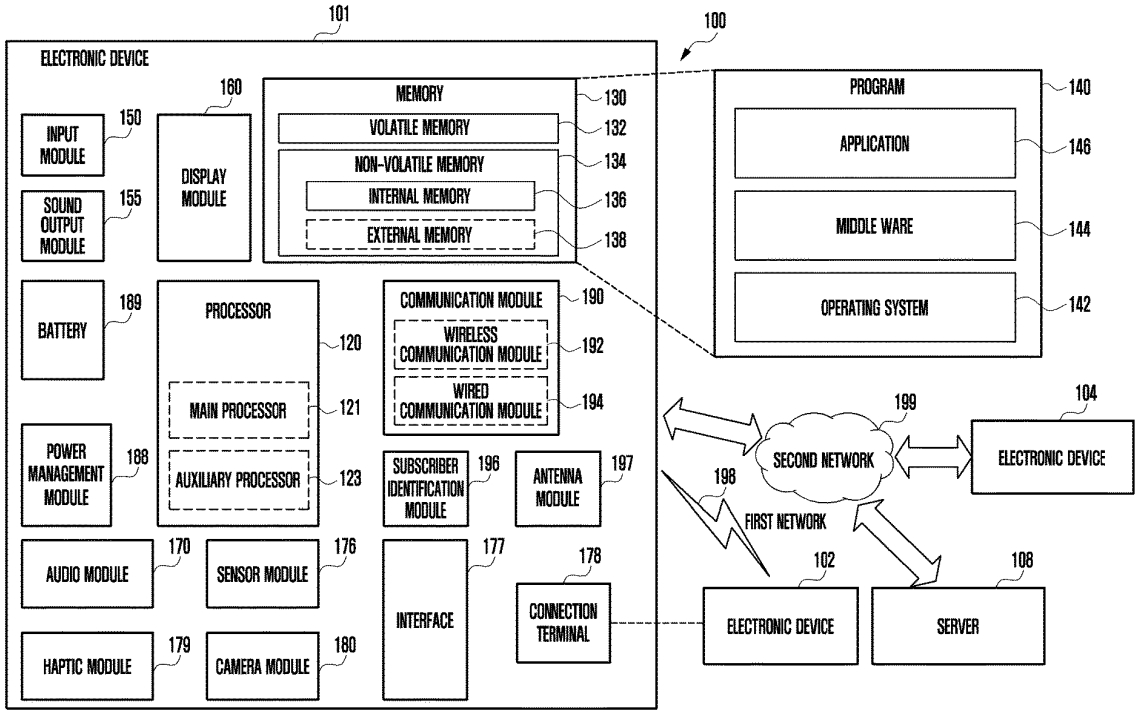
Publication Classification

(51) **Int. Cl.**
H01Q 9/04 (2006.01)
H01Q 5/35 (2006.01)
H01Q 21/06 (2006.01)

(52) **U.S. Cl.**
CPC ***H01Q 9/045*** (2013.01); ***H01Q 5/35*** (2015.01); ***H01Q 21/065*** (2013.01)

(57) **ABSTRACT**

An electronic device is provided. The electronic device includes a housing, an antenna structure, a first conductive material, and a second conductive material. The housing may be configured to provide a front surface and a rear surface of the electronic device. The antenna structure includes a printed circuit board positioned in the housing. The printed circuit board includes a first surface configured to face the front surface or the rear surface and a second surface configured to face a direction opposite to the first surface. The printed circuit board includes a first conductive layer, a second conductive layer, and a dielectric. The first conductive layer includes a first antenna element and a second antenna element which are configured so as not to overlap each other when viewed from above the first surface.



US 20230101103A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2023/0101103 A1**

TSUCHIYA (43) **Pub. Date: Mar. 30, 2023**

(54) **ANTENNA DEVICE**

(71) Applicant: **NEC Platforms, Ltd.**, Kawasaki-shi, Kanagawa (JP)

(72) Inventor: **Masato TSUCHIYA**, Kanagawa (JP)

(73) Assignee: **NEC Platforms, Ltd.**, Kawasaki-shi, Kanagawa (JP)

(21) Appl. No.: **17/908,319**

(22) PCT Filed: **Mar. 22, 2021**

(86) PCT No.: **PCT/JP2021/011658**

§ 371 (c)(1),
(2) Date: **Aug. 31, 2022**

(30) **Foreign Application Priority Data**

Mar. 27, 2020 (JP) 2020-057192

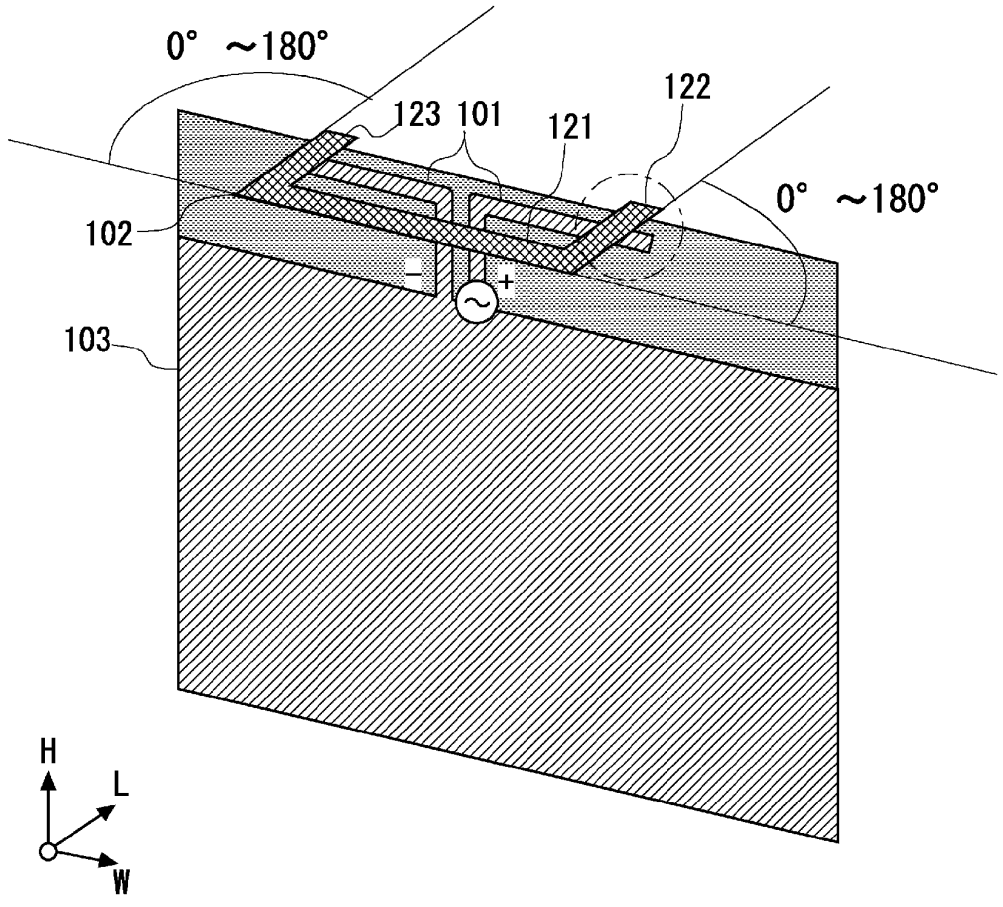
Publication Classification

(51) **Int. Cl.**
H01Q 9/28 (2006.01)
H01Q 19/06 (2006.01)

(52) **U.S. Cl.**
CPC ***H01Q 9/28*** (2013.01); ***H01Q 19/06*** (2013.01)

(57) **ABSTRACT**

An antenna device includes: a mounting board including a circuit configured to process a radio signal; a dipole antenna element configured to receive the radio signal, the dipole antenna element being disposed in the mounting board; and a parasitic element including a first conductor wire parallel to the dipole antenna element, a second conductor wire connected to the first conductor wire at a first end of the first conductor wire at an angle larger than 0 degrees and smaller than 180 degrees, and a third conductor wire connected to the first conductor wire at a second end of the first conductor wire at an angle larger than 0 degrees and smaller than 180 degrees, in which at least an end of the second conductor wire is located near the dipole antenna element.



