



US 20230118728A1

(19) **United States**

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

(10) **Pub. No.: US 2023/0118728 A1**

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

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

Publication Classification

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

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

(72) Inventors: **Janne Iivonen**, Helsinki (FI);
Jari-Matti Hannula, Espoo (FI); **Riku Kormilainen**, Espoo (FI); **Anu Lehtovuori**, Espoo (FI); **Rasmus Luomaniemi**, Espoo (FI); **Ville Viikari**, Espoo (FI); **Alexander Khripkov**, Helsinki (FI); **Joonas Krogerus**, Helsinki (FI)

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

(57) **ABSTRACT**

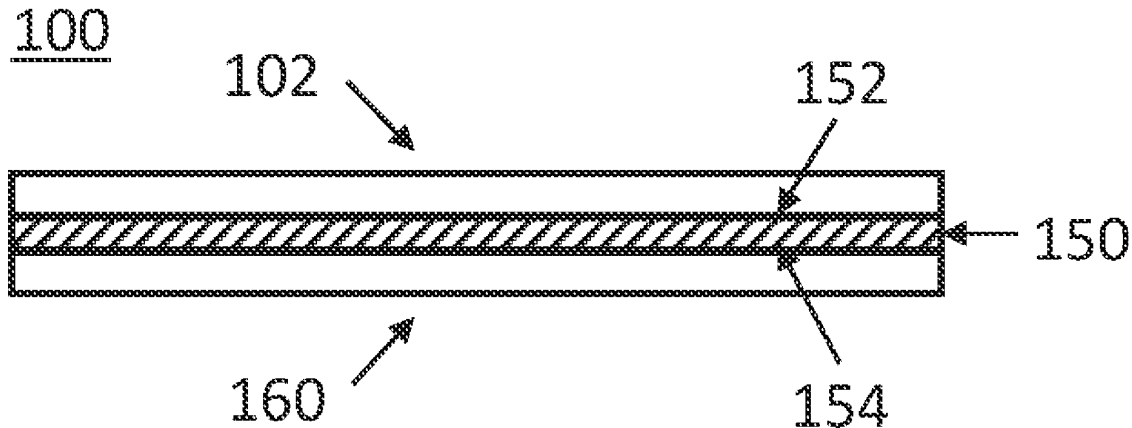
(21) Appl. No.: **17/975,253**

An antenna arrangement for a communication device comprises a top conductive patch comprising at least a first coupling point and a second coupling point coupled to one or more feed circuits carrying a radio frequency (RF) signal to or from the top conductive patch. The RF signal has a first phase in the first coupling point and a second phase in the second coupling point. A first slot extends in the conductive patch between the first coupling point and the second coupling point. The antenna arrangement according enables a desired current distribution to be realized in the antenna in a controlled and systematic manner. A communication device includes such an antenna arrangement.

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

Related U.S. Application Data

(63) Continuation of application No. PCT/EP2020/061638, filed on Apr. 27, 2020.





US 20230125358A1

(19) **United States**

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

(10) **Pub. No.: US 2023/0125358 A1**

(43) **Pub. Date: Apr. 27, 2023**

(54) **QUARTER-WAVELENGTH ANTENNAS**

Publication Classification

(71) Applicant: **HEWLETT-PACKARD
DEVELOPMENT COMPANY, L.P.**,
Spring, TX (US)

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

(72) Inventors: **Ju-Hung Chen**, Taipei City (TW);
Po-Chao Chen, Taipei City (TW);
Hung-Wen Cheng, Taipei City (TW)

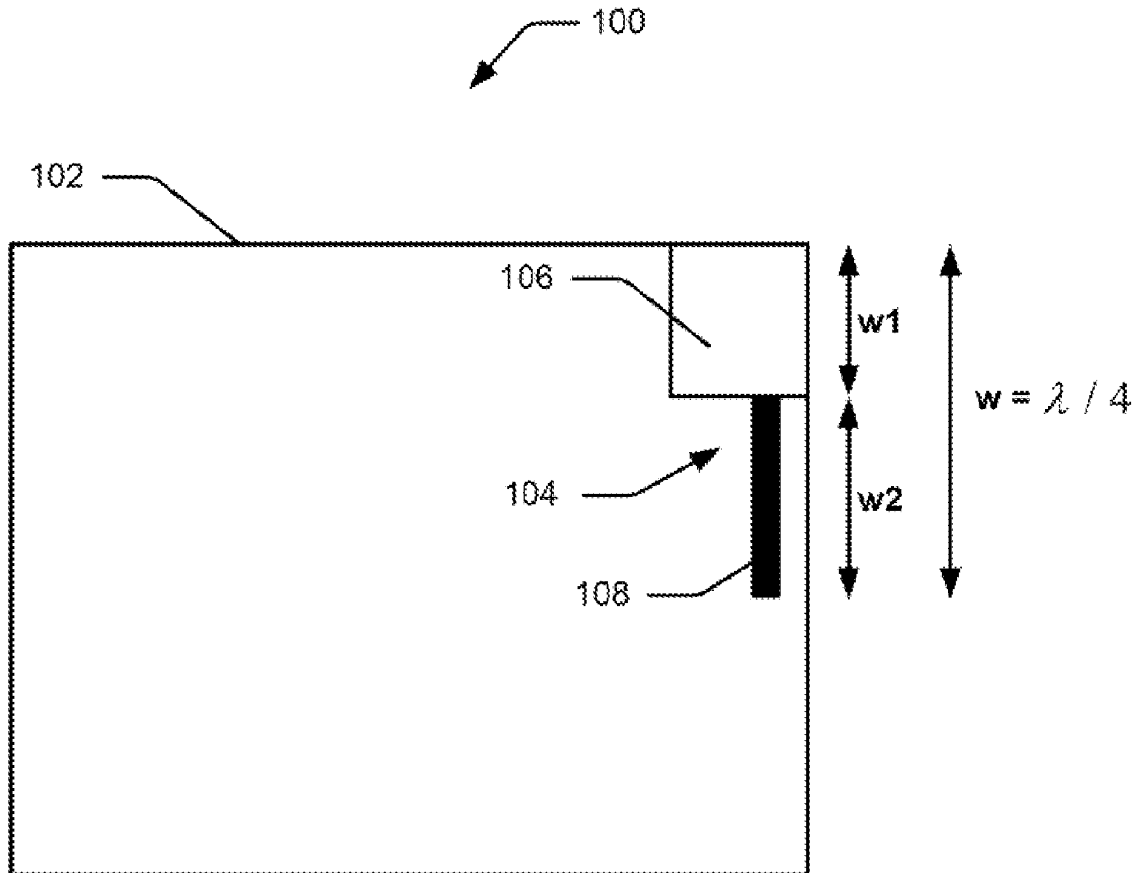
(52) **U.S. Cl.**
CPC **H01Q 9/0442** (2013.01); **H01Q 1/243**
(2013.01); **H01Q 9/0421** (2013.01)

(21) Appl. No.: **17/511,444**

(57) **ABSTRACT**

Examples of devices having a quarter-wavelength antenna are described herein. In an example, a device may include a chassis and a quarter-wavelength antenna. The quarter-wavelength antenna includes a resonant path electrically connected the chassis.

