US 20250096466A1

(19) **United States**

(12) **Patent Application Publication**

Deng

(10) **Pub. No.: US 2025/0096466 A1**

(43) **Pub. Date: Mar. 20, 2025**

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

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

(72) Inventor: **Shaogang Deng**, Shenzhen (CN)

(21) Appl. No.: **18/696,132**

(22) PCT Filed: **Aug. 26, 2022**

(86) PCT No.: **PCT/CN2022/115221**

§ 371 (c)(1),
(2) Date: **Mar. 27, 2024**

(30) **Foreign Application Priority Data**

Sep. 29, 2021 (CN) 202111156219.7

Publication Classification

(51) **Int. Cl.**

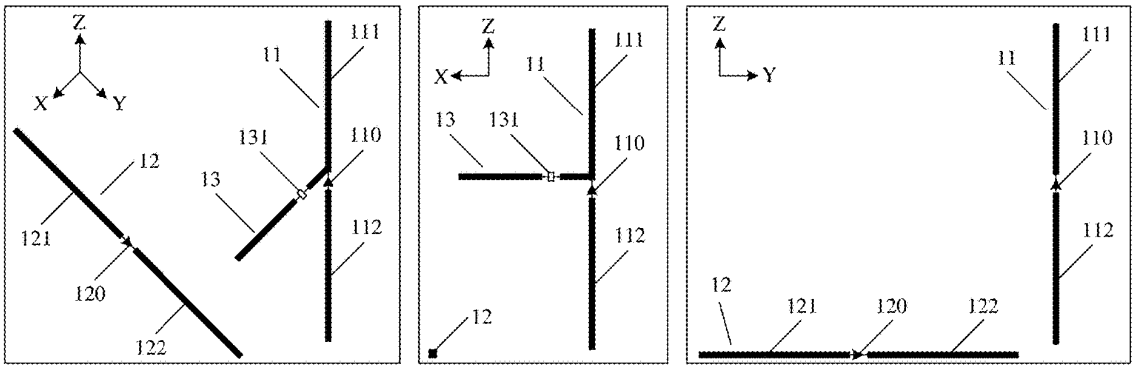
H01Q 5/371	(2015.01)
H01Q 9/24	(2006.01)
H01Q 9/30	(2006.01)
H01Q 13/10	(2006.01)
H01Q 21/28	(2006.01)

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

CPC ***H01Q 5/371*** (2015.01); ***H01Q 9/24*** (2013.01); ***H01Q 9/30*** (2013.01); ***H01Q 13/10*** (2013.01); ***H01Q 21/28*** (2013.01)

(57) **ABSTRACT**

An antenna system includes a first antenna, a second antenna, and a tuning stub, where the first antenna and the second antenna have a same first operating frequency band or similar first operating frequency bands. The tuning stub is electrically connected to the first antenna, and the tuning stub is configured to adjust an equivalent current path of the first antenna, so that a connection line between a projection point of a maximum equivalent current point of the first antenna and a projection point of a maximum equivalent current point of the second antenna on a first plane tends to be more perpendicular to a projection of the equivalent current path of the first antenna or of the second antenna on the first plane; or the equivalent current path of the first antenna and of the second antenna tend to be more perpendicular to each other.



US 20250103109A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2025/0103109 A1**

Williams et al. (43) **Pub. Date: Mar. 27, 2025**

(54) **ELECTRONIC DEVICE HAVING FINGER RECESS ANTENNA**

(71) Applicant: **Apple Inc.**, Cupertino, CA (US)

(72) Inventors: **Michael J Williams**, Campbell, CA (US); **Nikolaos Chiotellis**, San Jose, CA (US); **Joel D Barrera**, Cedar Park, TX (US); **Jerzy S Guterman**, Sunnyvale, CA (US); **Trevor J Edmonds**, San Francisco, CA (US); **Marc Soriano Baliarda**, San Jose, CA (US); **Mahmoud R Amini**, Redwood City, CA (US); **Soroush Kamrava**, Mountain View, CA (US)

(21) Appl. No.: **18/476,220**

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

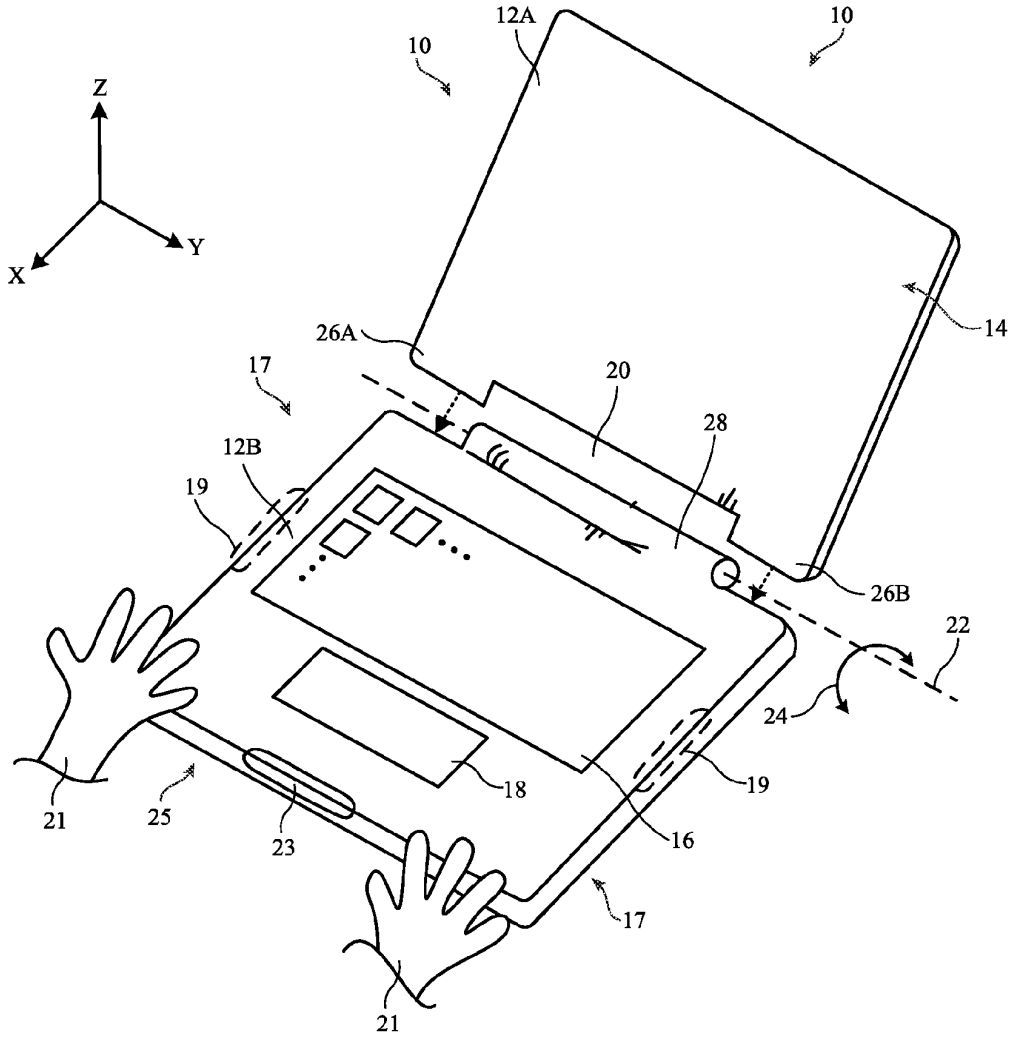
Publication Classification

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

(52) **U.S. Cl.**
CPC ***G06F 1/1681*** (2013.01)

(57) **ABSTRACT**

An electronic device such as a laptop computer may have an upper housing and a lower housing. The upper housing may be coupled to the lower housing by a hinge. The upper housing may be rotatable relative to the lower housing between an open position and a closed position. The lower housing may have an upper metal wall, a lower metal wall, and a metal sidewall that couples the lower metal wall to the upper metal wall. The lower metal housing may have a finger scoop in the metal sidewall. The finger scoop may have a surface that is oriented at a non-parallel and non-perpendicular angle to a lateral surface of the upper housing when the upper housing is in the closed position. The device may have an antenna with a radiating slot in the surface of the finger scoop.



US 20250105489A1

(19) **United States**

(12) **Patent Application Publication**

(10) **Pub. No.: US 2025/0105489 A1**

(43) **Pub. Date: Mar. 27, 2025**

LEE et al.

(54) **ANTENNA DEVICE, ANTENNA STRUCTURE INCLUDING THE SAME AND IMAGE DISPLAY DEVICE INCLUDING THE SAME**

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

(72) Inventors: **WON HEE LEE**, Jeollabuk-do (KR); **KI HUN SUNG**, Jeollabuk-do (KR); **SUNG JOON HONG**, Jeollabuk-do (KR)

(21) Appl. No.: **18/889,850**

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

(30) **Foreign Application Priority Data**

Sep. 22, 2023 (KR) 10-2023-0127276

Publication Classification

(51) **Int. Cl.**

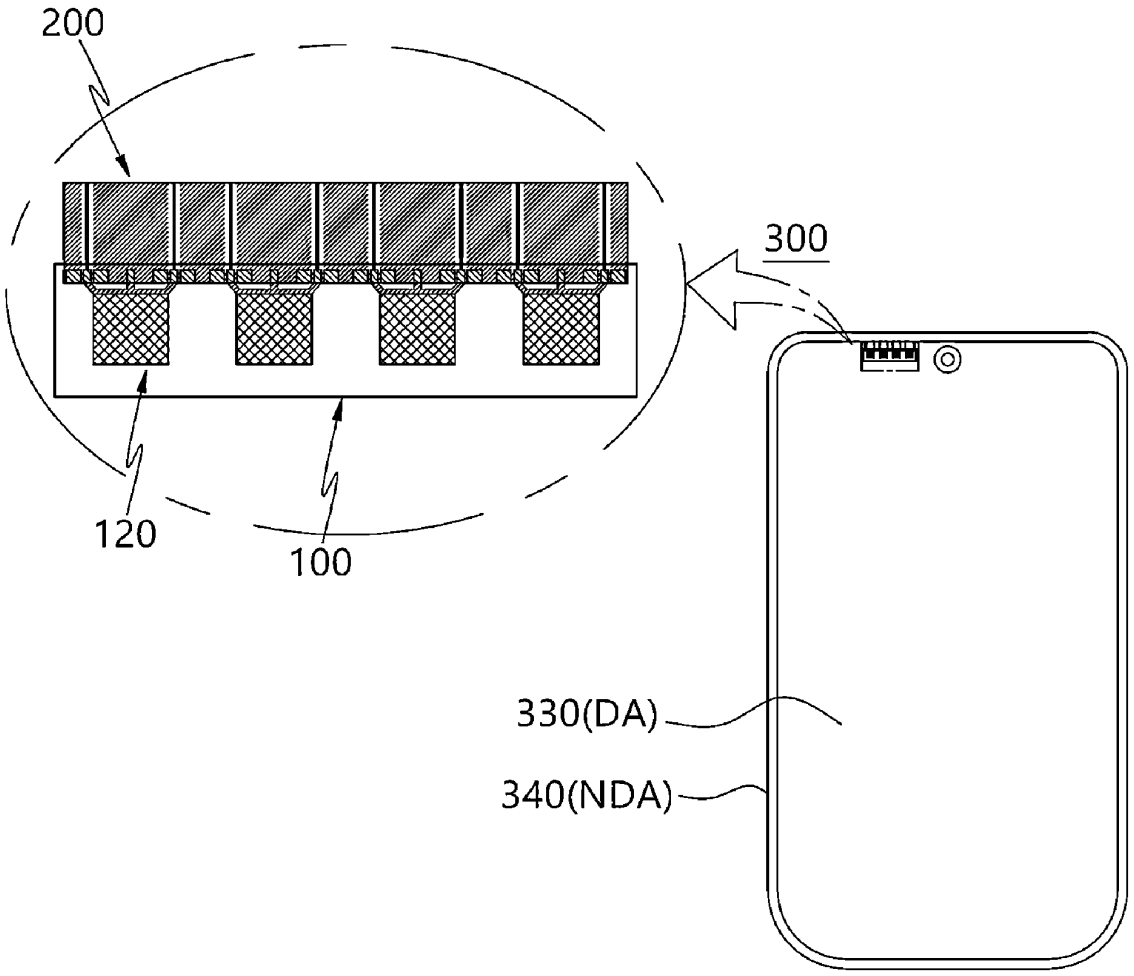
H01Q 1/22 (2006.01)
H01Q 1/48 (2006.01)
H01Q 1/50 (2006.01)

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

CPC ***H01Q 1/22*** (2013.01); ***H01Q 1/48*** (2013.01); ***H01Q 1/50*** (2013.01)

(57) **ABSTRACT**

An antenna device includes a radiator, a transmission line and a replay pattern. The transmission line is connected to the radiator and includes a first transmission line and a second transmission line that face each other. The relay pattern is disposed between the first transmission line and the second transmission line to be connected to the radiator.