US 20230102990A1

(19) **United States**

(12) **Patent Application Publication**

(10) **Pub. No.: US 2023/0102990 A1**

(43) **Pub. Date: Mar. 30, 2023**

KUM et al.

(54) **ANTENNA MODULE COMPRISING FEEDING UNIT PATTERN AND BASE STATION COMPRISING SAME**

(71) Applicant: **SAMSUNG ELECTRONICS CO., LTD.**, Suwon-si (KR)

(72) Inventors: **Junsig KUM**, Suwon-si (KR); **Yoongeon KIM**, Suwon-si (KR); **Seungho CHOI**, Suwon-si (KR); **Youngju LEE**, Suwon-si (KR)

(73) Assignee: **SAMSUNG ELECTRONICS CO., LTD.**, Suwon-si (KR)

(21) Appl. No.: **18/074,178**

(22) Filed: **Dec. 2, 2022**

Related U.S. Application Data

(63) Continuation of application No. PCT/KR2021/005789, filed on May 10, 2021.

(30) **Foreign Application Priority Data**

Jun. 3, 2020 (KR) 10-2020-0066842

Publication Classification

(51) **Int. Cl.**

H01Q 15/00 (2006.01)

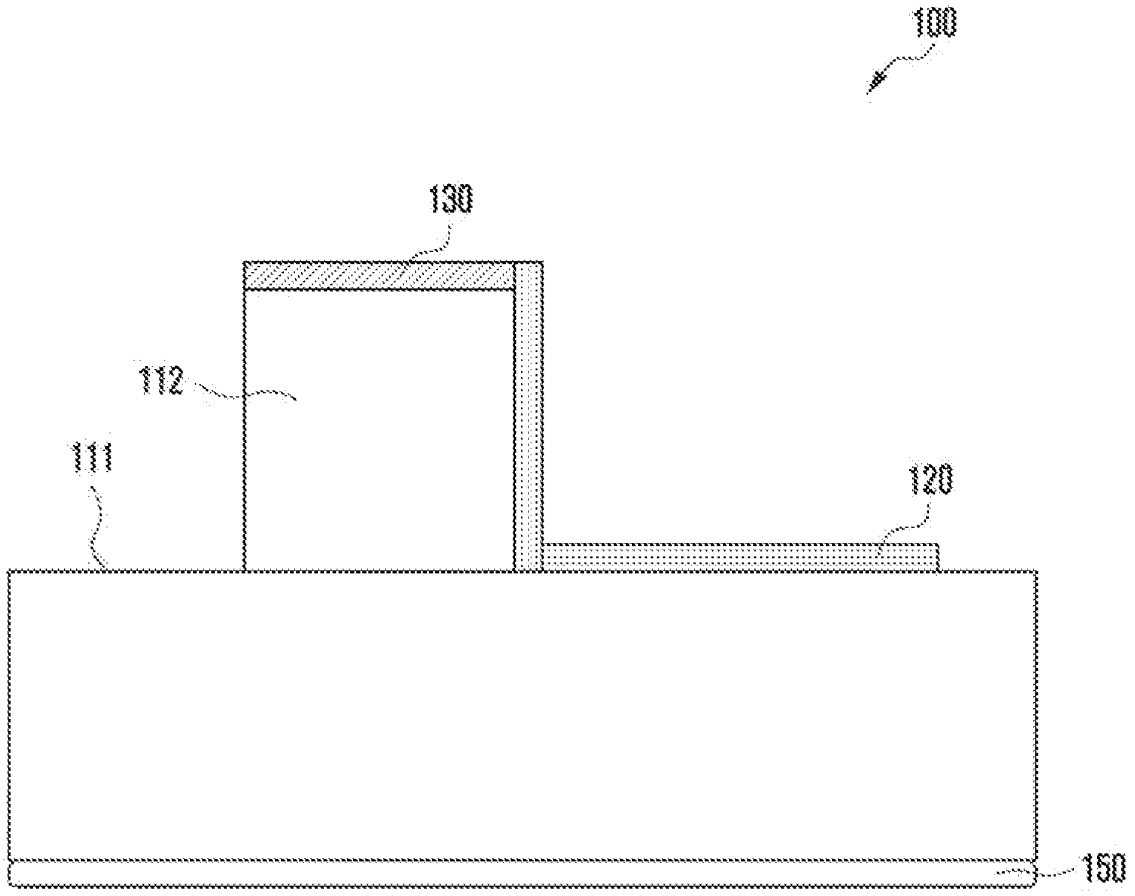
H01Q 1/24 (2006.01)

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

CPC ***H01Q 15/0013*** (2013.01); ***H01Q 1/246*** (2013.01)

(57) **ABSTRACT**

An antenna module of a base station in a wireless communication system includes: a dielectric; a radiator disposed on a horizontal plane spaced apart from a first surface of the dielectric by a predetermined first length; a first feeding unit disposed on the first surface of the dielectric and providing an electrical signal to the radiator; and a second feeding unit disposed on the first surface of the dielectric, the second feeding unit being extending along a direction in which the electrical signal is provided by the first feeding unit to the radiator. The second feeding unit being connected to the first feeding unit. A second surface of the second feeding unit is spaced apart from a third surface of the radiator by a predetermined second length.



US 20230105261A1

(19) United States

(12) Patent Application Publication

(10) Pub. No.: US 2023/0105261 A1

(43) Pub. Date: Apr. 6, 2023

LEE et al.

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

(71) Applicant: **SAMSUNG ELECTRONICS CO., LTD.**, Suwon-si (KR)

(72) Inventors: **Seokwoo LEE**, Suwon-si (KR); **Hyosung KANG**, Suwon-si (KR); **Dongryul SHIN**, Suwon-si (KR); **Jiwoo LEE**, Suwon-si (KR)

(21) Appl. No.: **17/972,551**

(22) Filed: **Oct. 24, 2022**

Related U.S. Application Data

(63) Continuation of application No. PCT/KR2022/013385, filed on Sep. 6, 2022.