(22) Filed: **Oct. 26, 2021**





US 20230126224A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2023/0126224 A1**
HEO et al. (43) **Pub. Date: Apr. 27, 2023**

(54) **ELECTRONIC DEVICE INCLUDING ANTENNA AND METHOD THEREOF**

(52) **U.S. Cl.**
CPC **H04M 1/0245** (2013.01); **H01Q 1/243** (2013.01); **H03H 7/38** (2013.01); **H04M 1/0237** (2013.01); **H04M 1/0216** (2013.01)

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

(72) Inventors: **Wonhyung HEO**, Suwon-si (KR); **Taeho KIM**, Suwon-si (KR); **Dongil SON**, Suwon-si (KR); **Choongsun SHIM**, Suwon-si (KR); **Sanghyun HAN**, Suwon-si (KR)

(57) **ABSTRACT**

An electronic device is provided. The electronic device includes a housing structure including a first housing and a second housing connected to first housing, the second housing being connected to the first housing so as to be slidable while being at least partially inserted into or withdrawn from the first housing, a sensor module including at least one sensor, an antenna, an antenna tuner electrically connected to the antenna and configured to match impedance of the antenna, and a processor operatively connected to the sensor module, the antenna, and the antenna tuner, wherein the processor is configured to determine withdrawal information about a withdrawn degree of the second housing by using the sensor module, select an index corresponding to the withdrawal information from among multiple indices in which impedance values of the antenna according to multiple different pieces of withdrawal information are sampled, and control, based on a tuning code corresponding to the selected index, the antenna tuner to activate or deactivate at least some among at least one of one or more capacitors or one or more inductors included in the antenna tuner, so as to match the impedance of the antenna.

(21) Appl. No.: **18/077,609**

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

Related U.S. Application Data

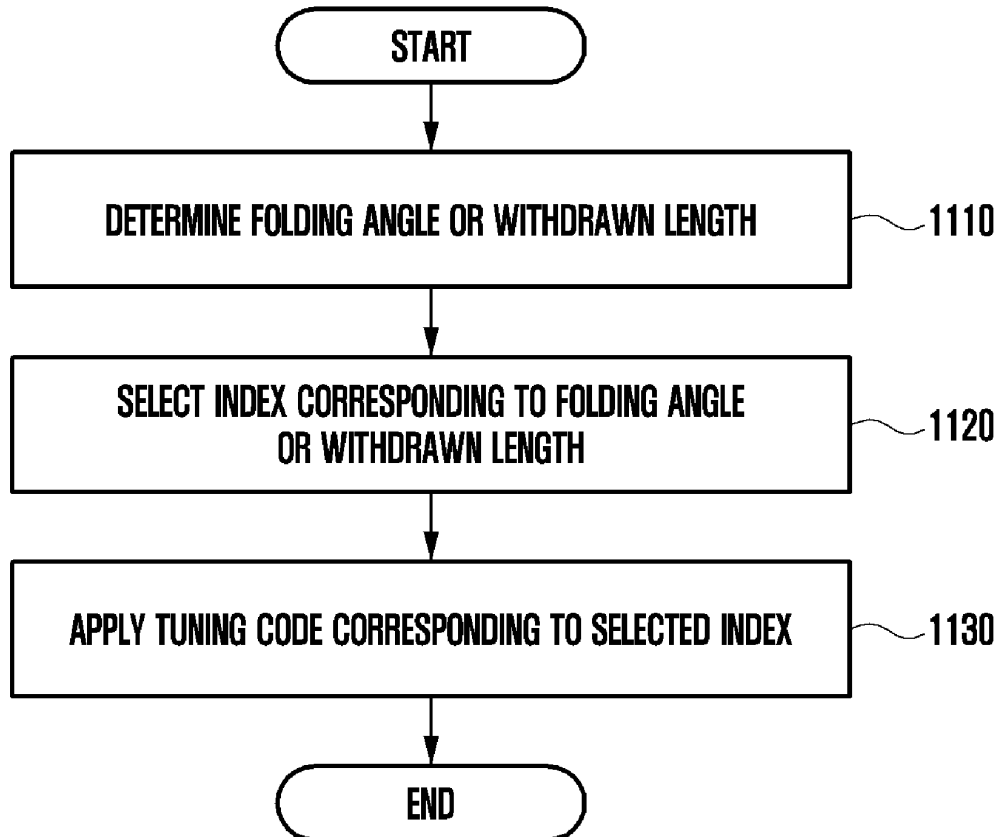
(63) Continuation of application No. PCT/KR2022/016498, filed on Oct. 26, 2022.

Foreign Application Priority Data

Oct. 26, 2021 (KR) 10-2021-0143913

Publication Classification

(51) **Int. Cl.**
H04M 1/02 (2006.01)
H01Q 1/24 (2006.01)
H03H 7/38 (2006.01)





US 20230130277A1

(19) **United States**

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

(10) **Pub. No.: US 2023/0130277 A1**

(43) **Pub. Date: Apr. 27, 2023**

(54) **ZERO-CLEARANCE FIFTH-GENERATION (5G) ULTRA-WIDEBAND (UWB) MULTIPLE-INPUT MULTIPLE-OUTPUT (MIMO) ANTENNA**

(52) **U.S. Cl.**
CPC **H01Q 9/065** (2013.01); **H04B 7/0413** (2013.01); **H01Q 21/0006** (2013.01); **H01Q 13/106** (2013.01)

(71) Applicant: **Anhui University**, Hefei City (CN)

(57) **ABSTRACT**

(72) Inventors: **Lixia Yang**, Hefei City (CN); **Zhanhao Zhang**, Hefei City (CN); **Aidi Ren**, Hefei City (CN); **Haoran Yu**, Hefei City (CN)

Provided is a zero-clearance fifth-generation (5G) ultra-wideband (UWB) Multiple-Input Multiple-Output (MIMO) antenna, including a main dielectric substrate, lateral dielectric substrates, and multiple antenna elements, where the lateral dielectric substrates are arranged at two sides of the main dielectric substrate; the multiple antenna elements are arranged on the lateral dielectric substrates; the antenna elements each include a feeding element and a grounding radiator element; the feeding element is provided at an inner side of each of the lateral dielectric substrates; and the grounding radiator element is provided at an outer side of the lateral dielectric substrate. Under a combined action of the feeding element and the grounding radiator element, the present disclosure forms a dual-resonant antenna structure to effectively cover N77, N78, N79 and 5G wireless local area network bands in 5G mobile communication, and achieves the desirable antenna efficiency as well as desirable isolation and ECC between the antenna elements.

(21) Appl. No.: **17/970,559**

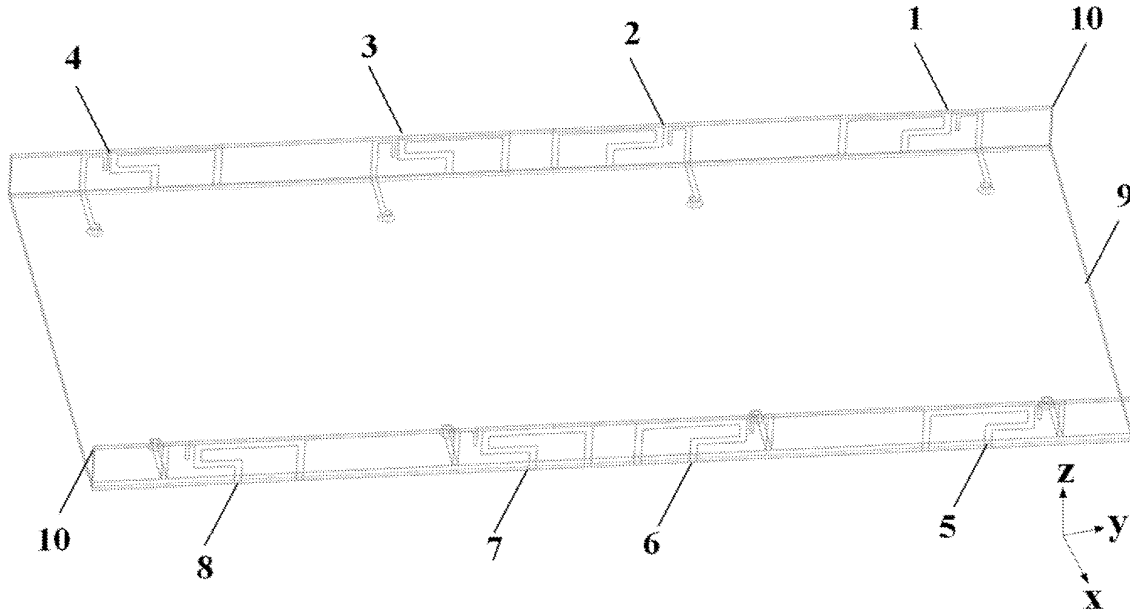
(22) Filed: **Oct. 20, 2022**

(30) **Foreign Application Priority Data**

Oct. 21, 2021 (CN) 202111229025.5

Publication Classification

(51) **Int. Cl.**
H01Q 9/06 (2006.01)
H04B 7/0413 (2006.01)
H01Q 21/00 (2006.01)
H01Q 13/10 (2006.01)