US 20250105490A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2025/0105490 A1**

Chiotellis et al. (43) **Pub. Date: Mar. 27, 2025**

(54) **ELECTRONIC DEVICE HAVING CLUTCH BARREL ANTENNA ARM**

(71) Applicant: **Apple Inc.**, Cupertino, CA (US)

(72) Inventors: **Nikolaos Chiotellis**, San Jose, CA (US); **Michael J. Williams**, Campbell, CA (US); **Joel D. Barrera**, Cedar Park, TX (US); **Marc Soriano Baliarda**, San Jose, CA (US); **Ayoub Yari Boroujeni**, Redwood City, CA (US); **Trevor J. Edmonds**, San Francisco, CA (US); **Jerzy S. Guterman**, Sunnyvale, CA (US)

(21) Appl. No.: **18/476,035**

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

Publication Classification

(51) **Int. Cl.**

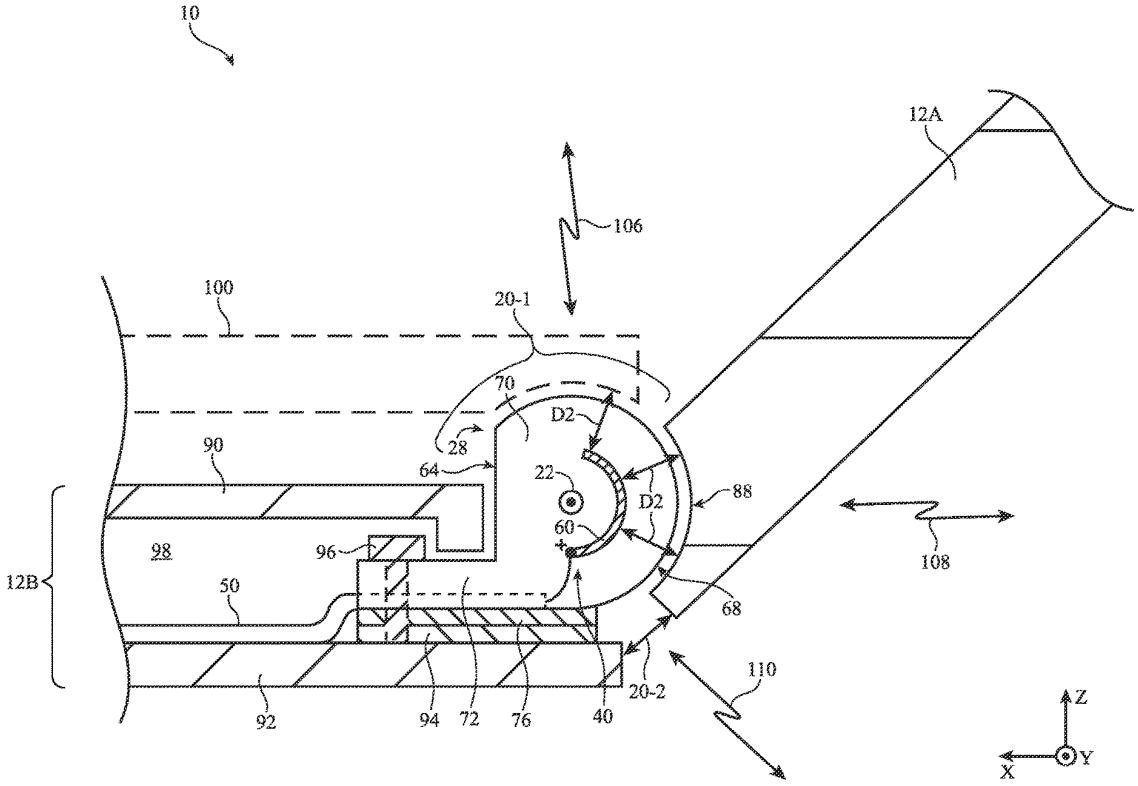
H01Q 1/22	(2006.01)
H01Q 1/38	(2006.01)
H01Q 9/04	(2006.01)

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

CPC ***H01Q 1/2266*** (2013.01); ***H01Q 1/38*** (2013.01); ***H01Q 9/0421*** (2013.01)

(57) **ABSTRACT**

An electronic device such as a laptop computer may have an upper housing and a lower housing. The lower housing may have a clutch barrel coupled to the upper housing by a hinge. The upper housing may be rotatable relative to the lower housing between an open position and a closed position. The upper housing may have a curved metal surface facing the clutch barrel. The device may have an antenna with a radiating arm on a curved interior surface of a substrate in the clutch barrel. The radiating arm may extend parallel to the curved metal surface. The radiating arm may remain separated from the curved metal surface across its lateral area as the upper housing is rotated from the open position to the closed position. This may ensure that the antenna is provided with a uniform capacitive load from the upper housing at all upper housing positions.



US 20250105492A1

(19) **United States**

(12) **Patent Application Publication**

XUE et al.

(10) **Pub. No.: US 2025/0105492 A1**

(43) **Pub. Date: Mar. 27, 2025**

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

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

(72) Inventors: **Kangle XUE**, Shenzhen (CN); **Xijian DI**, Shenzhen (CN); **Shouliang LI**, Shenzhen (CN); **Zhenrui TANG**, Shenzhen (CN)

(73) Assignee: **Honor Device Co., Ltd.**, Shenzhen (CN)

(21) Appl. No.: **18/730,710**

(22) PCT Filed: **Aug. 17, 2023**

(86) PCT No.: **PCT/CN2023/113606**

§ 371 (c)(1),
(2) Date: **Jul. 19, 2024**

(30) **Foreign Application Priority Data**

Sep. 7, 2022 (CN) 202211090616.3

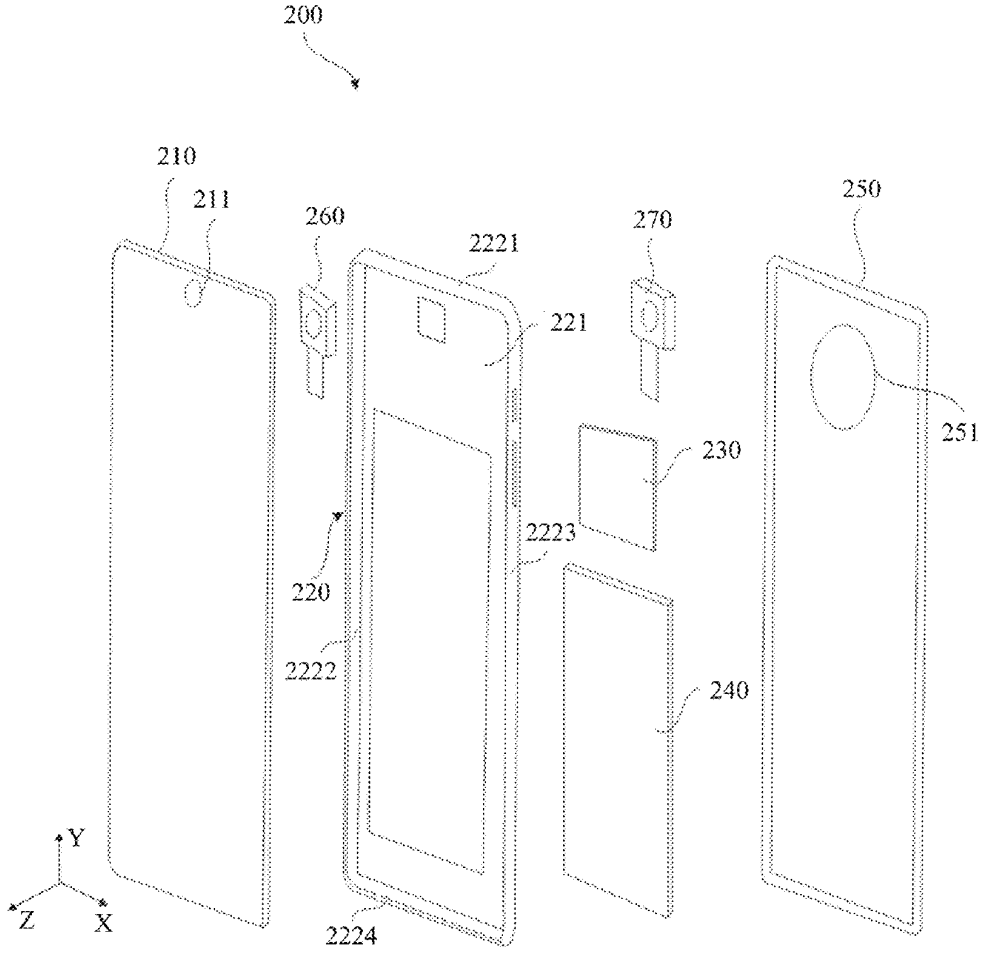
Publication Classification

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

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

(57) **ABSTRACT**

This application provides an electronic assembly and an electronic device. At least two antennas are formed on a metal frame of the electronic assembly, a circuit board and an electronic component are located on one side of the metal frame, and there is a gap between the metal frame and each of the circuit board and the electronic component. An orthographic projection of the electronic component on the metal frame covers a first antenna, a slit between the first antenna and a second antenna, and a part of the second antenna. One end of a first extension member is connected to one end of the first antenna which is close to the second antenna, the other end of the first extension member is electrically connected to a first feed point on the circuit board. The second antenna is electrically connected to a second feed point on the circuit board.



US 20250105493A1

(19) **United States**

(12) **Patent Application Publication**

ROH et al.

(10) **Pub. No.: US 2025/0105493 A1**

(43) **Pub. Date: Mar. 27, 2025**

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

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

(72) Inventors: **Hyunyoung ROH**, Suwon-si (KR); **Jeong PARK**, Suwon-si (KR)

(21) Appl. No.: **18/896,063**

(22) Filed: **Sep. 25, 2024**

Related U.S. Application Data

(63) Continuation of application No. PCT/KR2024/013920, filed on Sep. 12, 2024.

(30) **Foreign Application Priority Data**

Sep. 25, 2023 (KR) 10-2023-0128288
Nov. 22, 2023 (KR) 10-2023-0163584

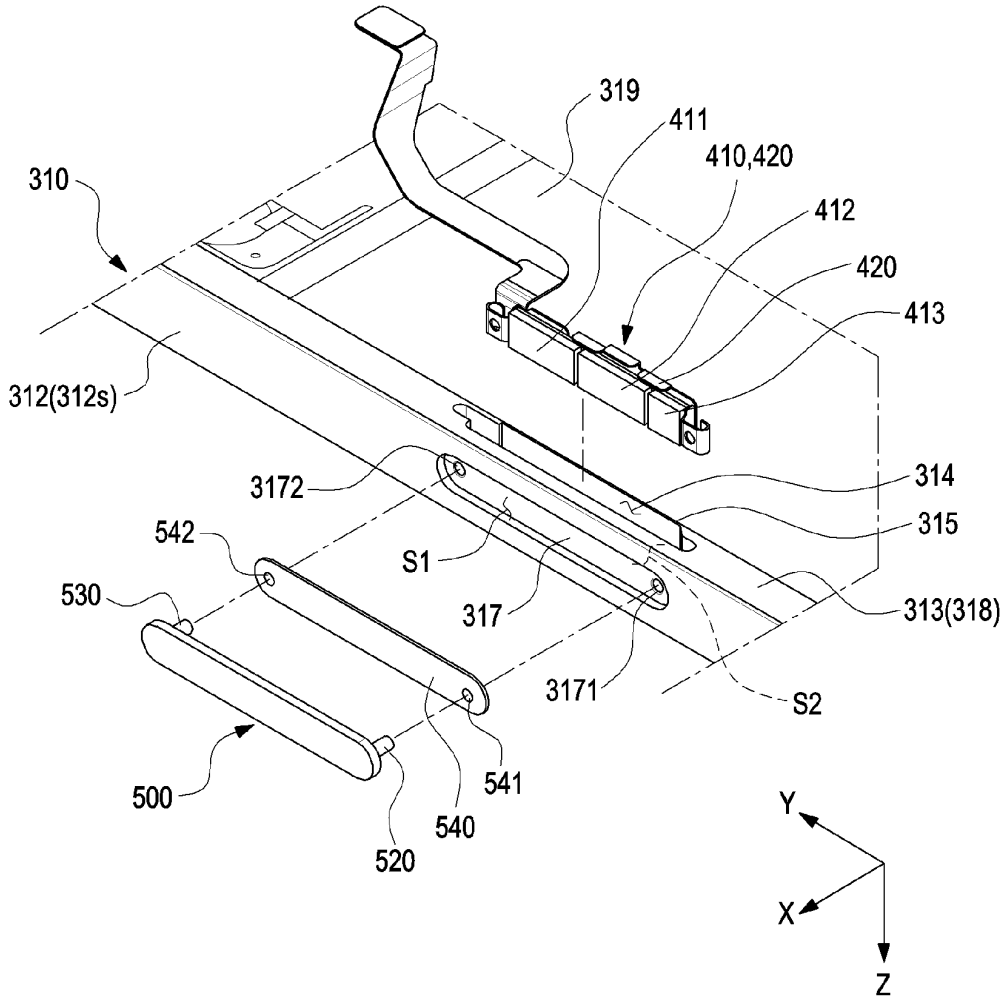
Publication Classification

(51) **Int. Cl.**
H01Q 1/24 (2006.01)
H01Q 9/04 (2006.01)
H01Q 9/16 (2006.01)

(52) **U.S. Cl.**
CPC ***H01Q 1/243*** (2013.01); *H01Q 9/0407* (2013.01); *H01Q 9/16* (2013.01)

(57) **ABSTRACT**

The disclosure relates to an electronic device. An electronic device according to an embodiment of the disclosure may include: a housing including a side wall, wherein the side wall includes a recess recessed from an outer surface of the side wall; a non-conductive cap disposed in the recess and including a protruding portion passing through the recess; an antenna module disposed opposite to the cap with respect to the recess and including at least one antenna element disposed to face the recess; and a bracket disposed inside the housing such that the antenna module is mounted thereon and including a coupling hole through which the protruding portion is inserted.



