



US 20240170831A1

(19) **United States**

(12) **Patent Application Publication**  
**Chao**

(10) **Pub. No.: US 2024/0170831 A1**

(43) **Pub. Date: May 23, 2024**

(54) **INTEGRATED ANTENNA**

**Publication Classification**

(71) Applicant: **Emplus Technologies, Inc.**, Taipei City (TW)

(51) **Int. Cl.**  
*H01Q 1/24* (2006.01)  
*H01Q 1/38* (2006.01)  
*H01Q 1/48* (2006.01)  
*H01Q 1/50* (2006.01)

(72) Inventor: **Shih-Ying Chao**, Taipei (TW)

(52) **U.S. Cl.**  
CPC ..... *H01Q 1/243* (2013.01); *H01Q 1/38* (2013.01); *H01Q 1/48* (2013.01); *H01Q 1/50* (2013.01)

(73) Assignee: **Emplus Technologies, Inc.**, Taipei City (TW)

(21) Appl. No.: **18/069,665**

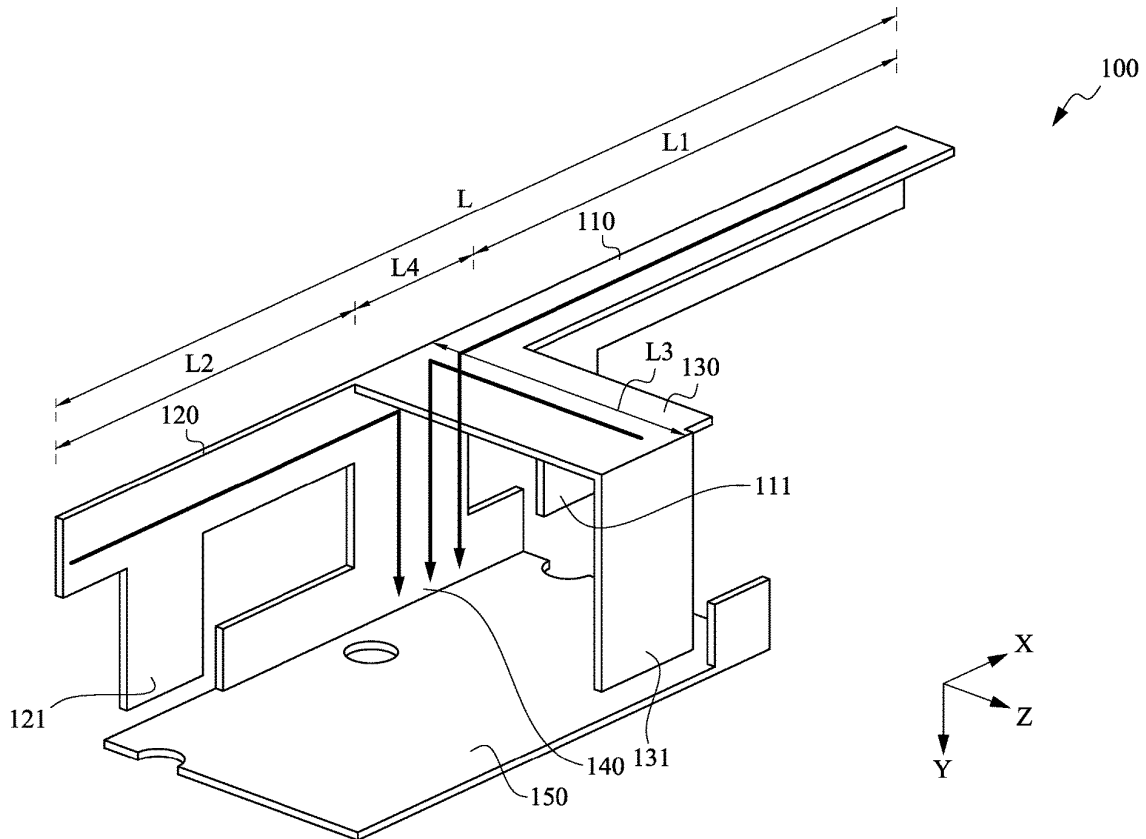
(57) **ABSTRACT**

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

An integrated antenna includes a first antenna, a second antenna, and a third antenna. The second antenna is electrically connected to the first antenna. The third antenna is electrically connected to the first antenna and the second antenna, and the third antenna is integrated with the first antenna and the second antenna to form the integrated antenna. Lengths of the first antenna, the second antenna, and the third antenna are different.

(30) **Foreign Application Priority Data**

Nov. 18, 2022 (TW) ..... 111144296





US 20240170832A1

(19) **United States**

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

(10) **Pub. No.: US 2024/0170832 A1**

(43) **Pub. Date: May 23, 2024**

(54) **MULTI-ANTENNA SYSTEM AND WIRELESS COMMUNICATION DEVICE**

*H01Q 1/52* (2006.01)

*H01Q 21/06* (2006.01)

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

(52) **U.S. Cl.**  
CPC ..... *H01Q 1/243* (2013.01); *H01Q 1/48* (2013.01); *H01Q 1/523* (2013.01); *H01Q 21/06* (2013.01)

(72) Inventors: **Yiwu Hu**, Shenzhen (CN); **Kunpeng Wei**, Shenzhen (CN); **Aofang Zhang**, Shenzhen (CN); **Qiao Guan**, Shenzhen (CN)

(57) **ABSTRACT**

(21) Appl. No.: **18/550,029**

This application discloses a multi-antenna system and a wireless communication device. The multi-antenna system includes a first antenna, a second antenna. A first extension branch is close to the second antenna, and a second extension branch is close to the first antenna. A feed of the first antenna is disposed on the first radiator, and a feed of the second antenna is disposed on a second radiator. A feed of the third antenna is disposed at the first extension branch. There is a spacing between the first extension branch and the second extension branch. An equivalent circuit of the spacing includes a distributed capacitor. The distributed capacitor is configured to isolate signal coupling between the first antenna and the second antenna when a first resonant frequency of the first antenna and a second resonant frequency of the second antenna are within a preset frequency range.

(22) PCT Filed: **Aug. 15, 2022**

(86) PCT No.: **PCT/CN2022/112393**

§ 371 (c)(1),

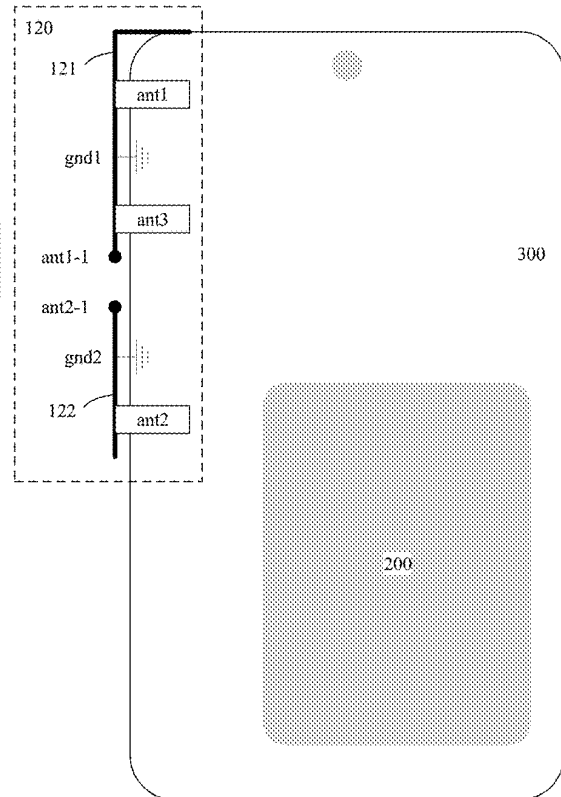
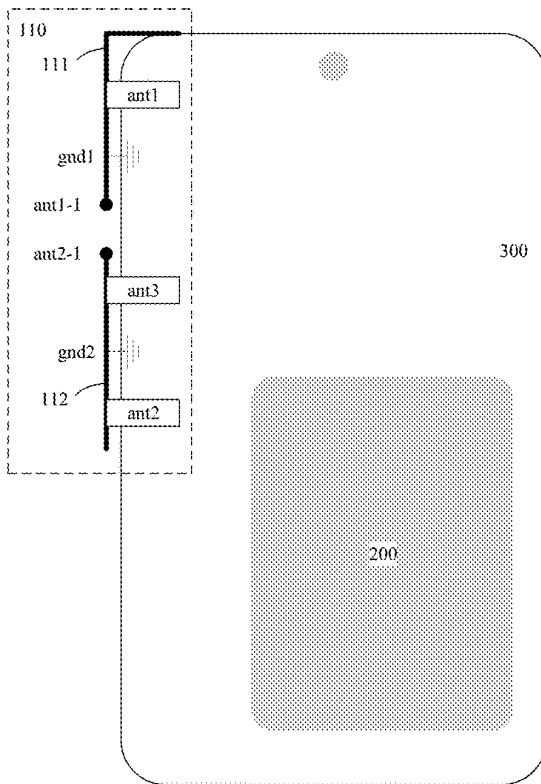
(2) Date: **Sep. 11, 2023**

(30) **Foreign Application Priority Data**

Sep. 7, 2021 (CN) ..... 202111045126.7

**Publication Classification**

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





US 20240170838A1

(19) **United States**

(12) **Patent Application Publication**  
**IZAWA**

(10) **Pub. No.: US 2024/0170838 A1**

(43) **Pub. Date: May 23, 2024**

(54) **ANTENNA DEVICE**

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

(71) Applicant: **Murata Manufacturing Co., Ltd.**,  
Kyoto (JP)

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

(72) Inventor: **Masahiro IZAWA**, Kyoto (JP)

(57) **ABSTRACT**

(21) Appl. No.: **18/426,896**

(22) Filed: **Jan. 30, 2024**

**Related U.S. Application Data**

(63) Continuation of application No. PCT/JP2022/  
030047, filed on Aug. 5, 2022.

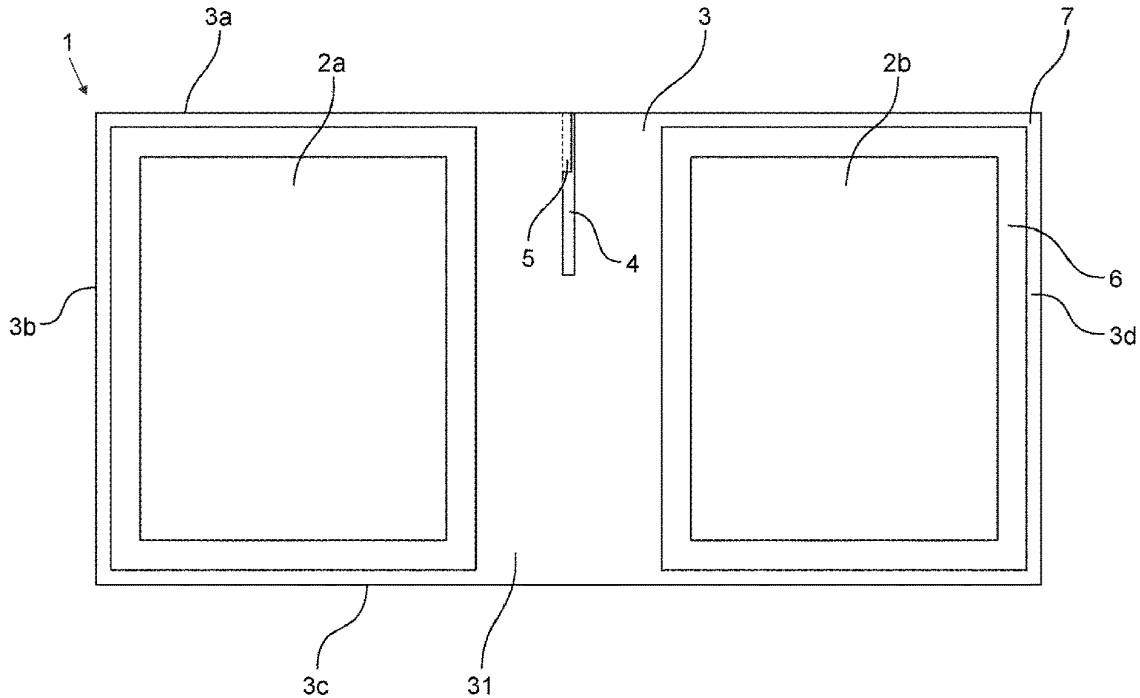
(30) **Foreign Application Priority Data**

Aug. 18, 2021 (JP) ..... 2021-133550

**Publication Classification**

(51) **Int. Cl.**  
**H01Q 1/48** (2006.01)  
**H01Q 9/04** (2006.01)

An antenna device includes a ground electrode on rear sides of first and second antenna elements. The ground electrode includes ground layers and respectively having slits located between the first and second antenna elements as viewed in the thickness direction of the ground electrode. A first edge on a side of the first antenna element of the slit includes a first portion and a second portion closer to a second edge on a side of the second antenna element than the first portion. A fourth edge on the side of the second antenna element of the slit includes a third portion closer to the second antenna element than the first portion and includes a fourth portion closer to a third edge on the side of the first antenna element than the third portion and closer to the first antenna element than the second portion.