US 20230134877A1

(19) **United States**

(12) **Patent Application Publication**
CHAO

(10) **Pub. No.: US 2023/0134877 A1**

(43) **Pub. Date: May 4, 2023**

(54) **MINIATURIZED BROADBAND ANTENNA
AND WIRELESS COMMUNICATION
DEVICE USING THE SAME**

(52) **U.S. Cl.**
CPC **H01Q 21/28** (2013.01); **H01Q 5/50**
(2015.01); **H01Q 5/335** (2015.01)

(71) Applicants: **Fu Tai Hua Industry (Shenzhen) Co.,
Ltd.**, Shenzhen (CN); **HON HAI
PRECISION INDUSTRY CO., LTD.**,
New Taipei (TW)

(57) **ABSTRACT**

(72) Inventor: **HSIN-HAO CHAO**, New Taipei (TW)

(21) Appl. No.: **18/091,161**

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

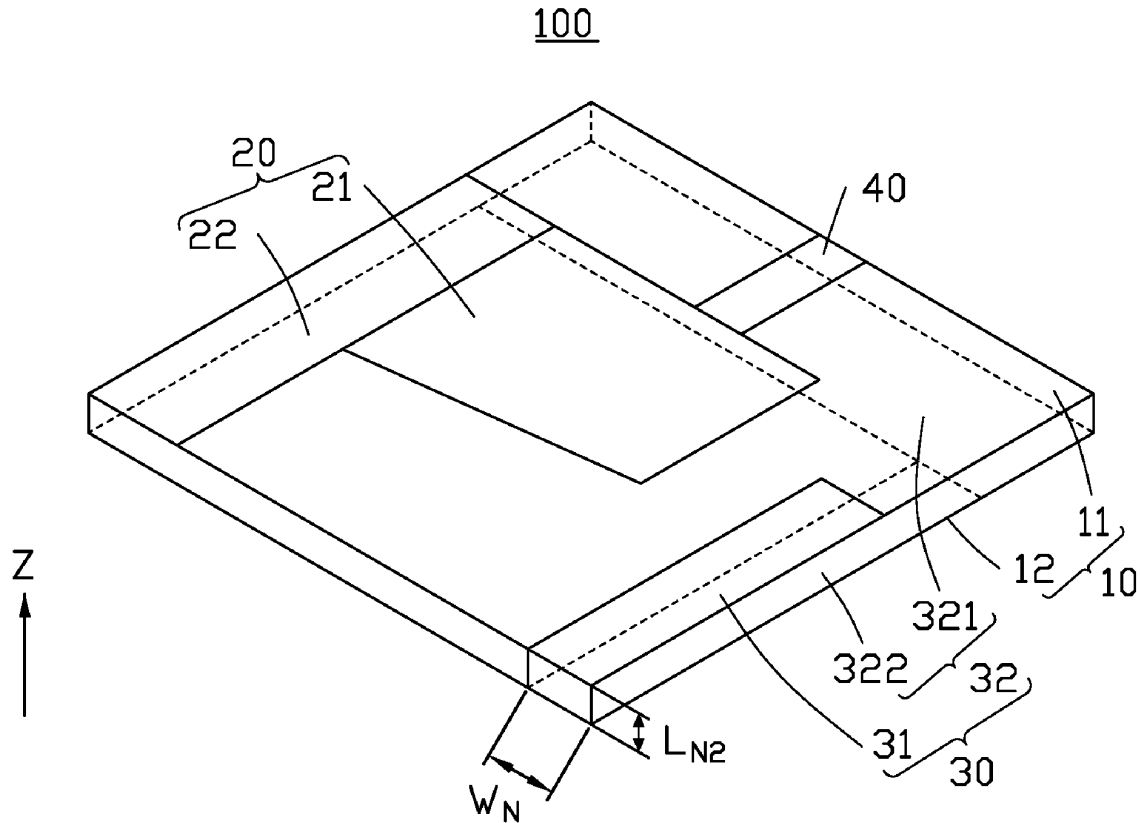
(30) **Foreign Application Priority Data**

Nov. 1, 2022 (CN) 202211357858.4

Publication Classification

(51) **Int. Cl.**
H01Q 21/28 (2006.01)
H01Q 5/50 (2006.01)
H01Q 5/335 (2006.01)

A miniaturized antenna with broadband capabilities includes a dielectric substrate, a first radiation unit, a second radiation unit and a feed portion. The dielectric substrate includes a first surface and a second surface. The first radiation unit is arranged on the first surface, the second radiation unit extends from the second surface to the first surface, the second radiation unit includes a ground portion and a first radiation portion. The feed portion feeds current to the first radiation unit, the first radiation unit excites a first radiation frequency band, and the first radiation portion excites a second radiation frequency band. The disclosure also provides a wireless communication device. The antenna is miniaturized and achieves broadband capabilities.





US 20230137645A1

(19) **United States**

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

(10) **Pub. No.: US 2023/0137645 A1**

(43) **Pub. Date: May 4, 2023**

(54) **MULTI-BAND SHARED-APERTURE
ANTENNA AND COMMUNICATION DEVICE**

H01Q 9/16 (2006.01)

H01Q 7/00 (2006.01)

H01Q 21/00 (2006.01)

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

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

CPC *H01Q 21/24* (2013.01); *H01Q 19/10*
(2013.01); *H01Q 9/16* (2013.01); *H01Q 7/00*
(2013.01); *H01Q 21/0006* (2013.01)

(72) Inventors: **Long Shen**, Shanghai (CN); **Guanxi
Zhang**, Shanghai (CN); **Xue Bai**,
Dongguan (CN)

(57) **ABSTRACT**

(21) Appl. No.: **18/148,874**

This application provides a multi-band shared-aperture antenna. The multi-band shared-aperture antenna includes a first antenna array, a second antenna array, and a reflection panel, where the first antenna array includes four first dielectric plates perpendicular, two adjacent first dielectric plates are perpendicular to each other, the first antenna array includes four hollowed butterfly dipole units, the dipole unit includes two radiation arms, the two radiation arms are respectively printed on two adjacent first dielectric plates, the radiation arm includes a first part and a second part, a first feeding stub is disposed on the first dielectric plate, the second part has a specified width in a direction perpendicular to the reflection panel, the second antenna array includes a plurality of second dielectric plates, four ring-shaped coils are disposed on any one of the second dielectric plates, and the ring-shaped coil is connected to a second feeding stub.