US 20250105496A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2025/0105496 A1**

DENG et al. (43) **Pub. Date: Mar. 27, 2025**

(54) **WEARABLE DEVICE**

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

(72) Inventors: **Ying-Cong DENG**, Taoyuan City (TW); **Chung-Ting HUNG**, Taoyuan City (TW); **Chin-Lung TSAI**, Taoyuan City (TW)

(21) Appl. No.: **18/398,358**

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

(30) **Foreign Application Priority Data**

Sep. 23, 2023 (TW) 11221033

Publication Classification

(51) **Int. Cl.**

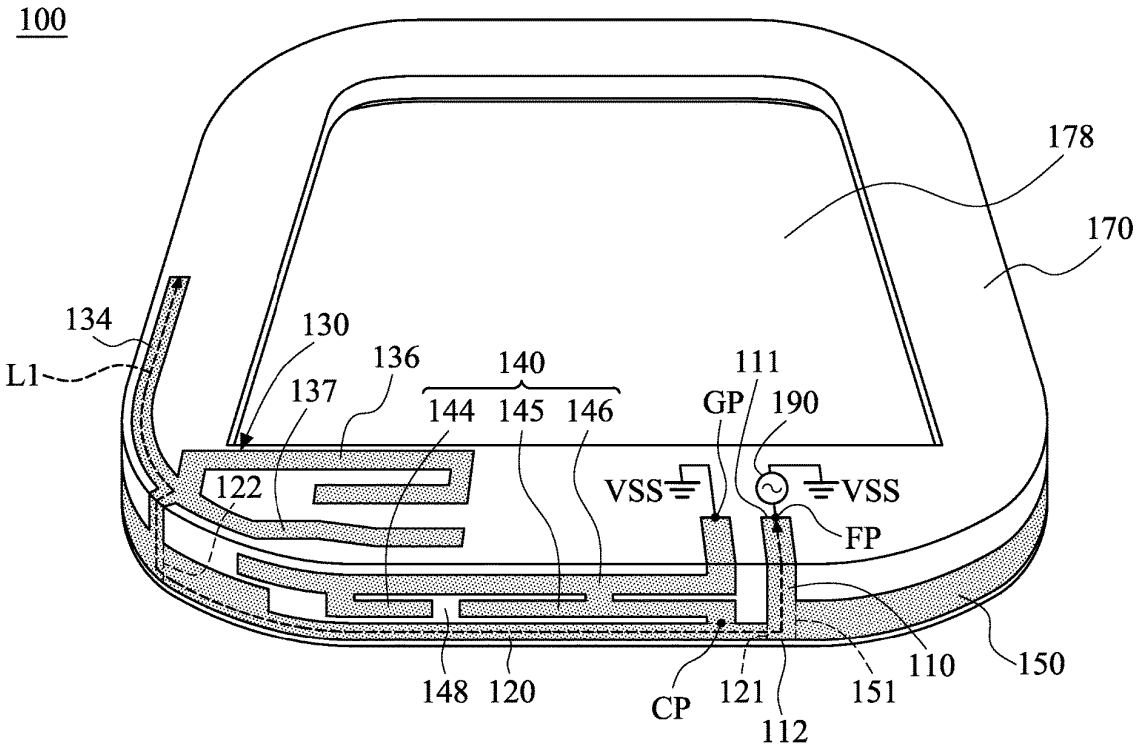
H01Q 1/27	(2006.01)
G04G 17/04	(2006.01)
H01Q 9/04	(2006.01)

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

CPC ***H01Q 1/273*** (2013.01); ***G04G 17/04*** (2013.01); ***H01Q 9/0421*** (2013.01)

(57) **ABSTRACT**

A wearable device includes a feeding radiation element, a connection radiation element, a bifurcate radiation element, a shorting radiation element, an extension radiation element, and a carrier element. The feeding radiation element has a feeding point. The connection radiation element is coupled to the feeding radiation element. The bifurcate radiation element is coupled to the connection radiation element. The connection radiation element is also coupled through the shorting radiation element to a grounding point. The extension radiation element is coupled to the feeding radiation element. The feeding radiation element, the connection radiation element, the bifurcate radiation element, the shorting radiation element, and the extension radiation element are disposed on the carrier element. An antenna structure is formed by the feeding radiation element, the connection radiation element, the bifurcate radiation element, the shorting radiation element, and the extension radiation element.



US 20250105500A1

(19) **United States**

(12) **Patent Application Publication**

(10) **Pub. No.: US 2025/0105500 A1**

(43) **Pub. Date: Mar. 27, 2025**

SUN et al.

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

(71) Applicant: **Wistron NeWeb Corporation**, Hsinchu (TW)

(72) Inventors: **Tzu-Kuan SUN**, Hsinchu (TW); **Hong-Jun JIAN**, Hsinchu (TW); **Hsiang-Chao LIU**, Hsinchu (TW)

(21) Appl. No.: **18/507,188**

(22) Filed: **Nov. 13, 2023**

(30) **Foreign Application Priority Data**

Sep. 23, 2023 (TW) 112136424

Publication Classification

(51) **Int. Cl.**

H01Q 1/44 (2006.01)

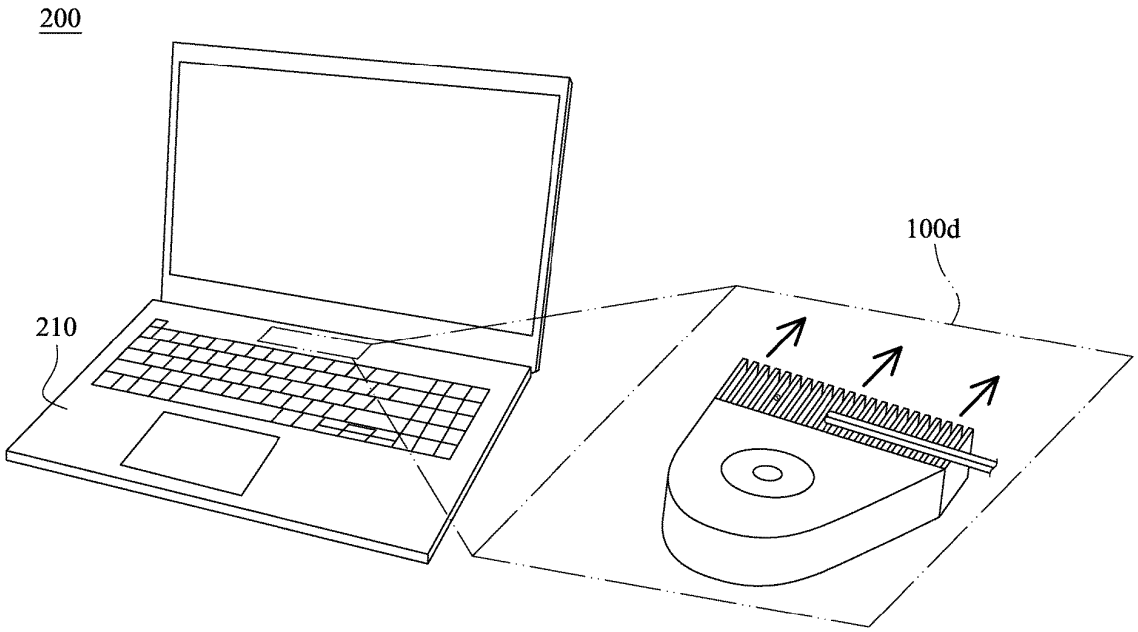
H05K 7/20 (2006.01)

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

CPC ***H01Q 1/44*** (2013.01); ***H05K 7/20336*** (2013.01); ***H05K 7/2039*** (2013.01)

(57) **ABSTRACT**

An antenna structure includes a heatsink and a feeding source. The heatsink includes a plurality of cooling fins and a metal connecting portion. The cooling fins are spaced apart from each other and have a same fin length. The metal connecting portion is connected to one end of each of the cooling fins. The feeding source is disposed on one side of the cooling fins and is signally connected to the heatsink by one of a direct feed type and a coupled feed type.



US 20250105506A1

(19) **United States**

(12) **Patent Application Publication**

(10) **Pub. No.: US 2025/0105506 A1**

(43) **Pub. Date: Mar. 27, 2025**

TOYAO

(54) **MULTI-RESONANT ANTENNA**

(71) Applicant: **JAPAN AVIATION ELECTRONICS INDUSTRY, LIMITED**, Tokyo (JP)

(72) Inventor: **Hiroshi TOYAO**, Tokyo (JP)

(73) Assignee: **JAPAN AVIATION ELECTRONICS INDUSTRY, LIMITED**, Tokyo (JP)

(21) Appl. No.: **18/820,746**

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

(30) **Foreign Application Priority Data**

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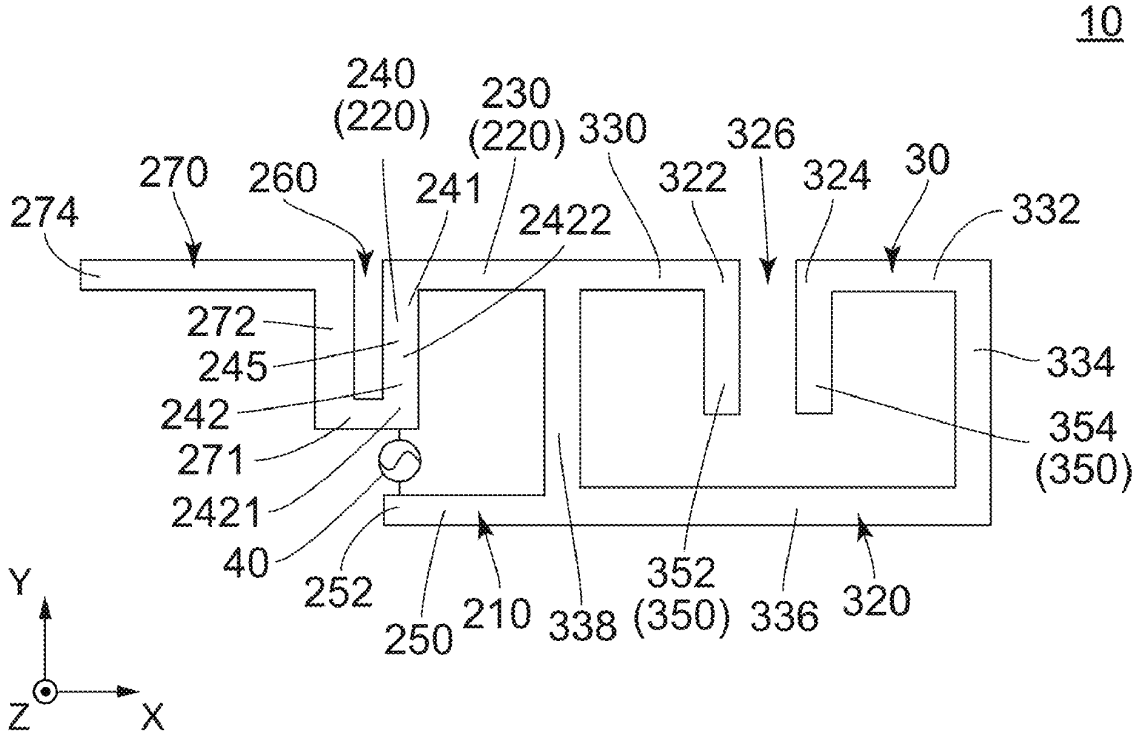
Publication Classification

(51) **Int. Cl.**
H01Q 5/10 (2015.01)
H01Q 5/35 (2015.01)

(52) **U.S. Cl.**
CPC ***H01Q 5/10*** (2015.01); ***H01Q 5/35*** (2015.01)

(57) **ABSTRACT**

A multi-resonant antenna comprises a main antenna and an additional radiation element. The main antenna comprises a main portion and a feeding portion. The main portion forms a split ring. The feeding portion extends outward of the main antenna from the main portion. The additional radiation element extends outward of the main antenna directly from the feeding portion.



US 20250105510A1

(19) **United States**

(12) **Patent Application Publication**

Zhang et al.

(10) **Pub. No.: US 2025/0105510 A1**

(43) **Pub. Date: Mar. 27, 2025**

(54) **ANTENNA AND ELECTRONIC DEVICE**

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

(72) Inventors: **Xiuyin Zhang**, Guangzhou (CN); **Di Pang**, Guangzhou (CN); **Huafeng Su**, Guangzhou (CN); **Huiliang Xu**, Shenzhen (CN)

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

(21) Appl. No.: **18/722,569**

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

(86) PCT No.: **PCT/CN2022/138413**

§ 371 (c)(1),
(2) Date: **Jun. 20, 2024**

(30) **Foreign Application Priority Data**

Jan. 17, 2022 (CN) 202210050320.2

Publication Classification

(51) **Int. Cl.**

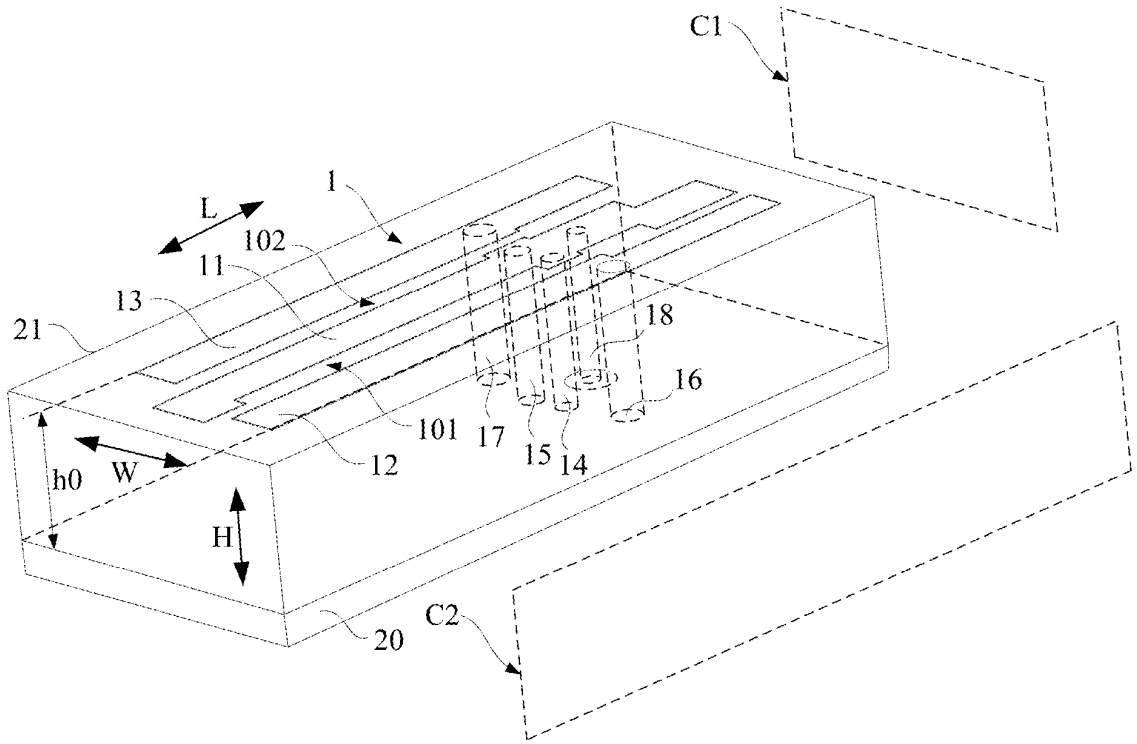
H01Q 5/328	(2015.01)
H01Q 3/26	(2006.01)
H01Q 13/08	(2006.01)

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

CPC ***H01Q 5/328*** (2015.01); ***H01Q 3/2611*** (2013.01); ***H01Q 13/08*** (2013.01)

(57) **ABSTRACT**

An antenna comprises a feeding element and a plurality of radiators including a first radiator, a second radiator, and a third radiator spaced from each other side by side in a first direction on a same plane. One end of the feeding element is connected to a feeding connection point of the first radiator, and the other end is connected to a feeding point. The antenna further includes a first ground element, a second ground element, a third ground element, and a fourth ground element that are spaced from each other in the first direction. A first gap is formed between the second radiator and the first radiator, and a second gap is formed between the third radiator and the first radiator.