(30) **Foreign Application Priority Data**

Oct. 1, 2021 (KR) 10-2021-0130721

Publication Classification

(51) **Int. Cl.**

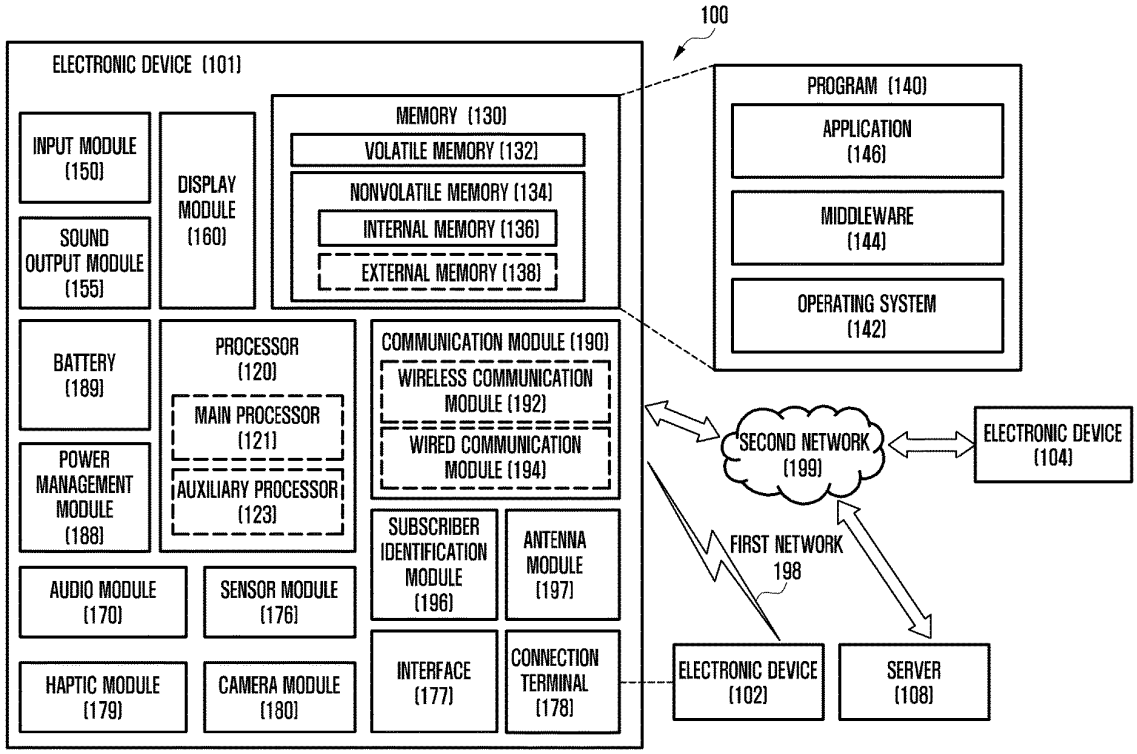
H01Q 3/24 (2006.01)
H01Q 13/16 (2006.01)
H01Q 1/38 (2006.01)

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

CPC ***H01Q 3/24*** (2013.01); ***H01Q 13/16*** (2013.01); ***H01Q 1/38*** (2013.01)

(57) **ABSTRACT**

An electronic device includes a housing, and an antenna structure disposed in the inner space of the housing. The antenna structure includes a substrate including a first surface, a second surface facing away from the first surface, and side surfaces surrounding a space between the first surface and the second surface. At least one antenna element is disposed to form a beam pattern in a direction in which the first surface is oriented, and at least one bracket is disposed in the inner space and configured to support the substrate such that the first surface is tilted to a predetermined angle with respect to a first direction. A wireless communication circuit is disposed in the inner space and is configured to form, via the at least one antenna element, the beam pattern in the direction in which the first surface is oriented.



US 20230107295A1

(19) United States
(12) Patent Application Publication
CHANG et al.

(10) Pub. No.: US 2023/0107295 A1
(43) Pub. Date: Apr. 6, 2023

(54) CONVERTIBLE NOTEBOOK COMPUTER

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

(72) Inventors: **Kun-Sheng CHANG**, New Taipei City (TW); **Ching-Chi LIN**, New Taipei City (TW)

(21) Appl. No.: **17/702,477**

(22) Filed: **Mar. 23, 2022**

(30) **Foreign Application Priority Data**

Oct. 6, 2021 (TW) 110137146

Publication Classification

(51) **Int. Cl.**

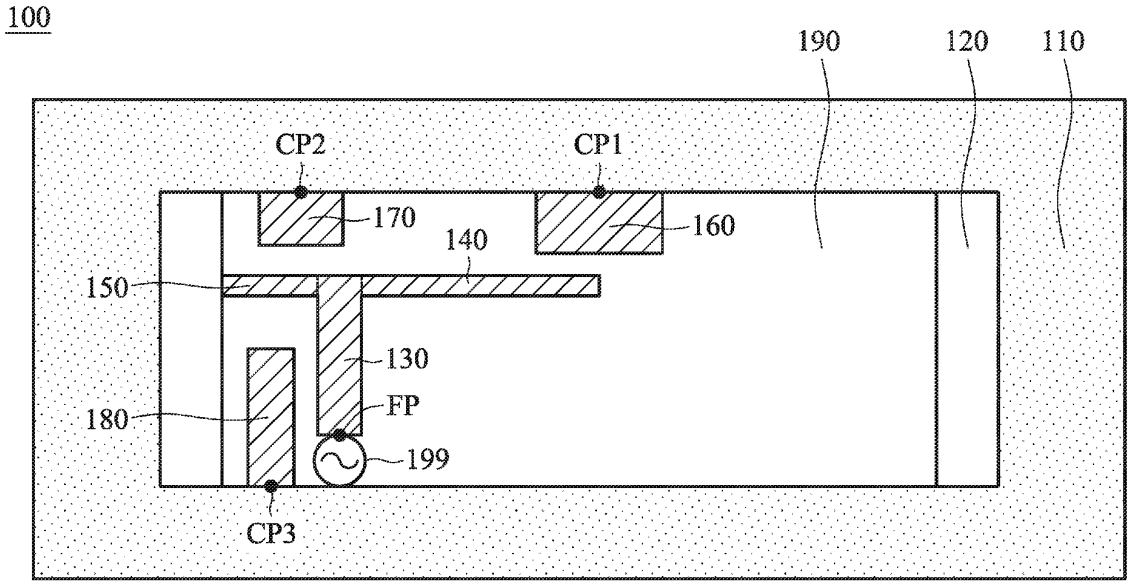
H01Q 5/385	(2006.01)
H01Q 1/22	(2006.01)
H01Q 9/06	(2006.01)
H01Q 13/10	(2006.01)

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

CPC ***H01Q 5/385*** (2015.01); ***H01Q 1/2266*** (2013.01); ***H01Q 9/06*** (2013.01); ***H01Q 13/10*** (2013.01)

(57) **ABSTRACT**

A convertible notebook computer includes a metal mechanism element, a first radiation element, a second radiation element, a third radiation element, a first parasitic element, a second parasitic element, a third parasitic element, and a dielectric substrate. The metal mechanism element has a closed slot. The first radiation element has a feeding point. The second radiation element is coupled to the first radiation element. The third radiation element is coupled to the first radiation element. The first parasitic element is adjacent to the second radiation element. The second parasitic element is adjacent to the third radiation element. The third parasitic element is adj acent to the first radiation element. An antenna structure is formed by the closed slot of the metal mechanism element, the first radiation element, the second radiation element, the third radiation element, the first parasitic element, the second parasitic element, and the third parasitic element.