(22) Filed: **Dec. 30, 2022**

Related U.S. Application Data

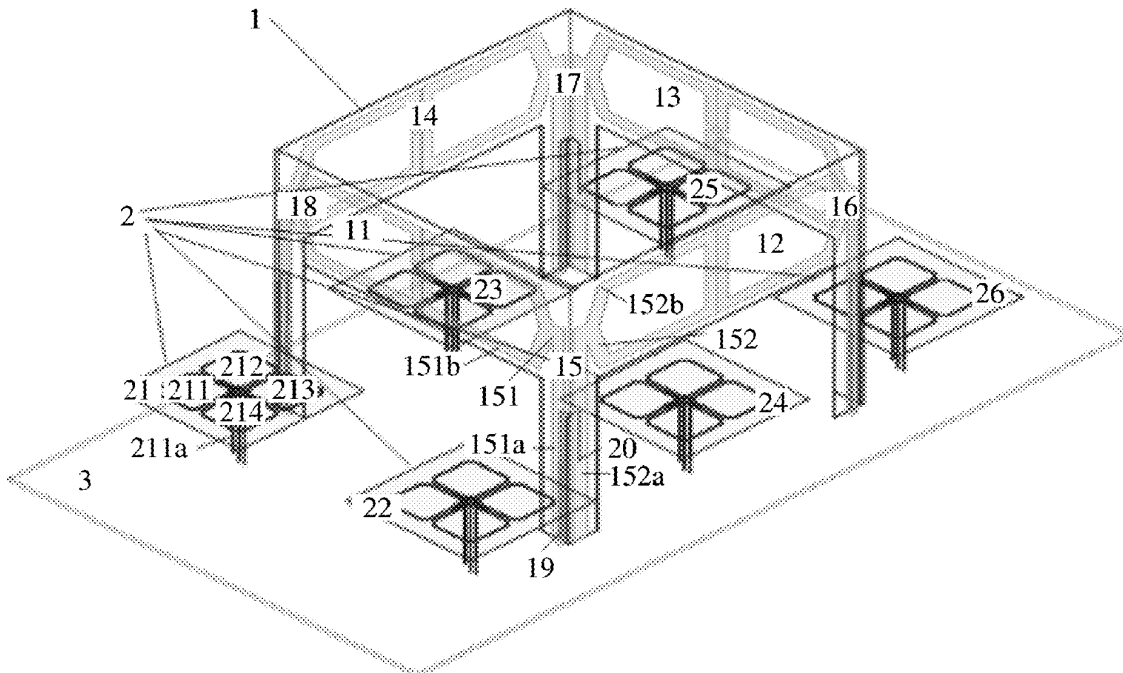
(63) Continuation of application No. PCT/CN2021/
104286, filed on Jul. 2, 2021.

Foreign Application Priority Data

Jul. 3, 2020 (CN) 202021278642.5

Publication Classification

(51) **Int. Cl.**
H01Q 21/24 (2006.01)
H01Q 19/10 (2006.01)





US 20230140862A1

(19) **United States**

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

(10) **Pub. No.: US 2023/0140862 A1**

(43) **Pub. Date: May 11, 2023**

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

Publication Classification

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

(51) **Int. Cl.**
H01Q 1/24 (2006.01)
H01Q 1/52 (2006.01)
H01Q 1/48 (2006.01)

(72) Inventors: **Seyoon BAE**, Suwon-si (KR);
Yongyoun KIM, Suwon-si (KR);
Sungsoo KIM, Suwon-si (KR);
Byoungryoul SONG, Suwon-si (KR)

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

(57) **ABSTRACT**

An electronic device includes a display module, and a side housing surrounding a side surface of the display module and formed of a conductive material. A protection member covers a part of the side housing and the display module. The protection member includes a first portion facing the display module and a second portion facing the side housing. A first conductive member is disposed in at least a part of the first portion of the protection member and is formed of a conductive material. A second conductive member is disposed in at least a part of the second portion of the protection member, is connected to the first conductive member, and is formed of a conductive material. A separation space is disposed between the second conductive member and the side housing, and an antenna is electrically connected to the side housing such that the side housing functions as an antenna.

(21) Appl. No.: **18/082,266**

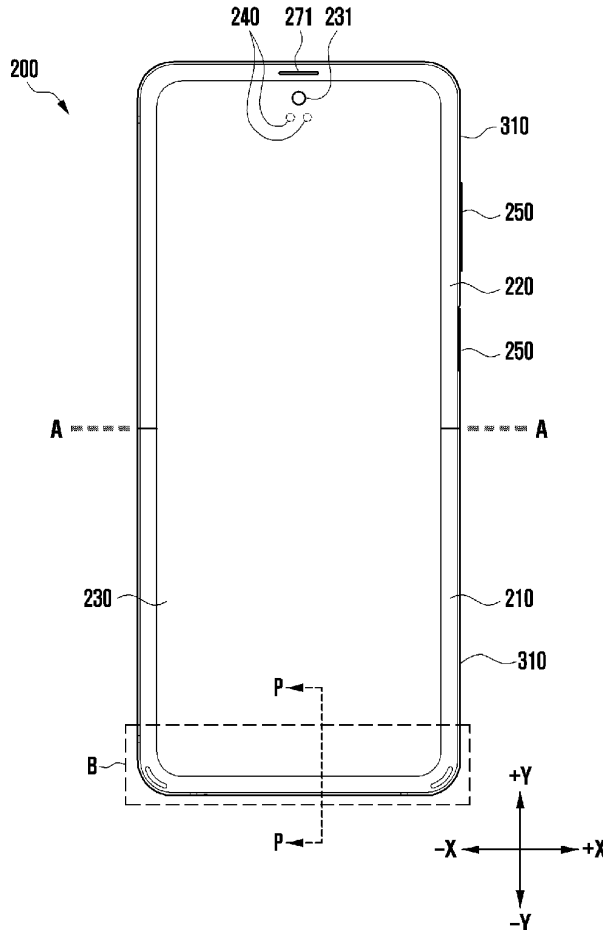
(22) Filed: **Dec. 15, 2022**

Related U.S. Application Data

(63) Continuation of application No. PCT/KR2022/017374, filed on Nov. 7, 2022.

(30) **Foreign Application Priority Data**

Nov. 8, 2021 (KR) 10-2021-0152373





US 20230141690A1

(19) **United States**

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

(10) **Pub. No.: US 2023/0141690 A1**

(43) **Pub. Date: May 11, 2023**

(54) **ELECTRONIC DEVICE INCLUDING CONDUCTIVE CONNECTION MEMBER**

Publication Classification

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

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

(72) Inventors: **Seungchang BAEK**, Suwon-si (KR);
Hyeongsam SON, Suwon-si (KR);
Changhyeok SHIN, Suwon-si (KR);
Yoonhee LEE, Suwon-si (KR);
Junghyun IM, Suwon-si (KR); **Sungho CHO**, Suwon-si (KR); **Jungwoo CHOI**, Suwon-si (KR); **Hangyu HWANG**, Suwon-si (KR); **Minwoo YOO**, Suwon-si (KR)

(52) **U.S. Cl.**
CPC **H05K 5/0217** (2013.01); **H05K 5/0247** (2013.01); **H05K 5/0018** (2022.08)

(57) **ABSTRACT**

An electronic device is provided. The electronic device includes a display, a frame structure including a first conductive member defining an external appearance of the electronic device and operated as an antenna element of the electronic device, a second conductive member coupled and electrically connected to the first conductive member, and a nonconductive member that supports the display together with the second conductive member, a bonding layer including a first layer at least partially disposed between the first conductive member and the nonconductive member, and a second layer at least partially disposed between the second conductive member and the nonconductive member, and at least one conductive connection member disposed at a portion, at which the first conductive member and the second conductive member are coupled to each other, and contacting the first conductive member and the second conductive member.