US 20250105511A1

(19) **United States**

(12) **Patent Application Publication**

(10) **Pub. No.: US 2025/0105511 A1**

(43) **Pub. Date: Mar. 27, 2025**

Sakurai

(54) **ANTENNA COMPOSITE**

(71) Applicant: **Hirschmann Car Communication (Shanghai) Co. Ltd.**, Shanghai (CN)

(72) Inventor: **Yohei Sakurai**, Kanagawa (JP)

(21) Appl. No.: **18/730,859**

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

(86) PCT No.: **PCT/JP2023/001509**

§ 371 (c)(1),
(2) Date: **Jul. 22, 2024**

(30) **Foreign Application Priority Data**

Jan. 20, 2022 (JP) 2022-007282

Publication Classification

(51) **Int. Cl.**

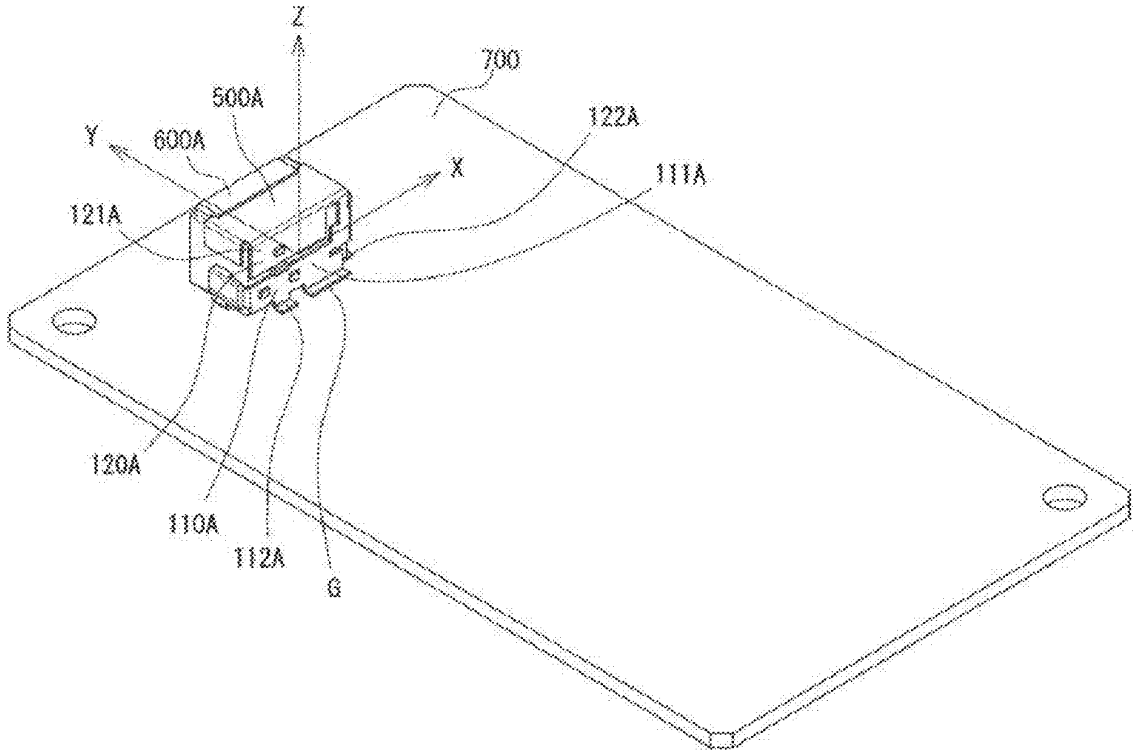
H01Q 5/328 (2015.01)
H01Q 1/48 (2006.01)
H01Q 9/04 (2006.01)

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

CPC ***H01Q 5/328*** (2015.01); ***H01Q 1/48*** (2013.01); ***H01Q 9/0421*** (2013.01)

(57) **ABSTRACT**

The present disclosure provides an antenna composite comprising two or more types of antennas of mutually different frequency bands, the antennas including a first antenna having a relatively high frequency band, and a second antenna combined with the first antenna and having a relatively low frequency band. The first antenna and the second antenna each comprise a single power-feeding unit, and mutually share a single grounding part.



US 20250105512A1

(19) **United States**

(12) **Patent Application Publication**

ZHU et al.

(10) **Pub. No.: US 2025/0105512 A1**

(43) **Pub. Date: Mar. 27, 2025**

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

(71) Applicant: **Wistron NeWeb Corporation**, Hsinchu (TW)

(72) Inventors: **Jia-Le ZHU**, Hsinchu (TW); **Ching-Wen CHEN**, Hsinchu (TW); **Cheng-Wei CHIANG**, Hsinchu (TW); **Wen-Pin HO**, Hsinchu (TW)

(21) Appl. No.: **18/888,198**

(22) Filed: **Sep. 18, 2024**

(30) **Foreign Application Priority Data**

Sep. 22, 2023 (TW) 112136237

Publication Classification

(51) **Int. Cl.**

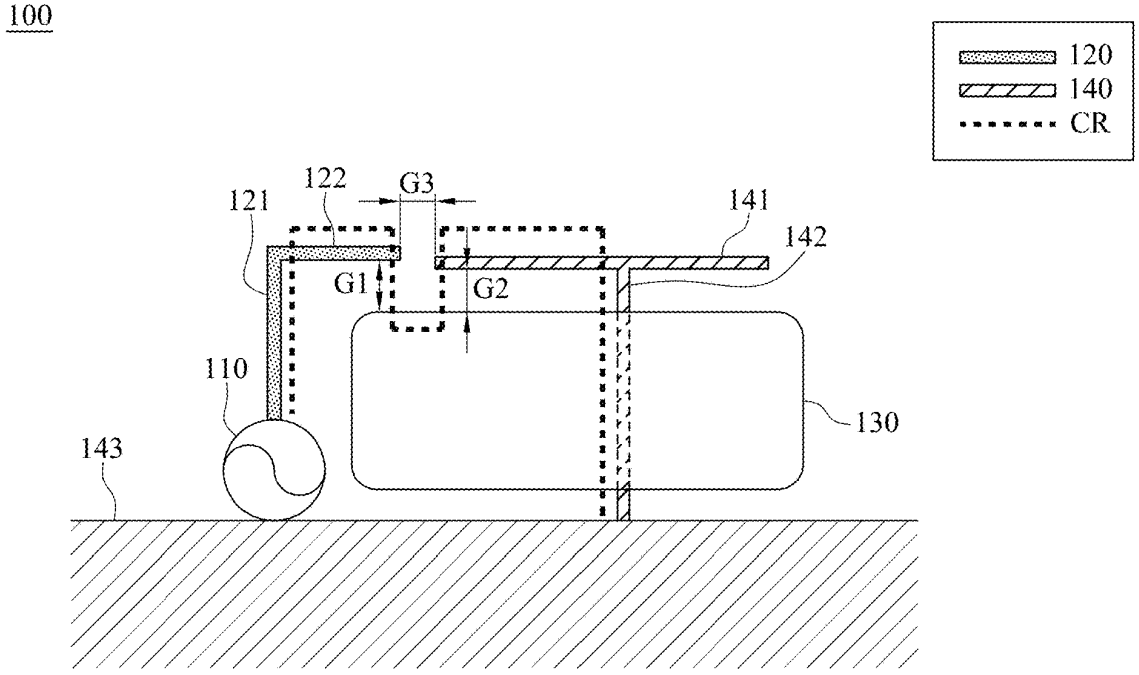
H01Q 5/328 (2015.01)
H01Q 5/48 (2015.01)
H01Q 9/04 (2006.01)

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

CPC ***H01Q 5/328*** (2015.01); ***H01Q 5/48*** (2015.01); ***H01Q 9/0407*** (2013.01)

(57) **ABSTRACT**

An antenna structure and an electronic device are provided. The antenna structure includes a feeding source, a main radiation portion, a metal portion, and a grounding portion. The main radiation portion is signally connected to the feeding source. There is a first gap between the metal portion and the main radiation portion. There is a second gap between the grounding portion and the metal portion, and there is a third gap between the grounding portion and the main radiation portion. The main radiation portion couples with the metal portion via the first gap, and the grounding portion couples with the metal portion via the second gap.



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(19) **United States**

(12) **Patent Application Publication**

(10) **Pub. No.: US 2025/0105514 A1**

(43) **Pub. Date: Mar. 27, 2025**

IINO

(54) **HALF-WAVELENGTH ANTENNA DEVICE AND LOW-PROFILE ANTENNA DEVICE USING SAME**

(71) Applicant: **HARADA INDUSTRY CO., LTD.**, Tokyo (JP)

(72) Inventor: **Shinji IINO**, Shinagawa-ku, Tokyo (JP)

(21) Appl. No.: **18/709,435**

(22) PCT Filed: **Nov. 9, 2022**

(86) PCT No.: **PCT/JP2022/041638**

§ 371 (c)(1),
(2) Date: **Dec. 5, 2024**

(30) **Foreign Application Priority Data**

Nov. 16, 2021 (JP) 2021-186311

Publication Classification

(51) **Int. Cl.**

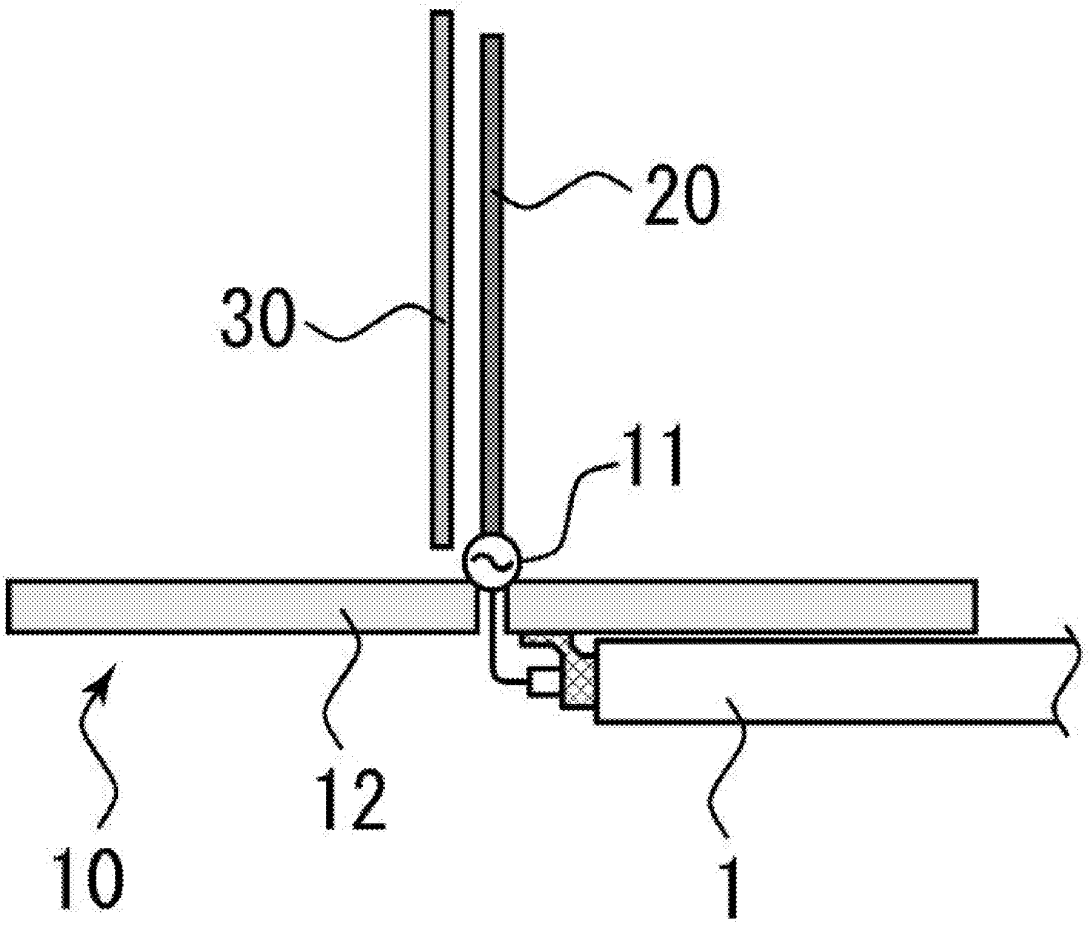
H01Q 5/378	(2015.01)
H01Q 9/32	(2006.01)
H01Q 9/40	(2006.01)
H01Q 19/26	(2006.01)
H01Q 21/30	(2006.01)

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

CPC ***H01Q 5/378*** (2015.01); ***H01Q 9/32*** (2013.01); ***H01Q 9/40*** (2013.01); ***H01Q 19/26*** (2013.01); ***H01Q 21/30*** (2013.01)

(57) **ABSTRACT**

To provide a small-sized half-wavelength antenna device capable of adjusting directivity. A half-wavelength antenna device for a vehicle includes: a conductive plate **10**; a half-wavelength element **20**; and a parasitic element **30**. The conductive plate **10** has a feeding part **11** and a ground **12**. The half-wavelength element **20** is vertically installed on the conductive plate **10** so as to be connected to the feeding part **11** but insulated from the ground **12**. The parasitic element **30** is disposed in proximity and parallel to the half-wavelength element **20** so as to be electromagnetically coupled thereto but insulated from the ground **12**.



US 20250105515A1

(19) **United States**

(12) **Patent Application Publication**

(10) **Pub. No.: US 2025/0105515 A1**

(43) **Pub. Date: Mar. 27, 2025**

TEZUKA et al.