US 20230107947A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2023/0107947 A1**

Wu et al. (43) **Pub. Date: Apr. 6, 2023**

(54) **ELECTRONIC DEVICE**

(71) Applicant: **PEGATRON CORPORATION**, TAIPEI CITY (TW)

(72) Inventors: **Chien-Yi Wu**, Taipei City (TW); **Chao-Hsu Wu**, Taipei City (TW); **Hau Yuen Tan**, Taipei City (TW); **Cheng-Hsiung Wu**, Taipei City (TW); **Chen-Kuang Wang**, Taipei City (TW); **Tse-Hsuan Wang**, Taipei City (TW); **Sheng-Chin Hsu**, Taipei City (TW); **Shih-Keng Huang**, Taipei City (TW); **Chia-Hung Chen**, Taipei City (TW)

(73) Assignee: **PEGATRON CORPORATION**, TAIPEI CITY (TW)

(21) Appl. No.: **17/898,341**

(22) Filed: **Aug. 29, 2022**

(30) **Foreign Application Priority Data**

Oct. 5, 2021 (TW) 110137082

Publication Classification

(51) **Int. Cl.**

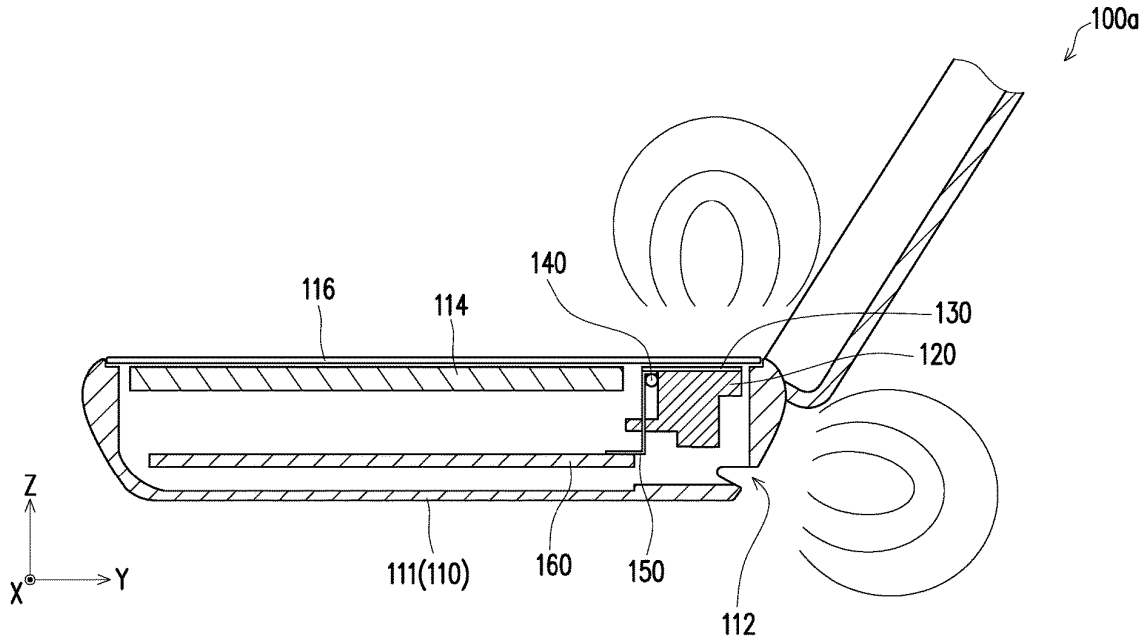
H01Q 5/50	(2006.01)
H01Q 1/22	(2006.01)
H01Q 13/10	(2006.01)
H01Q 1/48	(2006.01)
G06F 1/16	(2006.01)

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

CPC ***H01Q 5/50*** (2015.01); ***H01Q 1/2291*** (2013.01); ***H01Q 13/106*** (2013.01); ***H01Q 1/48*** (2013.01); ***G06F 1/1626*** (2013.01)

(57) **ABSTRACT**

An electronic device includes a metal back cover and an antenna module. The metal back cover includes a slit. The antenna module is separated from the metal back cover and disposed far away from the slit. The antenna module includes an antenna radiator, a first ground radiator, and a connection radiator. The antenna radiator includes a first section, a second section, and a third section that are sequentially connected and form bends, and the first section has a feeding end. A first slot is formed between the first ground radiator, the first section, the second section, and a part of the third section. A width and length of the first slot are associated with a center frequency and impedance matching of a high frequency band.



US 20230108271A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2023/0108271 A1**

PARK et al. (43) **Pub. Date: Apr. 6, 2023**

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

(71) Applicant: **DONGWOO FINE-CHEM CO., LTD.**, Jeollabuk-do (KR)

(72) Inventors: **Hee Jun PARK**, Gyeonggi-do (KR); **Dong Pil PARK**, Incheon (KR); **Jae Hyun LEE**, Gyeonggi-do (KR)

(21) Appl. No.: **18/078,369**

(22) Filed: **Dec. 9, 2022**

Related U.S. Application Data

(63) Continuation of application No. PCT/KR2021/007070, filed on Jun. 7, 2021.

(30) **Foreign Application Priority Data**

Jun. 11, 2020 (KR) 10-2020-0070988

Publication Classification

(51) **Int. Cl.**

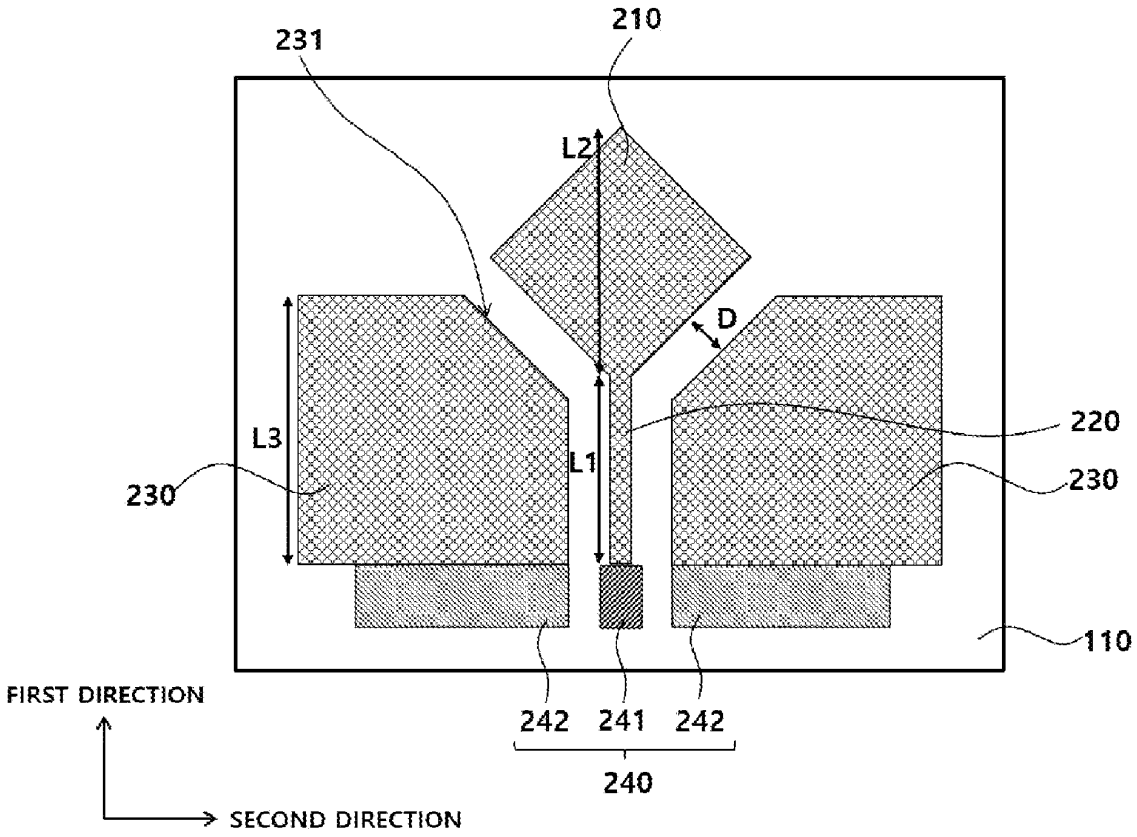
H01Q 1/38	(2006.01)
H01Q 1/48	(2006.01)
H01Q 5/10	(2006.01)
H01Q 5/307	(2006.01)
H01Q 21/00	(2006.01)
H01Q 1/24	(2006.01)

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

CPC ***H01Q 1/38*** (2013.01); ***H01Q 1/48*** (2013.01); ***H01Q 5/10*** (2015.01); ***H01Q 5/307*** (2015.01); ***H01Q 21/00*** (2013.01); ***H01Q 1/243*** (2013.01)

(57) **ABSTRACT**

An antenna device according to an embodiment includes a dielectric layer, a rhombus-shaped first radiator disposed on an upper surface of the dielectric layer, a transmission line connected to the first radiator, a signal pad connected to one end of the transmission line, ground pads disposed around the signal pad, and second radiators extending from the ground pad along lower sides of the first radiator.