(21) Appl. No.: **17/894,543**

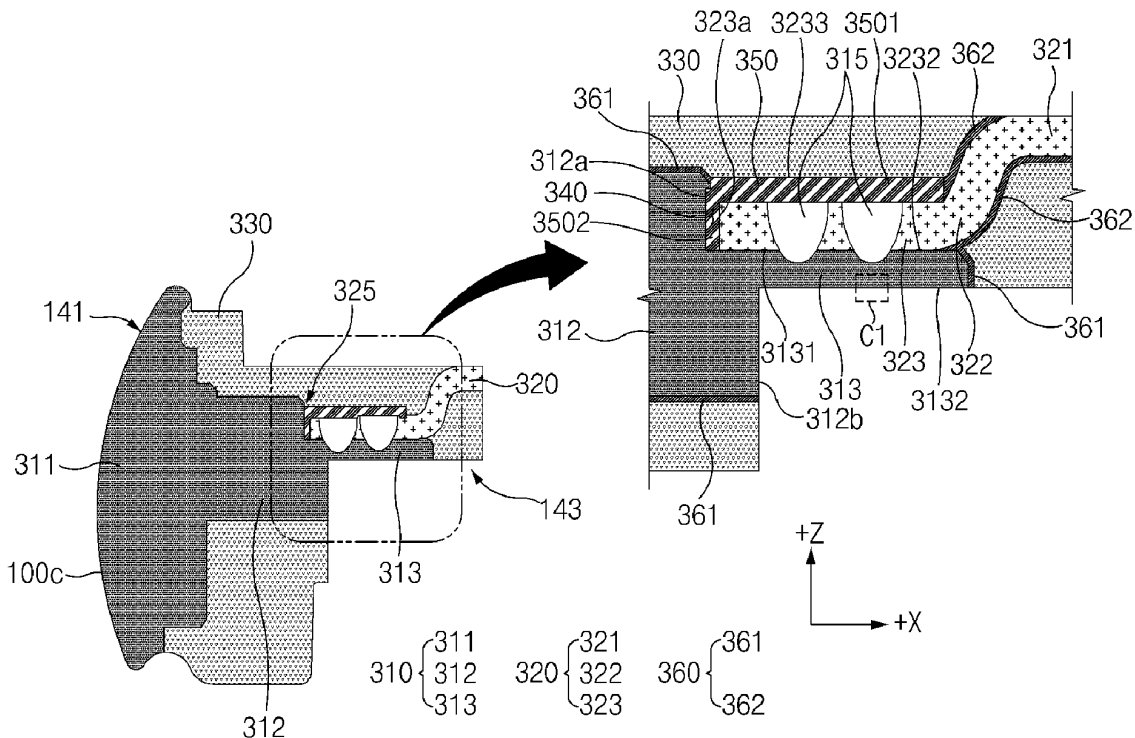
(22) Filed: **Aug. 24, 2022**

Related U.S. Application Data

(63) Continuation of application No. PCT/KR2022/012305, filed on Aug. 18, 2022.

(30) **Foreign Application Priority Data**

Nov. 10, 2021 (KR) 10-2021-0154237





US 20230152440A1

(19) **United States**

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

(10) **Pub. No.: US 2023/0152440 A1**

(43) **Pub. Date: May 18, 2023**

(54) **ELECTRONIC DEVICE FOR DETERMINING POSITION OF EXTERNAL ELECTRONIC DEVICE AND METHOD THEREOF**

Publication Classification

(51) **Int. Cl.**
G01S 13/76 (2006.01)
H01Q 21/30 (2006.01)
(52) **U.S. Cl.**
CPC *G01S 13/765* (2013.01); *H01Q 21/30* (2013.01)

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

(72) Inventors: **Sehwan CHOI**, Gyeonggi-do (KR);
Sukgi HONG, Gyeonggi-do (KR);
Hyunchul KIM, Gyeonggi-do (KR); **Yi YANG**, Gyeonggi-do (KR); **Sungjun LIM**, Gyeonggi-do (KR); **Jungsik PARK**, Gyeonggi-do (KR); **Hyunju HONG**, Gyeonggi-do (KR)

(57) **ABSTRACT**

A portable electronic device is disclosed that includes a communication circuit electrically connected to a first antenna or a third antenna and electrically connected to a second antenna, at least one processor, and a memory. The memory may store one or more instructions that, when executed, cause the at least one processor to receive a first signal including first data from an external electronic device using the first antenna and the second antenna, receive a second signal including second data from the external electronic device using the third antenna, and determine a position of the external electronic device based on a phase difference of the first signal, time information of the first data, and time information of the second data. In addition to the above, various embodiments understood through the present disclosure are possible.

(21) Appl. No.: **16/980,735**

(22) PCT Filed: **Sep. 7, 2020**

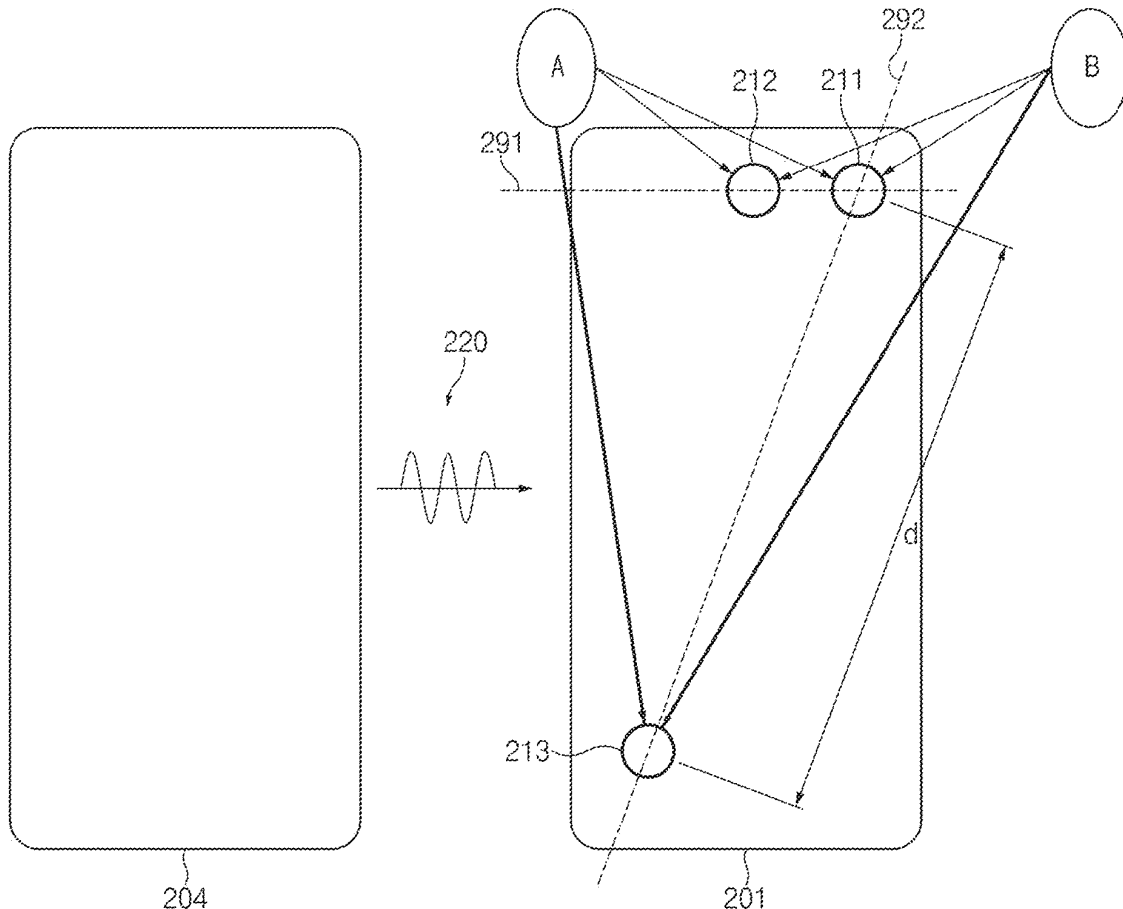
(86) PCT No.: **PCT/KR2020/012020**

§ 371 (c)(1),

(2) Date: **Sep. 14, 2020**

(30) **Foreign Application Priority Data**

Sep. 10, 2019 (KR) 10-2019-0112393





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(19) **United States**

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

(10) **Pub. No.: US 2023/0152865 A1**

(43) **Pub. Date: May 18, 2023**

(54) **ELECTRONIC DEVICE COMPRISING FLEXIBLE DISPLAY AND ANTENNA**

Publication Classification

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

(51) **Int. Cl.**
G06F 1/16 (2006.01)

(72) Inventors: **Sungkoo PARK**, Suwon-si (KR);
Kookjoo LEE, Suwon-si (KR);
Yongyoun KIM, Suwon-si (KR);
Chankyu AN, Suwon-si (KR); **Soonho HWANG**, Suwon-si (KR); **Gun LIM**, Suwon-si (KR); **Hyunju HONG**, Suwon-si (KR)

(52) **U.S. Cl.**
CPC **G06F 1/1698** (2013.01); **G06F 1/1656** (2013.01); **G06F 1/1624** (2013.01); **G06F 1/1652** (2013.01)

(57) **ABSTRACT**

An electronic device is provided. The electronic device comprises a housing including a first surface facing a first direction, and a second surface facing a second direction opposite to the first surface, a conductive plate disposed at the first surface of the housing to be slidable in a third direction perpendicular to the first direction and including a slot, a flexible display arranged to be supported by the conductive plate and including a first area facing the first surface and a second area extending from the first area and bendable according to the sliding of the conductive plate, and a wireless communication circuit configured to transmit and/or receive a signal in a selected or designated frequency band through an antenna formed on the basis of at least a part of the conductive plate, which surrounds the slot.