(54) **ANTENNA AND DISPLAY DEVICE**

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

(72) Inventors: **Kenichi TEZUKA**, Tokyo (JP); **Mei FUKAYA**, Tokyo (JP)

(73) Assignee: **TDK CORPORATION**, Tokyo (JP)

(21) Appl. No.: **18/724,918**

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

(86) PCT No.: **PCT/JP2022/048366**

§ 371 (c)(1),
(2) Date: **Jun. 27, 2024**

(30) **Foreign Application Priority Data**

Dec. 28, 2021 (JP) 2021-214184

Publication Classification

(51) **Int. Cl.**

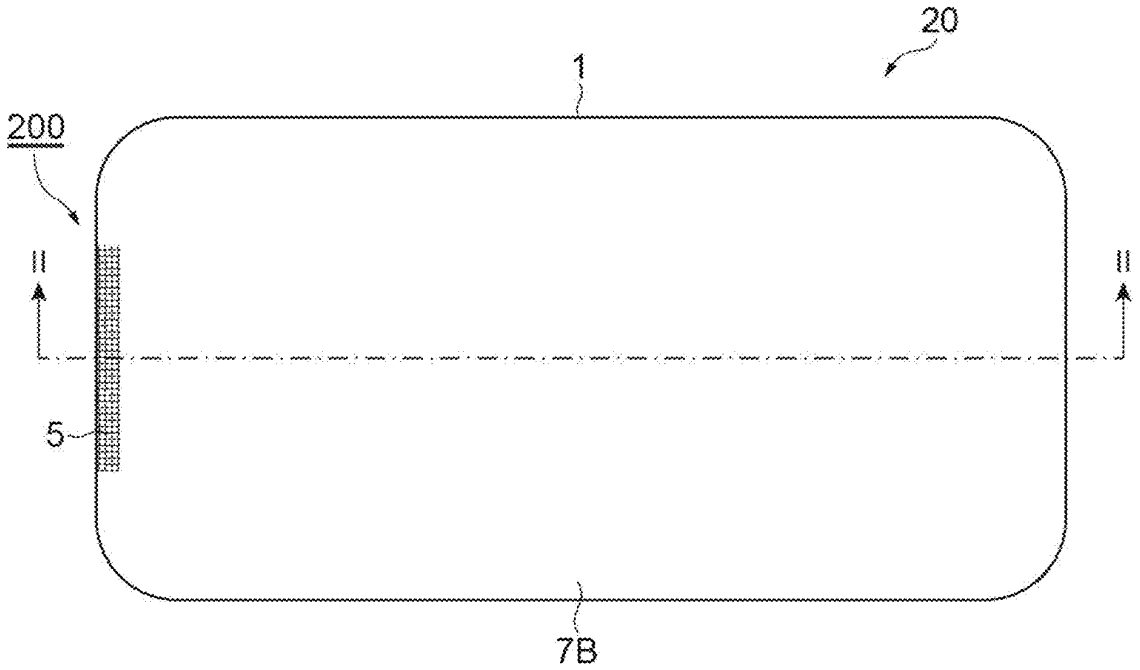
H01Q 5/378	(2015.01)
H01Q 1/38	(2006.01)
H01Q 13/08	(2006.01)

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

CPC ***H01Q 5/378*** (2015.01); ***H01Q 1/38*** (2013.01); ***H01Q 13/08*** (2013.01)

(57) **ABSTRACT**

An antenna includes a radiation conductor having a circular shape, a feed line configured to feed power to the radiation conductor, and a terminal connected to the feed line, in which impedance of the feed line is greater than impedance of a feed point of the terminal, and a line length of the feed line is longer than a radius of the radiation conductor.



US 20250105517A1

(19) **United States**

(12) **Patent Application Publication**

CHOI et al.

(10) **Pub. No.: US 2025/0105517 A1**

(43) **Pub. Date: Mar. 27, 2025**

(54) **ELECTRONIC DEVICE COMPRISING ANTENNA**

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

(72) Inventors: **Sanghoon CHOI**, Suwon-si (KR); **Youngjung Kim**, Suwon-si (KR); **Jonghoon Kim**, Suwon-si (KR); **Dongjun Oh**, Suwon-si (KR); **Himchan Yun**, Suwon-si (KR); **Youngsung Lee**, Suwon-si (KR); **Aro Cheon**, Suwon-si (KR)

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

(21) Appl. No.: **18/903,650**

(22) Filed: **Oct. 1, 2024**

Related U.S. Application Data

(63) Continuation of application No. PCT/KR2024/013356, filed on Sep. 4, 2024.

(30) **Foreign Application Priority Data**

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Nov. 2, 2023 (KR) 10-2023-0150359

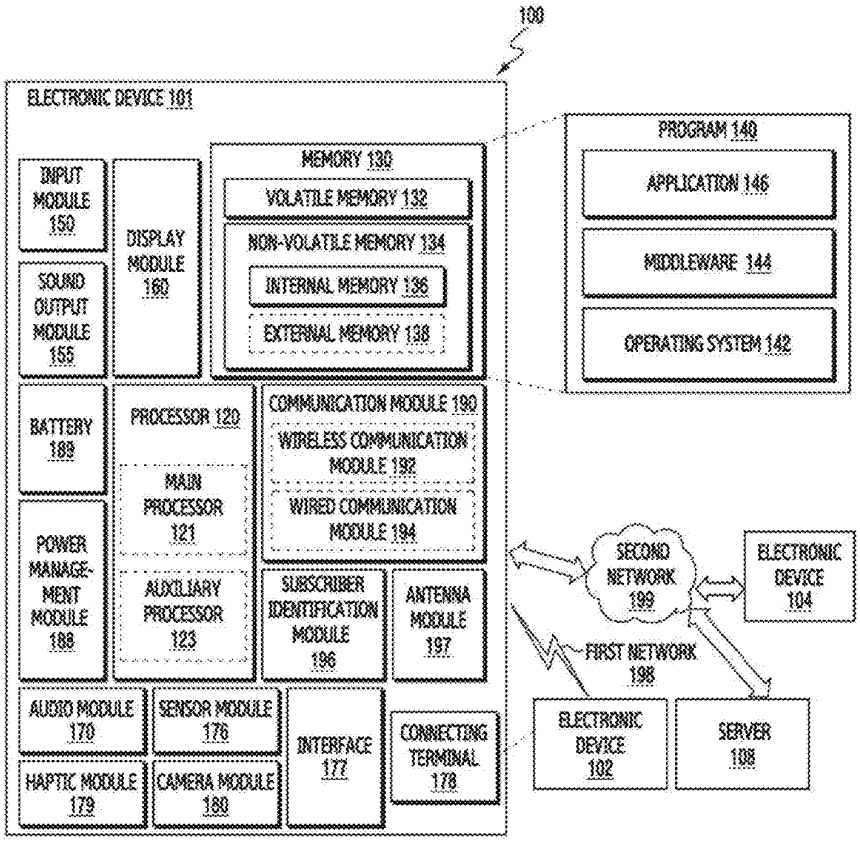
Publication Classification

(51) **Int. Cl.**
H01Q 5/50 (2015.01)
H01Q 1/50 (2006.01)

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

(57) **ABSTRACT**

An electronic device includes: a conductive portion; a printed circuit board having a first ground path, a second ground path, and a feed path; and a wireless communication circuit on the printed circuit board. The conductive portion includes a feed point, a first ground point, and a second ground point. The first ground point is connected to a ground of the electronic device through the first ground path. The second ground point is connected to the ground through the second ground path. The feed point is electrically connected to the wireless communication circuit through the feed path. The printed circuit board includes a conductive pattern connected between the feed path and the first ground path. The wireless communication circuit is configured to supply a signal, through the feed path, to the conductive portion and the conductive pattern. The signal is radiated through the conductive portion and the conductive pattern.



US 20250112354A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2025/0112354 A1**

Amjadi et al. (43) **Pub. Date: Apr. 3, 2025**

(54) **ELECTRONIC DEVICE HAVING SUPPORT PLATE ANTENNA**

(71) Applicant: **Apple Inc.**, Cupertino, CA (US)

(72) Inventors: **Seyed Mohammad Amjadi**, Santa Clara, CA (US); **Yiren Wang**, Cupertino, CA (US); **Sidharath Jain**, Redwood City, CA (US); **Victor C Lee**, Santa Clara, CA (US); **Mattia Pascolini**, San Francisco, CA (US); **Alden T Rush**, San Diego, CA (US); **Yuan Tao**, Santa Clara, CA (US); **Hao Xu**, Cupertino, CA (US); **Carlo Di Nallo**, Belmont, CA (US)

(21) Appl. No.: **18/477,872**

(22) Filed: **Sep. 29, 2023**

Publication Classification

(51) **Int. Cl.**

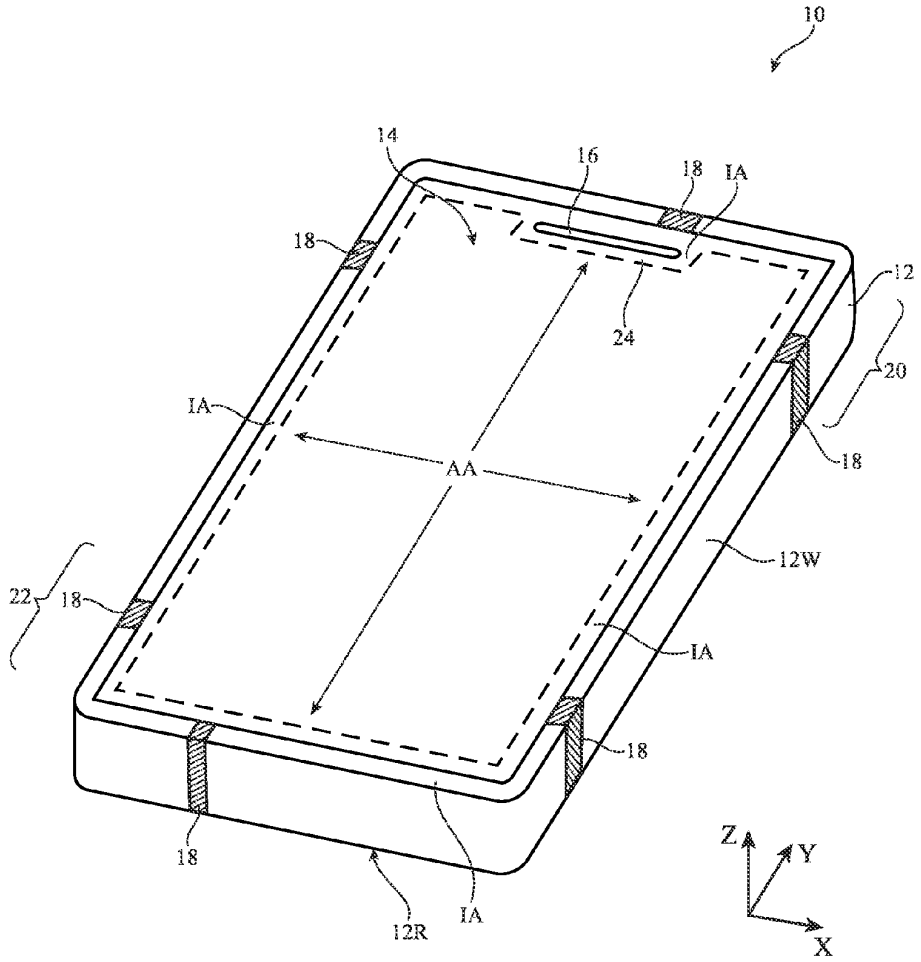
H01Q 1/22	(2006.01)
H01Q 1/42	(2006.01)
H01Q 13/10	(2006.01)

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

CPC ***H01Q 1/22*** (2013.01); ***H01Q 1/42*** (2013.01); ***H01Q 13/10*** (2013.01)

(57) **ABSTRACT**

An electronic device may be provided with peripheral conductive housing structures and a rear housing wall. The electronic device may have a display mounted to the peripheral conductive housing structures opposite the rear housing wall. The rear housing wall may have a dielectric cover layer and a conductive support plate that extends along the dielectric cover layer. The electronic device may have an antenna that radiates through the dielectric cover layer. The antenna may have a slot antenna resonating element that includes a first slot between the support plate and the peripheral structures and may include a second slot extending from the first slot into the support plate. A conductive interconnect may couple the support plate to the peripheral conductive housing structures at an end of the first slot. The antenna may be fed at a feed protrusion that extends into the second slot.



US 20250118893A1

(19) **United States**

(12) **Patent Application Publication**

(10) **Pub. No.: US 2025/0118893 A1**

(43) **Pub. Date: Apr. 10, 2025**

SEO et al.

(54) **ELECTRONIC DEVICE COMPRISING ANTENNA**

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

(72) Inventors: **Pilwon SEO**, Suwon-si (KR); **Seonguk PARK**, Suwon-si (KR); **Seokwoo LEE**, Suwon-si (KR); **Junhee HAN**, Suwon-si (KR); **Jiyoung KIM**, Suwon-si (KR); **Jeongseob KIM**, Suwon-si (KR)

(21) Appl. No.: **18/982,370**

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

Related U.S. Application Data

(63) Continuation of application No. PCT/KR2023/008548, filed on Jun. 20, 2023.

(30) **Foreign Application Priority Data**

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Aug. 4, 2022 (KR) 10-2022-0097440

Publication Classification

(51) **Int. Cl.**

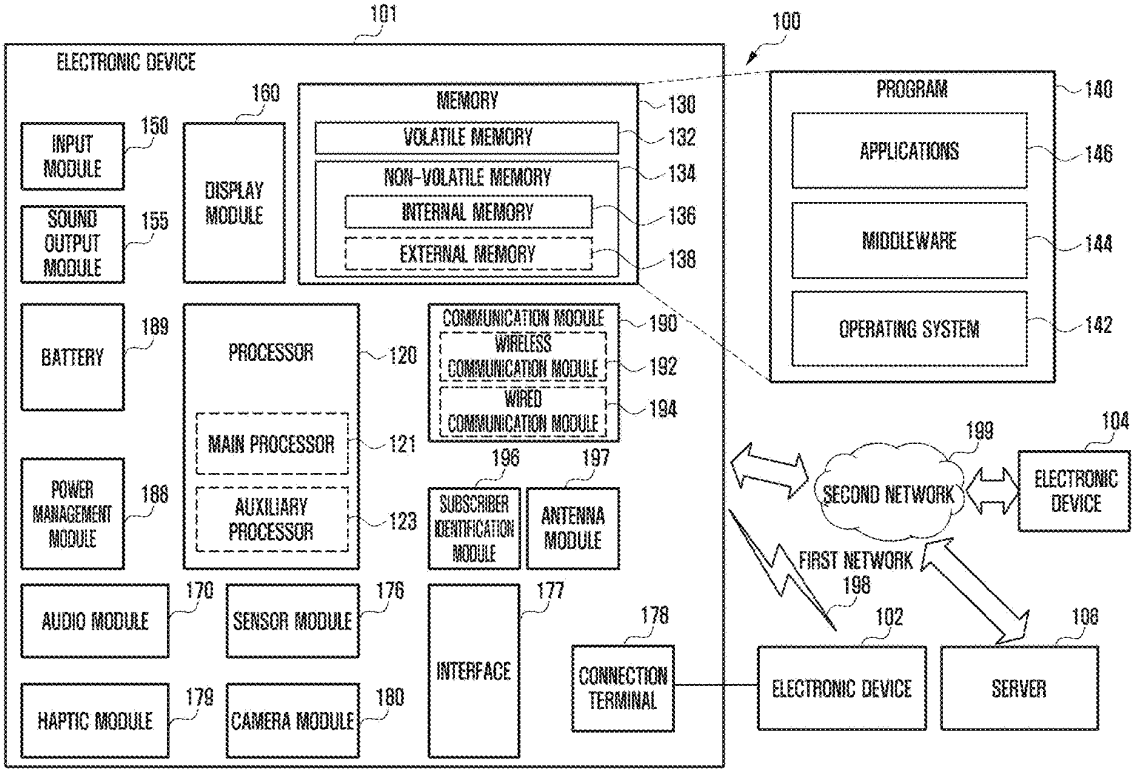
H01Q 3/02 (2006.01)
G06F 1/16 (2006.01)
H01Q 1/24 (2006.01)

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

CPC ***H01Q 3/02*** (2013.01); ***H01Q 1/243*** (2013.01); *G06F 1/1641* (2013.01)

(57) **ABSTRACT**

An electronic is provided. The electronic device includes a first housing, a second housing rotatably connected to the first housing, a display disposed on the front surface of the electronic device and having a partial area configured to be deformed by a rotation of the second housing relative to the first housing, a first antenna module disposed on one of the first housing and the second housing so that a communication signal is radiated in a direction identical to a direction in which the display faces the outside of the electronic device, and a radiation part included in the other or the first housing and the second housing and including an internal space that faces the first antenna module in a state in which the electronic device is folded so that the first housing and the second housing face each other, wherein the first antenna module transmits or receives the communication signal in a designated frequency band through the radiation part.