US 20230110612A1

(19) **United States**

(12) **Patent Application Publication**

HSU et al.

(10) **Pub. No.: US 2023/0110612 A1**

(43) **Pub. Date: Apr. 13, 2023**

(54) **ANTENNA STRUCTURE AND MOBILE DEVICE INCLUDING THE SAME**

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

(72) Inventors: **YUAN-CHIA HSU**, HSINCHU (TW); **CHIN-LUNG YEH**, HSINCHU (TW); **WEI-SHIN CHEN**, HSINCHU (TW)

(21) Appl. No.: **17/691,155**

(22) Filed: **Mar. 10, 2022**

(30) **Foreign Application Priority Data**

Oct. 13, 2021 (TW) 110137875

Publication Classification

(51) **Int. Cl.**

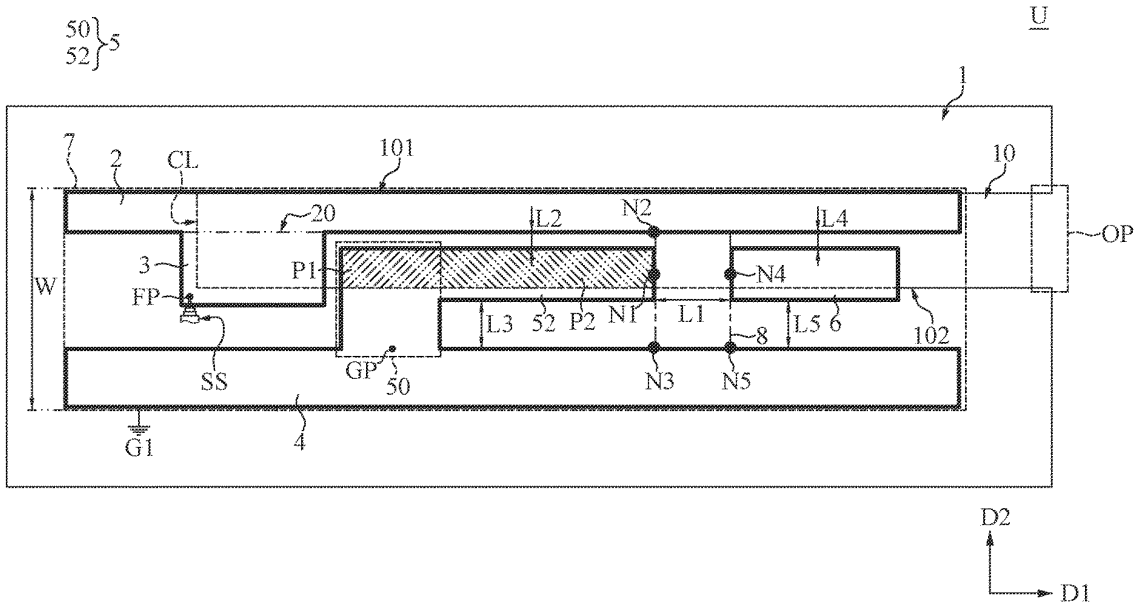
H01Q 1/24	(2006.01)
H01Q 1/48	(2006.01)
H01Q 5/321	(2006.01)
H01Q 5/378	(2006.01)
H01Q 5/371	(2006.01)

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

CPC ***H01Q 1/243*** (2013.01); ***H01Q 1/48*** (2013.01); ***H01Q 5/321*** (2015.01); ***H01Q 5/378*** (2015.01); ***H01Q 5/371*** (2015.01)

(57) **ABSTRACT**

An antenna structure and a mobile device including the same are provided. The antenna structure is arranged on a metal cover with an opening slot, and includes a radiator, a feeding part, a grounding element, a grounding parasitic element, an extending parasitic element, a substrate, and a matching circuit. The radiator extends along a first direction, and the feeding part is connected to the radiator and extends towards a second direction. The grounding parasitic element includes a branch part and a parasitic element body. The branch part extends from a grounding point towards the opening slot. The parasitic element body is connected to the grounding element through the branch part and extends towards a first direction. The extending parasitic element extends along the first direction. The matching circuit is electrically connected to the radiator, the grounding element, the grounding parasitic element, and the extending parasitic element.



US 20230112380A1

(19) United States
(12) Patent Application Publication
JANG et al.

(10) Pub. No.: US 2023/0112380 A1
(43) Pub. Date: Apr. 13, 2023

(54) **ELECTRONIC DEVICE INCLUDING ANTENNA**

(71) Applicant: **SAMSUNG ELECTRONICS CO., LTD.**, Suwon-si (KR)

(72) Inventors: **Sooyoung JANG**, Suwon-si (KR); **Yoonjung KIM**, Suwon-si (KR); **Gyubok PARK**, Suwon-si (KR); **Dongryul SHIN**, Suwon-si (KR); **Donghun SHIN**, Suwon-si (KR); **Hoonsang YOO**, Suwon-si (KR); **Minkyung LEE**, Suwon-si (KR); **Huiwon CHO**, Suwon-si (KR)

(21) Appl. No.: **17/976,449**

(22) Filed: **Oct. 28, 2022**

Related U.S. Application Data

(63) Continuation of application No. PCT/KR2022/014627, filed on Sep. 29, 2022.