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(19) **United States**

(12) **Patent Application Publication**  
**Shen**

(10) **Pub. No.: US 2024/0170843 A1**

(43) **Pub. Date: May 23, 2024**

(54) **ANTENNA MODULE**

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

(72) Inventor: **Su Mei Shen**, New Taipei City (TW)

(73) Assignee: **Wistron Corporation**, New Taipei City (TW)

(21) Appl. No.: **18/154,025**

(22) Filed: **Jan. 12, 2023**

(30) **Foreign Application Priority Data**

Nov. 21, 2022 (TW) ..... 111144326

**Publication Classification**

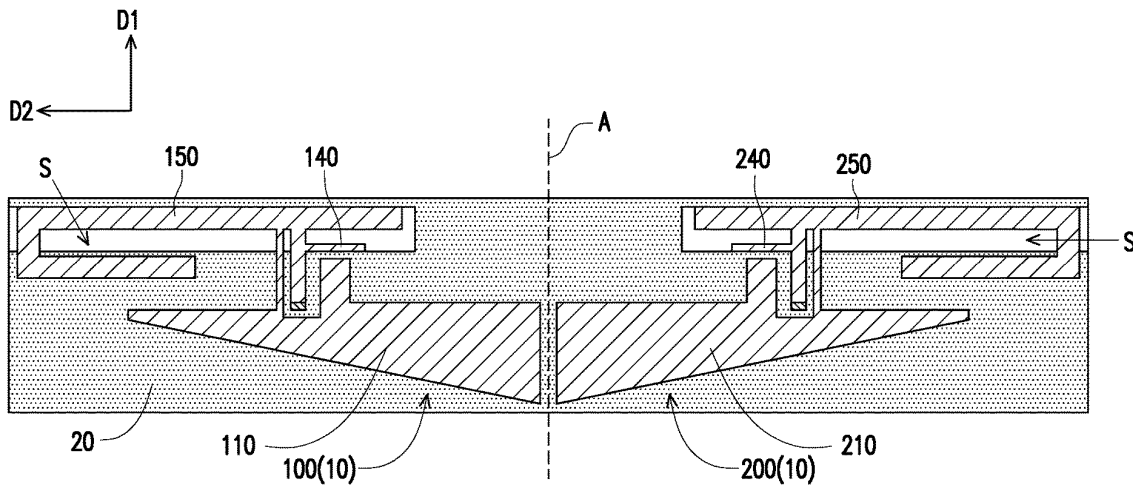
(51) **Int. Cl.**  
**H01Q 5/307** (2006.01)  
**H01Q 1/48** (2006.01)  
**H01Q 9/04** (2006.01)

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

CPC ..... **H01Q 5/307** (2015.01); **H01Q 1/48** (2013.01); **H01Q 9/0407** (2013.01)

(57) **ABSTRACT**

An antenna module includes an antenna structure including ground, first, second, and third radiators. The ground radiator includes a main ground portion and a branch portion extending from one side of the main ground portion. The first radiator located on the one side of the main ground portion includes a feeding terminal. The second radiator is connected to the one side of the main ground portion. The first radiator is located between the branch portion and the second radiator. The main ground portion, the branch portion, and the first and second radiators together form a waveguide structure. The first and second radiators are configured to excite a first high frequency band. The third radiator is located on the one side of the main ground portion, connected to the first radiator, and located beside the branch portion. The first and third radiators are configured to excite a second high frequency band.





(19) **United States**

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

(10) **Pub. No.: US 2024/0170844 A1**

(43) **Pub. Date: May 23, 2024**

(54) **MOBILE DEVICE SUPPORTING WIDEBAND OPERATION**

(52) **U.S. Cl.**  
CPC ..... **H01Q 5/307** (2015.01); **H01Q 1/2266**  
(2013.01); **H01Q 1/48** (2013.01); **H01Q 9/0421** (2013.01); **H01Q 21/24** (2013.01)

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

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

(57) **ABSTRACT**

A mobile device supporting wideband operations includes a feeding radiation element, a first radiation element, a second radiation element, a shorting radiation element, a third radiation element, and a fourth radiation element. The feeding radiation element has a feeding point. The first radiation element is coupled to the feeding radiation element. The second radiation element is coupled to the feeding radiation element. The second radiation element and the first radiation element substantially extend in opposite directions. The second radiation element is coupled through the shorting radiation element to a ground voltage. The third radiation element is coupled to the ground voltage. The fourth radiation element is coupled to the feeding radiation element. An antenna structure is formed by the feeding radiation element, the first radiation element, the second radiation element, the shorting radiation element, the third radiation element, and the fourth radiation element.

(21) Appl. No.: **18/156,051**

(22) Filed: **Jan. 18, 2023**

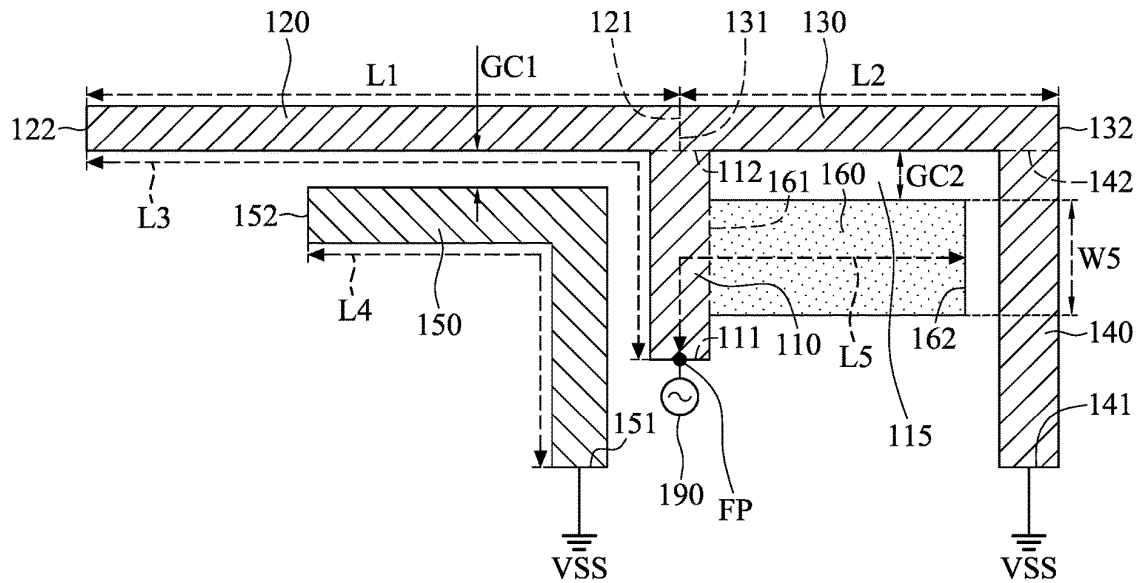
(30) **Foreign Application Priority Data**

Nov. 23, 2022 (TW) ..... 111144731

**Publication Classification**

(51) **Int. Cl.**  
**H01Q 5/307** (2006.01)  
**H01Q 1/22** (2006.01)  
**H01Q 1/48** (2006.01)  
**H01Q 9/04** (2006.01)  
**H01Q 21/24** (2006.01)

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(19) **United States**

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

(10) **Pub. No.: US 2024/0170846 A1**

(43) **Pub. Date: May 23, 2024**

(54) **THIN-FILM ANTENNA, DISPLAYING  
MODULE AND DISPLAYING DEVICE**

**Publication Classification**

(71) Applicant: **BOE Technology Group Co., Ltd.**,  
Beijing (CN)

(51) **Int. Cl.**  
**H01Q 7/00** (2006.01)  
**H01Q 1/22** (2006.01)  
**H01Q 1/50** (2006.01)

(72) Inventors: **Penghao Gu**, Beijing (CN); **Xin Wang**,  
Beijing (CN)

(52) **U.S. Cl.**  
CPC ..... **H01Q 7/00** (2013.01); **H01Q 1/22**  
(2013.01); **H01Q 1/50** (2013.01)

(73) Assignee: **BOE Technology Group Co., Ltd.**,  
Beijing (CN)

(57) **ABSTRACT**

(21) Appl. No.: **17/913,020**

A thin-film antenna, a displaying module and a displaying device. The thin-film antenna includes a first region and a second region, and the thin-film antenna includes: an antenna functional layer, a first film layer and a lead-wire layer that are arranged in stack. The antenna functional layer includes an antenna coil, the antenna coil is located within the first region, the lead-wire layer includes a lead wire and a terminal connected to the lead wire, the terminal is located within the second region, and the lead wire and the antenna coil are connected by a via hole provided in the first film layer. The thin-film antenna according to the present embodiment may be adhered to the back surface of the display panel, and the component for shielding signals such as a middle frame is not required to be provided between the antenna and the display panel.

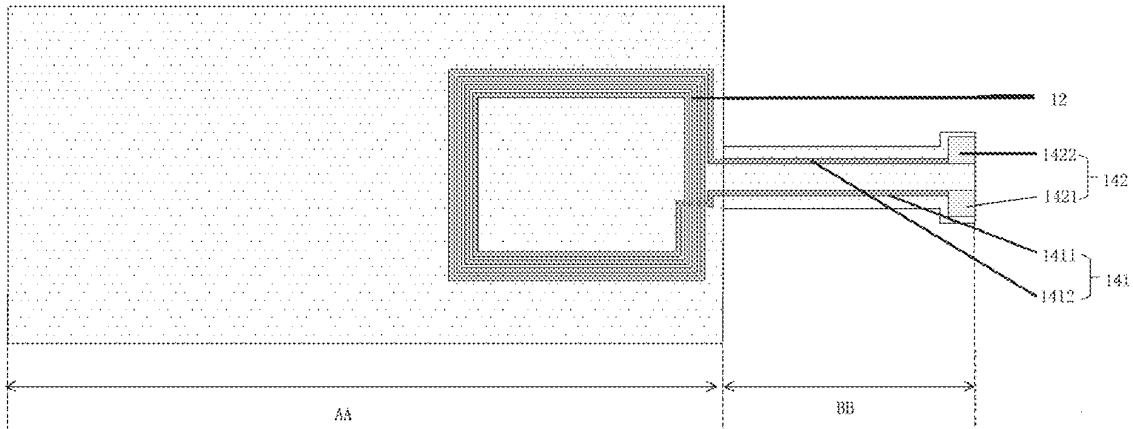
(22) PCT Filed: **Nov. 2, 2021**

(86) PCT No.: **PCT/CN2021/128096**

§ 371 (c)(1),  
(2) Date: **Sep. 20, 2022**

(30) **Foreign Application Priority Data**

Apr. 2, 2021 (CN) ..... 202110362865.2





(19) **United States**

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

(10) **Pub. No.: US 2024/0170859 A1**

(43) **Pub. Date: May 23, 2024**

(54) **MOBILE DEVICE SUPPORTING WIDEBAND OPERATION**

(52) **U.S. Cl.**  
CPC ..... **H01Q 21/28** (2013.01); **H01Q 9/0421** (2013.01)

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

(57) **ABSTRACT**

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

A mobile device supporting wideband operations includes a feeding radiation element, a first radiation element, a second radiation element, a third radiation element, a shorting radiation element, a fourth radiation element, and a fifth radiation element. The first radiation element is coupled to the feeding radiation element. The second radiation element is adjacent to the first radiation element. The second radiation element and the third radiation element are coupled through the shorting radiation element to a ground voltage. The fourth radiation element is coupled to the feeding point. The fourth radiation element is adjacent to the second radiation element. The fifth radiation element is coupled to the feeding point. An antenna structure is formed by the feeding radiation element, the first radiation element, the second radiation element, the third radiation element, the shorting radiation element, the fourth radiation element, and the fifth radiation element.

