



US 20240222845A1

(19) **United States**

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

(10) **Pub. No.: US 2024/0222845 A1**

(43) **Pub. Date: Jul. 4, 2024**

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

Publication Classification

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

(51) **Int. Cl.**
H01Q 1/22 (2006.01)
H01Q 19/10 (2006.01)
H01Q 21/30 (2006.01)

(72) Inventors: **Yongchao Wang**, Xi'an (CN); **Yu Yao**,
Shanghai (CN)

(52) **U.S. Cl.**
CPC **H01Q 1/2258** (2013.01); **H01Q 19/10**
(2013.01); **H01Q 21/30** (2013.01)

(21) Appl. No.: **18/558,045**

(57) **ABSTRACT**

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

An antenna array includes a plurality of first antenna elements and second antenna element(s). The first antenna elements operate at least in a first frequency band and a second frequency band, and any frequency in the second frequency band is higher than any frequency in the first frequency band. The second antenna element(s) operate at least in a third frequency band, and the third frequency band at least partially overlaps the second frequency band. The first antenna elements are arranged at intervals, and the second antenna element(s) is/are disposed between at least two adjacent first antenna elements. A center distance between every two adjacent first antenna elements is within a preset size range, so that a gain of the antenna array in the first frequency band is greater than or equal to a target value.

(86) PCT No.: **PCT/CN2022/087471**

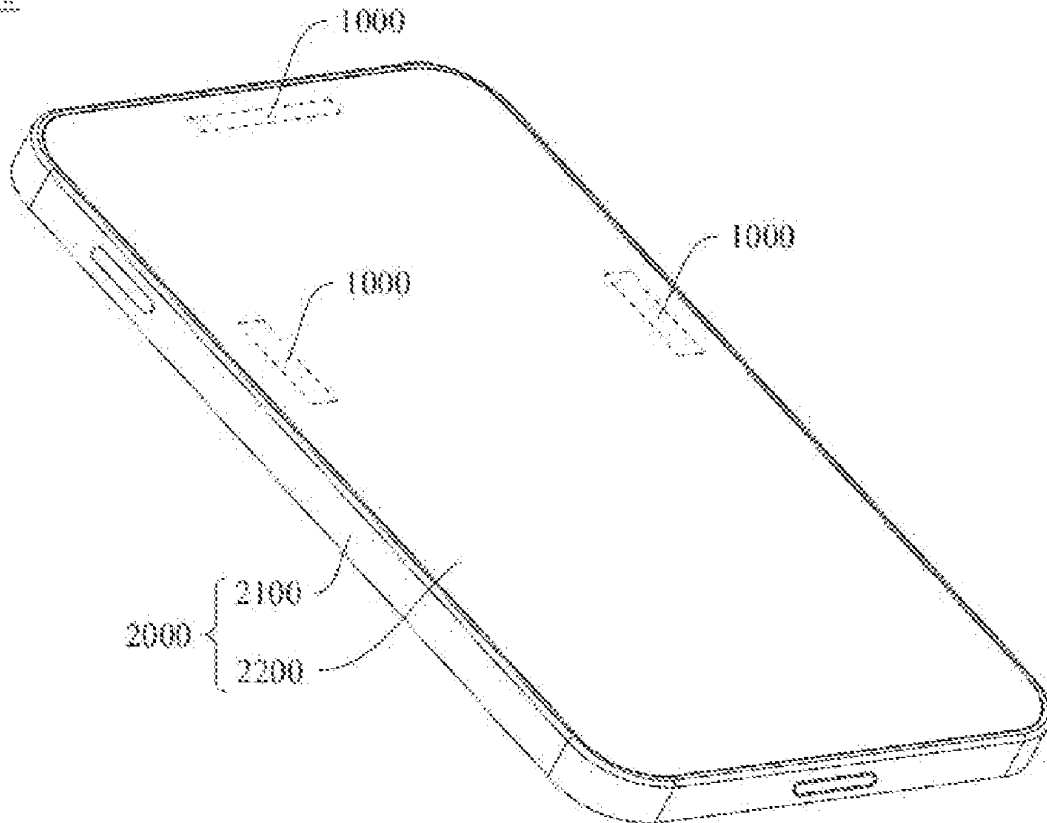
§ 371 (c)(1),

(2) Date: **Oct. 30, 2023**

(30) **Foreign Application Priority Data**

Apr. 30, 2021 (CN) 202110482045.7

10000





US 20240222849A1

(19) **United States**

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

(10) **Pub. No.: US 2024/0222849 A1**

(43) **Pub. Date: Jul. 4, 2024**

(54) **COMMUNICATIONS DEVICE**

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

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

CPC **H01Q 1/243** (2013.01); **H01Q 1/002**
(2013.01); **H01Q 1/246** (2013.01); **H01Q**
9/0485 (2013.01)

(72) Inventors: **Dehao ZHUANG**, Shenzhen (CN); **Mei**
XUE, Shenzhen (CN)

(57) **ABSTRACT**

(21) Appl. No.: **18/550,164**

(22) PCT Filed: **Jan. 4, 2023**

(86) PCT No.: **PCT/CN2023/070439**

§ 371 (c)(1),
(2) Date: **Sep. 12, 2023**

This application provides a communications device which includes an antenna and a wave dense medium. The wave dense medium is located in an emission direction of the antenna and is spaced apart from the antenna, a dielectric constant of a medium, in the communications device, located on a side that is of the wave dense medium and that is close to the antenna and a dielectric constant of a medium located on a side that is of the wave dense medium and that is away from the antenna are both less than a dielectric constant of the wave dense medium, and a thickness D of the wave dense medium from a surface that is close to the antenna to a surface that is away from the antenna satisfies $0.5 n\lambda(1-10\%) \leq D \leq 0.5 n\lambda(1+10\%)$, where $n\lambda$ is a resonance wavelength of an operating band of the antenna in the wave dense medium.

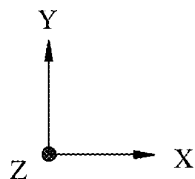
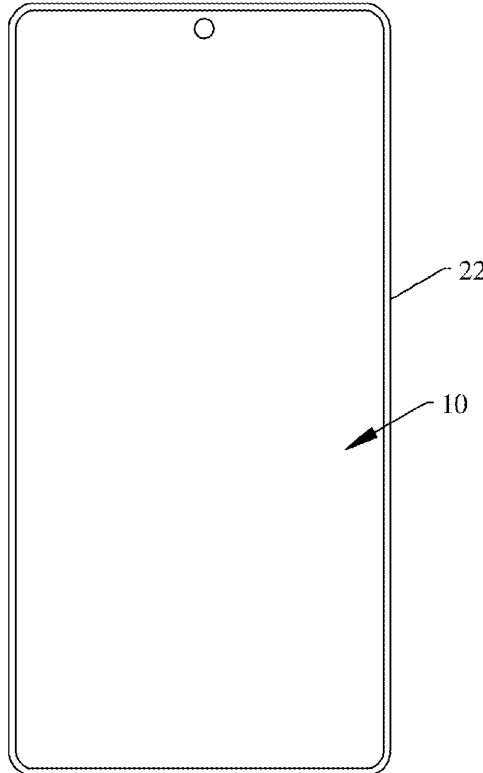
(30) **Foreign Application Priority Data**

Jan. 27, 2022 (CN) 202210103508.9

Publication Classification

(51) **Int. Cl.**
H01Q 1/24 (2006.01)
H01Q 1/00 (2006.01)
H01Q 9/04 (2006.01)

100 ↘





US 20240222868A1

(19) **United States**

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

(10) **Pub. No.: US 2024/0222868 A1**

(43) **Pub. Date: Jul. 4, 2024**

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

Publication Classification

(71) Applicant: **Universal Global Technology (Kunshan) Co., Ltd.**, Jiangsu Province (CN)

(51) **Int. Cl.**
H01Q 9/04 (2006.01)
H01Q 3/22 (2006.01)

(72) Inventors: **SHANG HAO LIU**, Jiangsu Province (CN); **YU SHENG SU**, Jiangsu Province (CN); **HUNG WEI CHIU**, Jiangsu Province (CN); **JUI CHIH CHIEN**, Jiangsu Province (CN)

(52) **U.S. Cl.**
CPC **H01Q 9/0414** (2013.01); **H01Q 3/22** (2013.01)

(57) **ABSTRACT**

A composite antenna and an electronic device are proposed. The electronic device includes the composite antenna, and the composite antenna includes a substrate, a first antenna structure, two contact springs, an antenna holder and a second antenna structure. The first antenna structure is disposed on the substrate, and two ends of the first antenna structure are coupled to a feeding point and a grounding point, respectively. The two contact springs are disposed on the first antenna structure, and electrically connected to the feeding point and the grounding point, respectively. The antenna holder is removably disposed on the substrate. The second antenna structure is disposed on the antenna holder and electrically connected to the two contact springs.