(30) **Foreign Application Priority Data**

Oct. 13, 2021 (KR) 10-2021-0135690

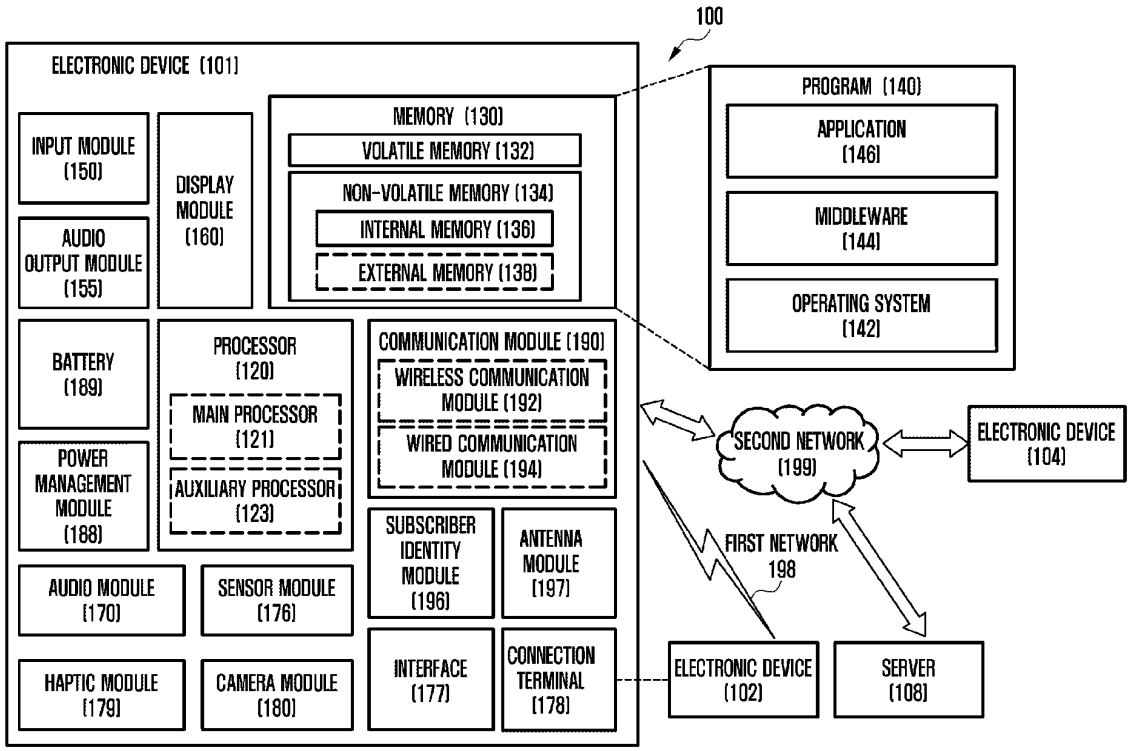
Publication Classification

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

(52) **U.S. Cl.**
CPC ***H01Q 1/02*** (2013.01); ***H01Q 1/241*** (2013.01)

(57) **ABSTRACT**

An example electronic device including an antenna includes a housing including a first conductive portion, a first support member disposed inside the housing, a printed circuit board disposed on one surface of the first support member and including a wireless communication module, an electronic component electrically connected to the printed circuit board, and a conductive plate supporting the electronic component. The conductive plate is constituted such that a first portion is electrically connected to the wireless communication module and a second portion is electrically connected to the first conductive portion, and thereby broadband radiation characteristics can be provided.



US 20230112607A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2023/0112607 A1**

Fan et al. (43) **Pub. Date: Apr. 13, 2023**

(54) **PORTABLE ELECTRONIC DEVICE AND PLATE ANTENNA MODULE THEREOF**

(71) Applicant: **Taiwan Inpaq electronic Co., Ltd.**, Miaoli County (TW)

(72) Inventors: **Yang-Hsin Fan**, Hsinchu County (TW); **Ta-Fu Cheng**, Miaoli County (TW); **Cheng-Yi Wang**, New Taipei City (TW); **ZHI-XIANG WANG**, Taoyuan City (TW)

(21) Appl. No.: **17/672,629**

(22) Filed: **Feb. 15, 2022**

(30) **Foreign Application Priority Data**

Oct. 13, 2021 (TW) 110137880

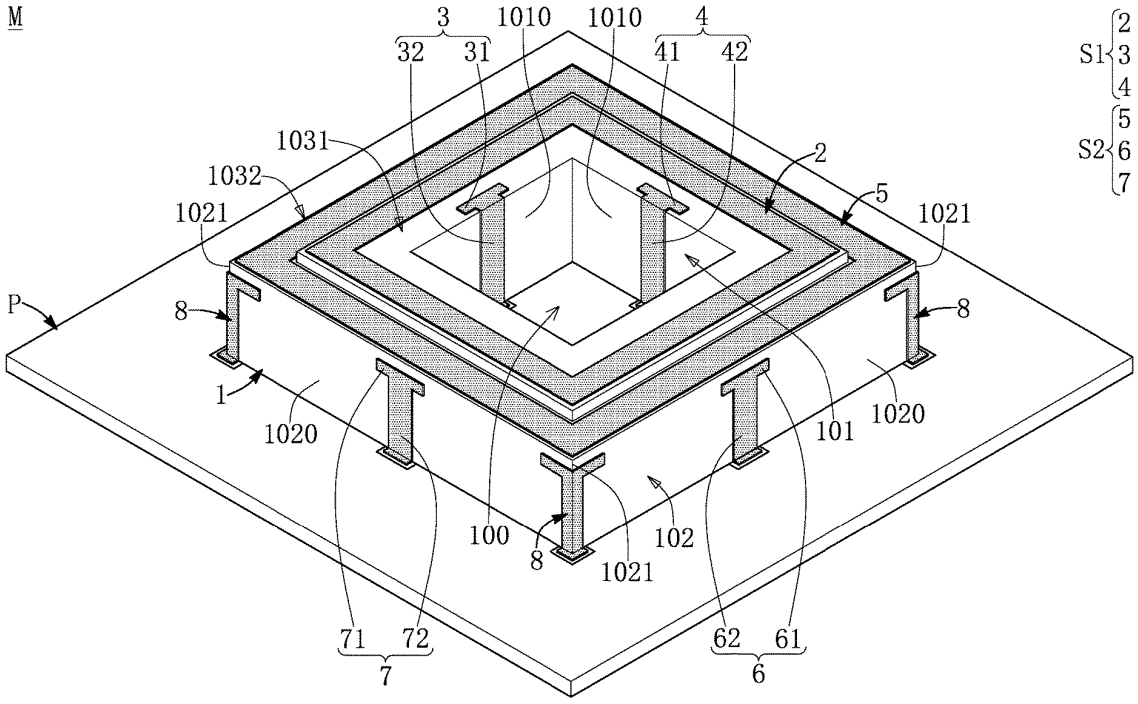
Publication Classification

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

(52) **U.S. Cl.**
CPC ***H01Q 9/0421*** (2013.01); ***H01Q 1/243*** (2013.01)

(57) **ABSTRACT**

A portable electronic device and a plate antenna module thereof are provided. The plate antenna module includes an antenna carrying structure, an inner surrounding radiation structure, a first inner feeding structure, an outer surrounding radiation structure, and a first outer feeding structure. The first inner feeding structure is surrounded by the inner surrounding radiation structure. The inner surrounding radiation structure is surrounded by the outer surrounding radiation structure. The inner surrounding radiation structure and the outer surrounding radiation structure are respectively disposed on two different planes of the antenna carrying structure. The inner surrounding radiation structure and the first inner feeding structure cooperate with each other to form a first antenna assembly for generating a first antenna operating frequency, and the outer surrounding radiation structure and the first outer feeding structure cooperate with each other to form a second antenna assembly for generating a second antenna operating frequency.



US 20230113751A1

(19) **United States**

(12) **Patent Application Publication**

(10) **Pub. No.: US 2023/0113751 A1**

(43) **Pub. Date: Apr. 13, 2023**

FANG et al.

(54) **ANTENNA, ANTENNA ASSEMBLY, AND WIRELESS COMMUNICATION DEVICE**

(71) Applicant: **SZ DJI TECHNOLOGY CO., LTD.**, Shenzhen (CN)

(72) Inventors: **Mu FANG**, Shenzhen (CN); **Chao LYU**, Shenzhen (CN); **Chao MA**, Shenzhen (CN)

(73) Assignee: **SZ DJI TECHNOLOGY CO., LTD.**, Shenzhen (CN)

(21) Appl. No.: **17/970,500**

(22) Filed: **Oct. 20, 2022**

Related U.S. Application Data

(63) Continuation of application No. PCT/CN2020/087318, filed on Apr. 27, 2020.