(21) Appl. No.: **18/166,540**

(22) Filed: **Feb. 9, 2023**

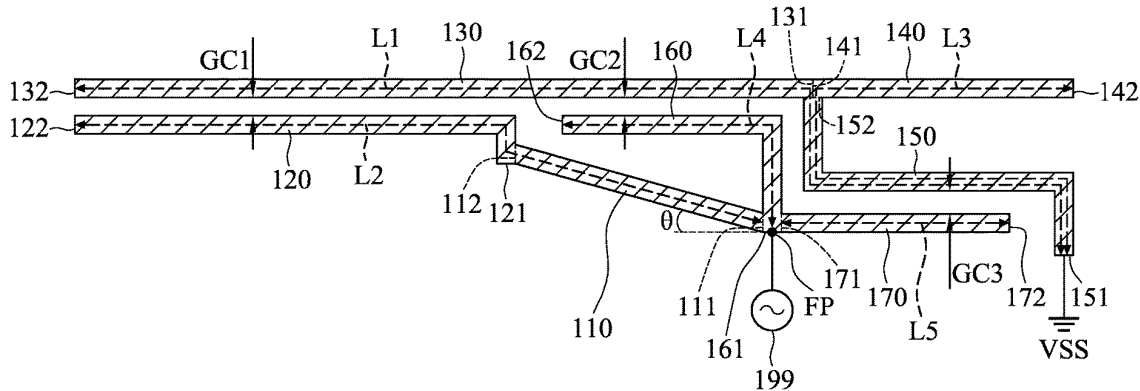
(30) **Foreign Application Priority Data**

Nov. 17, 2022 (TW) ..... 111143905

**Publication Classification**

(51) **Int. Cl.**  
**H01Q 21/28** (2006.01)  
**H01Q 9/04** (2006.01)

100





US 20240178546A1

(19) **United States**

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

(10) **Pub. No.: US 2024/0178546 A1**

(43) **Pub. Date: May 30, 2024**

(54) **ELECTRONIC DEVICE**

**Publication Classification**

(71) Applicant: **Lenovo (Beijing) Limited**, Beijing (CN)

(51) **Int. Cl.**  
*H01Q 1/22* (2006.01)  
*H01Q 1/48* (2006.01)  
*H01Q 21/30* (2006.01)

(72) Inventors: **Yuling XU**, Beijing (CN); **Dafei MO**, Beijing (CN)

(52) **U.S. Cl.**  
CPC ..... *H01Q 1/22* (2013.01); *H01Q 1/48* (2013.01); *H01Q 21/30* (2013.01)

(21) Appl. No.: **18/524,830**

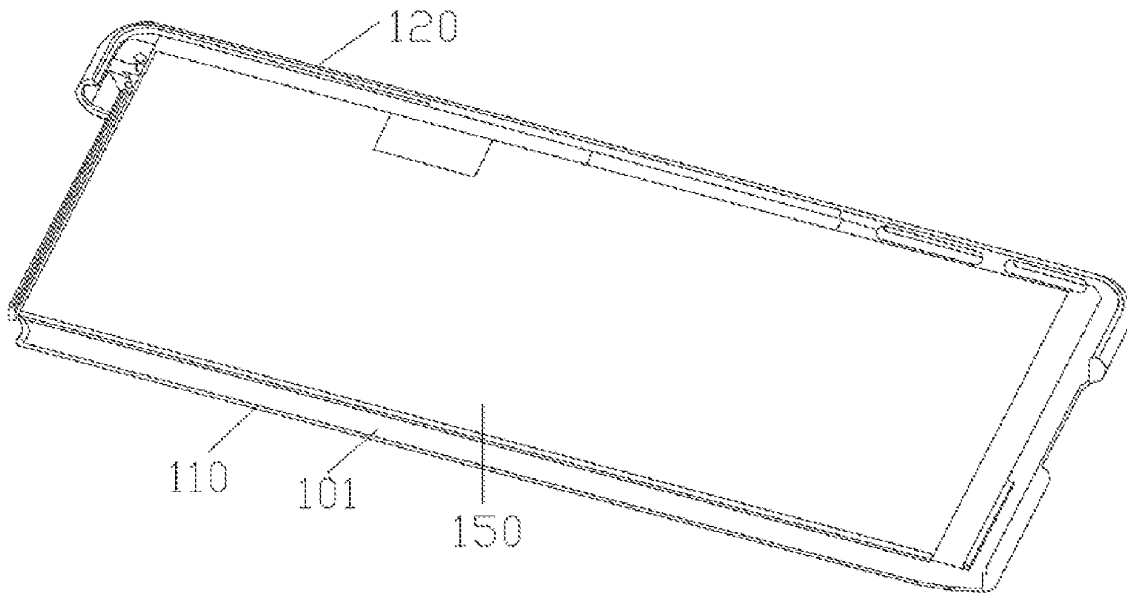
(57) **ABSTRACT**

(22) Filed: **Nov. 30, 2023**

An electronic device includes a shell forming an accommodation space. The shell includes a first wall including a first opening communicating with the accommodation space. At least a part of the first wall located at the first opening forms a first antenna radiator of the electronic device.

(30) **Foreign Application Priority Data**

Nov. 30, 2022 (CN) ..... 202211524409.4







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(19) **United States**

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

(10) **Pub. No.: US 2024/0178548 A1**

(43) **Pub. Date: May 30, 2024**

(54) **ELECTRONIC DEVICE INCLUDING ANTENNA**

**Publication Classification**

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

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

(72) Inventors: **Wangik SON**, Suwon-si (KR); **Jungsik PARK**, Suwon-si (KR); **Incheol BAEK**, Suwon-si (KR); **Sunghyup LEE**, Suwon-si (KR); **Dongwoo SEO**, Suwon-si (KR); **Youngsoo CHUN**, Suwon-si (KR); **Byengsang JUNG**, Suwon-si (KR)

(52) **U.S. Cl.**  
CPC ..... **H01Q 1/241** (2013.01); **H01Q 9/045** (2013.01)

(57) **ABSTRACT**

An electronic device includes a housing, a circuit board, a first electronic component, a first conductive plate, and a first antenna. The housing includes a support member and a side frame surrounding a periphery of the support member. The support member includes a first conductive area. The circuit board is disposed on a surface of the support member and includes a feeding point on a surface of the circuit board. The first electronic component is disposed on the surface of the support member. The first conductive plate is disposed on a surface of the first electronic component. The first conductive area is disposed between the first electronic component and the side frame. The first antenna includes a first radiator, a first feeding part, and a first signal terminal. At least a portion of the first electronic component is disposed between the first conductive area and the circuit board.

(21) Appl. No.: **18/521,234**

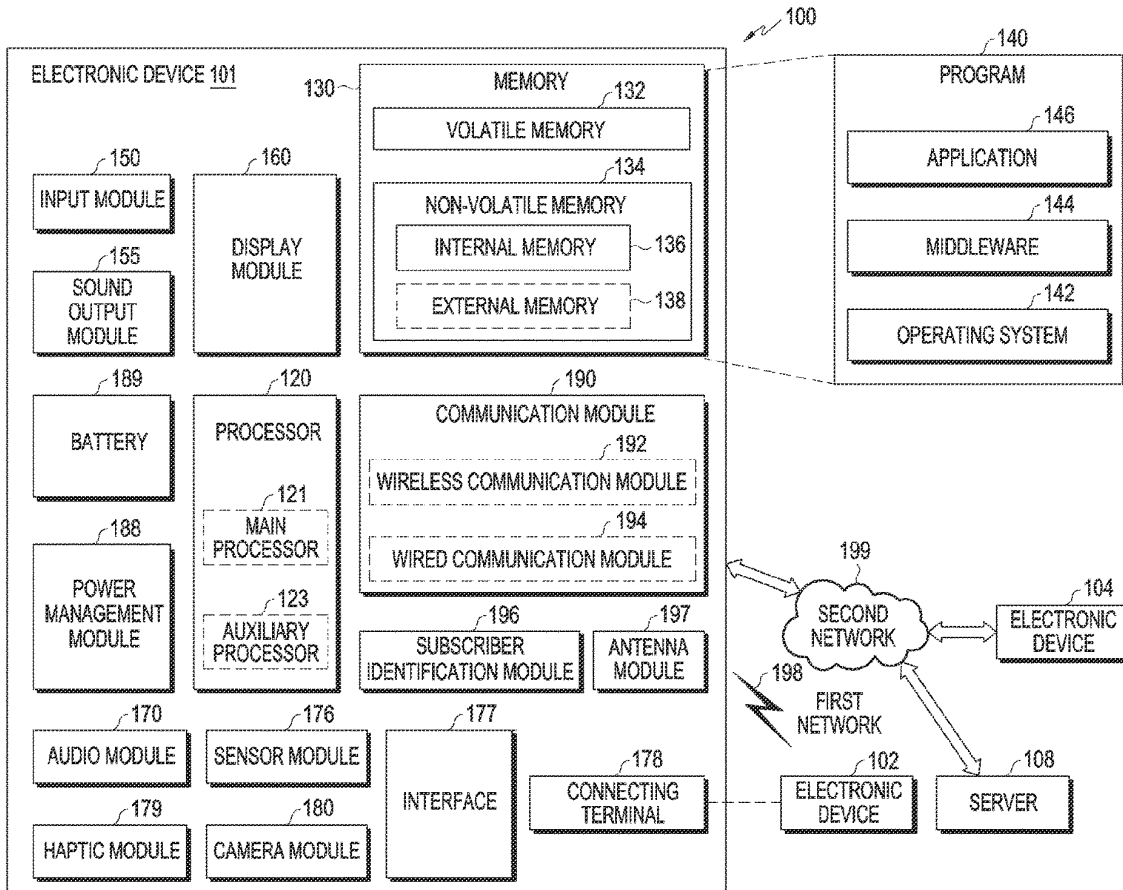
(22) Filed: **Nov. 28, 2023**

**Related U.S. Application Data**

(63) Continuation of application No. PCT/KR2023/019314, filed on Nov. 28, 2023.

(30) **Foreign Application Priority Data**

Nov. 28, 2022 (KR) ..... 10-2022-0161828  
Jan. 4, 2023 (KR) ..... 10-2023-0001422





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(19) **United States**

(12) **Patent Application Publication**  
**SATO**

(10) **Pub. No.:** US 2024/0178567 A1

(43) **Pub. Date:** **May 30, 2024**

(54) **ANTENNA MODULE AND COMMUNICATION APPARATUS EQUIPPED WITH THE SAME**

**Publication Classification**

(51) **Int. Cl.**  
*H01Q 9/04* (2006.01)  
*H01Q 19/00* (2006.01)  
(52) **U.S. Cl.**  
CPC ..... *H01Q 9/0428* (2013.01); *H01Q 19/005* (2013.01)

(71) Applicant: **Murata Manufacturing Co., Ltd.**,  
Nagaokakyo-shi (JP)

(72) Inventor: **Yosuke SATO**, Nagaokakyo-shi (JP)

(73) Assignee: **Murata Manufacturing Co., Ltd.**,  
Nagaokakyo-shi (JP)

(57) **ABSTRACT**

An antenna module including a passive element, a ground electrode, a feed element, a feed line, and a feed line. The feed element includes a radiating electrode and a radiating electrode. The feed lines pass through respective through holes formed in the passive element and are connected to the radiating electrode, respectively. The feed element radiates radio waves in a second frequency band higher than a first frequency band of radio waves radiated by the passive element. The passive element is capable of radiating radio waves including polarized waves in a first polarization direction and polarized waves in a second polarization direction. The polarization direction of the radiating electrode and the polarization direction of the radiating electrode differ from each other.

(21) Appl. No.: **18/437,314**

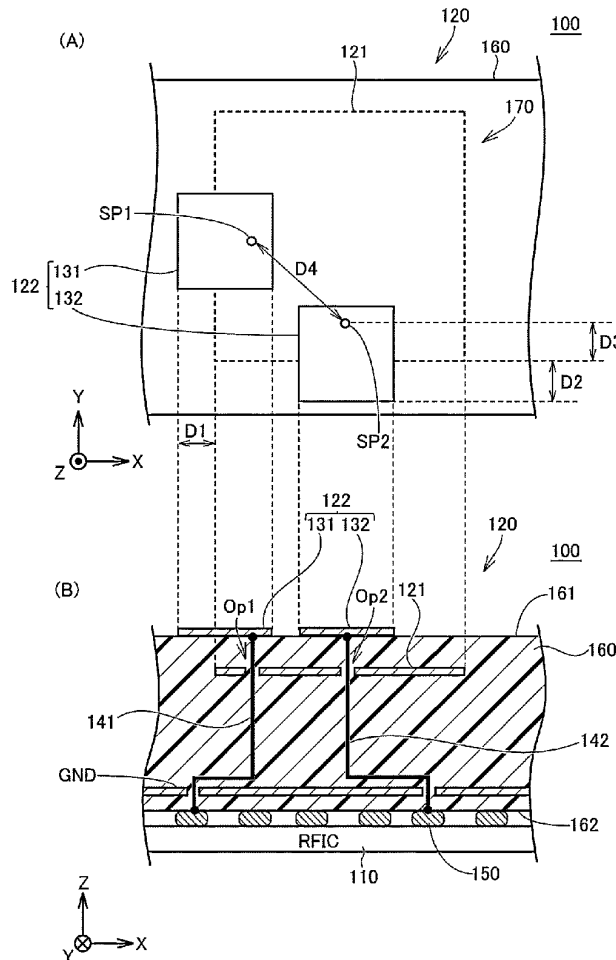
(22) Filed: **Feb. 9, 2024**

**Related U.S. Application Data**

(63) Continuation of application No. PCT/JP2022/029830, filed on Aug. 3, 2022.