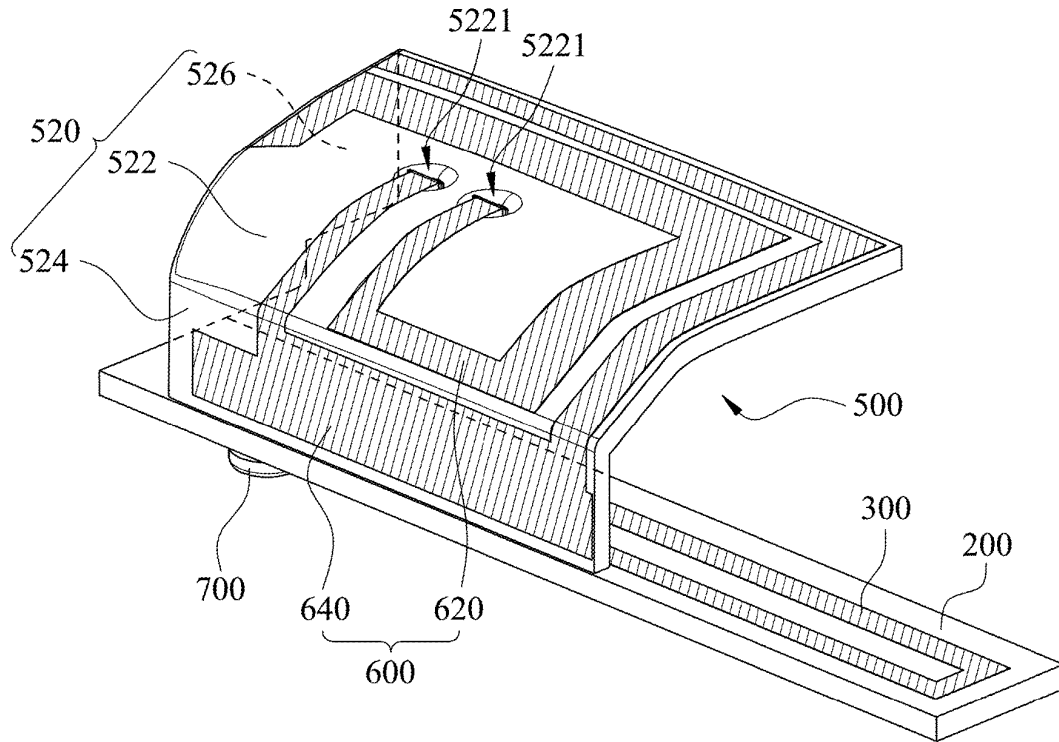
(21) Appl. No.: **18/184,648**

(22) Filed: **Mar. 15, 2023**

(30) **Foreign Application Priority Data**

Dec. 29, 2022 (CN) 202211726830.3

100





US 20240222870A1

(19) **United States**

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

(10) **Pub. No.: US 2024/0222870 A1**

(43) **Pub. Date: Jul. 4, 2024**

(54) **ANTENNA AND ELECTRONIC DEVICE**

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

CPC **H01Q 9/0442** (2013.01)

(71) Applicants: **Beijing BOE Technology Development Co., Ltd.**, Beijing (CN); **BOE TECHNOLOGY GROUP CO., LTD.**, Beijing (CN)

(57) **ABSTRACT**

(72) Inventors: **Chunxin LI**, Beijing (CN); **Jingwen GUO**, Beijing (CN); **Qianhong WU**, Beijing (CN); **Feng QU**, Beijing (CN)

An antenna including a dielectric layer, and a first radiation patch and at least one second radiation patch on the dielectric layer; wherein each second radiation patch is connected to the first radiation patch through at least one switch unit; a side edge of the first radiation patch has at least one first opening; each switch unit includes a signal electrode and a membrane bridge; the signal electrode includes a first end connected to the second radiation patch and a second end opposite to the first end; an orthographic projection of the second end on the dielectric layer is within an orthographic projection of one first opening on the dielectric layer; the membrane bridge spans the one first opening and is electrically connected to the first radiation patch; and a first insulating layer is on a surface of the signal electrode close to the membrane bridge.

(21) Appl. No.: **17/920,093**

(22) PCT Filed: **Nov. 24, 2021**

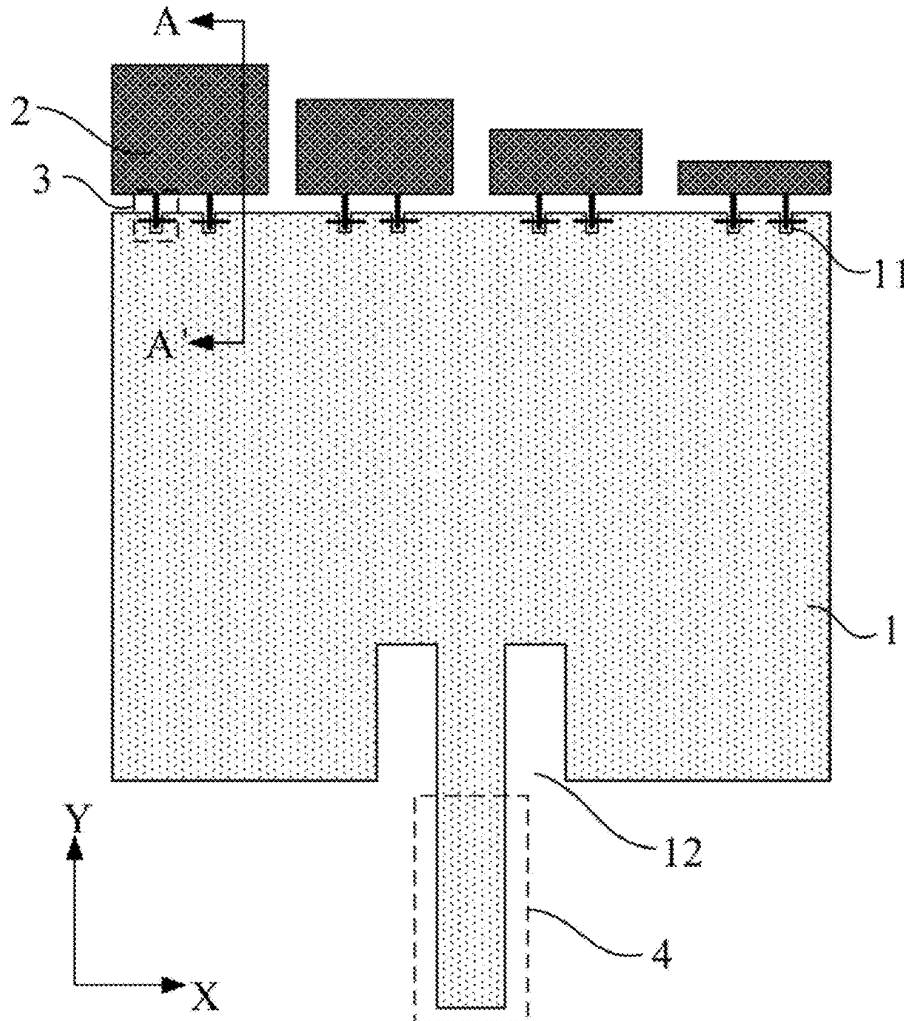
(86) PCT No.: **PCT/CN2021/132765**

§ 371 (c)(1),

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

Publication Classification

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





US 20240222874A1

(19) **United States**

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

(10) **Pub. No.: US 2024/0222874 A1**

(43) **Pub. Date: Jul. 4, 2024**

(54) **BROADSIDE ANTENNA, ANTENNA IN PACKAGE, AND COMMUNICATION DEVICE**

H01Q 1/36 (2006.01)

H01Q 1/48 (2006.01)

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

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

CPC *H01Q 13/10* (2013.01); *H01Q 1/22*
(2013.01); *H01Q 1/36* (2013.01); *H01Q 1/48*
(2013.01)

(72) Inventors: **Chen-Fang Tai**, Taipei City (CN);
Chih-Wei Hsu, Taipei City (CN);
Chien-Ming Lee, Taipei City (CN);
Chih Yu Tsai, Taipei City (CN)

(57)

ABSTRACT

(21) Appl. No.: **18/573,036**

(22) PCT Filed: **Jun. 21, 2022**

(86) PCT No.: **PCT/CN2022/100213**

§ 371 (c)(1),

(2) Date: **Dec. 21, 2023**

(30) **Foreign Application Priority Data**

Jun. 24, 2021 (CN) 202110707696.1

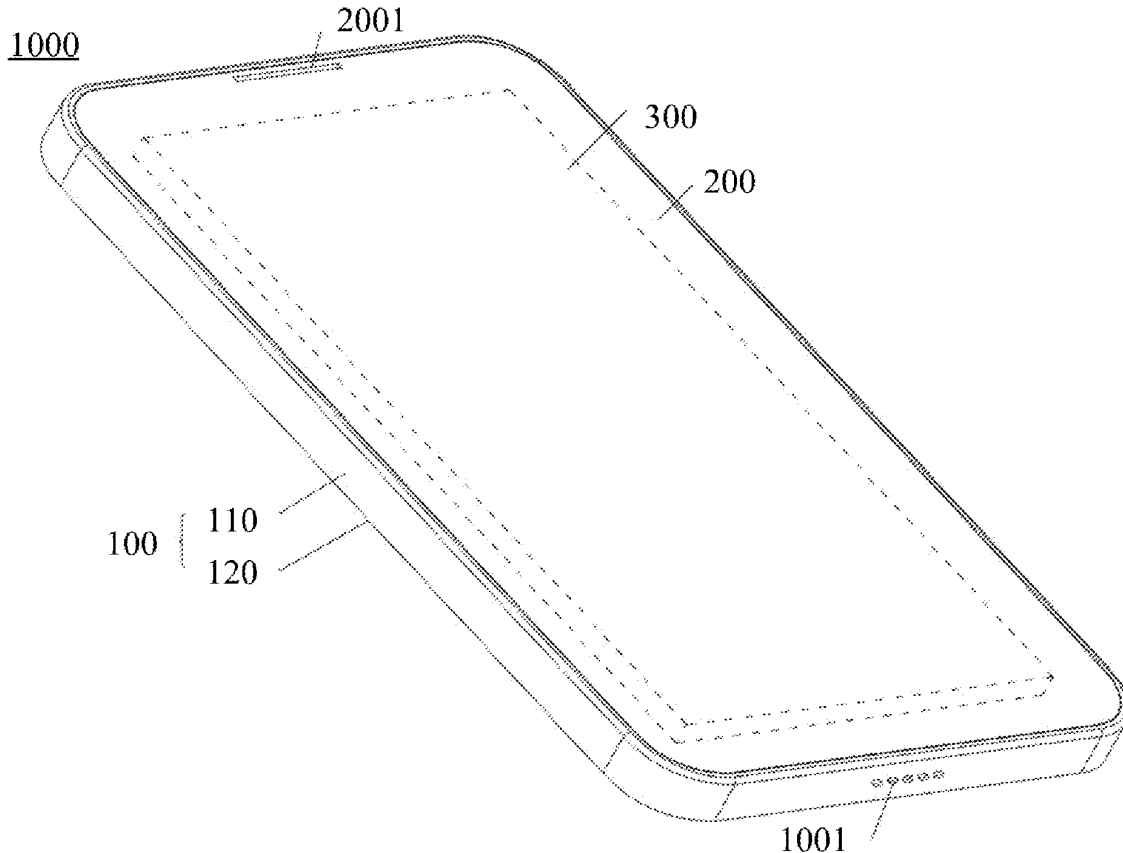
Publication Classification

(51) **Int. Cl.**

H01Q 13/10 (2006.01)