US 20250123697A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2025/0123697 A1**

Leung et al. (43) **Pub. Date: Apr. 17, 2025**

(54) **STYLUS ANTENNA**

(71) Applicant: **Apple Inc.**, Cupertino, CA (US)

(72) Inventors: **Brandon Y Leung**, San Jose, CA (US); **Zhe Zhang**, Santa Clara, CA (US); **Caleb J Flori**, Cupertino, CA (US); **Lu Zhang**, Shanghai (CN); **Stephen J Marrone**, San Francisco, CA (US); **Harish Rajagopalan**, San Jose, CA (US); **Colin J Abraham**, Mountain View, CA (US); **Kevin Bui**, San Jose, CA (US); **Stephanie Chou**, San Francisco, CA (US)

(21) Appl. No.: **18/487,471**

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

Publication Classification

(51) **Int. Cl.**

G06F 3/0354 (2013.01)

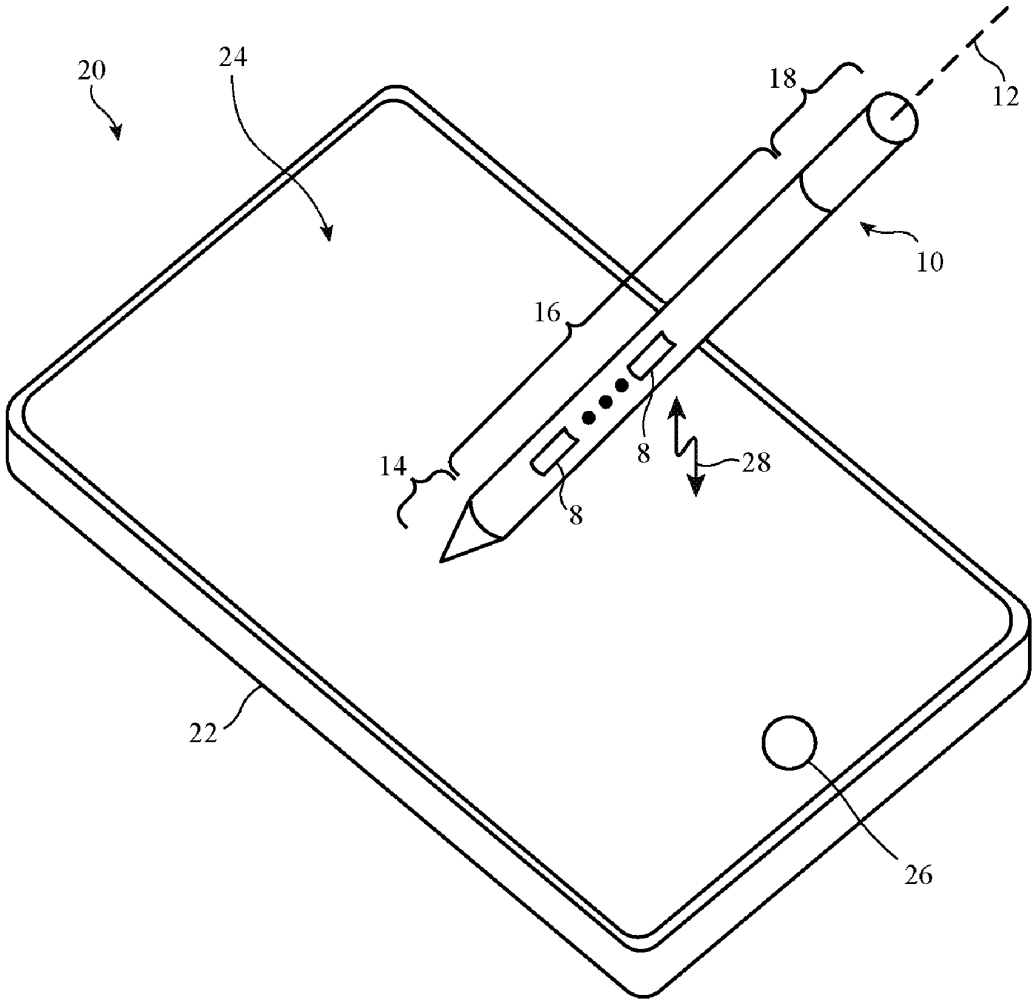
H01Q 1/22 (2006.01)

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

CPC ***G06F 3/03545*** (2013.01); ***H01Q 1/22*** (2013.01)

(57) **ABSTRACT**

A computer stylus may have a shaft with a metal tube and a cap slidable between open and closed positions. A connector port may be exposed in the open position and hidden in the closed position. An antenna element may be formed from conductive traces on a printed circuit board in the shaft and aligned with a window in the metal tube. The cap may include a metal hook extending from a conductive wall into the shaft. The hook may overlap the antenna element in the closed position. The shaft may include a dielectric bumper in an opening of the hook. The hook and wall may slide relative to the shaft along the dielectric bumper. The cap may include a metal sleeve around the port. The cap may include a conductive bumper on the wall. The conductive bumper may contact the sleeve when the cap is in the closed position.



US 20250124249A1

(19) **United States**

(12) **Patent Application Publication**

(10) **Pub. No.: US 2025/0124249 A1**

(43) **Pub. Date: Apr. 17, 2025**

ARAO

(54) **ANTENNA PATTERN AND RFID INLAY**

(71) Applicant: **SATO HOLDINGS KABUSHIKI KAISHA**, Tokyo (JP)

(72) Inventor: **Yuichi ARAO**, Tokyo (JP)

(73) Assignee: **SATO HOLDINGS KABUSHIKI KAISHA**, Tokyo (JP)

(21) Appl. No.: **18/834,909**

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

(86) PCT No.: **PCT/JP2022/043862**

§ 371 (c)(1),
(2) Date: **Jul. 31, 2024**

(30) **Foreign Application Priority Data**

Feb. 8, 2022 (JP) 2022-018039

Publication Classification

(51) **Int. Cl.**
G06K 19/077 (2006.01)
H01Q 1/22 (2006.01)

(52) **U.S. Cl.**
CPC ***G06K 19/07786*** (2013.01); ***H01Q 1/2225*** (2013.01)

(57) **ABSTRACT**

An aspect of the present invention is an antenna pattern used in a UHF-band RFID inlay. The antenna pattern includes a first element and a second element. The first element is formed to include a loop portion and an emission portion. The loop portion includes a pair of electric power supply portions. The emission portion is connected to the loop portion, and extends line-symmetrically from the loop portion. The emission portion operates as a dipole antenna to emit a radio wave whose half wavelength is a first length. The second element is formed apart from the first element. The second element operates as a dipole antenna by electromagnetic coupling with the first element to emit a radio wave whose half wavelength is a second length. The second length is different from the first length.

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(19) **United States**

(12) **Patent Application Publication**

(10) **Pub. No.: US 2025/0125516 A1**

(43) **Pub. Date: Apr. 17, 2025**

YAO et al.

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

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

(72) Inventors: **DE-SHAO YAO**, HSINCHU (TW); **CHIH-FENG TAI**, HSINCHU (TW)

(21) Appl. No.: **18/650,543**

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

(30) **Foreign Application Priority Data**

Oct. 11, 2023 (TW) 112138655

Publication Classification

(51) **Int. Cl.**

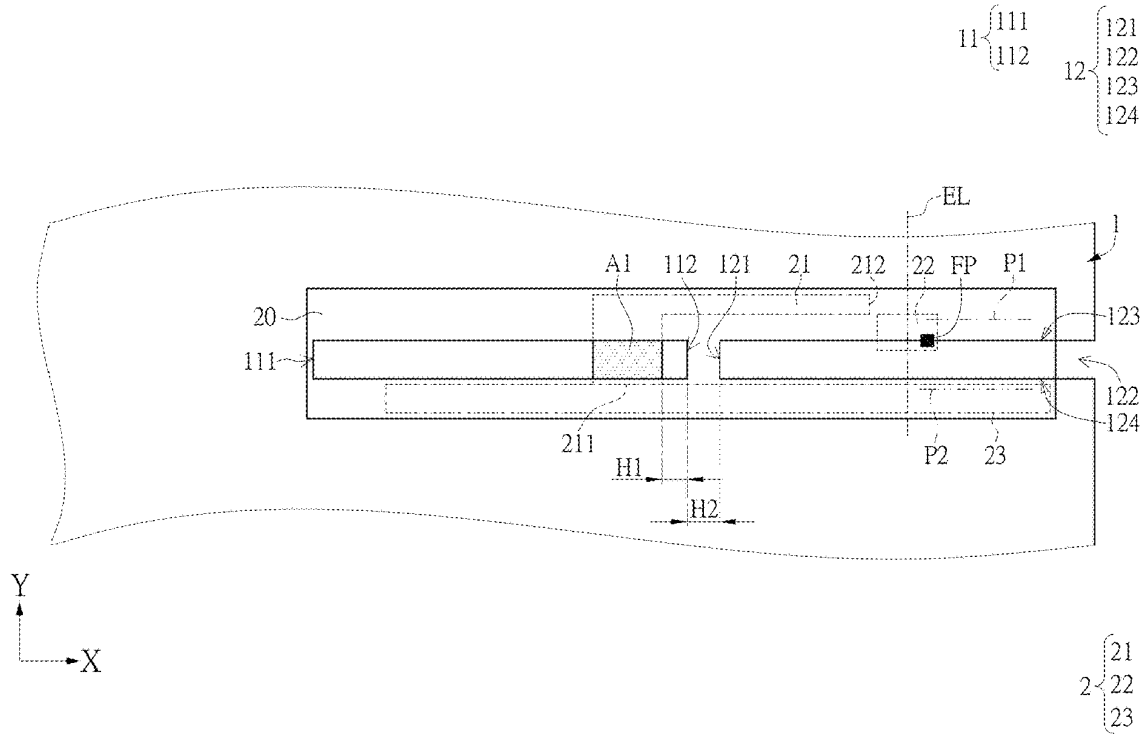
H01Q 1/22	(2006.01)
H01Q 1/48	(2006.01)
H01Q 5/307	(2015.01)
H01Q 13/10	(2006.01)
H01Q 21/06	(2006.01)

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

CPC ***H01Q 1/2266*** (2013.01); ***H01Q 1/48*** (2013.01); ***H01Q 5/307*** (2015.01); ***H01Q 13/10*** (2013.01); ***H01Q 21/06*** (2013.01)

(57) **ABSTRACT**

An electronic device includes a housing and an antenna structure. The housing includes a first slot and a second slot. The first slot and the second slot extend along a same direction. The first slot has a first closed end and a second closed end. The second slot has a third closed end and an open end. The antenna structure is disposed in the housing. The antenna structure includes a grounding element, a first radiating element, and a second radiating element. The first radiating element has a first end and a second end, the first end is connected to the grounding element, and the second end is located between the third closed end and the open end. An orthogonal projection of the first radiating element that is projected onto the housing overlaps with and crosses on the first slot.



US 20250125517A1

(19) **United States**

(12) **Patent Application Publication**

(10) **Pub. No.: US 2025/0125517 A1**

(43) **Pub. Date: Apr. 17, 2025**

LIEN et al.