(30) **Foreign Application Priority Data**

Aug. 31, 2021 (JP) ..... 2021-140567





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(19) **United States**

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

(10) **Pub. No.: US 2024/0178570 A1**

(43) **Pub. Date: May 30, 2024**

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

*H01Q 1/27* (2006.01)

*H01Q 1/36* (2006.01)

(71) Applicant: **HONOR DEVICE CO., LTD.**,  
Shenzhen (CN)

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

CPC ..... *H01Q 13/10* (2013.01); *H01Q 1/243*

(2013.01); *H01Q 1/273* (2013.01); *H01Q 1/36*

(2013.01)

(72) Inventors: **Jianfeng LIU**, Shenzhen (CN);  
**Hongxing WANG**, Shenzhen (CN);  
**Lijun YANG**, Shenzhen (CN)

(57)

**ABSTRACT**

(21) Appl. No.: **18/275,723**

(22) PCT Filed: **Dec. 27, 2022**

(86) PCT No.: **PCT/CN2022/142499**

§ 371 (c)(1),

(2) Date: **Aug. 3, 2023**

(30) **Foreign Application Priority Data**

Feb. 21, 2022 (CN) ..... 202210157230.3

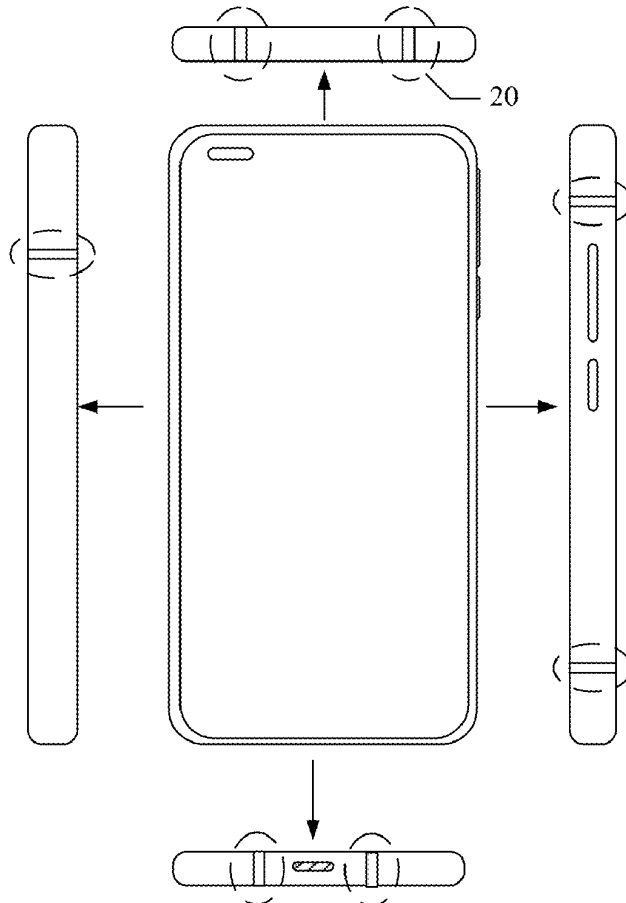
**Publication Classification**

(51) **Int. Cl.**

*H01Q 13/10* (2006.01)

*H01Q 1/24* (2006.01)

An antenna slot structure and an electronic device are provided and relate to the field of terminal technologies. The antenna slot structure includes insulating plastic and a metal frame. The metal frame includes a first part and a second part, and the first part and the second part are separated to form an antenna slot. At least one of the first part and the second part is provided with a first groove at the antenna slot. The first groove starts from the antenna slot and extends toward a direction away from the antenna slot; and the insulating plastic fills the first groove and the antenna slot. The solution improves the bonding strength between the insulating plastic and the metal frame at the antenna slot, enhances the airtightness of the electronic device, and ensures the dustproof and waterproof capabilities of the electronic device.





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(19) **United States**

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

(10) **Pub. No.: US 2024/0178577 A1**

(43) **Pub. Date: May 30, 2024**

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

(52) **U.S. Cl.**  
CPC ..... **H01Q 21/28** (2013.01); **H01Q 1/241** (2013.01)

(71) Applicant: **REALME CHONGQING MOBILE TELECOMMUNICATIONS CORP., LTD.**, Chongqing (CN)

(57) **ABSTRACT**

(72) Inventors: **Siying Lin**, Chongqing (CN); **Yuanbin Xiang**, Chongqing (CN)

(21) Appl. No.: **18/435,826**

(22) Filed: **Feb. 7, 2024**

**Related U.S. Application Data**

(63) Continuation of application No. PCT/CN2022/114648, filed on Aug. 25, 2022.

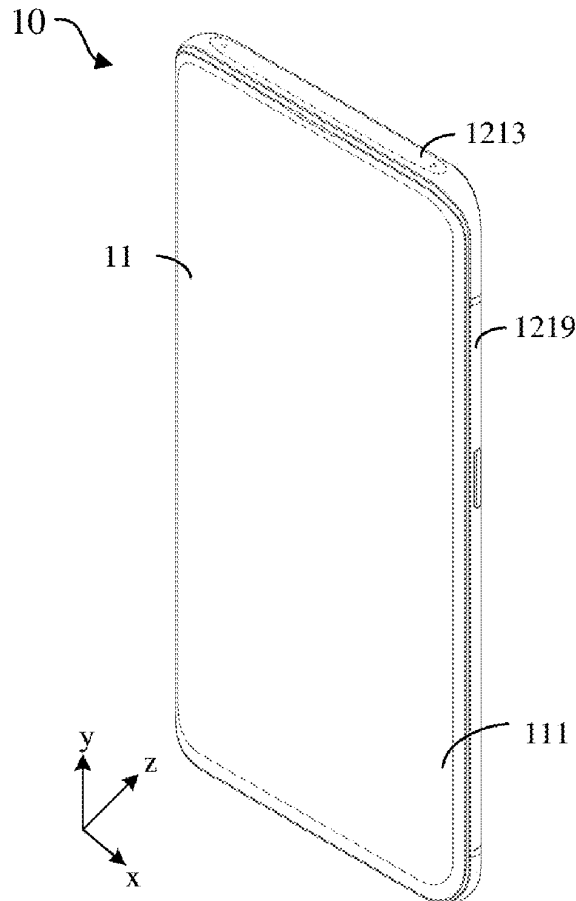
(30) **Foreign Application Priority Data**

Sep. 13, 2021 (CN) ..... 202111069517.2

**Publication Classification**

(51) **Int. Cl.**  
**H01Q 21/28** (2006.01)  
**H01Q 1/24** (2006.01)

Provided are an antenna assembly and an electronic device. The antenna assembly includes a housing, a radio frequency circuit, a first antenna, a second antenna, and a third antenna. The first, second and third antennas are provided on the housing. The first antenna radiates a first radio frequency signal at a GPS frequency band L1, and each of the second and third antennas radiates a second radio frequency signal at a GPS frequency band L5. A first GPS module of the radio frequency circuit is connected with the first antenna and supports receipt and transmission of the first radio frequency signal. A second GPS module of the radio frequency circuit is selectively connected to one of the second and third antennas, and switch, based on network information of a received second radio frequency signal, between being connected to the second antenna and being connected to the third antenna.





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(19) **United States**

(12) **Patent Application Publication**  
**TAKI**

(10) **Pub. No.: US 2024/0178578 A1**

(43) **Pub. Date: May 30, 2024**

(54) **ANTENNA DEVICE**

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

(71) Applicant: **Murata Manufacturing Co., Ltd.**,  
Kyoto (JP)

CPC ..... **H01Q 21/28** (2013.01); **H01Q 9/0414**  
(2013.01); **H01Q 9/065** (2013.01)

(72) Inventor: **Shota TAKI**, Kyoto (JP)

(57) **ABSTRACT**

(21) Appl. No.: **18/500,455**

An antenna board of an antenna device includes a connection portion, and first and second conductor elements. The connection portion includes an inner side portion electrode and an outer side portion electrode connected to a coaxial cable. The first conductor element includes first conductor portion connected to the inner side portion electrode at first end, and second conductor portion disposed such that first mounting region is present between second and third ends. The second conductor is disposed such that second and third mounting regions are respectively present between fifth end and the inner side portion electrode and between the fifth end and the outer side portion electrode. An electrical length portion between the first and second ends of the first conductor portion is equal to an electrical length between the fifth and sixth ends of the second conductor element.

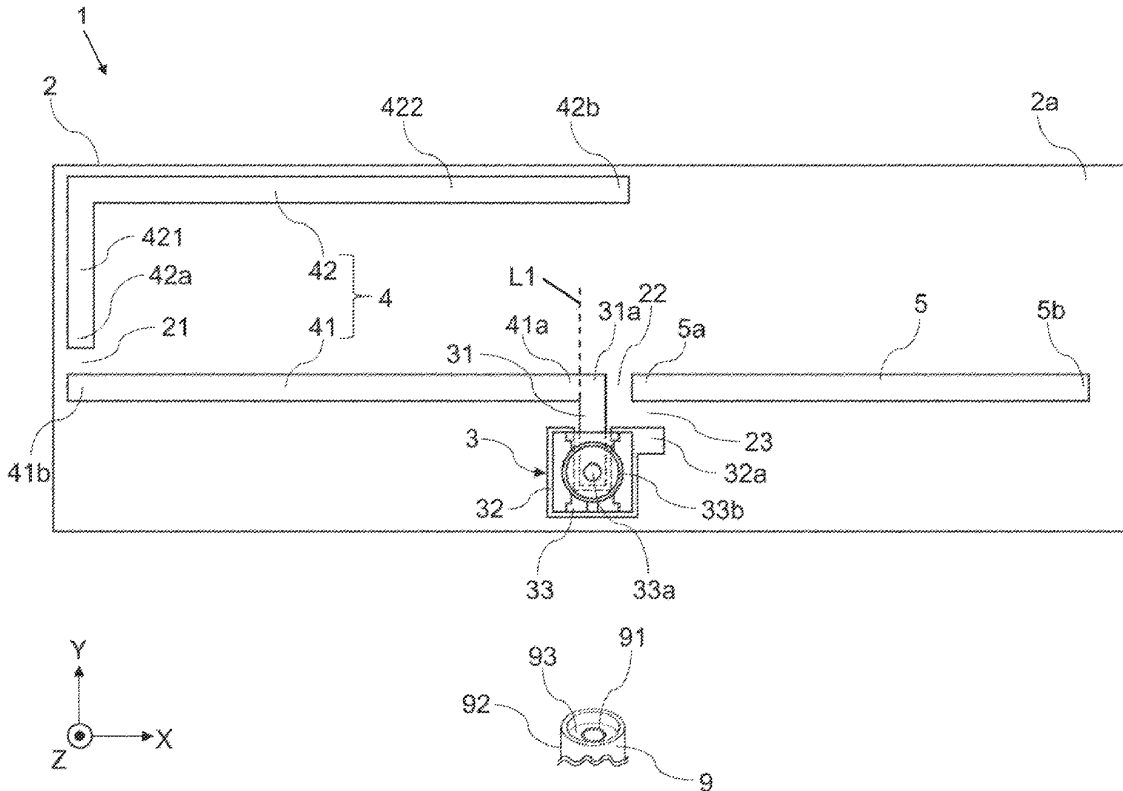
(22) Filed: **Nov. 2, 2023**

(30) **Foreign Application Priority Data**

Nov. 24, 2022 (JP) ..... 2022-187718  
Apr. 18, 2023 (JP) ..... 2023-067854

**Publication Classification**

(51) **Int. Cl.**  
**H01Q 21/28** (2006.01)  
**H01Q 9/04** (2006.01)  
**H01Q 9/06** (2006.01)





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(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2024/0186681 A1**

**KIM et al.**

(43) **Pub. Date: Jun. 6, 2024**

(54) **MOBILE COMMUNICATION DEVICE  
COMPRISING ANTENNA**

**Publication Classification**

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

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

(72) Inventors: **Yunsik KIM**, Suwon-si (KR); **Woosuk KANG**, Suwon-si (KR); **Mincheol SEO**, Suwon-si (KR); **Donghun SHIN**, Suwon-si (KR); **Changha YU**, Suwon-si (KR); **Minkyung LEE**, Suwon-si (KR); **Gyubok PARK**, Suwon-si (KR); **Kiyong JUNG**, Suwon-si (KR)

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

(57) **ABSTRACT**

A mobile communication device is provided. The mobile communication device includes a housing which includes a first edge and a second edge, the first edge extending in a first direction and the second edge extending from one end of the first edge in a second direction perpendicular to the first direction, a wireless communication circuit, and a conductive member, wherein the housing includes a first conductive portion forming a part of the first edge and having a predetermined length, and a second conductive portion forming an inner frame of the mobile communication device, at least a part of the second conductive portion is spaced apart from the first conductive portion, and includes an indentation formed to correspond to the protrusion of the first conductive portion, and the wireless communication circuit supplies power to the protrusion to transmit/receive a wireless signal through the first conductive portion, the second conductive portion, or at least a part of the conductive member.