H01Q 1/22 (2006.01)

A broadside antenna includes a first radiation element and a second radiation element arranged at an interval, a first grounding element and a second grounding element arranged at an interval, and a first excitation element. A first gap is formed between the first radiation element and the second radiation element. The first excitation element includes a first feeding structure and a first extension stub that are arranged at an interval. The first feeding structure includes a first feed-in part connected to a feed source. The first extension stub is located on a side of the first feeding structure adjacent close to the first feed-in part. The first extension stub includes a first grounding part adjacent to the first feed-in part. The first grounding part is connected to the grounding surface.





US 20240235024A1

(19) **United States**

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

(10) **Pub. No.: US 2024/0235024 A1**

(43) **Pub. Date: Jul. 11, 2024**

(54) **EXTERNAL TRIPLE-FREQUENCY
ANTENNA FOR UNMANNED AERIAL
VEHICLE**

Publication Classification

(51) **Int. Cl.**
H01Q 5/335 (2015.01)
H01Q 1/28 (2006.01)
(52) **U.S. Cl.**
CPC *H01Q 5/335* (2015.01); *H01Q 1/28*
(2013.01)

(71) Applicant: **AUTEL ROBOTICS CO., LTD.**,
Shenzhen (CN)

(72) Inventors: **Jianping SONG**, Shenzhen (CN);
Xuefeng SUN, Shenzhen (CN); **Jianlei
WANG**, Shenzhen (CN)

(73) Assignee: **AUTEL ROBOTICS CO., LTD.**,
Shenzhen (CN)

(57) **ABSTRACT**

The present disclosure falls within the technical field of communications, and specifically discloses an external triple-frequency antenna for an unmanned aerial vehicle, including a substrate, vibrator circuits, and a feed line. Preferably, the vibrator circuits are disposed on the substrate. The vibrator circuits include a high-frequency vibrator circuit, a middle-frequency vibrator circuit, and a low-frequency vibrator circuit; a shared microstrip line is disposed between the middle-frequency vibrator circuit and the low-frequency vibrator circuit; the feed line includes a first feed line and a second feed line, where the first feed line is connected to the high-frequency vibrator circuit; and the second feed line is connected to the shared microstrip line, and a capacitor is disposed at the connection of the second feed line and the shared microstrip line.

(21) Appl. No.: **18/542,595**

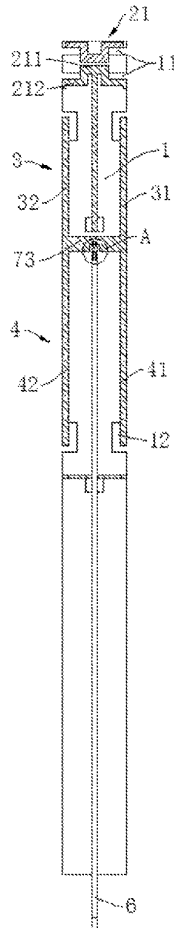
(22) Filed: **Dec. 16, 2023**

Related U.S. Application Data

(63) Continuation of application No. PCT/CN2022/
099232, filed on Jun. 16, 2022.

(30) **Foreign Application Priority Data**

Jun. 16, 2021 (CN) 202110665219.3





US 20240243480A1

(19) **United States**

(12) **Patent Application Publication**

FAN et al.

(10) **Pub. No.: US 2024/0243480 A1**

(43) **Pub. Date: Jul. 18, 2024**

(54) **ANTENNA AND ELECTRONIC DEVICE**

H01Q 1/50 (2006.01)

H01Q 13/10 (2006.01)

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

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

CPC *H01Q 13/0233* (2013.01); *H01Q 1/36* (2013.01); *H01Q 1/48* (2013.01); *H01Q 1/50* (2013.01); *H01Q 13/10* (2013.01)

(72) Inventors: **Xichao FAN**, Beijing (CN); **Yali WANG**, Beijing (CN); **Youjian HU**, Beijing (CN); **Zhipeng LU**, Beijing (CN); **Guoqiang TANG**, Beijing (CN)

(57) **ABSTRACT**

An antenna and an electronic device are provided in the present disclosure. The antenna includes a first conductive layer, a dielectric layer, and a second conductive layer which are stacked; the first conductive layer is provided as a microstrip line structure; the second conductive layer is provided with a radiation structure and a director; the radiation structure includes a first edge and a second edge disposed oppositely along a first direction; the radiation structure is provided with a first slot, a second slot, and a third slot that are sequentially communicated along the first direction and away from the first edge, the first slot is circular, the second slot is rectangular, and the third slot gradually increases in dimension in the second direction; the director is disposed on the second conductive layer and located at a side of the third slot away from the second slot.

(21) Appl. No.: **18/016,682**

(22) PCT Filed: **Feb. 21, 2022**

(86) PCT No.: **PCT/CN2022/077115**

§ 371 (c)(1),

(2) Date: **Jan. 18, 2023**

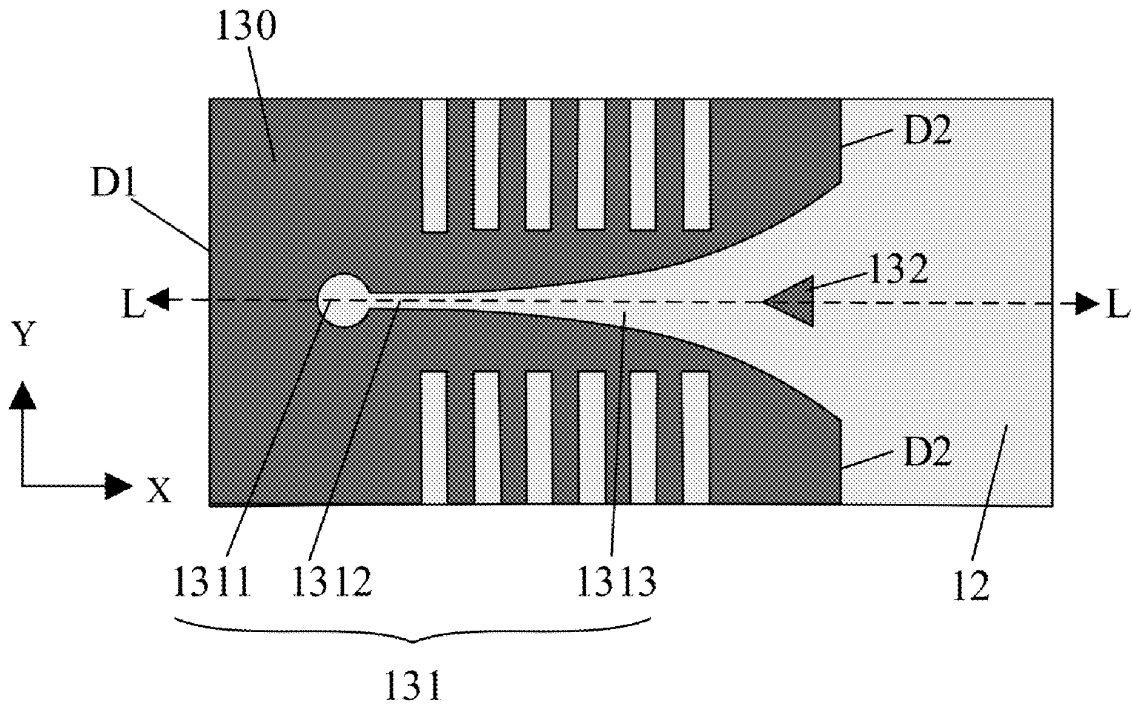
Publication Classification

(51) **Int. Cl.**

H01Q 13/02 (2006.01)

H01Q 1/36 (2006.01)

H01Q 1/48 (2006.01)





US 20240243488A1

(19) **United States**

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

(10) **Pub. No.: US 2024/0243488 A1**

(43) **Pub. Date: Jul. 18, 2024**

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

Publication Classification

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

(51) **Int. Cl.**
H01Q 21/29 (2006.01)
H01Q 13/02 (2006.01)
H01Q 21/08 (2006.01)
H01Q 21/24 (2006.01)

(72) Inventors: **Hideki UEDA**, Nagaokakyo-shi (JP);
Takaya NEMOTO, Nagaokakyo-shi (JP);
Kengo ONAKA, Nagaokakyo-shi (JP)

(52) **U.S. Cl.**
CPC *H01Q 21/29* (2013.01); *H01Q 13/02* (2013.01); *H01Q 21/08* (2013.01); *H01Q 21/24* (2013.01)

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

(57) **ABSTRACT**

(21) Appl. No.: **18/619,207**

An array accommodated in a housing includes multiple antenna elements. The antenna elements face an inside surface of the housing and are arrayed in a first direction at least one-dimensionally. A waveguide is coupled to the antenna elements of the array antenna and extends from the array antenna toward the inside surface of the housing. The waveguide has a housing-side end face facing the inside surface of the housing and an antenna-side end face facing the array antenna. A length from one end to an opposite end of the housing-side end face in the first direction is greater than a length from one end to an opposite end of the antenna-side end face in the first direction. An antenna device that can improve antenna gain without increasing the size of the antenna module is provided.