(21) Appl. No.: **18/157,574**

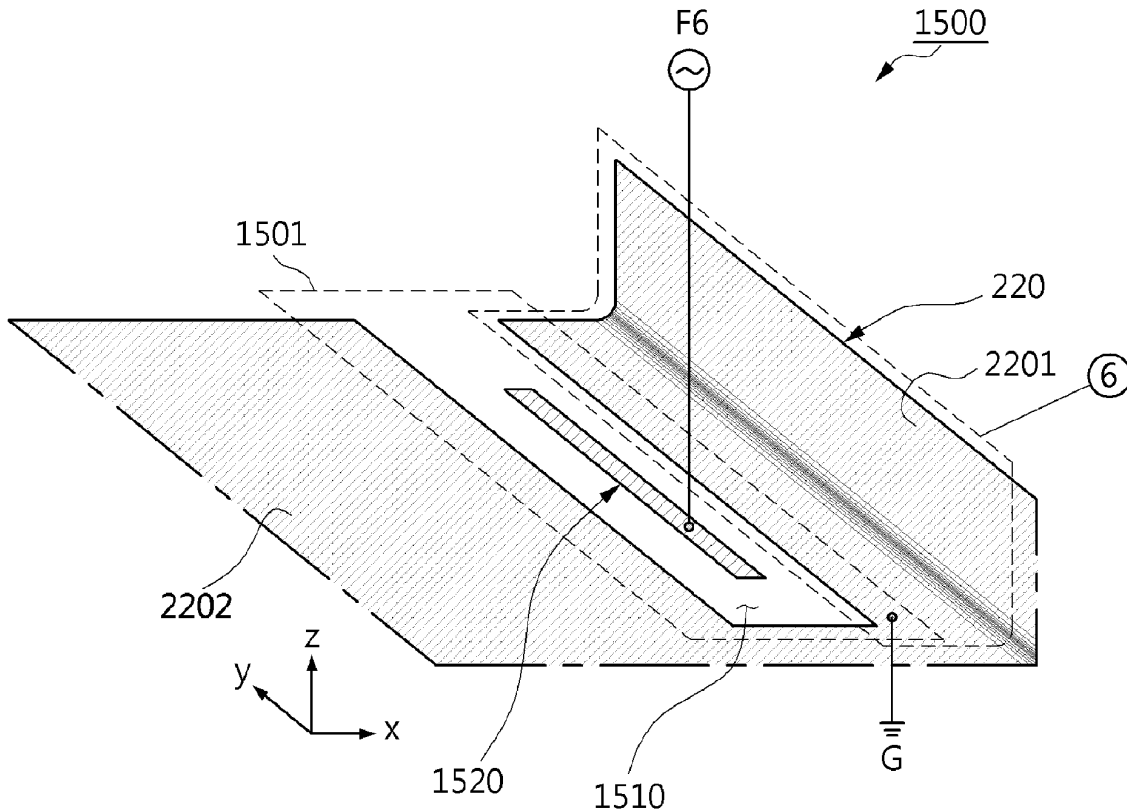
(22) Filed: **Jan. 20, 2023**

Related U.S. Application Data

(63) Continuation of application No. PCT/KR2021/009503, filed on Jul. 22, 2021.

Foreign Application Priority Data

Jul. 22, 2020 (KR) 10-2020-0091080





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(19) **United States**

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

(10) **Pub. No.: US 2023/0155275 A1**

(43) **Pub. Date: May 18, 2023**

(54) **TERMINAL**

Publication Classification

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

(51) **Int. Cl.**
H01Q 1/24 (2006.01)
G06F 3/0354 (2006.01)
H01Q 1/46 (2006.01)

(72) Inventors: **Ben Lai**, Wuhan (CN); **Yuhui Wang**,
Shenzhen (CN); **Ning Ma**, Shenzhen
(CN); **Quan Yu**, Wuhan (CN); **Kemeng
Wang**, Dongguan (CN); **Teng Long**,
Wuhan (CN)

(52) **U.S. Cl.**
CPC *H01Q 1/241* (2013.01); *G06F 3/03545*
(2013.01); *H01Q 1/46* (2013.01)

(21) Appl. No.: **17/802,346**

(57) **ABSTRACT**

(22) PCT Filed: **Dec. 15, 2020**

A terminal includes a terminal body part and an electronic accessory part. A WI-FI antenna apparatus is disposed on the terminal body part. The WI-FI antenna apparatus has a closed slot antenna. The closed slot antenna has an antenna slot that includes a main straight slot and a first slot and a second slot that are separately bent with respect to two ends of the main straight slot and extend to a same side of the main straight slot. The first slot and the second slot are perpendicular to the main straight slot, and the electronic accessory part is located on a side surface of the main straight slot.

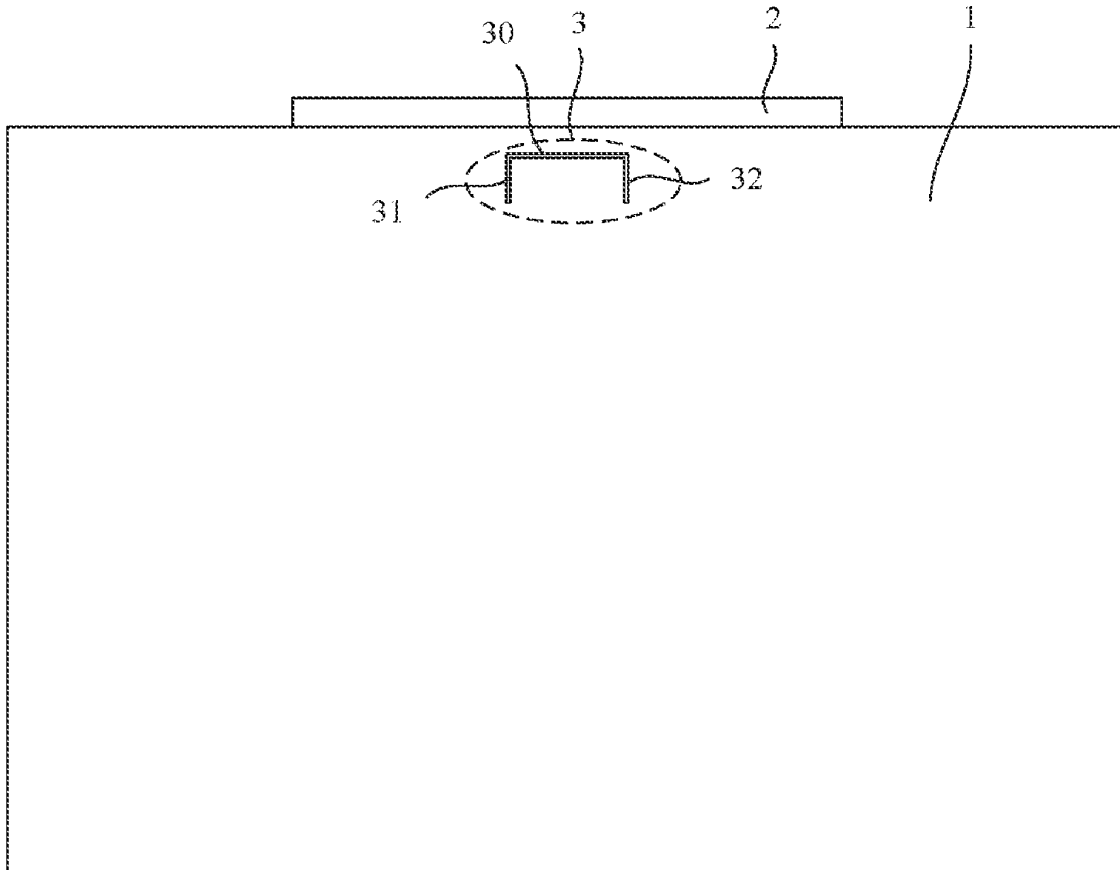
(86) PCT No.: **PCT/CN2020/136405**

§ 371 (c)(1),

(2) Date: **Aug. 25, 2022**

(30) **Foreign Application Priority Data**

Feb. 25, 2020 (CN) 202010117703.8





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(19) **United States**

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

(10) **Pub. No.:** US 2023/0155279 A1

(43) **Pub. Date:** May 18, 2023

(54) **ANTENNA STACK STRUCTURE**

Publication Classification

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

(51) **Int. Cl.**
H01Q 1/48 (2006.01)
H01Q 1/24 (2006.01)
H01Q 9/04 (2006.01)