(21) Appl. No.: **18/436,333**

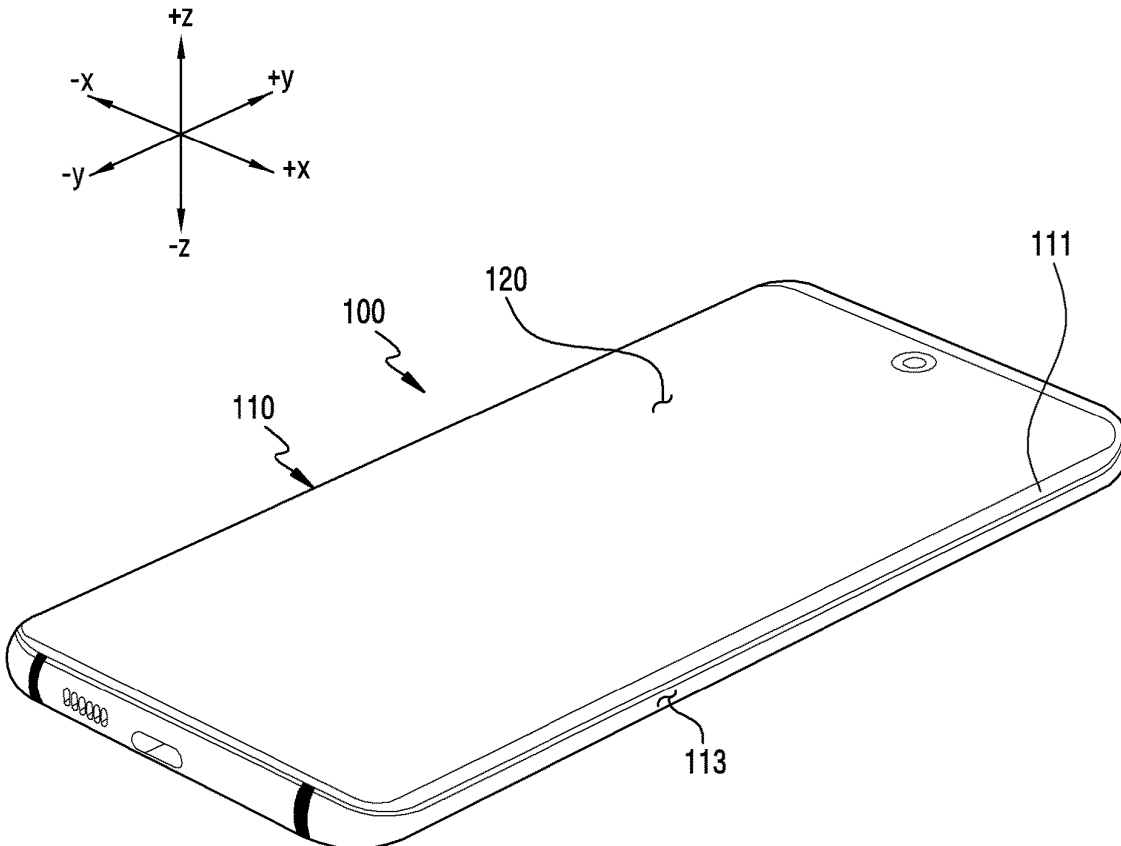
(22) Filed: **Feb. 8, 2024**

**Related U.S. Application Data**

(63) Continuation of application No. PCT/KR2022/011369, filed on Aug. 2, 2022.

**Foreign Application Priority Data**

(30) Aug. 12, 2021 (KR) ..... 10-2021-0106895





US 20240186682A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2024/0186682 A1**  
NAM et al. (43) **Pub. Date: Jun. 6, 2024**

(54) **ELECTRONIC DEVICE INCLUDING STRUCTURE IN WHICH KEY BUTTON AND ANTENNA MODULE OVERLAP**

(30) **Foreign Application Priority Data**

Oct. 5, 2021 (KR) ..... 10-2021-0132023  
Nov. 2, 2021 (KR) ..... 10-2021-0149272

(71) Applicant: **Samsung Electronics Co., Ltd.**,  
Suwon-si (KR)  
(72) Inventors: **In NAM**, Suwon-si (KR); **Daeyoung NOH**, Suwon-si (KR); **Jongdo KIM**,  
Suwon-si (KR); **Daeseung PARK**,  
Suwon-si (KR); **Kyoungho BAE**,  
Suwon-si (KR); **Younghwan HONG**,  
Suwon-si (KR)

**Publication Classification**

(51) **Int. Cl.**  
*H01Q 1/24* (2006.01)  
*H04M 1/02* (2006.01)  
(52) **U.S. Cl.**  
CPC ..... *H01Q 1/243* (2013.01); *H04M 1/026*  
(2013.01)

(21) Appl. No.: **18/440,028**

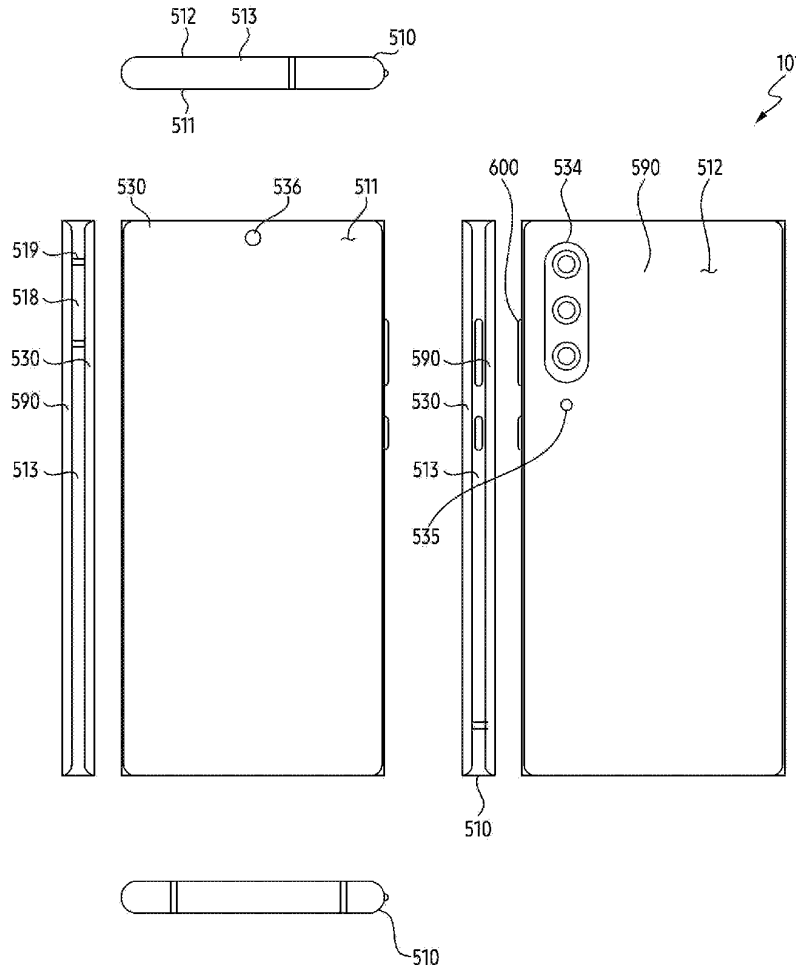
(57) **ABSTRACT**

An electronic device is provided. The electronic device includes a housing, a key button structure in the housing, and a plurality of antenna elements spaced apart from the key button structure into an inner space. The key button structure includes a flexible printed circuit board, and a dome which is pressed by at least one key button when the at least one key button moves into the inner space, and electrically connected to the flexible printed circuit board. When the key button structure is vertically viewed, an antenna module may overlap a portion of the flexible printed circuit board.

(22) Filed: **Feb. 13, 2024**

**Related U.S. Application Data**

(63) Continuation of application No. PCT/KR2022/013215, filed on Sep. 2, 2022.





US 20240186700A1

(19) **United States**

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

(10) **Pub. No.: US 2024/0186700 A1**

(43) **Pub. Date: Jun. 6, 2024**

(54) **ANTENNA SYSTEM**

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

(71) Applicant: **Wistron NeWeb Corp.**, Hsinchu (TW)

CPC ..... **H01Q 5/371** (2015.01); **H01Q 15/14** (2013.01)

(72) Inventors: **Chin-Lien HUANG**, Hsinchu (TW);  
**Chun-Jui PAN**, Hsinchu (TW);  
**Kuo-Jen LAI**, Hsinchu (TW)

(57) **ABSTRACT**

(21) Appl. No.: **18/503,281**

An antenna system includes a signal feeding element, a first transmission line, a second transmission line, a first antenna element, a second antenna element, and a reflective plane. The first antenna element includes a first radiation element and a second radiation element. The second antenna element includes a third radiation element and a fourth radiation element. Each of the first radiation element, the second radiation element, the third radiation element, and the fourth radiation element includes a main branch, a first branch, and a second branch. The main branch has a first end and a second end. The first branch is coupled to the first end of the main branch. The second branch is coupled to the second end of the main branch. A slot region is surrounded by the main branch, the first branch, and the second branch.

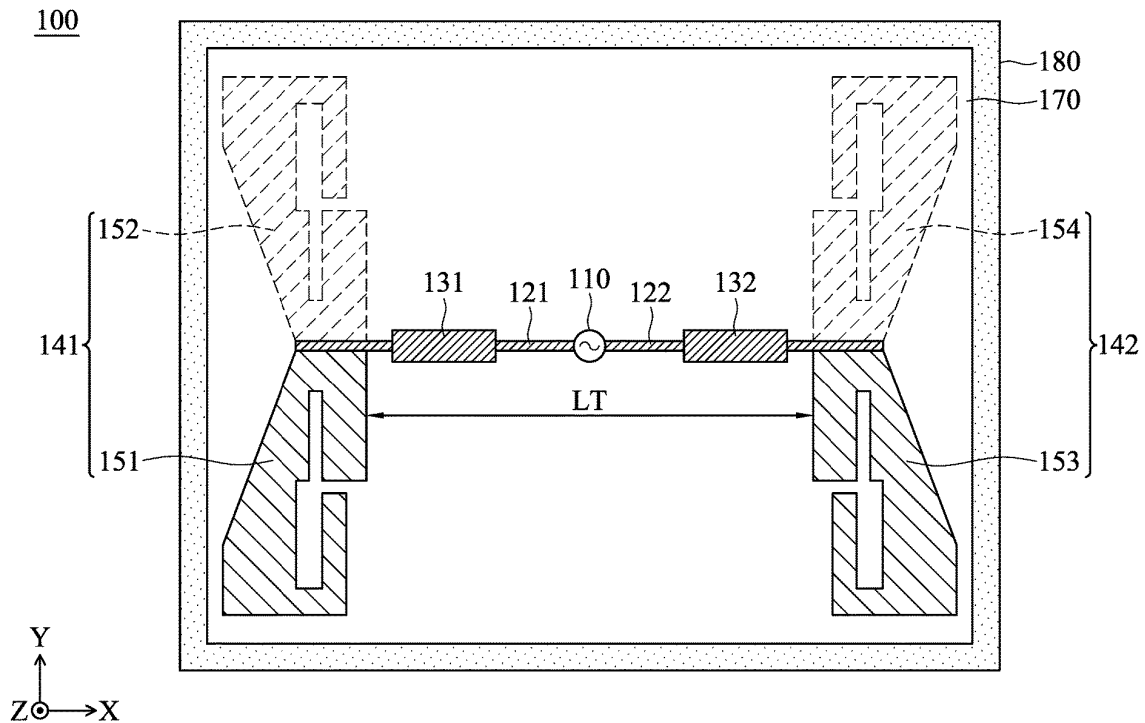
(22) Filed: **Nov. 7, 2023**

(30) **Foreign Application Priority Data**

Dec. 6, 2022 (TW) ..... 111146660

**Publication Classification**

(51) **Int. Cl.**  
**H01Q 5/371** (2006.01)  
**H01Q 15/14** (2006.01)







US 20240186702A1

(19) **United States**

(12) **Patent Application Publication**  
**GOTO**

(10) **Pub. No.: US 2024/0186702 A1**

(43) **Pub. Date: Jun. 6, 2024**

(54) **ANTENNA DEVICE**

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

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

CPC ..... **H01Q 9/0414** (2013.01); **H01Q 5/50** (2015.01)