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

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

(72) Inventors: **CHUNG-CHE LIEN**, HSINCHU (TW); **TZU-KUAN SUN**, HSINCHU (TW); **TING-HAN SHIH**, HSINCHU (TW); **CHIA-HAO CHANG**, HSINCHU (TW)

(21) Appl. No.: **18/763,353**

(22) Filed: **Jul. 3, 2024**

(30) **Foreign Application Priority Data**

Oct. 17, 2023 (TW) 112139478

Publication Classification

(51) **Int. Cl.**

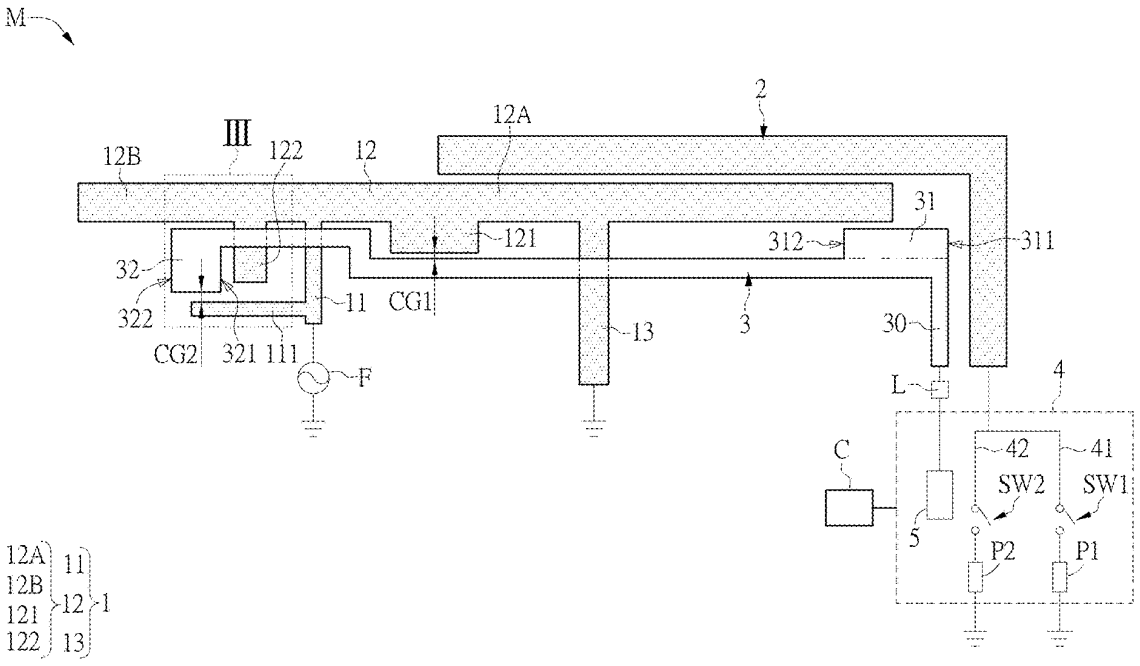
H01Q 1/22 (2006.01)
H01Q 1/27 (2006.01)
H01Q 1/42 (2006.01)
H01Q 9/16 (2006.01)

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

CPC ***H01Q 1/2266*** (2013.01); ***H01Q 1/27*** (2013.01); ***H01Q 1/42*** (2013.01); ***H01Q 9/16*** (2013.01)

(57) **ABSTRACT**

An electronic device includes a housing and an antenna module. The antenna module is disposed in the housing. The antenna module includes a first radiating element, a switching circuit, a proximity sensing circuit, a second radiating element, and a third radiating element. The first radiating element includes a feeding portion, a radiating portion, and a grounding portion. The feeding portion and the grounding portion are connected to the radiating portion. The second radiating element is electrically connected to the switching circuit. The second radiating element and the radiating portion are separated from and coupled with each other. The third radiating element is electrically connected to the proximity sensing circuit. The third radiating element and the second radiating element are separated from each other, and the third radiating element and the radiating portion are separated from and coupled with each other.



US 20250125538A1

(19) **United States**

(12) **Patent Application Publication**

(10) **Pub. No.: US 2025/0125538 A1**

(43) **Pub. Date: Apr. 17, 2025**

JO et al.

(54) **ELECTRONIC DEVICE INCLUDING ANTENNA**

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

(72) Inventors: **Jaehoon JO**, Suwon-si (KR); **Hojung NAM**, Suwon-si (KR); **Sungkoo PARK**, Suwon-si (KR); **Kyungjae LEE**, Suwon-si (KR); **Kookjoo LEE**, Suwon-si (KR); **Soonho HWANG**, Suwon-si (KR)

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

(21) Appl. No.: **18/986,127**

(22) Filed: **Dec. 18, 2024**

Related U.S. Application Data

(63) Continuation of application No. PCT/KR2024/015429, filed on Oct. 11, 2024.

(30) **Foreign Application Priority Data**

Oct. 12, 2023 (KR) 10-2023-0135975
Jan. 23, 2024 (KR) 10-2024-0010353

Publication Classification

(51) **Int. Cl.**

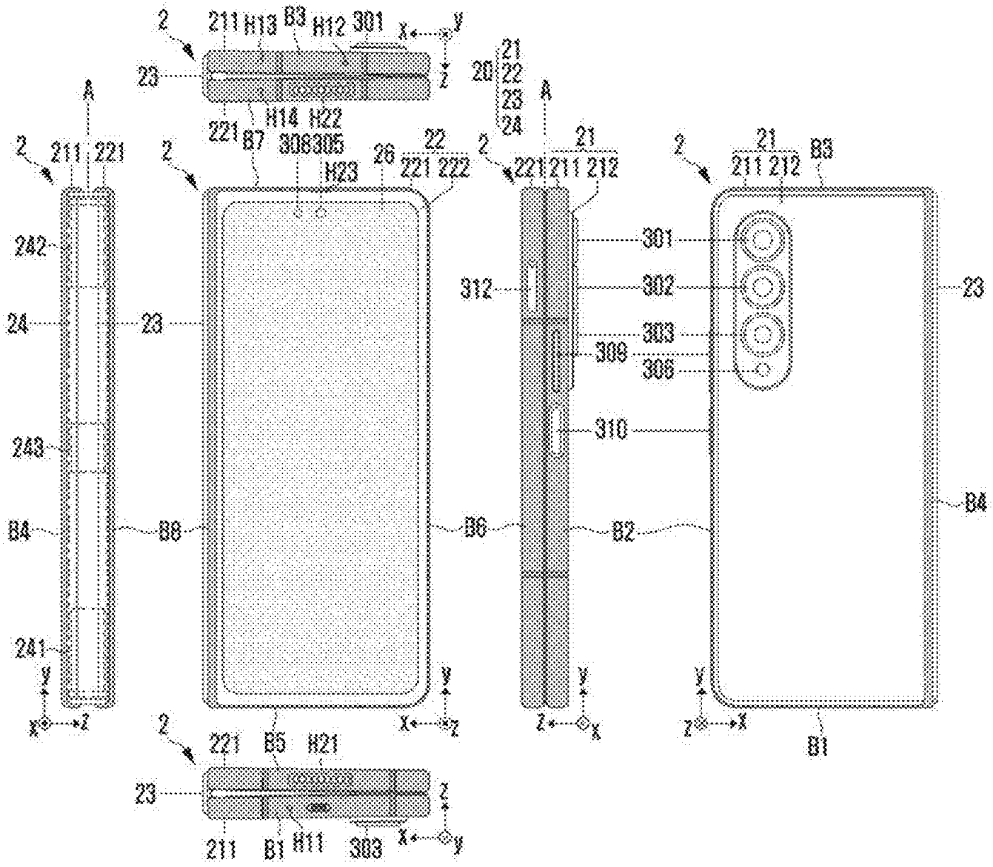
H01Q 21/06	(2006.01)
H01Q 1/24	(2006.01)
H01Q 1/42	(2006.01)
H05K 1/14	(2006.01)

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

CPC ***H01Q 21/064*** (2013.01); ***H01Q 1/241*** (2013.01); ***H01Q 1/42*** (2013.01); ***H05K 1/147*** (2013.01)

(57) **ABSTRACT**

A foldable electronic device includes a first housing including a first rear cover and a first bracket, a second housing including a second rear cover and a second bracket, a hinge module rotatably interconnecting the first housing and the second housing, a hinge cover coupled to the hinge module, and a wireless communication circuit. A first slot is formed in a conductive area of the first bracket. In a direction orthogonal to the first rear cover, at least a portion of the first slot overlaps the hinge cover in an unfolded state of the foldable electronic device. The wireless communication circuit is configured to transmit, receive, or transmit and receive a signal of a predetermined frequency band through the first slot formed in the conductive area of the first bracket.



US 20250132486A1

(19) **United States**

(12) **Patent Application Publication**

PUDENZ

(10) **Pub. No.: US 2025/0132486 A1**

(43) **Pub. Date: Apr. 24, 2025**

(54) **ANTENNA ARRANGEMENT FOR RECEIVING AND TRANSMITTING ELECTROMAGNETIC WAVES OF DIFFERENT POLARIZATION**

(71) Applicant: **SICK AG**, Waldkirch (DE)

(72) Inventor: **Florian PUDENZ**, Hamburg (DE)

(21) Appl. No.: **18/904,524**

(22) Filed: **Oct. 2, 2024**

(30) **Foreign Application Priority Data**

Oct. 18, 2023 (EP) 23204364.6

Publication Classification

(51) **Int. Cl.**

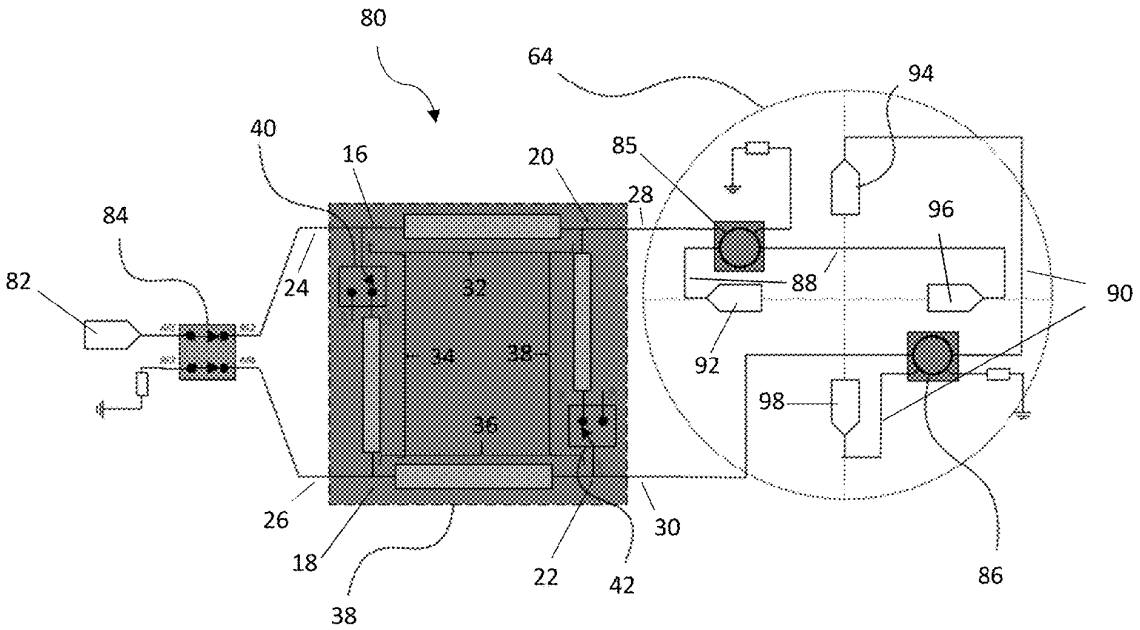
H01Q 1/22	(2006.01)
H01Q 9/04	(2006.01)
H01Q 21/24	(2006.01)

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

CPC ***H01Q 1/2208*** (2013.01); ***H01Q 9/0428*** (2013.01); ***H01Q 21/24*** (2013.01)

(57) **ABSTRACT**

An antenna arrangement for receiving and transmitting electromagnetic waves of different polarization includes an antenna that has at least two feed points arranged spaced apart. The antenna arrangement includes a signal input for a high-frequency input signal and a coupler circuit coupled to the signal input. The coupler circuit includes a first coupler input connected to a first node; a second coupler input connected to a second node; a first coupler output connected to a third node; and a second coupler output connected to a fourth node. The first and third node are electrically coupled to one another via a first line, the second and fourth node are electrically coupled to one another via a third line, a first switching apparatus can electrically couple the first and second node via a second line and a second switching apparatus can electrically couple the third and fourth node via a fourth line.



US 20250132487A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2025/0132487 A1**

Khan (43) **Pub. Date: Apr. 24, 2025**

(54) **MULTI-BAND CONFORMAL SLOT ANTENNAS AND RELATED DEVICES**

(71) Applicant: **Sensus Spectrum, LLC**, Morrisville, NC (US)

(72) Inventor: **Zafarullah Khan**, Kenner, LA (US)

(21) Appl. No.: **18/492,207**

(22) Filed: **Oct. 23, 2023**

Publication Classification

(51) **Int. Cl.**

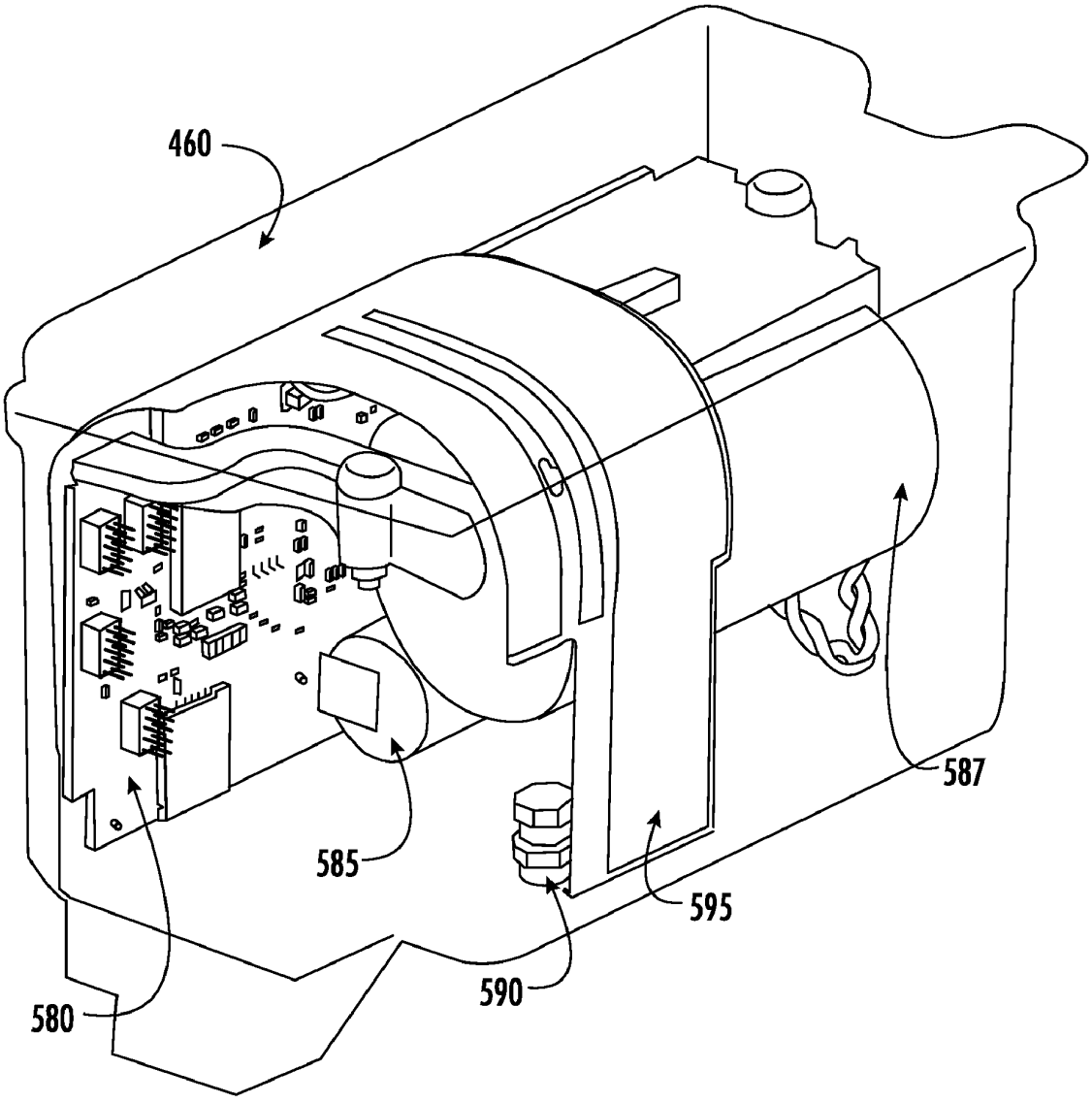
H01Q 1/22	(2006.01)
G01D 4/00	(2006.01)
H01Q 13/10	(2006.01)

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

CPC ***H01Q 1/2233*** (2013.01); ***G01D 4/002*** (2013.01); ***H01Q 13/10*** (2013.01)

(57) **ABSTRACT**

A multi-band conformal slot antenna is provided. The multi-band conformal slot antenna includes an antenna ground plane including two or more radiating slots of substantially equal length therein. The antenna ground plane has a length L and a width W of the antenna ground plane. The antenna ground plane includes a flexible material that bends into a form factor that allows the multi-band conformal slot antenna to be positioned in an enclosure that has a length less than the length L of the antenna ground plane.