(72) Inventors: **Byung Jin CHOI**, Incheon (KR); **Dong Pil PARK**, Incheon (KR); **Jae Hyun LEE**, Gyeonggi-do (KR)

(52) **U.S. Cl.**
CPC *H01Q 1/48* (2013.01); *H01Q 1/243* (2013.01); *H01Q 9/0407* (2013.01)

(21) Appl. No.: **18/098,837**

(22) Filed: **Jan. 19, 2023**

(57) **ABSTRACT**

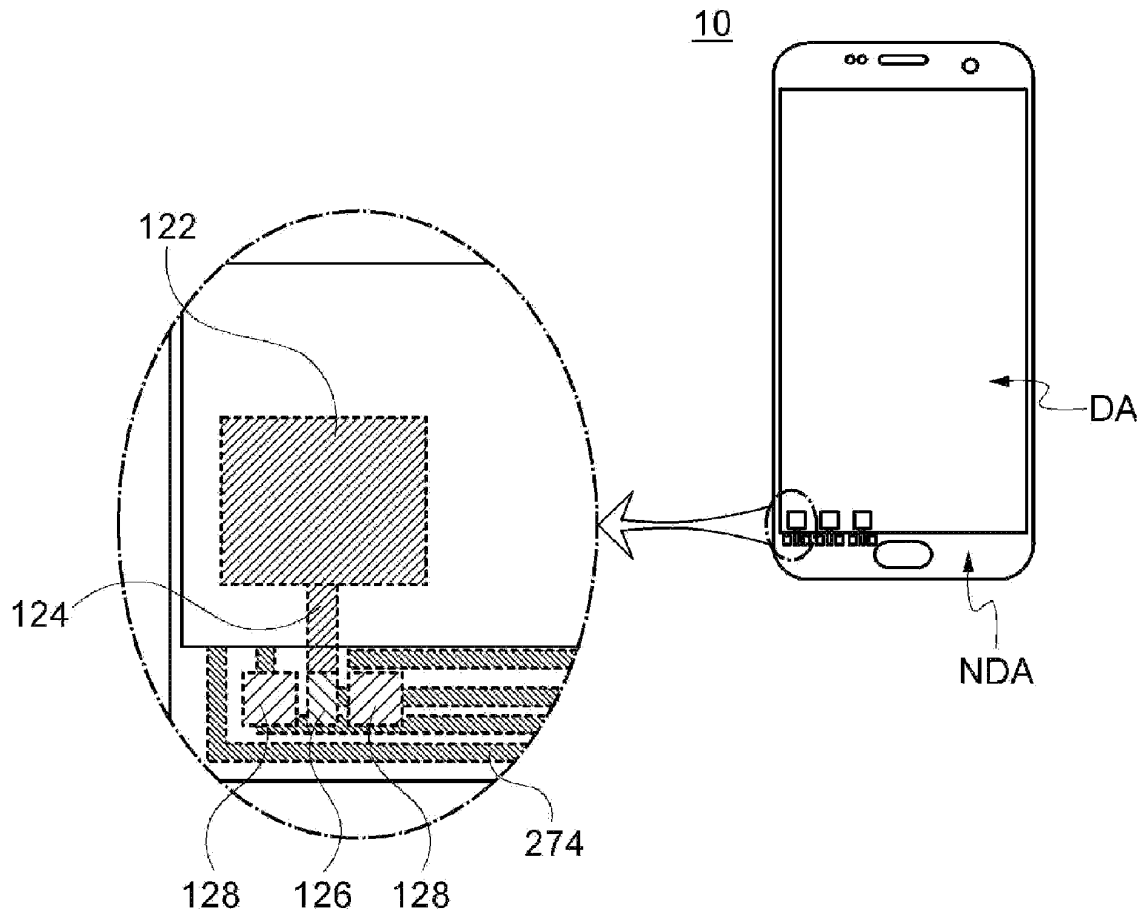
Related U.S. Application Data

(63) Continuation of application No. PCT/KR2021/009409, filed on Jul. 21, 2021.

An antenna stack structure according to an embodiment includes an antenna substrate layer, an antenna unit disposed on a top surface of the antenna substrate layer, the antenna unit including a radiator and an antenna pad, and a display panel including a grounding element disposed on a bottom surface of the antenna substrate layer. The antenna pad is superimposed over the grounding element in a planar view. Signaling and radiation properties can be improved utilizing the antenna pad.

Foreign Application Priority Data

Jul. 24, 2020 (KR) 10-2020-0092535





US 20230155285A1

(19) **United States**

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

(10) **Pub. No.: US 2023/0155285 A1**

(43) **Pub. Date: May 18, 2023**

(54) **ANTENNA**

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

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

(21) Appl. No.: **17/621,126**

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

(86) PCT No.: **PCT/CN2021/078020**

§ 371 (c)(1),

(2) Date: **Dec. 20, 2021**

Publication Classification

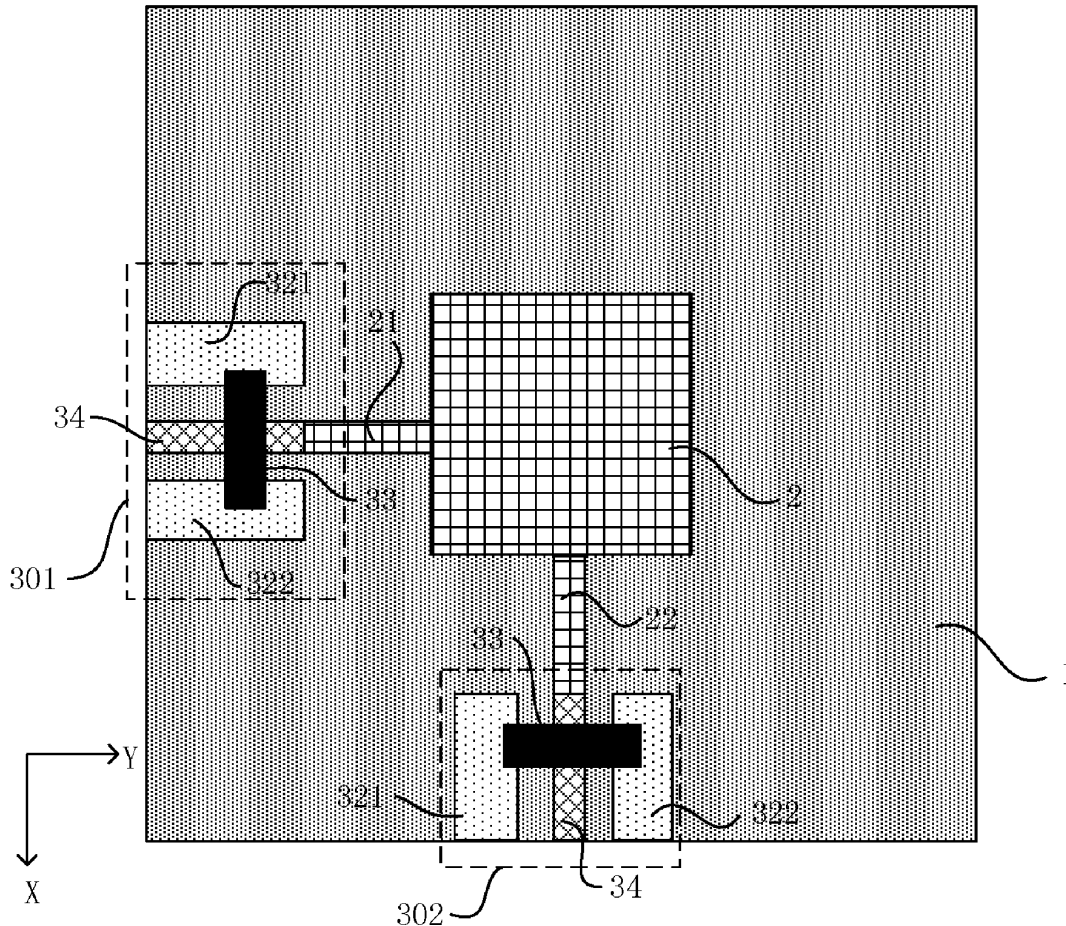
(51) **Int. Cl.**
H01Q 3/26 (2006.01)
H01Q 1/50 (2006.01)
H01P 1/18 (2006.01)