(72) Inventor: **Tetsuzo GOTO**, Tokyo (JP)

(57) **ABSTRACT**

(21) Appl. No.: **18/528,081**

(22) Filed: **Dec. 4, 2023**

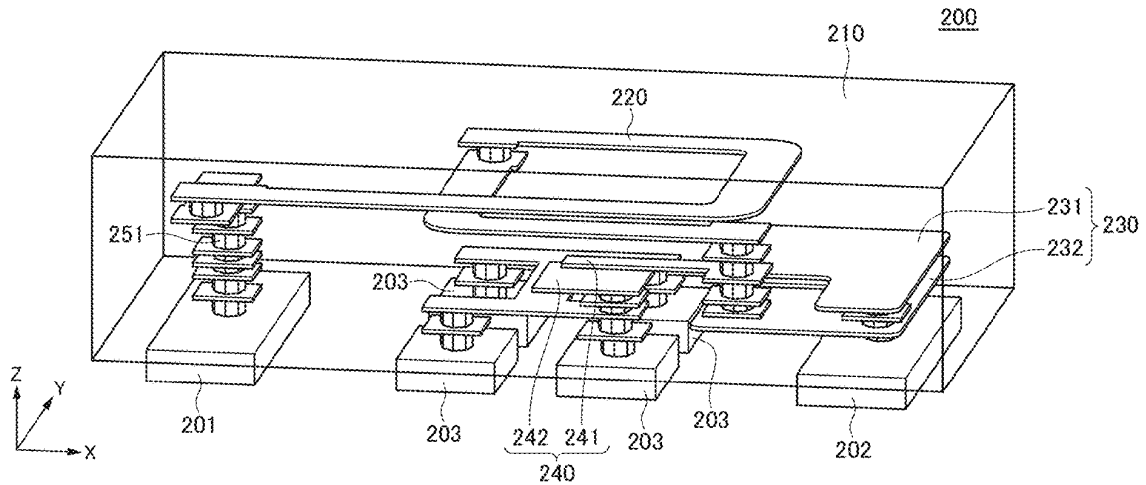
Disclosed herein is an antenna device that includes a substrate, a ground pattern provided on a surface of the substrate, an antenna element mounted on the surface of the substrate, and first and second conductor patterns provided in a ground clearance area free from the ground pattern on the surface of the substrate. The first conductor pattern extends in a first direction, and the second conductor pattern extends in a direction different from the first direction. One end of the first conductor pattern is connected to the antenna element, and another end of the first conductor pattern is connected to a connection point positioned between both ends of the second conductor pattern.

(30) **Foreign Application Priority Data**

Dec. 5, 2022 (JP) ..... 2022-194034

**Publication Classification**

(51) **Int. Cl.**  
**H01Q 9/04** (2006.01)  
**H01Q 5/50** (2006.01)





US 20240186705A1

(19) **United States**

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

(10) **Pub. No.: US 2024/0186705 A1**

(43) **Pub. Date: Jun. 6, 2024**

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

**Publication Classification**

(71) Applicants: **Beijing BOE Technology Development Co., Ltd.**, Beijing (CN); **BOE Technology Group Co., Ltd.**, Beijing (CN)

(51) **Int. Cl.**  
*H01Q 9/04* (2006.01)  
*H01Q 1/24* (2006.01)  
(52) **U.S. Cl.**  
CPC ..... *H01Q 9/045* (2013.01); *H01Q 1/243* (2013.01)

(72) Inventors: **Yali WANG**, Beijing (CN); **Dongdong ZHANG**, Beijing (CN); **Yafei ZHANG**, Beijing (CN); **Hai YU**, Beijing (CN); **Guoqiang TANG**, Beijing (CN); **Mengwen JIA**, Beijing (CN); **Feng QU**, Beijing (CN); **Biqi LI**, Beijing (CN)

(57) **ABSTRACT**

An antenna structure includes a substrate, a ground layer, a radiation patch, a first feed structure, and a second feed structure. The radiation patch, the first feed structure, and the second feed structure are located on a first surface of the substrate, and the ground layer is located on a second surface of the substrate. The first surface and the second surface are two surfaces of the substrate facing away from each other. The radiation patch has a slotted structure. In a first direction, the first feed structure and the second feed structure are symmetrically located on both sides of the radiation patch.

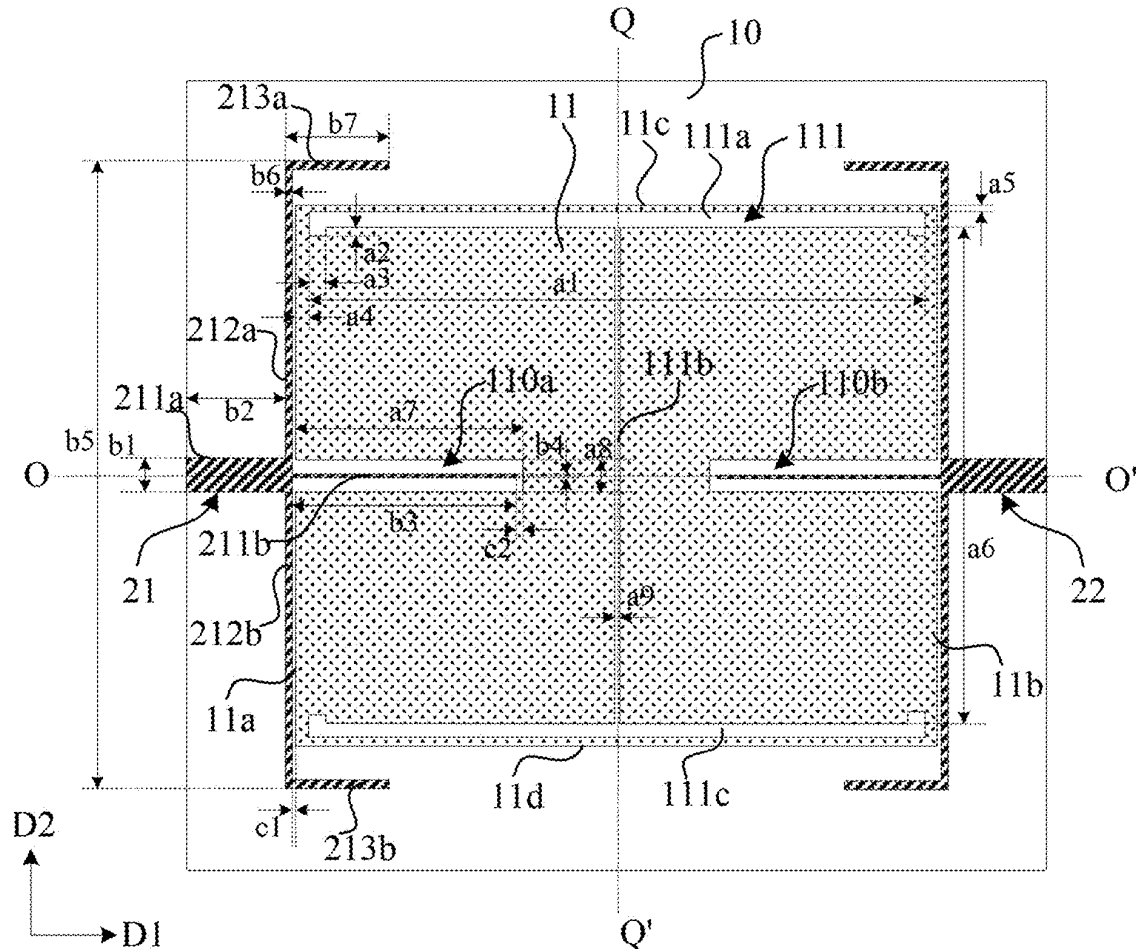
(21) Appl. No.: **17787,342**

(22) PCT Filed: **Aug. 26, 2021**

(86) PCT No.: **PCT/CN2021/114782**

§ 371 (c)(1),

(2) Date: **Jun. 20, 2022**





US 20240186708A1

(19) **United States**

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

(10) **Pub. No.: US 2024/0186708 A1**

(43) **Pub. Date: Jun. 6, 2024**

(54) **ANTENNA AND ELECTRONIC APPARATUS**

**Publication Classification**

(71) Applicants: **Beijing BOE Technology Development Co., Ltd.**, Beijing (CN); **BOE Technology Group Co., Ltd.**, Beijing (CN)

(51) **Int. Cl.**  
*H01Q 9/06* (2006.01)  
*H01Q 1/36* (2006.01)  
*H01Q 9/04* (2006.01)

(72) Inventors: **Liang Guo**, Beijing (CN); **He Liu**, Beijing (CN); **Feng Qu**, Beijing (CN); **Guoqiang Tang**, Beijing (CN); **Yali Wang**, Beijing (CN)

(52) **U.S. Cl.**  
CPC ..... *H01Q 9/065* (2013.01); *H01Q 1/36* (2013.01); *H01Q 9/045* (2013.01)

(73) Assignees: **Beijing BOE Technology Development Co., Ltd.**, Beijing (CN); **BOE Technology Group Co., Ltd.**, Beijing (CN)

(57) **ABSTRACT**

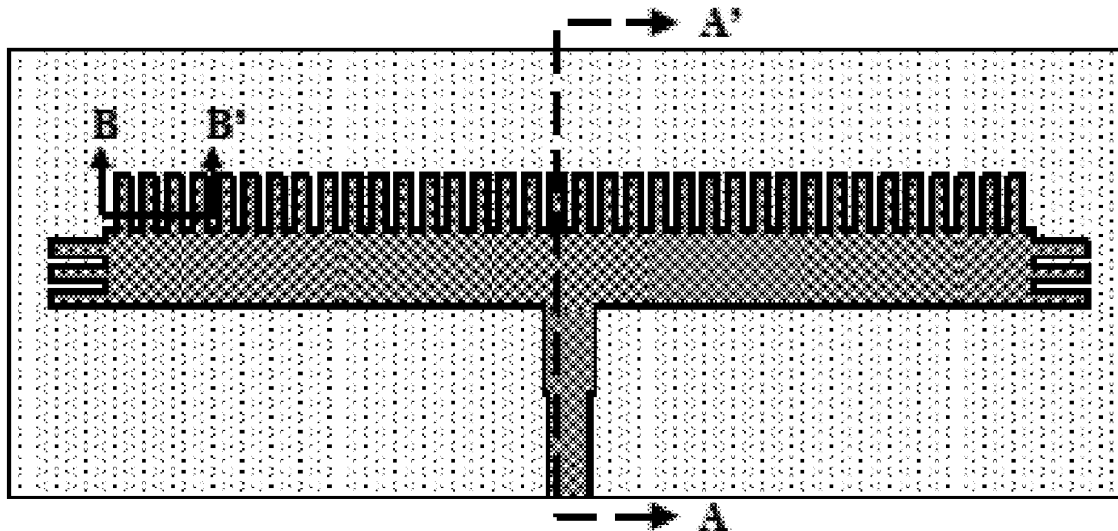
An antenna is provided. The antenna includes a ground plate; a dielectric layer on the ground plate; and a radiating patch and a microstrip feed line on a side of the dielectric layer away from the ground plate. The radiating patch has a parallelogram shape having a first side connected to the microstrip feed line, a second side opposite to the first side, a third side connecting the first side and the second side, and a fourth side converting the first side and the second side, the third side being opposite to the fourth side. The antenna further includes a gain enhancement structure on at least one of the second side, the third side, or the fourth side.

(21) Appl. No.: **17760,271**

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

(86) PCT No.: **PCT/CN2021/140356**

§ 371 (c)(1),  
(2) Date: **Aug. 5, 2022**





US 20240195049A1

(19) **United States**

(12) **Patent Application Publication**  
**KIM**

(10) **Pub. No.: US 2024/0195049 A1**

(43) **Pub. Date: Jun. 13, 2024**

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

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

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

(57) **ABSTRACT**

(72) Inventor: **Gidae KIM**, Suwon-si (KR)

(21) Appl. No.: **18/587,060**

(22) Filed: **Feb. 26, 2024**

An electronic device includes a support member and a lateral member extending from the support member and defining a side surface, a circuit board on the support member and including a camera spaced apart from the side surface, a signal-radiating antenna electrically connected to the circuit board, and a flexible circuit board electrically connecting the circuit board to the signal-radiating antenna and including a flexible area and a rigid area. The support member further defines an inclined surface between the side surface and the camera, on which the signal-radiating antenna is disposed, the inclined surface forming a first inclined angle with respect to one surface of the support member, and a flexible circuit board support surface adjacent to the first inclined surface along which a length of the flexible circuit board extends, the flexible circuit board support surface forming a second inclined angle with respect to one surface of the support member.