US 20250132488A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2025/0132488 A1**

CHANG et al. (43) **Pub. Date: Apr. 24, 2025**

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

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

(72) Inventors: **CHIA-HAO CHANG**, HSINCHU (TW); **CHUNG-CHE LIEN**, HSINCHU (TW); **TING-HAN SHIH**, HSINCHU (TW); **TZU-KUAN SUN**, HSINCHU (TW)

(21) Appl. No.: **18/916,886**

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

(30) **Foreign Application Priority Data**

Oct. 19, 2023 (TW) 112139871

Publication Classification

(51) **Int. Cl.**

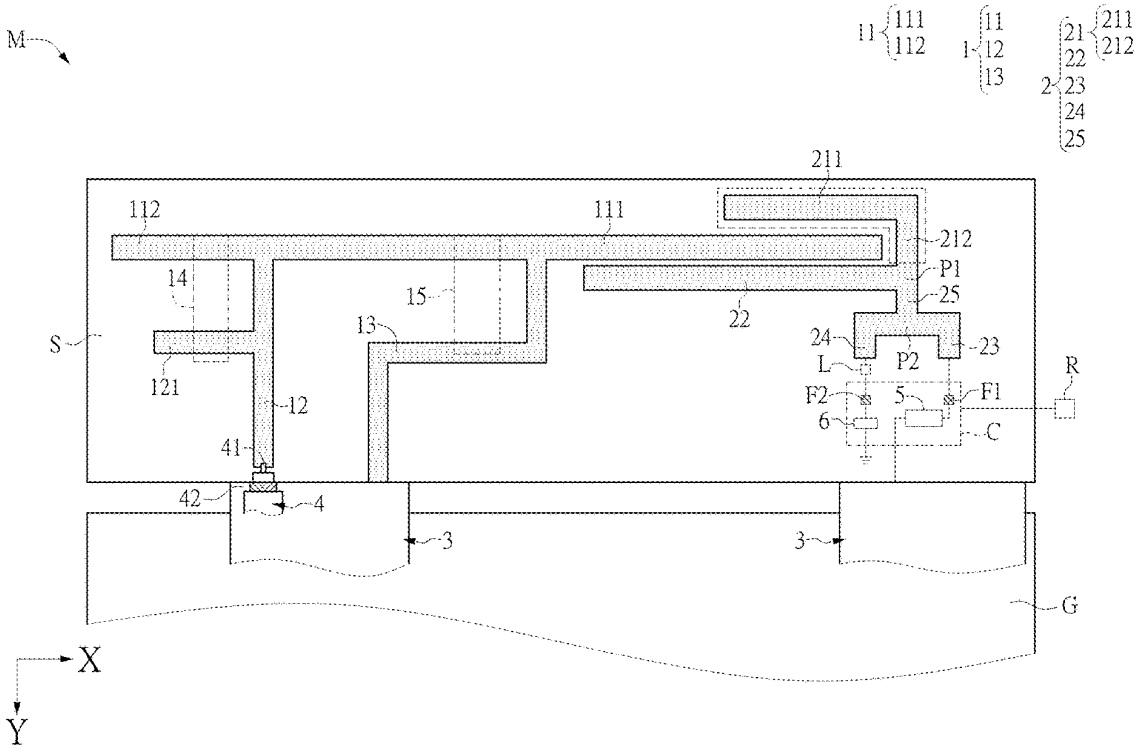
H01Q 1/22	(2006.01)
H01Q 1/48	(2006.01)
H01Q 5/307	(2015.01)

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

CPC ***H01Q 1/2266*** (2013.01); ***H01Q 1/48*** (2013.01); ***H01Q 5/307*** (2015.01)

(57) **ABSTRACT**

An electronic device and an antenna structure are provided. The electronic device includes a housing and an antenna structure which includes a first radiating element with a first radiating part, a feed part, and a grounding part, a second radiating element with five branches, a grounding element connected to the grounding part, a feed element connected to the feed part, a switching circuit electrically connected to the third branch, and a proximity sensing circuit electrically connected to the fourth branch. The first branch and the second branch intersect at a first branching point, the third branch and the fourth branch intersect at a second branching point. The fifth branch is connected between the first branching point and the second branching point. The first radiating part extends between the first branch and the second branch so the first radiating part and the second radiating element couple with each other.



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Chou et al.

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

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

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Related U.S. Application Data

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H01Q 5/48 (2015.01)

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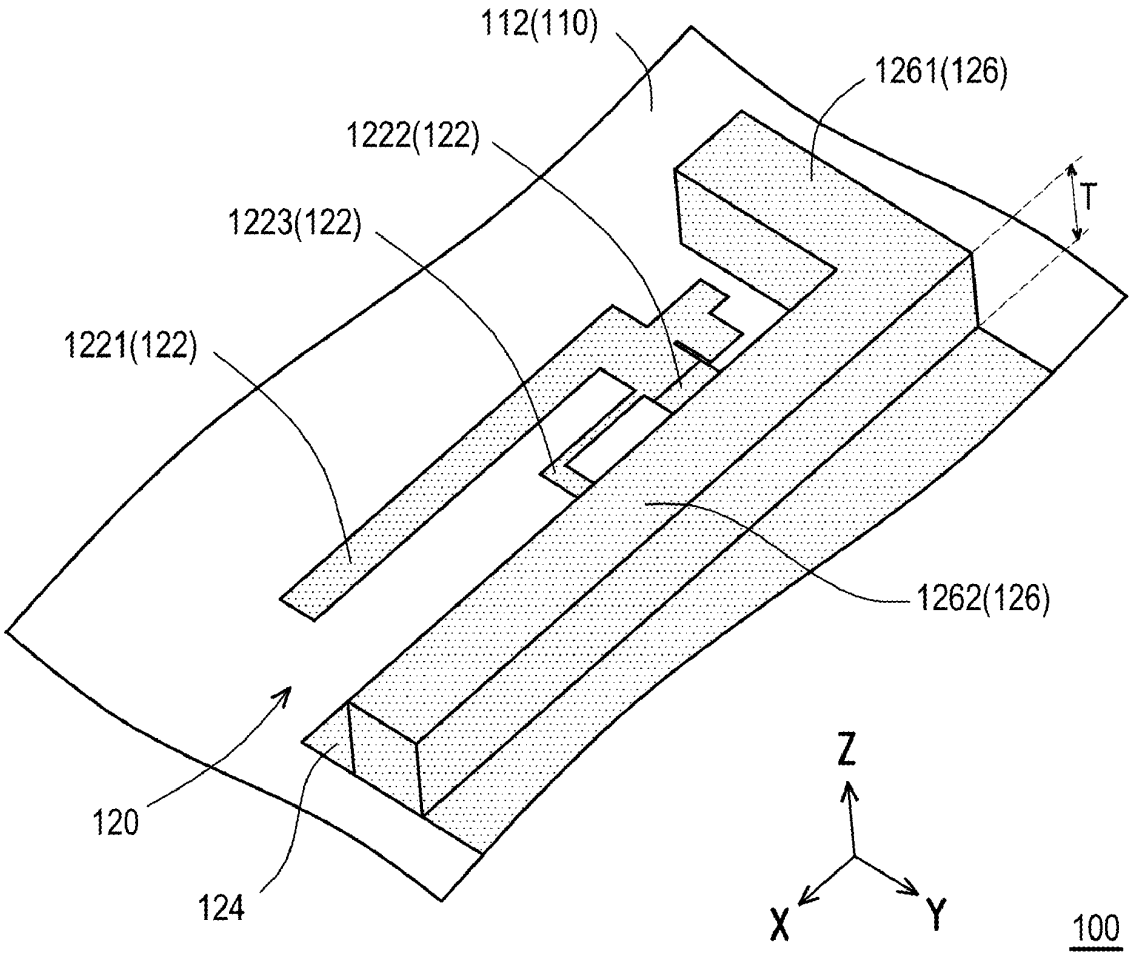
(52) **U.S. Cl.**

CPC ***H01Q 5/48*** (2015.01); ***H01Q 1/526*** (2013.01)

(57) **ABSTRACT**

An antenna module includes an antenna structure, a grounding plane, and an electromagnetic shielding structure. The antenna structure includes a radiating portion and a feeding portion coupled to each other. The grounding plane is adjacent to the antenna structure in a width direction of the antenna module. The feeding portion is coupled between the radiating portion and the grounding plane. The electromagnetic shielding structure is integrally connected to the grounding plane. In addition, an electronic device including the antenna module is also provided.



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(12) **Patent Application Publication**

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(43) **Pub. Date: Apr. 24, 2025**

RAMABADRAN et al.

(54) **WIDEBAND DUAL-POLARIZED ANTENNA ELEMENT AND INTERLEAVED ANTENNA ARRAY**

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(72) Inventors: **Prasidh RAMABADRAN**, Bangalore (IN); **Sunil KUMAR**, Bangalore (IN); **Madhav VENKATESWARAN**, Hyderabad (IN)

(21) Appl. No.: **18/490,283**

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H01Q 21/06 (2006.01)
H01Q 9/04 (2006.01)

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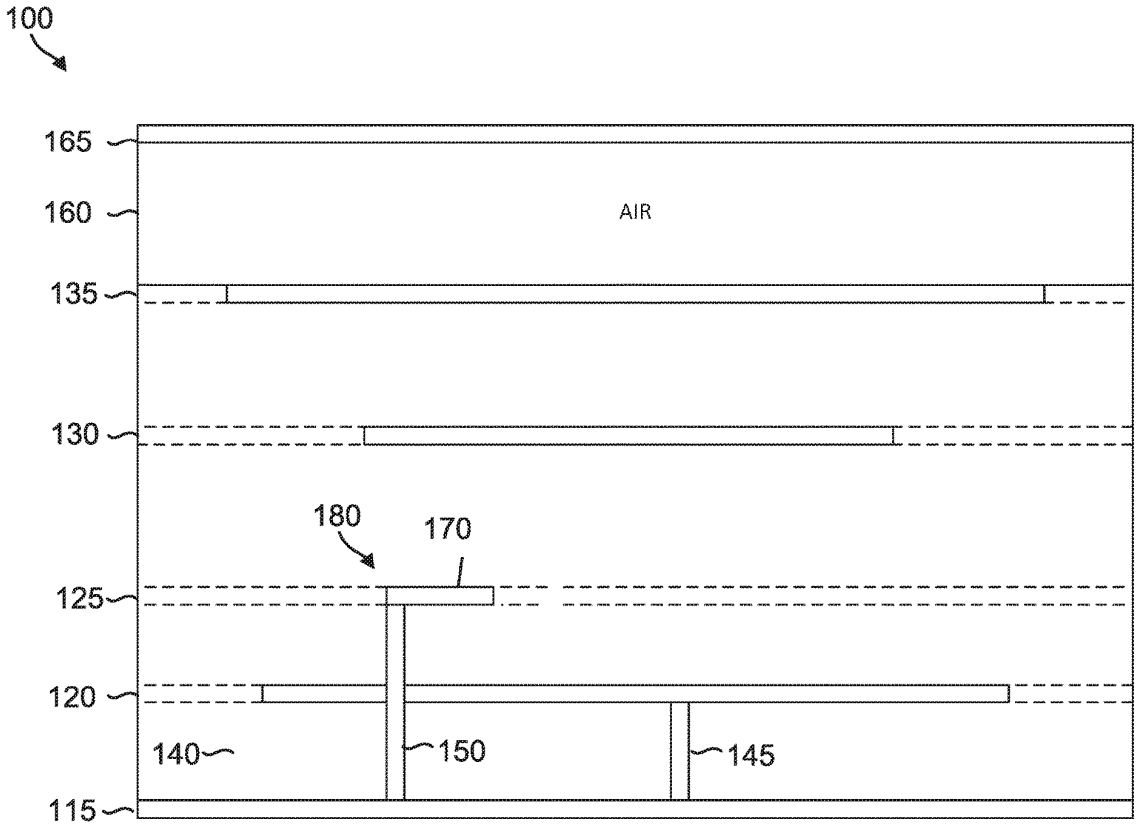
(57) **ABSTRACT**

A multi-band antenna element is provided with a stacked pair of a first low-band patch antenna element and a second low-band patch antenna element and also a high-band patch antenna element for operation across both a low band and a high band. An L-shaped probe in the multi-band antenna is configured to parasitically excite the high-band patch antenna element. A linear slot in the second low-band patch antenna element is configured to resonant in the high band.



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SAMPO et al.

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(54) **ANTENNA DEVICE**

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(21) Appl. No.: **18/973,112**

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

Related U.S. Application Data

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(30) **Foreign Application Priority Data**

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

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(57) **ABSTRACT**

An antenna device includes: a pair of first elements that are arranged on a first plane; and a pair of second elements that are arranged on a second plane parallel to the first plane such that a polarized wave direction of the pair of second elements is orthogonal to that of the pair of first elements. Each element of the pair of first elements and the pair of second elements includes a portion that acts as a self-similarity antenna or an antenna that acts based on similar operating principle to the self-similarity antenna. In one embodiment, each element of the pair of first elements and the pair of second elements includes two arms that extend in a direction away from each other from a proximal end portion to which a feed point is connectable.