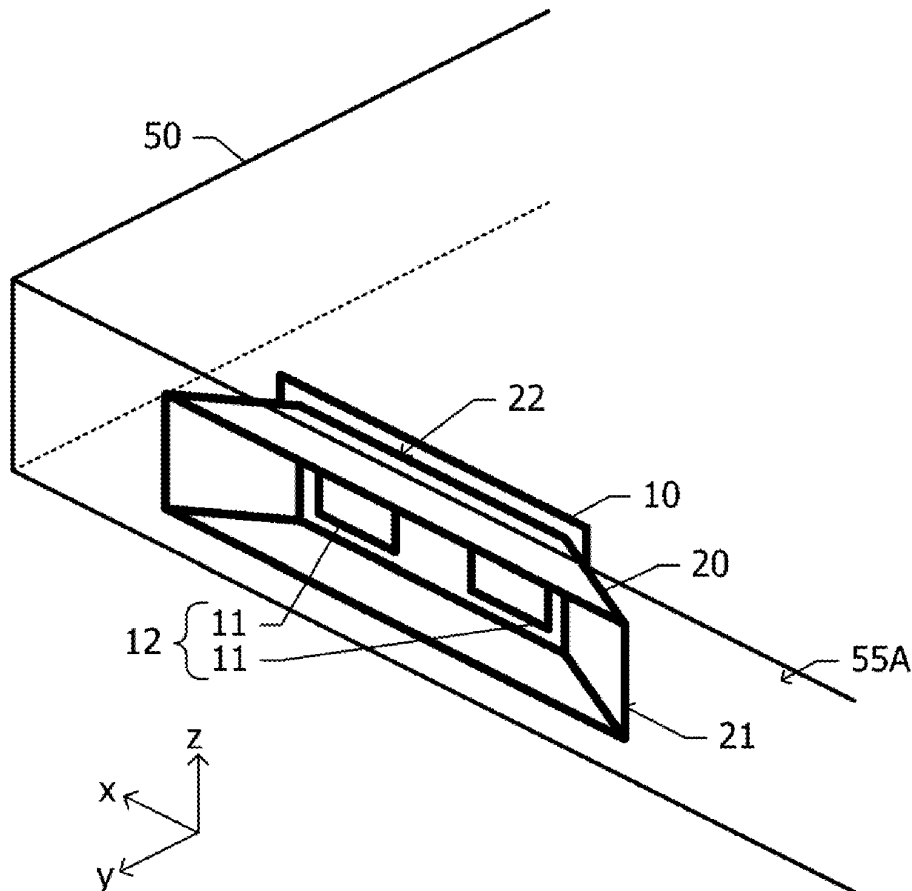
(22) Filed: **Mar. 28, 2024**

Related U.S. Application Data

(63) Continuation of application No. PCT/JP2022/033462, filed on Sep. 6, 2022.

Foreign Application Priority Data

(30) Sep. 28, 2021 (JP) 2021-157780





US 20240258691A1

(19) **United States**

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

(10) **Pub. No.: US 2024/0258691 A1**

(43) **Pub. Date: Aug. 1, 2024**

(54) **ANTENNA DEVICE**

Publication Classification

(71) Applicant: **Mitsubishi Electric Corporation,**
Tokyo (JP)

(51) **Int. Cl.**
H01Q 1/52 (2006.01)
H01Q 1/12 (2006.01)
H01Q 1/50 (2006.01)
H01Q 7/00 (2006.01)

(72) Inventors: **Shingo YAMAURA,** Tokyo (JP); **Saki WADA,** Tokyo (JP); **Kengo NISHIMOTO,** Tokyo (JP); **Toru FUKASAWA,** Tokyo (JP)

(52) **U.S. Cl.**
CPC **H01Q 1/52** (2013.01); **H01Q 1/50** (2013.01); **H01Q 7/00** (2013.01); **H01Q 1/1285** (2013.01)

(73) Assignee: **Mitsubishi Electric Corporation,**
Tokyo (JP)

(57) **ABSTRACT**

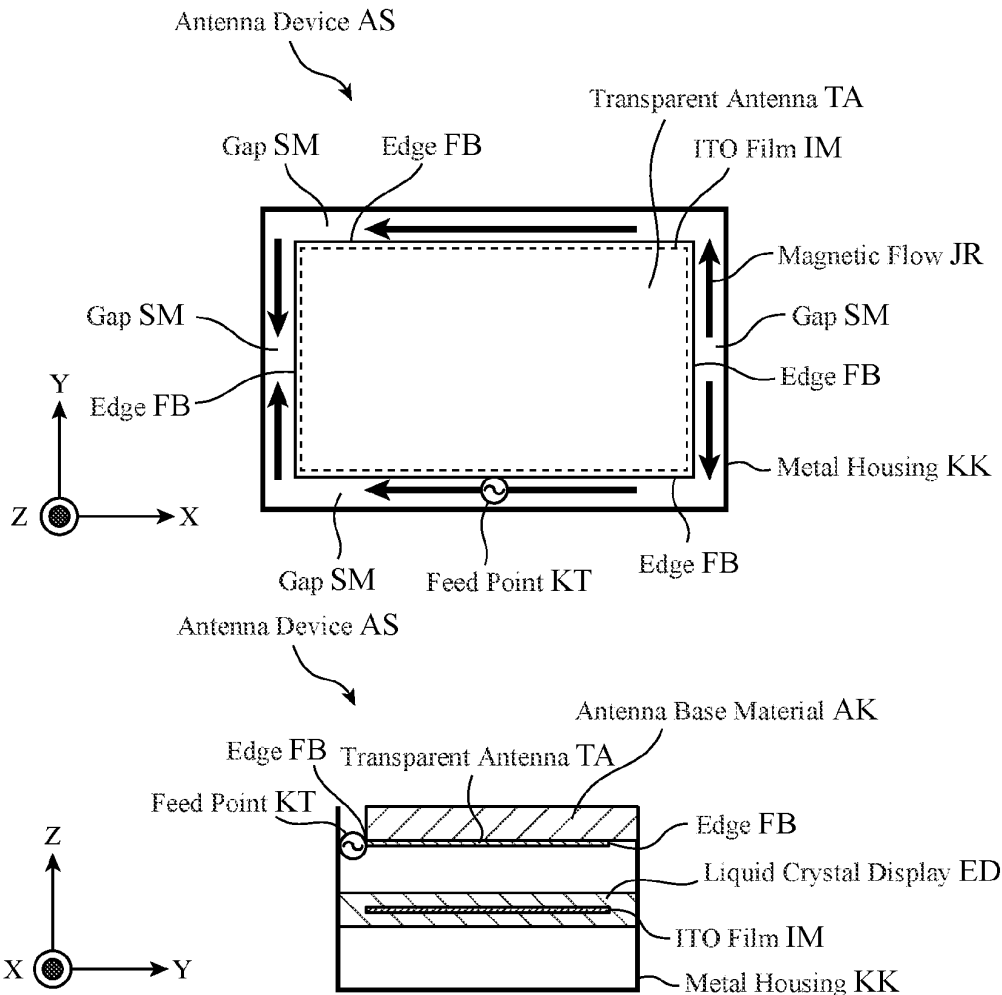
An antenna device includes; a metal housing in which at least one surface thereof is open; a display unit provided inside the metal housing and configured to perform a display from the one surface of the metal housing toward outside; a first transparent conductor plate present in the display unit; a second transparent conductor plate provided to be spaced apart from the first transparent conductor plate in an outside or inside direction, the second transparent conductor plate to define a gap between the second transparent conductor plate and the metal housing; and a feed unit provided between the metal housing and the second transparent conductor plate.

(21) Appl. No.: **18/636,442**

(22) Filed: **Apr. 16, 2024**

Related U.S. Application Data

(63) Continuation of application No. PCT/JP2021/048068, filed on Dec. 24, 2021.