Publication Classification

(51) **Int. Cl.**

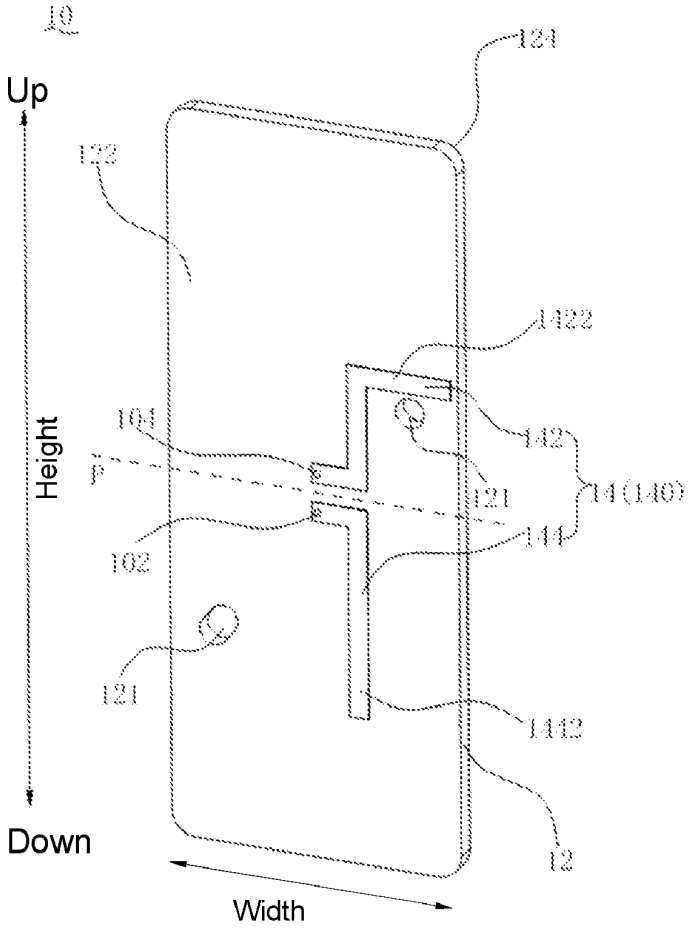
H01Q 1/50	(2006.01)
H01Q 1/24	(2006.01)
H01Q 1/36	(2006.01)
H01Q 5/47	(2006.01)
H01Q 15/14	(2006.01)

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

CPC ***H01Q 1/50*** (2013.01); ***H01Q 1/24*** (2013.01); ***H01Q 1/36*** (2013.01); ***H01Q 5/47*** (2015.01); ***H01Q 15/14*** (2013.01)

(57) **ABSTRACT**

An antenna, an antenna assembly and a wireless communication device are provided. The antenna includes an antenna substrate; and at least one radiation unit disposed on the antenna substrate, each of the at least one radiation unit including: a first radiation branch, and a second radiation branch, where one of the first radiation branch or the second radiation branch is connected to a feeding point, the other of the first radiation branch or the second radiation branch is connected to a ground point, an end part of the first radiation branch bends toward the second radiation branch, and an end part of the second radiation branch is extend in a direction away from the first radiation branch.



US 20230115428A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2023/0115428 A1**

CHUANG et al. (43) **Pub. Date: Apr. 13, 2023**

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

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

(72) Inventors: **Shih Ming CHUANG**, New Taipei City (TW); **Lung-Fai TUEN**, New Taipei City (TW); **Pei-Cheng HU**, New Taipei City (TW)

(21) Appl. No.: **17/521,547**

(22) Filed: **Nov. 8, 2021**

(30) **Foreign Application Priority Data**

Oct. 7, 2021 (TW) 110137309

Publication Classification

(51) **Int. Cl.**

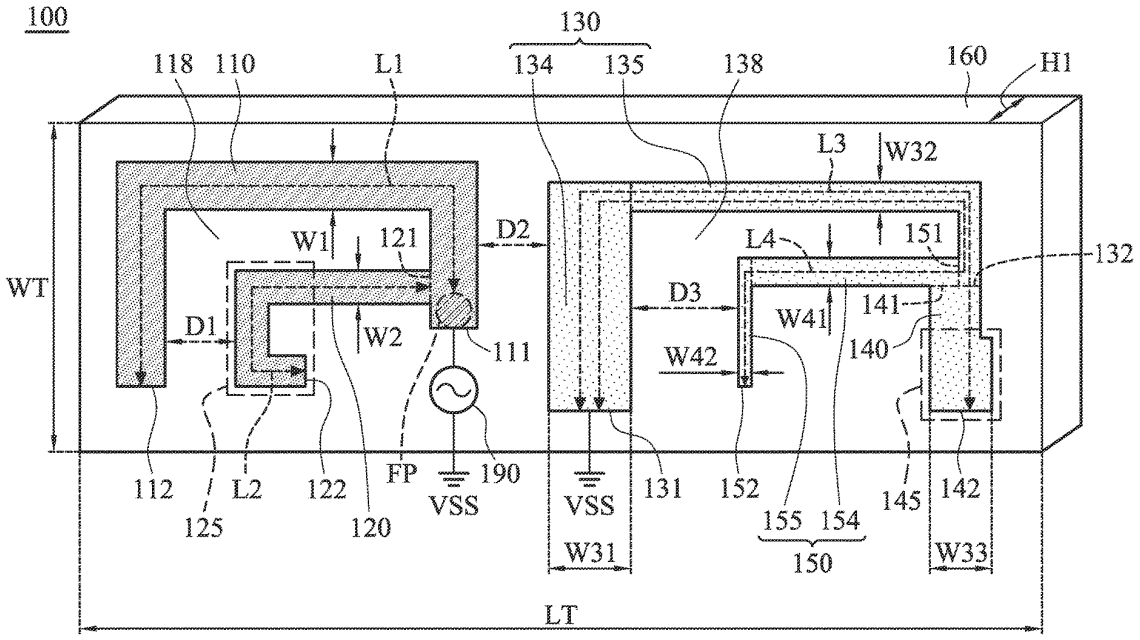
H01Q 1/36 (2006.01)
H01Q 5/371 (2006.01)
H01Q 9/04 (2006.01)
H01Q 1/24 (2006.01)

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

CPC ***H01Q 1/36*** (2013.01); ***H01Q 5/371*** (2015.01); ***H01Q 9/045*** (2013.01); ***H01Q 1/243*** (2013.01)

(57) **ABSTRACT**

An antenna structure includes a first radiation element, a second radiation element, a third radiation element, a fourth radiation element, and a fifth radiation element. The first radiation element has a feeding point. The second radiation element is coupled to the feeding point. The second radiation element is at least partially surrounded by the first radiation element. The third radiation element is coupled to a ground voltage. The fourth radiation element is coupled to the third radiation element. The fifth radiation element is coupled to the third radiation element. The fifth radiation element is at least partially surrounded by the third radiation element and the fourth radiation element.



US 20230117264A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2023/0117264 A1**

CHANG et al. (43) **Pub. Date: Apr. 20, 2023**

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

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

(72) Inventors: **Hsuan-Jui CHANG**, HSINCHU (TW); **Hsieh-Chih LIN**, HSINCHU (TW); **Guan-Ren SU**, HSINCHU (TW)