**Related U.S. Application Data**

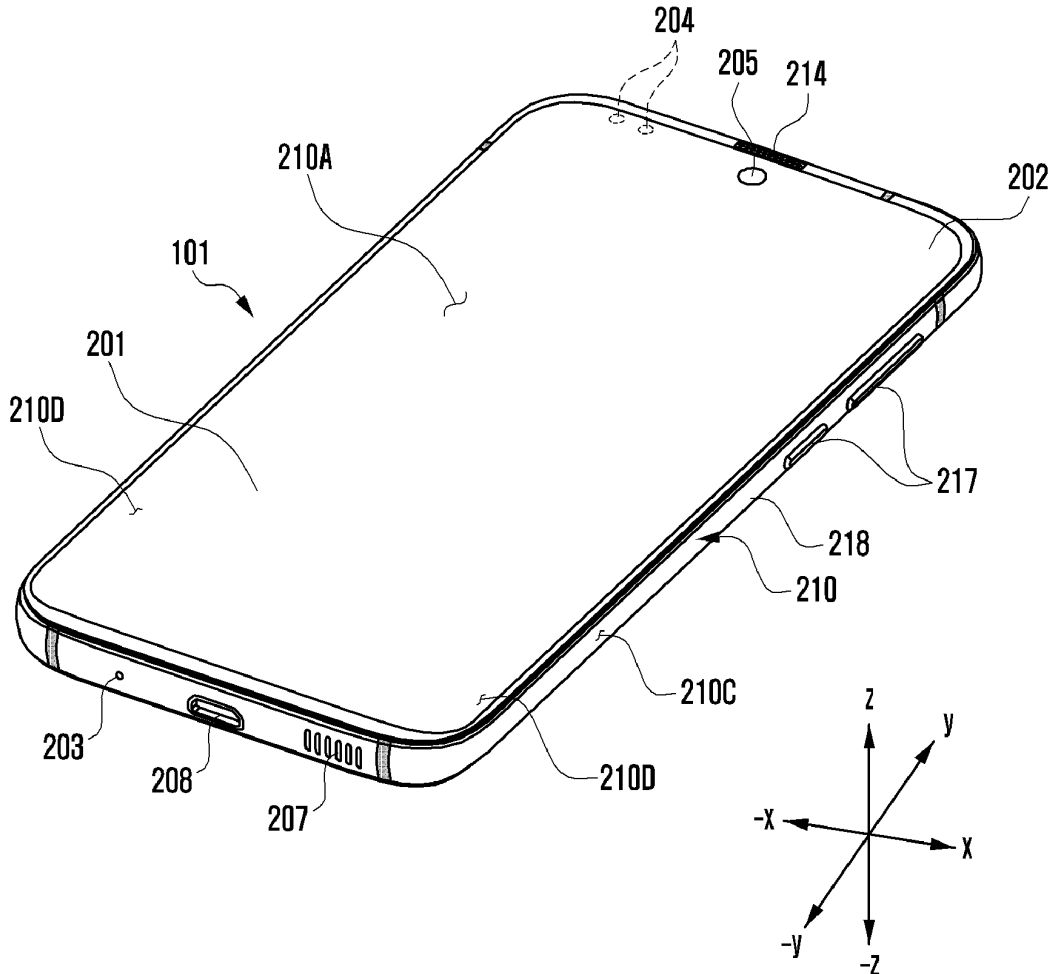
(63) Continuation of application No. PCT/KR2022/013702, filed on Sep. 14, 2022.

**Foreign Application Priority Data**

(30) Sep. 16, 2021 (KR) ..... 10-2021-0123754

**Publication Classification**

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





US 20240195063A1

(19) **United States**

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

(10) **Pub. No.: US 2024/0195063 A1**

(43) **Pub. Date: Jun. 13, 2024**

(54) **DUAL RESONANT WIDEBAND  
MEANDERED PCB ANTENNA**

(52) **U.S. Cl.**  
CPC ..... **H01Q 5/10** (2015.01); **H01Q 1/38**  
(2013.01); **H01Q 1/50** (2013.01)

(71) Applicant: **Silicon Laboratories Inc.**, Austin, TX  
(US)

(72) Inventors: **Marton Komanecik**, Budapest (HU);  
**Zoltan Vida**, Budapest (HU); **Attila  
Zolomy**, Budapest (HU)

(57) **ABSTRACT**

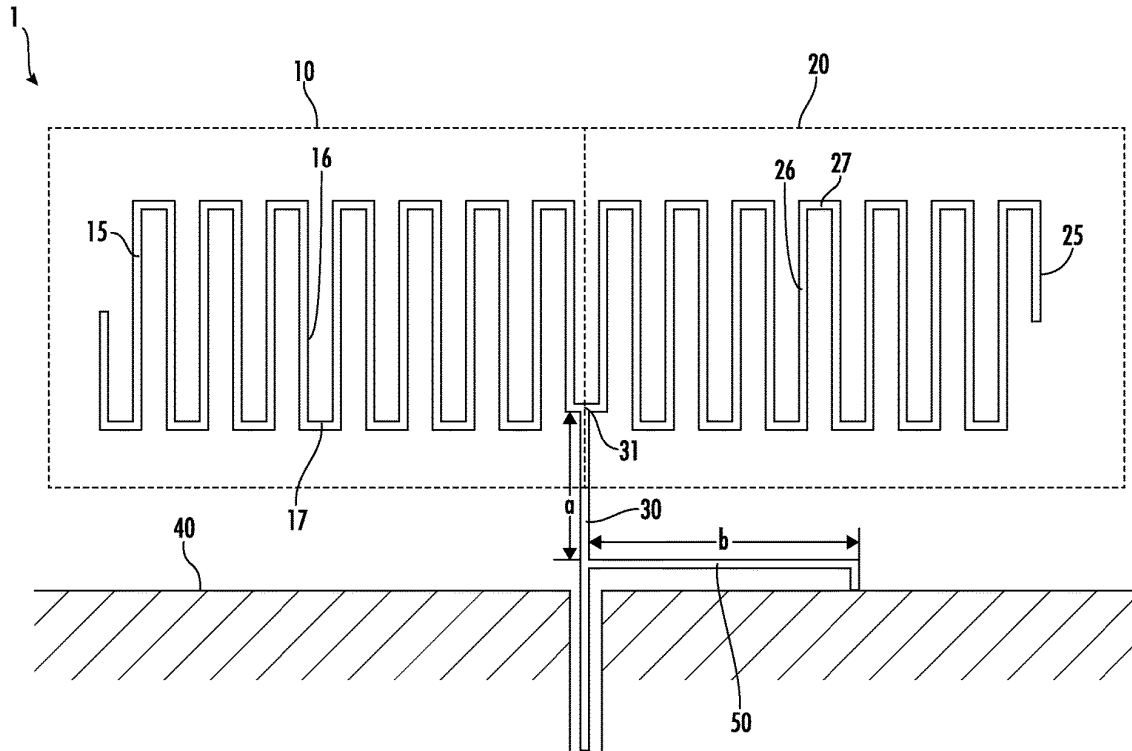
(21) Appl. No.: **18/079,124**

(22) Filed: **Dec. 12, 2022**

A dual resonant wideband meandered PCB antenna is disclosed. The antenna includes two meandered paths that are joined at a common feeding path. The meandered paths have different lengths, which results in different resonance frequencies. The antenna may also include a short circuit stub connected to the feeding path for impedance matching. In some embodiments, the antenna is formed on one layer of a printed circuit board. In another embodiment, to conserve space, the antenna may be formed on multiple layers of the printed circuit board.

**Publication Classification**

(51) **Int. Cl.**  
**H01Q 5/10** (2006.01)  
**H01Q 1/38** (2006.01)  
**H01Q 1/50** (2006.01)





US 20240195066A1

(19) **United States**

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

(10) **Pub. No.: US 2024/0195066 A1**

(43) **Pub. Date: Jun. 13, 2024**

(54) **ANTENNA STRUCTURE**

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

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

CPC ..... **H01Q 7/00** (2013.01); **H01Q 1/38** (2013.01); **H01Q 1/50** (2013.01)

(72) Inventors: **Ying-Cong DENG**, Taoyuan City (TW); **Chung-Ting HUNG**, Taoyuan City (TW); **Chin-Lung TSAI**, Taoyuan City (TW); **Yi-Ling TSENG**, Taoyuan City (TW); **Yu-Chen ZHAO**, Taoyuan City (TW); **Yi-Chih LO**, Taoyuan City (TW)

(57)

**ABSTRACT**

An antenna structure includes a main ground plane, a protruding ground plane, a feeding radiation element, a connection radiation element, a shorting radiation element, a first radiation element, and a second radiation element. The protruding ground plane is coupled to the main ground plane. The feeding radiation element has a feeding point. The connection radiation element is coupled to the feeding radiation element. The connection radiation element is further coupled through the shorting radiation element to the protruding ground plane. The first radiation element is coupled to the feeding radiation element. The second radiation element is coupled to the connection radiation element. The protruding ground plane further includes an extension portion. The first radiation element is adjacent to the extension portion of the protruding ground plane.

(21) Appl. No.: **18/153,730**

(22) Filed: **Jan. 12, 2023**

(30) **Foreign Application Priority Data**

Dec. 7, 2022 (TW) ..... 111146916

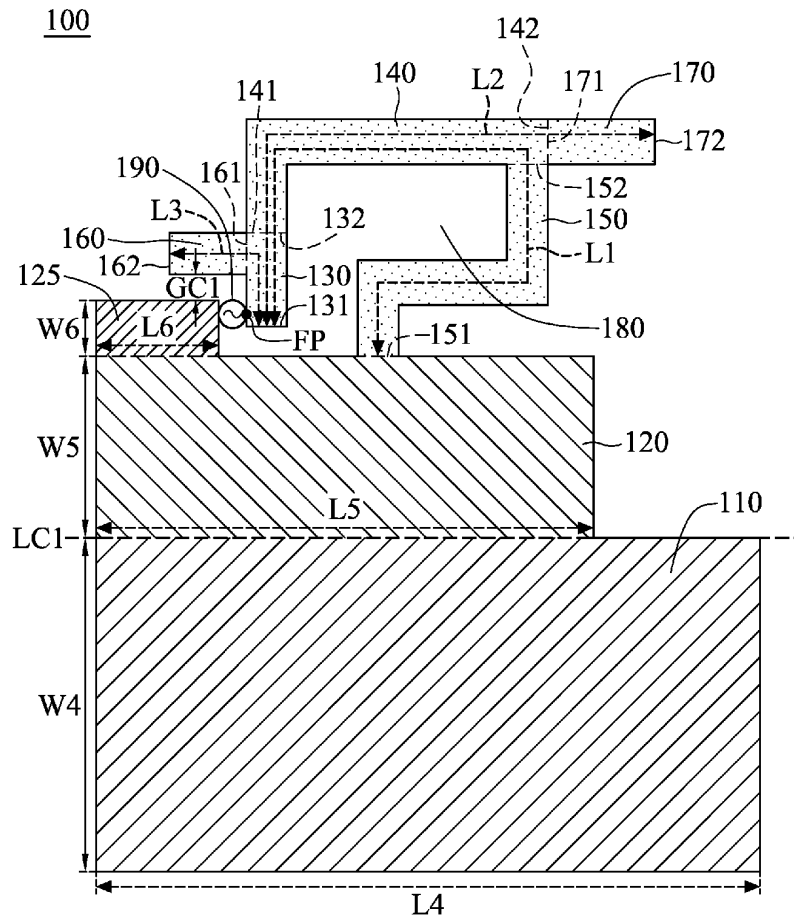
**Publication Classification**

(51) **Int. Cl.**

**H01Q 7/00** (2006.01)

**H01Q 1/38** (2006.01)

**H01Q 1/50** (2006.01)





US 20240195082A1

(19) **United States**

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

(10) **Pub. No.: US 2024/0195082 A1**

(43) **Pub. Date: Jun. 13, 2024**

(54) **ANTENNA STRUCTURE**

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

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

CPC ..... **H01Q 21/30** (2013.01); **H01Q 21/28** (2013.01)

(72) Inventors: **Yi-Chih LO**, Taoyuan City (TW); **Chung-Ting HUNG**, Taoyuan City (TW); **Chun-Yuan WANG**, Taoyuan City (TW); **Chun-I CHEN**, Taoyuan City (TW); **Jing-Yao XU**, Taoyuan City (TW); **Yan-Cheng HUANG**, Taoyuan City (TW); **Chu-Yu TANG**, Taoyuan City (TW)

(57) **ABSTRACT**

An antenna structure includes a ground element, a feeding radiation element, a first radiation element, a second radiation element, a shorting radiation element, a third radiation element, and a fourth radiation element. The feeding radiation element has a feeding point. The first radiation element is coupled to the feeding radiation element. The second radiation element is coupled to the feeding radiation element. The second radiation element substantially extend in opposite directions. The feeding radiation element is further coupled through the shorting radiation element to the ground element. The third radiation element is coupled to the ground element. The third radiation element is adjacent to the first radiation element. The fourth radiation element is coupled to the ground element. The fourth radiation element is adjacent to the second radiation element.