US 20240258693A1

(19) **United States**

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

(10) **Pub. No.: US 2024/0258693 A1**

(43) **Pub. Date: Aug. 1, 2024**

(54) **COMPACT DUAL BAND ANTENNA**

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

(71) Applicant: **Honeywell International Inc.**,
Charlotte, NC (US)

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

(72) Inventors: **Zhong Liu**, Doylestown, PA (US);
Amit B. Kulkarni, Duluth, GA (US);
Justin Jose, Muvattupuzha (IN)

(57) **ABSTRACT**

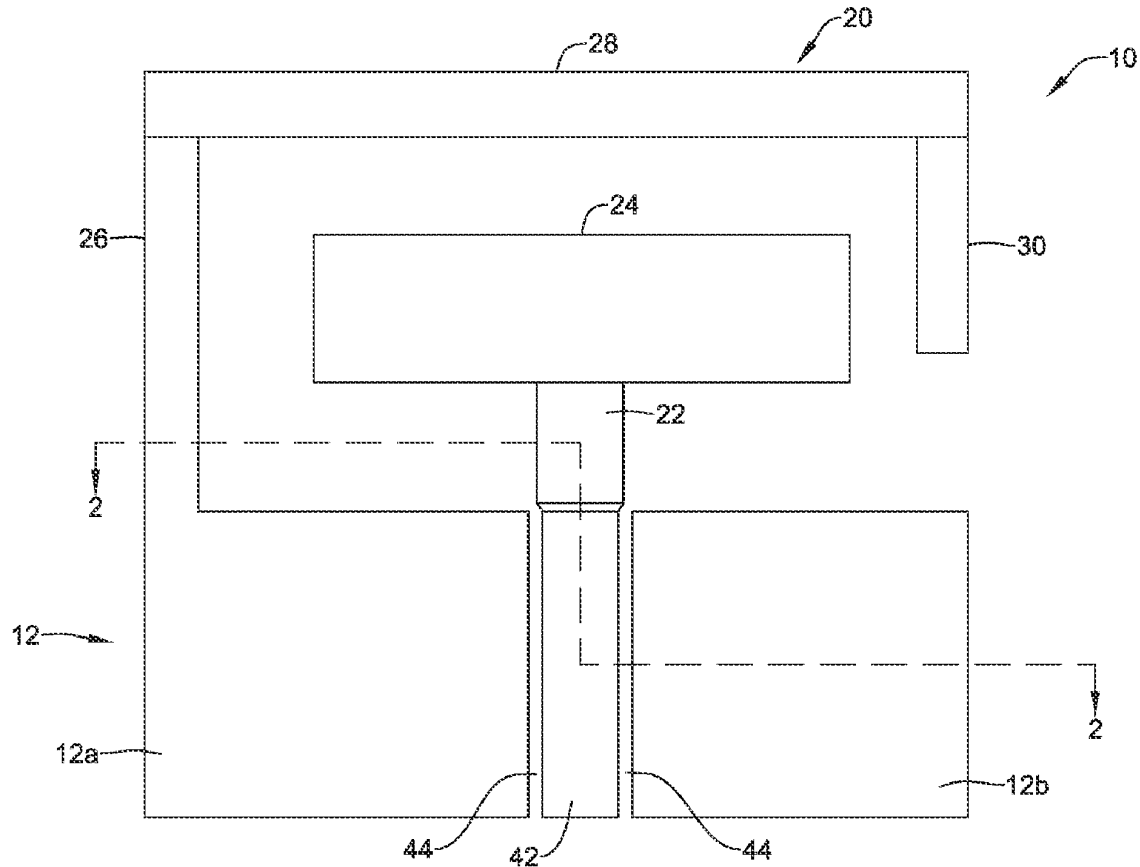
(21) Appl. No.: **18/160,065**

An antenna system formed by one or more layers of a Printed Circuit Board (PCB). The antenna system includes a first antenna element configured to resonate in a first frequency band centered at about 5.4 GHz and a second antenna element configured to resonate in a second frequency band centered at about 2.4 GHz. The first antenna element and the second antenna element fit within a rectangular area of less than about 100 square millimeters on the PCB. The first antenna element has a bandwidth of at least 2 GHz and the second antenna element has a bandwidth of at least 100 MHz, wherein the bandwidth is defined as having less than a -10 dB return loss within the band. The first antenna element and the second antenna element may be formed on a common conductive layer of a PCB.

(22) Filed: **Jan. 26, 2023**

Publication Classification

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





US 20240258694A1

(19) **United States**

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

(10) **Pub. No.: US 2024/0258694 A1**

(43) **Pub. Date: Aug. 1, 2024**

(54) **DUAL BAND PRINTED F-ANTENNA USING
A TRAP WITH SMALL BAND SEPARATION**

(52) **U.S. Cl.**
CPC **H01Q 5/321** (2015.01); **H01Q 9/0421**
(2013.01)

(71) Applicant: **Honeywell International Inc.**,
Charlotte, NC (US)

(72) Inventors: **Zhong Liu**, Doylestown, PA (US);
Justin Jose, Muvattupuzha (IN); **Amit
Kulkarni**, Duluth, GA (US)

(57) **ABSTRACT**

A dual band inverted-F antenna includes a first antenna element having a first leg connected to a ground plane and a second leg extending along a length from the first leg to a distal end of the second leg. A second antenna element connects to the second leg at a first connection point that is proximal of the distal end of the second leg, the second antenna element electrically coupled to an antenna signal trace of a PCB. A third antenna element is spaced from the second leg of the first antenna element by a gap and positioned along the length of the second leg proximal of the distal end of the second leg but distal of the first connection point. A trap is operatively coupled across the gap between the second leg of the first antenna element and the third antenna element.

(21) Appl. No.: **18/354,434**

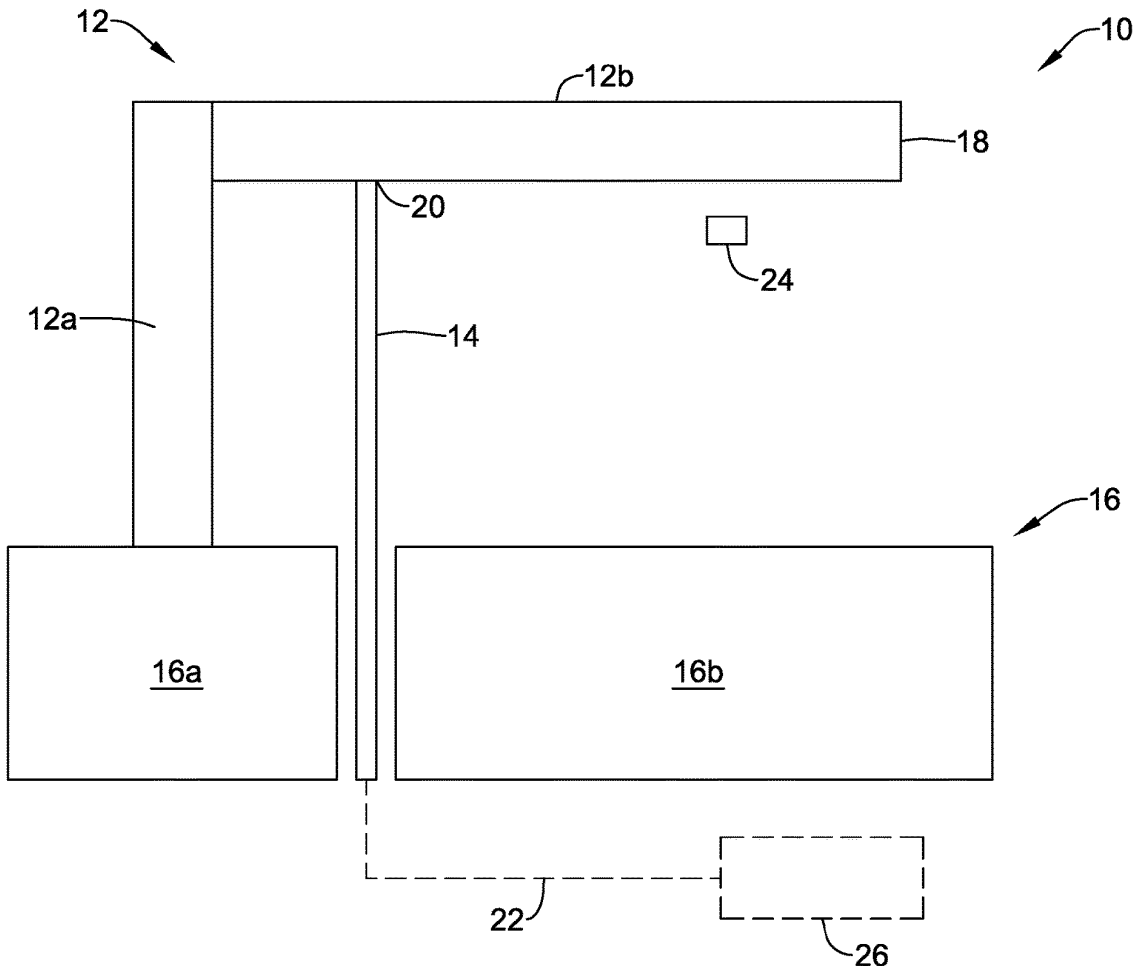
(22) Filed: **Jul. 18, 2023**

Related U.S. Application Data

(60) Provisional application No. 63/481,724, filed on Jan. 26, 2023.