(21) Appl. No.: **17/817,406**

(22) Filed: **Aug. 4, 2022**

(30) **Foreign Application Priority Data**

Oct. 15, 2021 (TW) 110138286

Publication Classification

(51) **Int. Cl.**

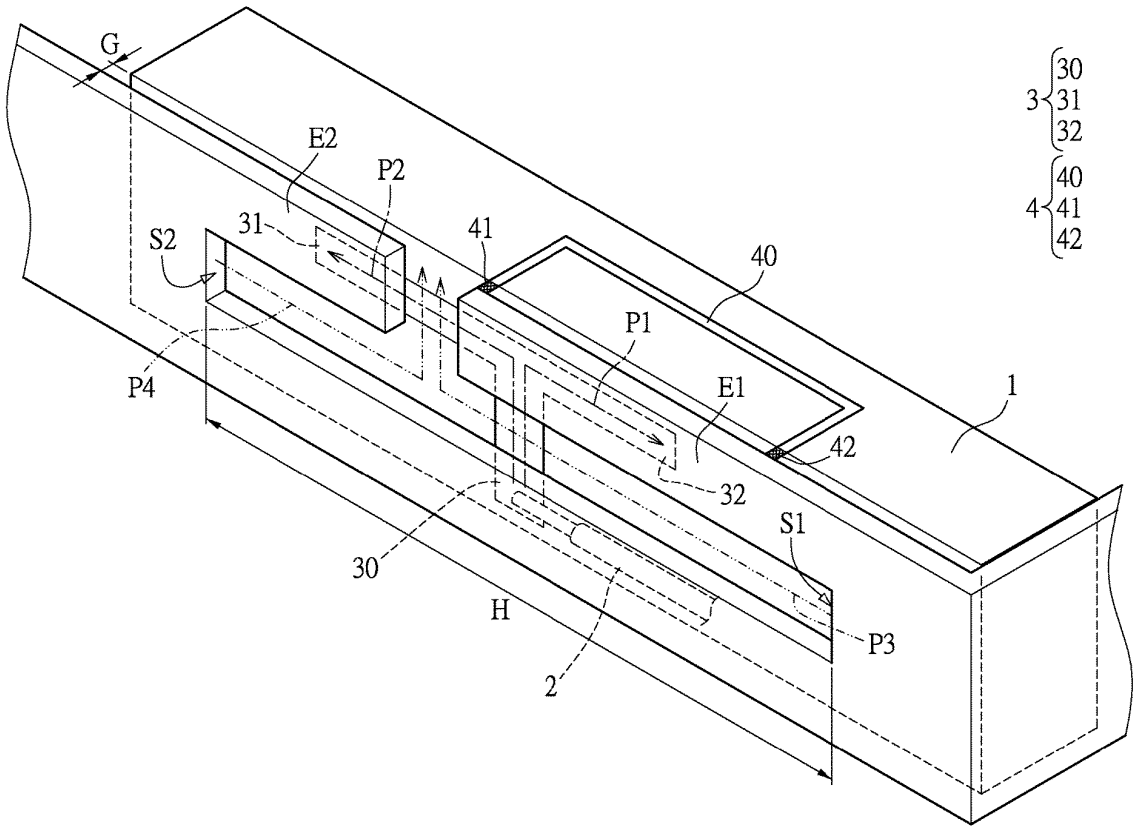
H01Q 13/16	(2006.01)
H01Q 1/22	(2006.01)
H01Q 5/378	(2006.01)

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

CPC ***H01Q 13/16*** (2013.01); ***H01Q 1/2266*** (2013.01); ***H01Q 5/378*** (2015.01)

(57) **ABSTRACT**

An electronic device and an antenna module are provided. The electronic device includes a metal housing with a slot having an open end and a first upper edge portion located at an upper edge of the slot. The antenna module is arranged in the metal housing and includes a carrier board, a feeding element, a radiating element with a feeding portion connected to the feeding element, and a first parasitic radiating element arranged on the carrier board and connected or coupled to the first upper edge portion. A vertical projection of the radiating element on the metal housing at least partially overlaps the slot. One side of the first parasitic radiating element is near an edge of the open end. The radiating element is fed with a signal through the feeding element to generate a resonant mode and is coupled to the slot to excite another resonant mode.



US 20230118456A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2023/0118456 A1**

Cheng et al. (43) **Pub. Date: Apr. 20, 2023**

(54) **ANTENNA STRUCTURE AND ELECTRONIC APPARATUS**

(71) Applicants: **Ta-Hong Cheng**, Taipei City (TW); **Yen-Hao Yu**, Taipei City (TW); **Shih-Chia Liu**, Taipei City (TW); **Po-Hsuan Chen**, Taipei City (TW); **Jui-Hung Lai**, Taipei City (TW)

(72) Inventors: **Ta-Hong Cheng**, Taipei City (TW); **Yen-Hao Yu**, Taipei City (TW); **Shih-Chia Liu**, Taipei City (TW); **Po-Hsuan Chen**, Taipei City (TW); **Jui-Hung Lai**, Taipei City (TW)

(73) Assignee: **COMPAL ELECTRONICS, INC.**, Taipei City (TW)

(21) Appl. No.: **17/959,303**

(22) Filed: **Oct. 4, 2022**

Related U.S. Application Data

(60) Provisional application No. 63/257,562, filed on Oct. 19, 2021.

Publication Classification

(51) **Int. Cl.**

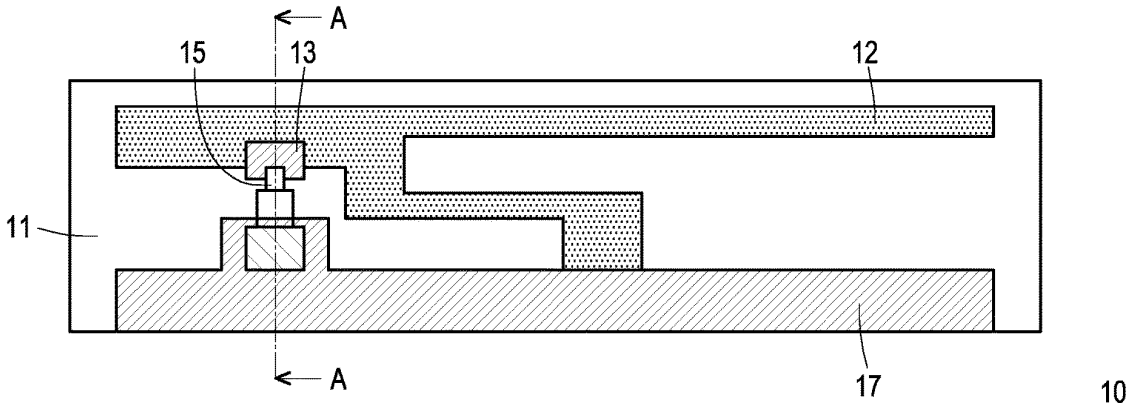
H01Q 9/04	(2006.01)
H01Q 1/48	(2006.01)
H01Q 17/00	(2006.01)

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

CPC ***H01Q 9/0407*** (2013.01); ***H01Q 1/48*** (2013.01); ***H01Q 17/00*** (2013.01)

(57) **ABSTRACT**

An antenna structure and an electronic apparatus are provided. The antenna structure includes a substrate, a first radiation part, and a second radiation part. The substrate has a first surface and a second surface opposite to each other. The first radiation part is disposed on the first surface. The first radiation part is an absorber material. The second radiation part is disposed on the second surface. The second radiation part is coupled to a feeding part. There is a distance between the second radiation part and the first radiation part, so as to excite a first resonance mode through the coupling of the second radiation part to the first radiation part. Accordingly, the specific absorption rate (SAR) value of the electromagnetic wave is reduced.



US 20230122586A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2023/0122586 A1**

PARK et al. (43) **Pub. Date: Apr. 20, 2023**

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

(71) Applicant: **DONGWOO FINE-CHEM CO., LTD.**, Jeollabuk-do (KR)

(72) Inventors: **Hee Jun PARK**, Gyeonggi-do (KR); **Ho Dong YOON**, Gyeonggi-do (KR); **Won Hee LEE**, Incheon (KR)

(21) Appl. No.: **18/082,639**

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(57) **ABSTRACT**

An antenna device according to an embodiment may include a dielectric layer, a first radiator disposed on an upper surface of the dielectric layer, a transmission line whose one end is connected with the first radiator on the upper surface of the dielectric layer, a signal pad connected to the other end of the transmission line, ground pads disposed around the signal pad, and a second radiator extending from the ground pad parallel to the transmission line and including one or more uneven parts.