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

CPC **H01Q 3/26** (2013.01); **H01Q 1/50** (2013.01); **H01P 1/18** (2013.01)

(57) **ABSTRACT**

An antenna includes: a substrate; a first reference electrode on a first surface of the substrate; a radiating element on a second surface of the substrate, feeding directions of a first port and a second port of the radiating element are different; and at least one transmission structure on the second surface of the substrate and connected to at least one of the first port and the second port. The transmission structure includes: a signal electrode, a second reference electrode on at least one side of the signal electrode, and at least one membrane bridge; the signal electrode feeds a microwave signal into the radiating element, is positioned in a space surrounded by the membrane bridge and the substrate, and is insulated from the membrane bridge through an interlayer dielectric layer; orthographic projections of the membrane bridge and the second reference electrode on the substrate are overlapped.





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(54) **ANTENNA APPARATUS**

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(71) Applicant: **NOKIA TECHNOLOGIES OY**,
Espoo (FI)

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(72) Inventors: **Mikko KOMULAINEN**, Oulu (FI);
Juha Samuel HALLIVUORI, Tampere
(FI); **Willem VERBIEST**,
Sint-Gillis-Waas (BE); **Ronny**
PEETERS, Hoboken (BE); **Natalia**
DEMENTIEVA, Antwerp (BE);
Nikolaus SINGER, Gablitz (AT);
Nikolas OLAZIREGI, Antwerp (BE)

(57) **ABSTRACT**

An apparatus includes an antenna array having a plurality of antenna elements. The antenna array includes one or more grouping of the plurality of antenna elements, configured to provide: a first configuration in which the one or more grouping of antenna elements supports at least transmission of a signal according to a first antenna system; and a second configuration in which the one or more grouping of antenna elements supports at least reception of a signal according to a second antenna system. The first antenna system includes a Single Input, Single Output antenna system or Multiple Input, Multiple Output antenna system. The second antenna system includes a Single Input, Single Output antenna system or Multiple Input, Multiple Output antenna system. An array of antenna elements can support different modes of operation, for example, different Multiple Input, Multiple Output modes or Multiple Input, Multiple Output and Single Input, Single Output modes.

(73) Assignee: **NOKIA TECHNOLOGIES OY**,
Espoo (FI)

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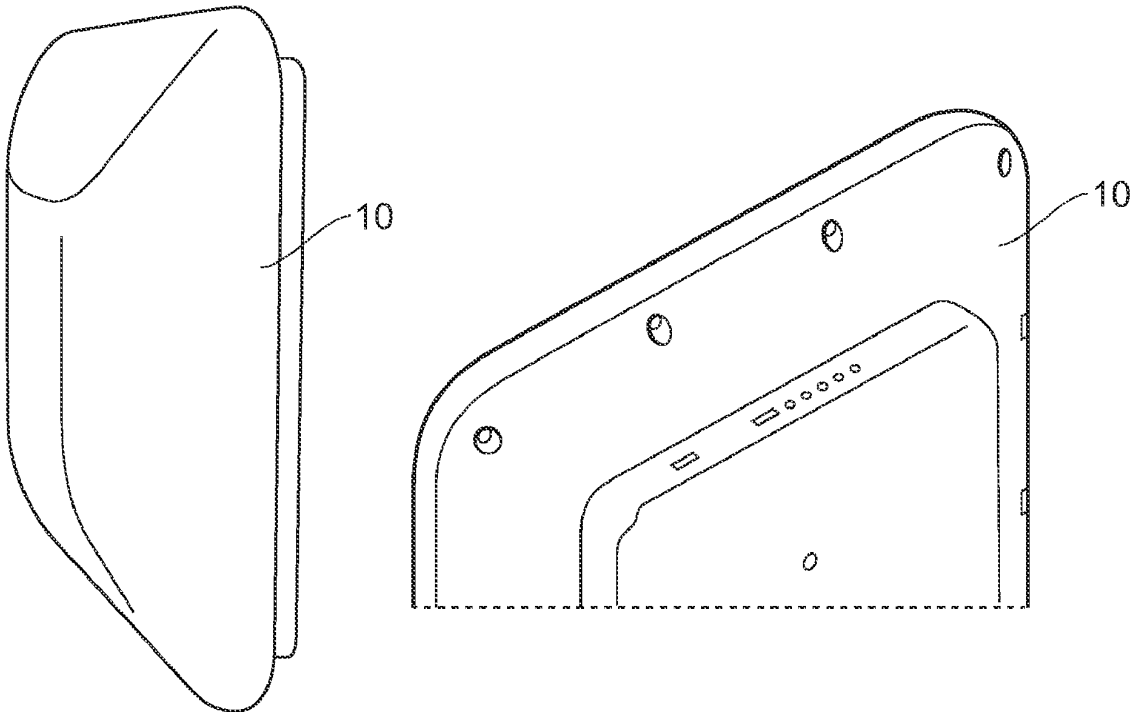
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(54) **ANTENNA AND ELECTRONIC DEVICE INCLUDING THE SAME**

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

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(72) Inventors: **Yoondo LEE**, Suwon-si (KR); **Sigwan KIM**, Suwon-si (KR); **Hyelee SONG**, Suwon-si (KR); **Dongryul SHIN**, Suwon-si (KR); **Dongmin SHIN**, Suwon-si (KR); **Yoonjae LEE**, Suwon-si (KR); **Handug LEE**, Suwon-si (KR); **Woosik CHO**, Suwon-si (KR); **Weonjai CHOI**, Suwon-si (KR); **Taewook HAM**, Suwon-si (KR); **Kyunggu KIM**, Suwon-si (KR); **Hongpyo BAE**, Suwon-si (KR); **Jinwoo JUNG**, Suwon-si (KR); **Youngjun CHO**, Suwon-si (KR)

(57) **ABSTRACT**

In embodiments, an electronic device may include a housing having an inner space, a printed circuit board (PCB) disposed in the inner space of the housing, a first antenna structure disposed at a position spaced apart from the PCB, and transmitting and/or receiving a radio signal in a first frequency band, at least one second antenna structure disposed at a position spaced apart from the PCB, and transmitting and/or receiving a radio signal in a second frequency band different from the first frequency band, and a flexible substrate electrically connecting the PCB and the first antenna structure. The flexible substrate may include a first connecting portion electrically connected to the PCB, an interconnecting portion extended from the first connecting portion to the first antenna structure, at least one branch portion branched from at least a part of the interconnecting portion, and extended to the at least one second antenna structure, at least one first conductive path disposed in the interconnecting portion, and electrically connecting the first connecting portion and the first antenna structure, and at least one second conductive path disposed in the interconnecting portion and the at least one branch portion, and electrically connecting the first connecting portion and the at least one second antenna structure.

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