Publication Classification

(51) **Int. Cl.**
H01Q 5/321 (2006.01)
H01Q 9/04 (2006.01)





US 20240258696A1

(19) **United States**

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

(10) **Pub. No.: US 2024/0258696 A1**

(43) **Pub. Date: Aug. 1, 2024**

(54) **ANTENNA**

(71) Applicants: **Beijing BOE Sensor Technology Co., Ltd.**, Beijing (CN); **BOE TECHNOLOGY GROUP CO., LTD.**, Beijing (CN)

(72) Inventors: **Yunnan JIN**, Beijing (CN); **Zhe CHEN**, Beijing (CN); **Shuo YANG**, Beijing (CN); **Lei WANG**, Beijing (CN)

(21) Appl. No.: **18/016,419**

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

(86) PCT No.: **PCT/CN2022/077232**

§ 371 (c)(1),

(2) Date: **Jan. 16, 2023**

Publication Classification

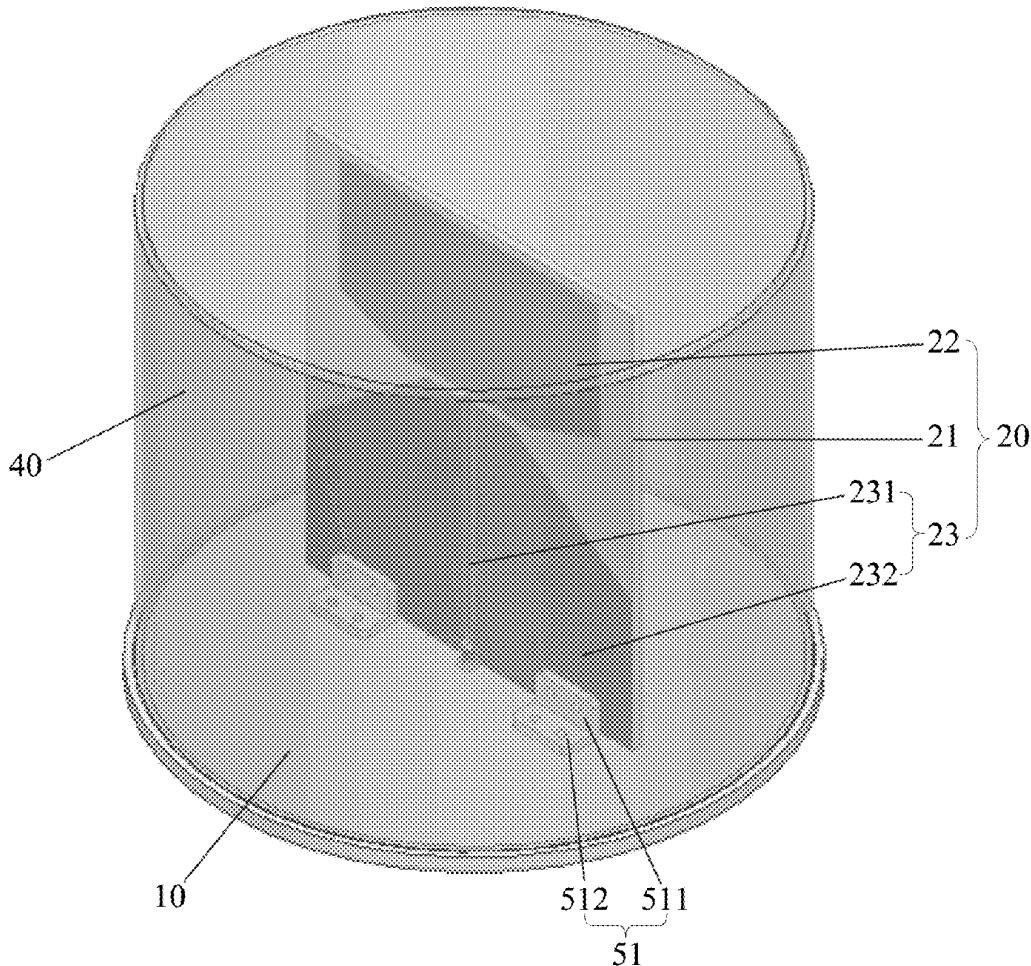
(51) **Int. Cl.**
H01Q 9/04 (2006.01)
H01Q 1/48 (2006.01)

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

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

(57) **ABSTRACT**

An antenna is provided and includes a bottom plate for being connected with a mounting body and an antenna body on the bottom plate. The antenna body includes: a substrate fixedly connected to the bottom plate; a plane of the substrate intersects the bottom plate; a radiation element on the substrate; a feeding structure configured to transmit and/or receive radio frequency signals to/from the radiation element and including a signal electrode and a ground electrode on a surface of the substrate. The signal electrode is electrically connected to the radiation element. On a reference plane perpendicular to the bottom plate, an orthographic projection of the ground electrode is spaced apart from that of the radiation element, and is entirely located between the orthographic projection of the radiation element and the bottom plate. The antenna can prevent the ground electrode from reflecting the electromagnetic waves radiated by the radiation element.





US 20240258697A1

(19) **United States**

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

(10) **Pub. No.: US 2024/0258697 A1**

(43) **Pub. Date: Aug. 1, 2024**

(54) **PIFA TYPE ANTENNA**

Publication Classification

(71) Applicant: **OHSUNG ELECTRONICS CO., LTD.**, Busan (KR)

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

(72) Inventors: **Min Woo KANG**, Gyeongsangbuk-do (KR); **Je Won SON**, Gyeongsangnam-do (KR)

(52) **U.S. Cl.**
CPC **H01Q 9/0414** (2013.01); **H01Q 9/0421** (2013.01)

(21) Appl. No.: **18/301,504**

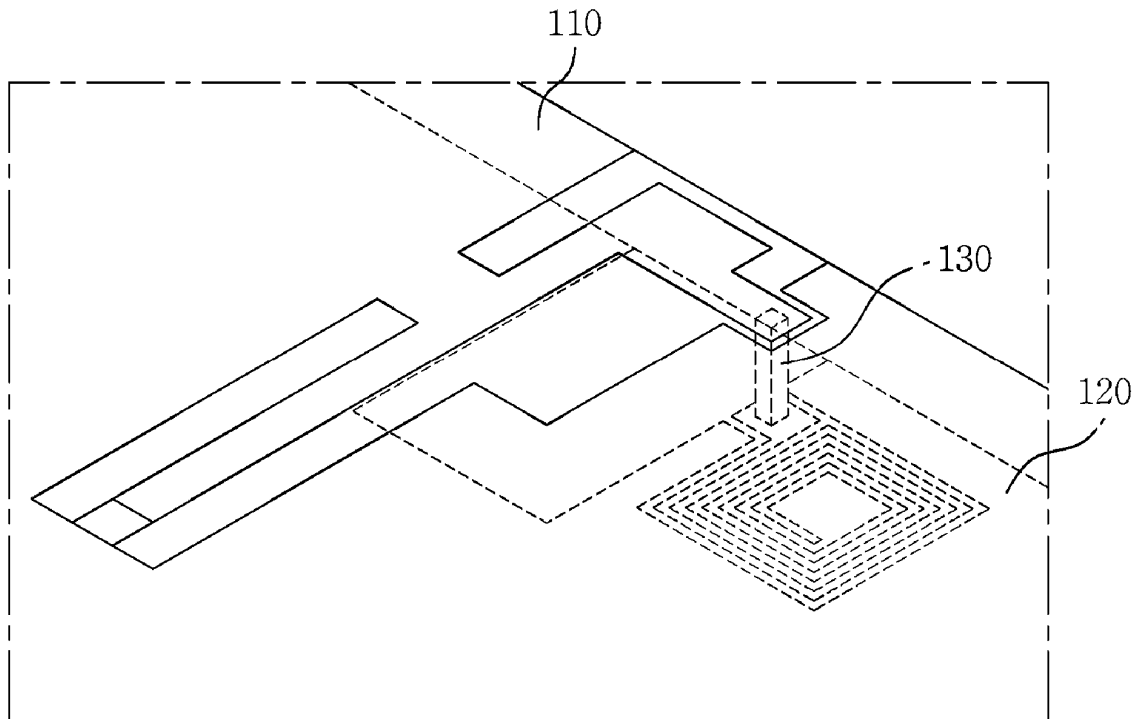
(57) **ABSTRACT**

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

Planar inverted-F antenna (PIFA) type antenna using antenna patterns formed on opposite ends of a PCB. The PIFA type antenna includes a first antenna pattern provided on an upper surface of a PCB; a second antenna pattern provided on a lower surface of the PCB; and a via provided in the PCB and connecting the first antenna pattern with the second antenna pattern.

(30) **Foreign Application Priority Data**

Jan. 26, 2023 (KR) 10-2023-0009872





US 20240266732A1

(19) **United States**

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

(10) **Pub. No.: US 2024/0266732 A1**

(43) **Pub. Date: Aug. 8, 2024**

(54) **TUNABLE ANTENNA, METHOD FOR PREPARING THE SAME, AND ELECTRONIC DEVICE USING THE SAME**

Publication Classification

(71) Applicants: **BEIJING BOE TECHNOLOGY DEVELOPMENT CO., LTD.**, Beijing (CN); **BOE TECHNOLOGY GROUP CO., LTD.**, Beijing (CN)

(51) Int. Cl.	
<i>H01Q 5/364</i>	(2006.01)
<i>H01Q 1/24</i>	(2006.01)
<i>H01Q 9/14</i>	(2006.01)
<i>H01Q 9/42</i>	(2006.01)
<i>H01Q 21/00</i>	(2006.01)
<i>H01Q 23/00</i>	(2006.01)

(72) Inventors: **Chunxin Li**, Beijing (CN); **Jingwen Guo**, Beijing (CN); **Qianhong Wu**, Beijing (CN); **Zibo Cao**, Beijing (CN); **Feng Qu**, Beijing (CN)

(52) U.S. Cl.	
CPC <i>H01Q 5/364</i> (2015.01); <i>H01Q 1/243</i> (2013.01); <i>H01Q 9/14</i> (2013.01); <i>H01Q 9/42</i> (2013.01); <i>H01Q 21/0075</i> (2013.01); <i>H01Q 23/00</i> (2013.01)

(73) Assignees: **BEIJING BOE TECHNOLOGY DEVELOPMENT CO., LTD.**, Beijing (CN); **BOE TECHNOLOGY GROUP CO., LTD.**, Beijing (CN)