(21) Appl. No.: **18/153,745**

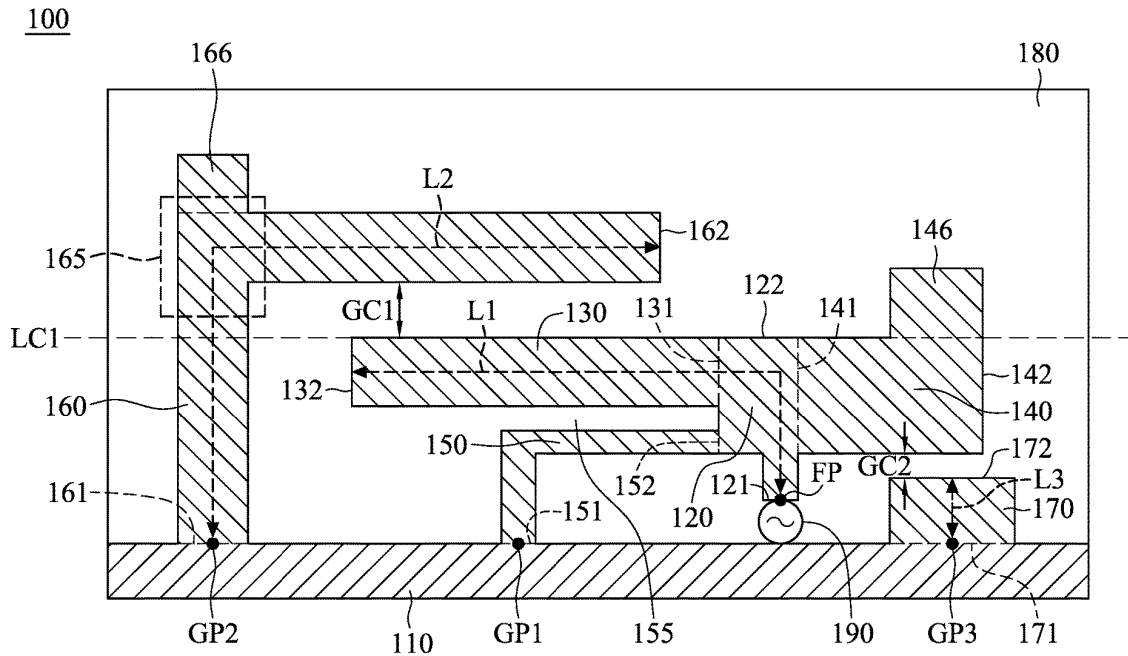
(22) Filed: **Jan. 12, 2023**

(30) **Foreign Application Priority Data**

Dec. 7, 2022 (TW) ..... 111146909

**Publication Classification**

(51) **Int. Cl.**  
**H01Q 21/30** (2006.01)  
**H01Q 21/28** (2006.01)





(19) **United States**

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

(10) **Pub. No.: US 2024/0195083 A1**

(43) **Pub. Date: Jun. 13, 2024**

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

**Publication Classification**

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

(51) **Int. Cl.**  
**H01Q 21/30** (2006.01)  
**H01Q 1/22** (2006.01)  
**H01Q 1/48** (2006.01)  
**H01Q 9/04** (2006.01)

(72) Inventors: **Chien-Yi Wu**, Taipei City (TW);  
**Chao-Hsu Wu**, Taipei City (TW);  
**Shih-Keng Huang**, Taipei City (TW);  
**Hau Yuen Tan**, Taipei City (TW);  
**Chih-Wei Liao**, Taipei City (TW);  
**Chia-Hung Chen**, Taipei City (TW);  
**Wen-Hgin Chuang**, Taipei City (TW);  
**Chia-Hong Chen**, Taipei City (TW);  
**Lin-Hsu Chiang**, Taipei City (TW);  
**Hsi Yung Chen**, Taipei City (TW)

(52) **U.S. Cl.**  
CPC ..... **H01Q 21/30** (2013.01); **H01Q 1/2266** (2013.01); **H01Q 1/48** (2013.01); **H01Q 9/0421** (2013.01)

(73) Assignee: **PEGATRON CORPORATION**, Taipei City (TW)

(57) **ABSTRACT**

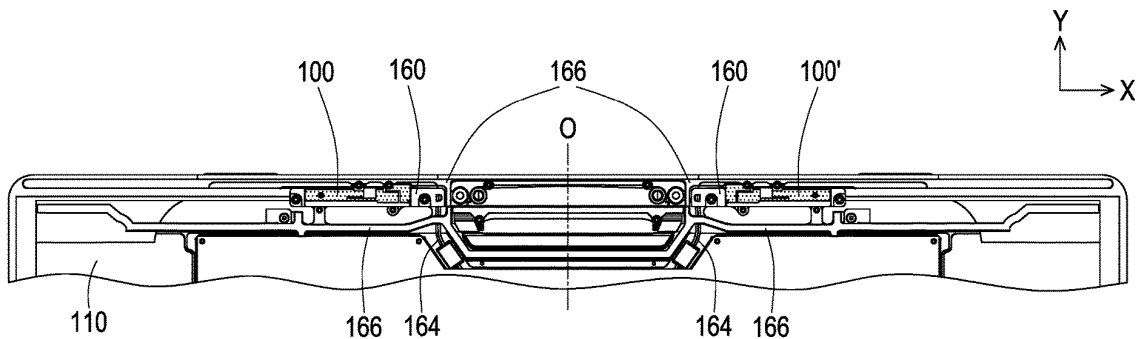
An antenna module including a first radiator and a second radiator is provided. The first radiator includes a first segment to a fifth segment connected in sequence. A first slot is formed between the second segment and the fourth segment. The second radiator has an edge. A first retracting distance is between the second segment and an extension line. A second retracting distance is between the fourth segment and the extension line. The first segment resonates at a first high frequency band. The first radiator and the first slot resonate at a low frequency band and a second high frequency band. The first retracting distance, the second retracting distance, the second segment, the fourth segment, the fifth segment and the first slot resonate at a third high frequency band. The first segment and the second radiator resonate at a fourth high frequency band. In addition, an electronic device is provided.

(21) Appl. No.: **18/488,855**

(22) Filed: **Oct. 17, 2023**

(30) **Foreign Application Priority Data**

Dec. 9, 2022 (TW) ..... 111147315







US 20240186703A1

(19) **United States**

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

(10) **Pub. No.: US 2024/0186703 A1**

(43) **Pub. Date: Jun. 6, 2024**

(54) **ANTENNA AND DISPLAY APPARATUS**

**Publication Classification**

(71) Applicants: **Beijing BOE Technology Development Co., Ltd.**, Beijing (CN); **BOE Technology Group Co., Ltd.**, Beijing (CN)

(51) **Int. Cl.**  
**H01Q 9/04** (2006.01)  
**H01Q 1/22** (2006.01)

(72) Inventors: **Yali Wang**, Beijing (CN); **Feng Qu**, Beijing (CN)

(52) **U.S. Cl.**  
CPC ..... **H01Q 9/0428** (2013.01); **H01Q 1/22** (2013.01)

(73) Assignees: **Beijing BOE Technology Development Co., Ltd.**, Beijing (CN); **BOE Technology Group Co., Ltd.**, Beijing (CN)

(57) **ABSTRACT**

(21) Appl. No.: **17760,258**

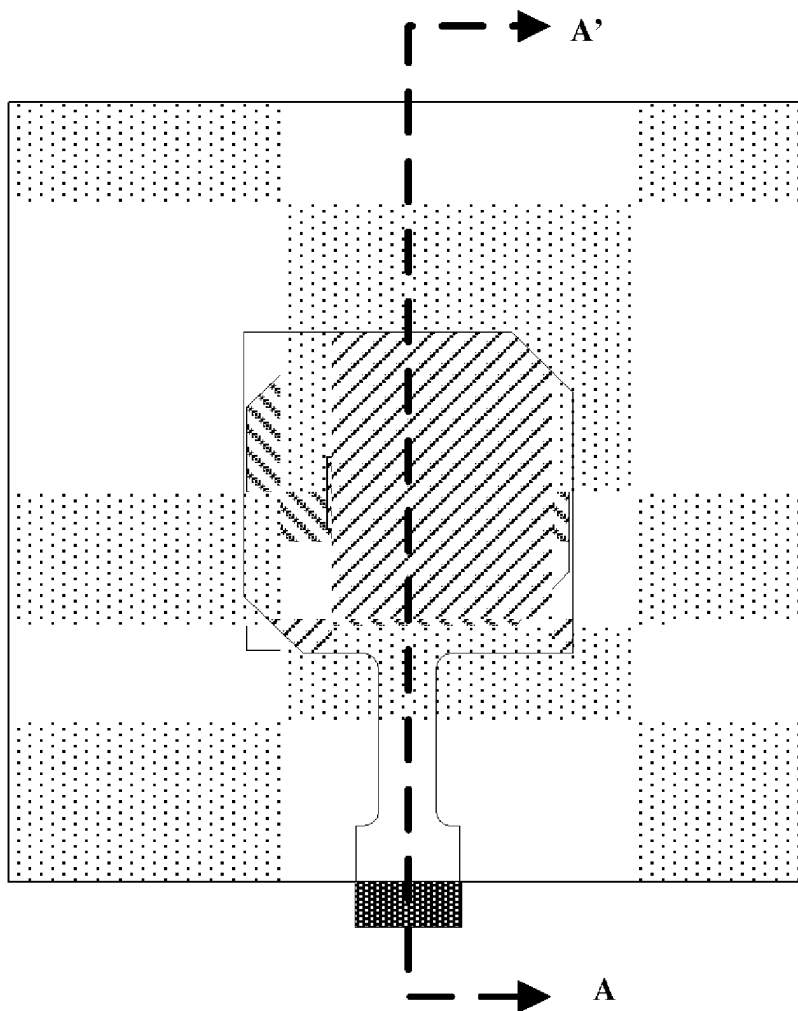
An antenna is provided. The antenna includes a ground plate, and a slot extending through the ground plate; a first dielectric layer on the ground plate and the slot; a microstrip feed line and a first radiating patch on a side of the first dielectric layer away from the ground plate, the first radiating patch being coupled to the microstrip feed line and configured to receive a signal from the microstrip feed line; a second dielectric layer on a side of the ground plate and the slot away from the first dielectric layer, the first radiating patch, and the microstrip feed line; and a second radiating patch on a side of the second dielectric layer away from the ground plate, the second radiating patch being configured to receive a signal by aperture coupling through the slot.

(22) PCT Filed: **Nov. 17, 2021**

(86) PCT No.: **PCT/CN2021/131071**

§ 371 (c)(1),

(2) Date: **Aug. 5, 2022**





US 20240188245A1

(19) **United States**

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

(10) **Pub. No.: US 2024/0188245 A1**

(43) **Pub. Date: Jun. 6, 2024**

(54) **ELECTRONIC APPARATUS**

**Publication Classification**

(71) Applicant: **Sony Interactive Entertainment Inc.,**  
Tokyo (JP)

(51) **Int. Cl.**  
*H05K 7/12* (2006.01)  
*H01Q 1/22* (2006.01)  
*H05K 1/02* (2006.01)  
*H05K 9/00* (2006.01)

(72) Inventors: **Katsushi Ito,** Chiba (JP); **Kazutaka Eto,** Tokyo (JP); **Kazuya Odagiri,** Kanagawa (JP); **Sho Kobayashi,** Tokyo (JP)

(52) **U.S. Cl.**  
CPC ..... *H05K 7/12* (2013.01); *H01Q 1/2291* (2013.01); *H05K 1/0215* (2013.01); *H05K 9/0098* (2013.01); *H05K 2201/10098* (2013.01)

(73) Assignee: **Sony Interactive Entertainment Inc.,**  
Tokyo (JP)

(21) Appl. No.: **18/554,224**

(57) **ABSTRACT**

(22) PCT Filed: **Apr. 18, 2022**

(86) PCT No.: **PCT/JP2022/018066**

§ 371 (c)(1),

(2) Date: **Oct. 6, 2023**

Provided is an electronic apparatus in which a state where a cable is in contact with a ground part can be stably maintained for a long period of time. An electronic apparatus includes a shield that is in contact with a ground pattern on a circuit board and that functions as a ground part. The cable extends from a front antenna, is connected to the circuit board, and passes between the shield and a first cushioning member. An inner surface of the housing presses the first cushioning member against the shield.

(30) **Foreign Application Priority Data**

Apr. 19, 2021 (JP) ..... 2021-070604