(57) **ABSTRACT**

(21) Appl. No.: **18/021,423**

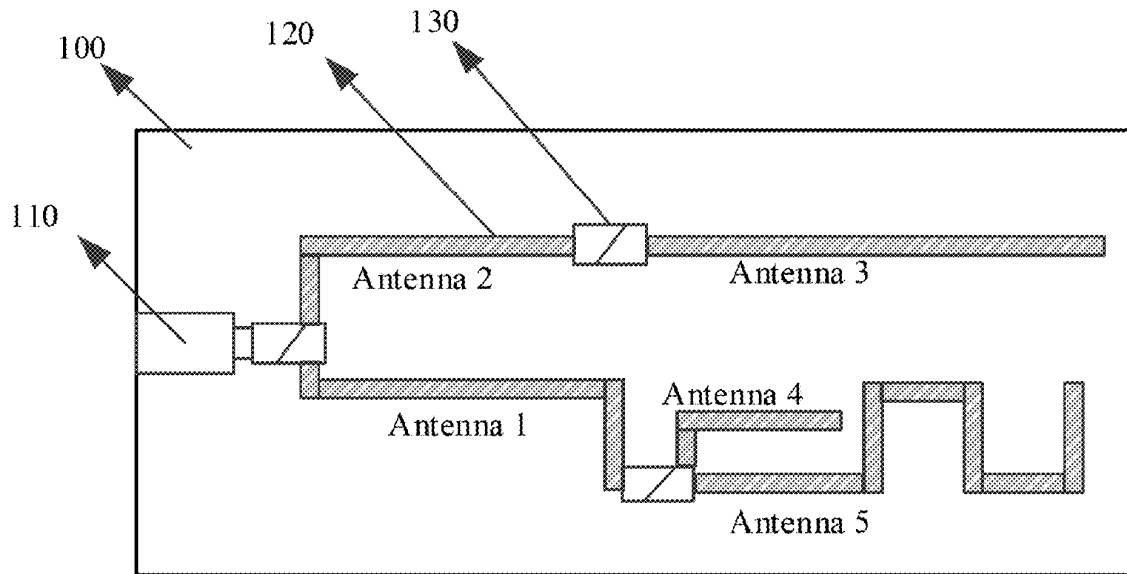
The disclosure provides a tunable antenna, a method for preparing the tunable antenna and an electronic device, wherein the tunable antenna includes a substrate, and a microstrip feeder and a plurality of antennas arranged at intervals on a side of the substrate, wherein the microstrip feeder is configured to provide a coupling signal; and a control switch, arranged between the microstrip feeder and the plurality of antennas, and/or between at least two adjacent antennas the plurality of antennas, wherein the control switch is configured to control conduction between the microstrip feeder and at least one of the plurality of antennas, so as to output the coupling signal provided by the microstrip feeder into electromagnetic waves of different frequency bands.

(22) PCT Filed: **Jun. 29, 2022**

(86) PCT No.: **PCT/CN2022/102481**

§ 371 (c)(1),

(2) Date: **Feb. 15, 2023**





US 20240266733A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2024/0266733 A1**

WEI et al.

(43) **Pub. Date: Aug. 8, 2024**

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

(52) **U.S. Cl.**
CPC **H01Q 5/378** (2015.01); **H01Q 5/328** (2015.01)

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

(57) **ABSTRACT**

(72) Inventors: **SHIH-CHIANG WEI, HSINCHU (TW); YUNG-CHIEH YU, HSINCHU (TW); HSIEH-CHIH LIN, HSINCHU (TW)**

An electronic device and an antenna structure are provided. The antenna structure includes a grounding element, a feeding radiation element, a feeding element, a switching circuit, and a first parasitic radiation element. The feeding radiation element includes a feeding portion, a first radiating portion, and a second radiating portion. The feeding portion is connected between the first radiating portion and the second radiating portion. The feeding element includes a grounding end and a feeding end. The grounding end is connected to the grounding element. The feeding end is connected to the feeding portion or the second radiating portion. The switching circuit is electrically connected to the grounding element. The first parasitic radiation element includes a first grounding branch and a second grounding branch. The first grounding branch and the second grounding branch are electrically connected to the switching circuit.

(21) Appl. No.: **18/519,213**

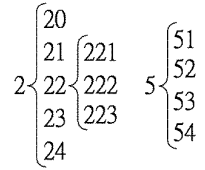
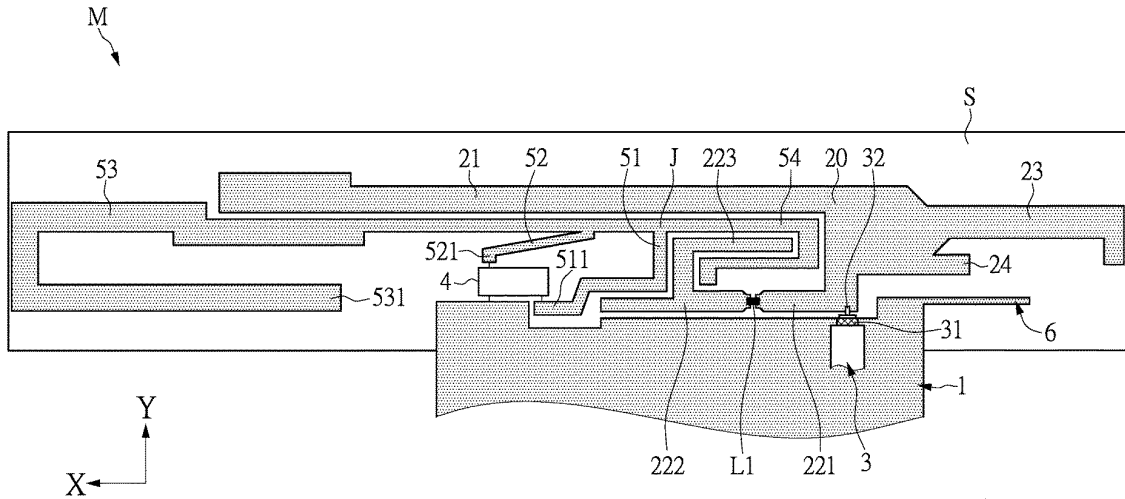
(22) Filed: **Nov. 27, 2023**

(30) **Foreign Application Priority Data**

Feb. 2, 2023 (TW) 112103560

Publication Classification

(51) **Int. Cl.**
H01Q 5/378 (2006.01)
H01Q 5/328 (2006.01)





US 20240275027A1

(19) **United States**

(12) **Patent Application Publication**
Wang

(10) **Pub. No.: US 2024/0275027 A1**

(43) **Pub. Date: Aug. 15, 2024**

(54) **5G ULTRA-WIDEBAND MONOPOLE ANTENNA**

H01Q 1/38 (2006.01)

H01Q 5/307 (2006.01)

H01Q 9/40 (2006.01)

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

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

(72) Inventor: **Daniel Wang**, Sydney (AU)

CPC *H01Q 1/246* (2013.01); *H01Q 1/38*

(2013.01); *H01Q 5/307* (2015.01); *H01Q 9/40*

(2013.01); *H01Q 1/007* (2013.01)

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

(21) Appl. No.: **18/641,271**

(57)

ABSTRACT

(22) Filed: **Apr. 19, 2024**

Related U.S. Application Data

(63) Continuation of application No. 18/197,003, filed on May 12, 2023, now Pat. No. 11,996,609, which is a continuation of application No. 17/359,788, filed on Jun. 28, 2021, now Pat. No. 11,652,279.

(60) Provisional application No. 63/048,044, filed on Jul. 3, 2020.

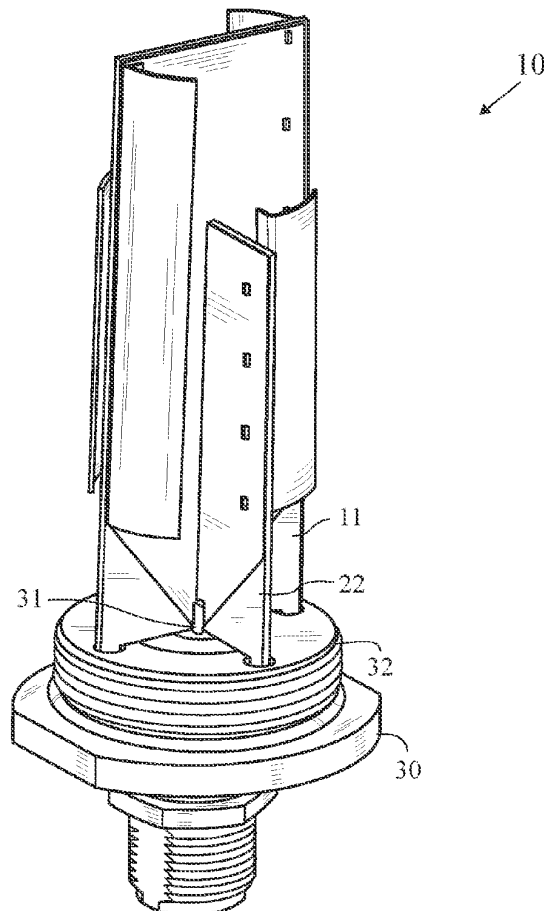
An ultra-wideband monopole antenna for 5G application is disclosed comprising a first quarter wavelength conductor and a second quarter wavelength conductor, for transmitting and/or receiving electromagnetic waves. A flat portion of the first quarter wavelength conductor and a flat portion of the second quarter wavelength conductor are preferably arranged and located perpendicular and intersecting to each other. Two curved wings of the first quarter wavelength conductor and two curved wings of the second quarter wavelength conductor are preferably arranged and located concentrically and having a same center. The first and second quarter wavelength conductors are joined to deliver ultra wideband frequency in the range of 600-960 MHz and 1710-6000 MHz.

Publication Classification

(51) **Int. Cl.**

H01Q 1/24 (2006.01)

H01Q 1/00 (2006.01)





US 20240275032A1

(19) **United States**

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

(10) **Pub. No.: US 2024/0275032 A1**

(43) **Pub. Date: Aug. 15, 2024**

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

(52) **U.S. Cl.**
CPC **H01Q 1/36** (2013.01); **H01Q 1/48** (2013.01); **H01Q 23/00** (2013.01)

(71) Applicant: **DELTA ELECTRONICS, INC.**,
Taoyuan City (TW)

(72) Inventors: **Chieh-Tsao HWANG**, Taoyuan City (TW); **Siang-Rong HSU**, Taoyuan City (TW); **Yen-Ting CHEN**, Taoyuan City (TW)

(57) **ABSTRACT**

(21) Appl. No.: **18/451,845**

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

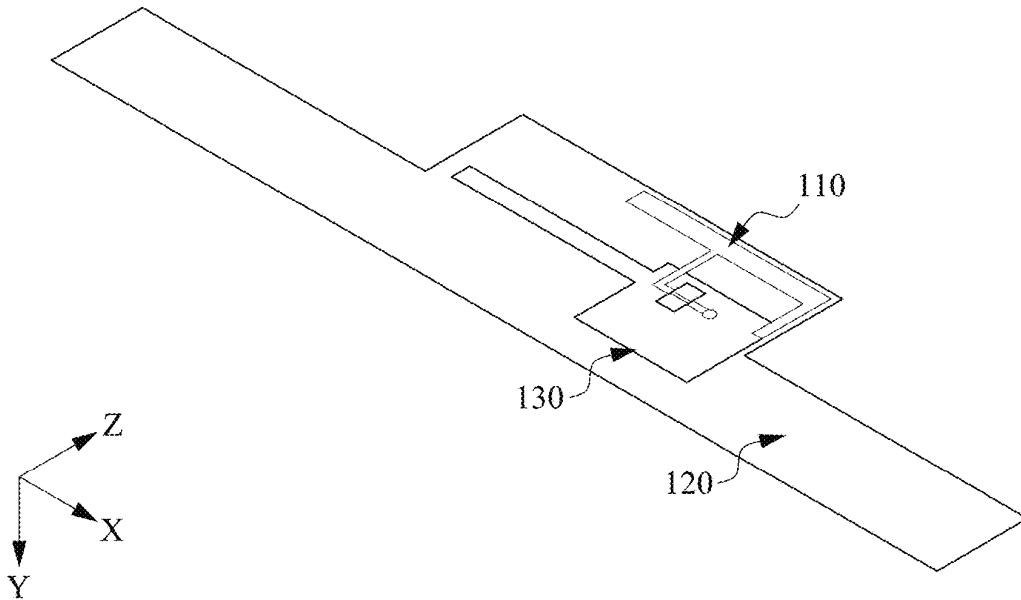
(30) **Foreign Application Priority Data**

Feb. 10, 2023 (CN) 202310093286.1

Publication Classification

(51) **Int. Cl.**
H01Q 1/36 (2006.01)
H01Q 1/48 (2006.01)
H01Q 23/00 (2006.01)

An antenna structure, which comprises a substrate, a ground plane and an antenna element. The substrate comprises a first surface and a second surface opposite to the first surface. The ground plane comprises a ground branch. The antenna element comprises a feed-in body, a radiating body and a short circuit part. The feed-in body is configured for receiving a feed-in signal, wherein projection of a part of the feed-in body to the first surface overlaps with the ground plane. The radiating body comprises a first radiating part and a second radiating part connected to the first radiating part. The short circuit part is connected to the second radiating part, and configured for connecting the ground plane through a via hole.





US 20240275051A1

(19) **United States**

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

(10) **Pub. No.: US 2024/0275051 A1**

(43) **Pub. Date: Aug. 15, 2024**

(54) **ANTENNA AND ELECTRONIC DEVICE**

H01Q 21/06 (2006.01)

H01Q 23/00 (2006.01)

(71) Applicants: **Beijing BOE Technology Development Co., Ltd.**, Beijing (CN); **BOE TECHNOLOGY GROUP CO., LTD.**, Beijing (CN)

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

CPC *H01Q 9/0407* (2013.01); *H01Q 1/22* (2013.01); *H01Q 21/065* (2013.01); *H01Q 23/00* (2013.01)

(72) Inventors: **Chunxin LI**, Beijing (CN); **Qianhong WU**, Beijing (CN); **Jingwen GUO**, Beijing (CN); **Feng QU**, Beijing (CN)

(57) **ABSTRACT**

The present disclosure provides an antenna and electronic device. The antenna includes a dielectric substrate, and a first radiation patch, at least one second radiation patch and a feed unit disposed on the dielectric substrate; the feed unit is electrically connected with the first radiation patch; a switch unit is arranged between each second radiation patch and the first radiation patch; the switch unit includes a driving electrode and a membrane bridge arranged on the dielectric substrate, a bridge deck of the membrane bridge is suspended on a side, away from the dielectric substrate, of the driving electrode, and an insulating layer covers on a side, close to the bridge deck, of the driving electrode; the switch unit is configured to control whether the membrane bridge allows a current between the first radiation patch and the second radiation patch by controlling a voltage applied to the driving electrode.

(21) Appl. No.: **18/018,921**

(22) PCT Filed: **Feb. 25, 2022**

(86) PCT No.: **PCT/CN2022/077850**

§ 371 (c)(1),

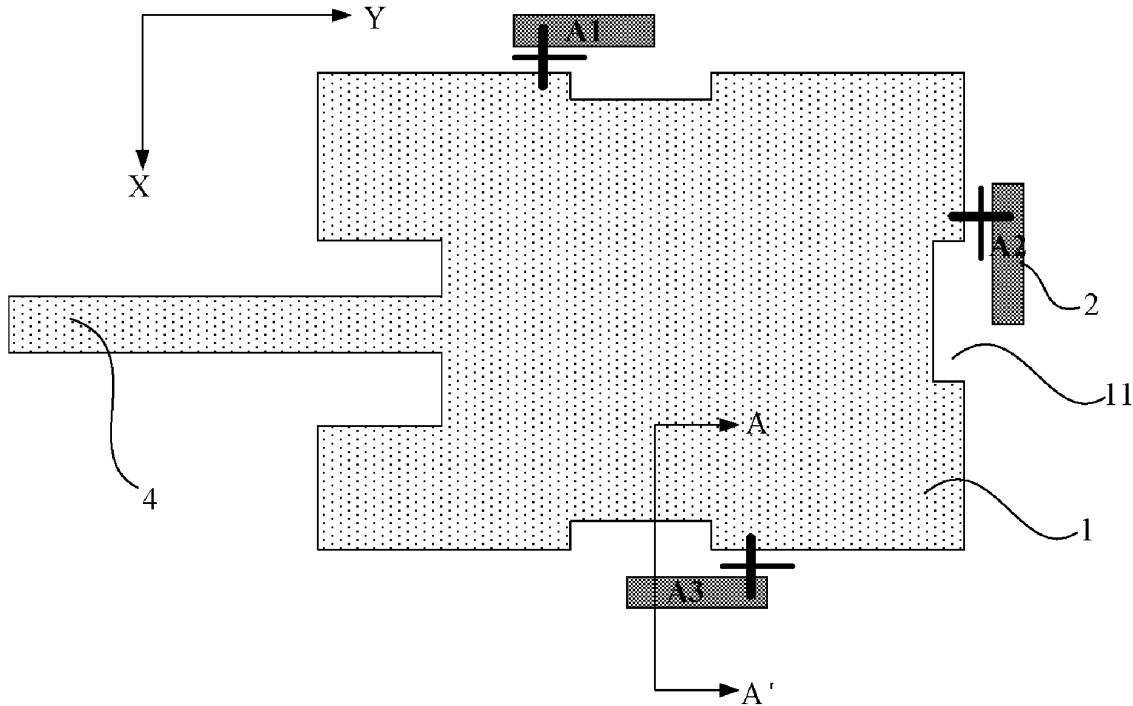
(2) Date: **Jan. 31, 2023**

Publication Classification

(51) **Int. Cl.**

H01Q 9/04 (2006.01)

H01Q 1/22 (2006.01)





US 20240275054A1

(19) **United States**

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

(10) **Pub. No.: US 2024/0275054 A1**

(43) **Pub. Date: Aug. 15, 2024**

(54) **ANTENNA AND ELECTRONIC DEVICE**

Publication Classification

(71) Applicants: **Beijing BOE Sensor Technology 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: **Sihui BAO**, Beijing (CN); **Chunnan FENG**, Beijing (CN); **Yunnan JIN**, Beijing (CN); **Zhifeng ZHANG**, Beijing (CN); **Guohui NAN**, Beijing (CN); **Liang GUO**, Beijing (CN); **Haoyang ZHANG**, Beijing (CN); **Zhe CHEN**, Beijing (CN); **Shuo YANG**, Beijing (CN); **Zheng CHEN**, Beijing (CN)

(52) **U.S. Cl.**
CPC **H01Q 9/0414** (2013.01); **H01Q 1/22** (2013.01)

(57) **ABSTRACT**

An antenna is provided, and belongs to the field of communication technology and includes a first dielectric substrate, a first conductive layer, a second dielectric substrate, a second conductive layer, a third dielectric substrate and a conductive third layer which are sequentially stacked. The first conductive layer includes at least one first and second feed lines; the second conductive layer is provided with at least one first and second openings; the third conductive layer includes at least one first radiation part. Orthographic projections of any two of a first opening, a first feed line, a first radiation part corresponding to each on the other first dielectric substrate overlap with other; each an orthographic projection of a first radiation part on the first dielectric substrate intersects with that of each of a corresponding first and second feed lines on the first dielectric substrate.

(21) Appl. No.: **18/021,965**

(22) PCT Filed: **May 13, 2022**

(86) PCT No.: **PCT/CN2022/092630**

§ 371 (c)(1),

(2) Date: **Feb. 17, 2023**

