US012394886B2

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An et al.

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(45) **Date of Patent: Aug. 19, 2025**

(54) **DISPLAY STRUCTURE INCLUDING DIELECTRIC LAYER AND ELECTRONIC DEVICE INCLUDING SAME**

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

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(21) Appl. No.: **18/321,224**

(22) Filed: **May 22, 2023**

(65) **Prior Publication Data**

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Related U.S. Application Data

(63) Continuation of application No. PCT/KR2022/003095, filed on Mar. 4, 2022.

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Mar. 5, 2021 (KR) 10-2021-0029309
Aug. 11, 2021 (KR) 10-2021-0106174
Dec. 23, 2021 (KR) 10-2021-0186462

(51) **Int. Cl.**
G06F 1/16 (2006.01)
H01Q 1/24 (2006.01)
H04M 1/02 (2006.01)

(52) **U.S. Cl.**
CPC ***H01Q 1/243*** (2013.01); ***G06F 1/1616*** (2013.01); ***G06F 1/1656*** (2013.01); ***G06F 1/1681*** (2013.01); ***H04M 1/0216*** (2013.01)

(58) **Field of Classification Search**
CPC combination set(s) only.
See application file for complete search history.

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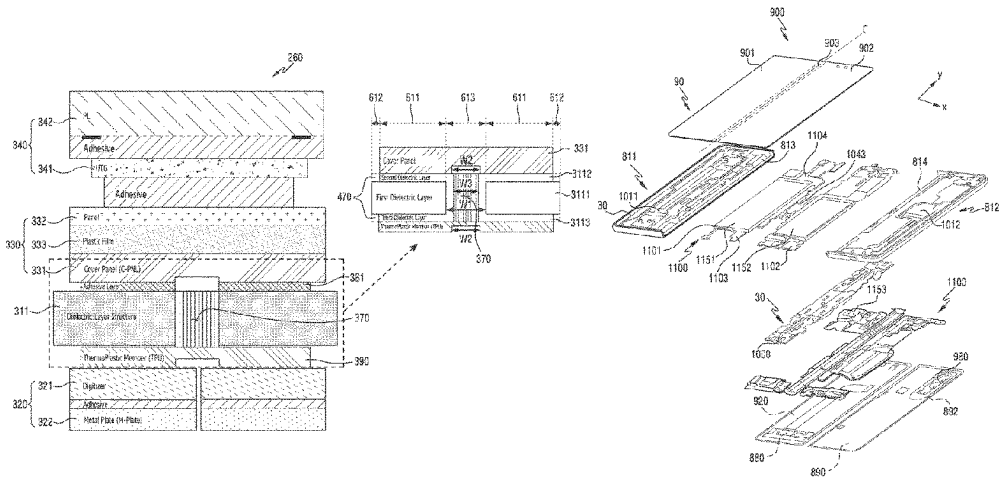
(74) *Attorney, Agent, or Firm* — Nixon & Vanderhye, P.C.

(57) **ABSTRACT**

A display structure according to an embodiment may include: a cover glass forming an outer face of the display structure, a display panel disposed under the cover class, a first dielectric layer having a first periphery formed at least in part on an outer side of a periphery of the display panel, and disposed under the display panel, a second dielectric layer disposed on a first face of the first dielectric layer adjacent to the display panel, and a third dielectric layer disposed on a second face corresponding to the first face of the first dielectric layer. A second periphery of the second dielectric layer and a third periphery of the third dielectric layer, corresponding to the first periphery of the first dielectric layer, may be formed on an inner side of the first periphery. The first dielectric layer may have a first permittivity. The second dielectric layer and the third dielectric
(Continued)



layer may each have a permittivity greater than the first permittivity.

25 Claims, 18 Drawing Sheets

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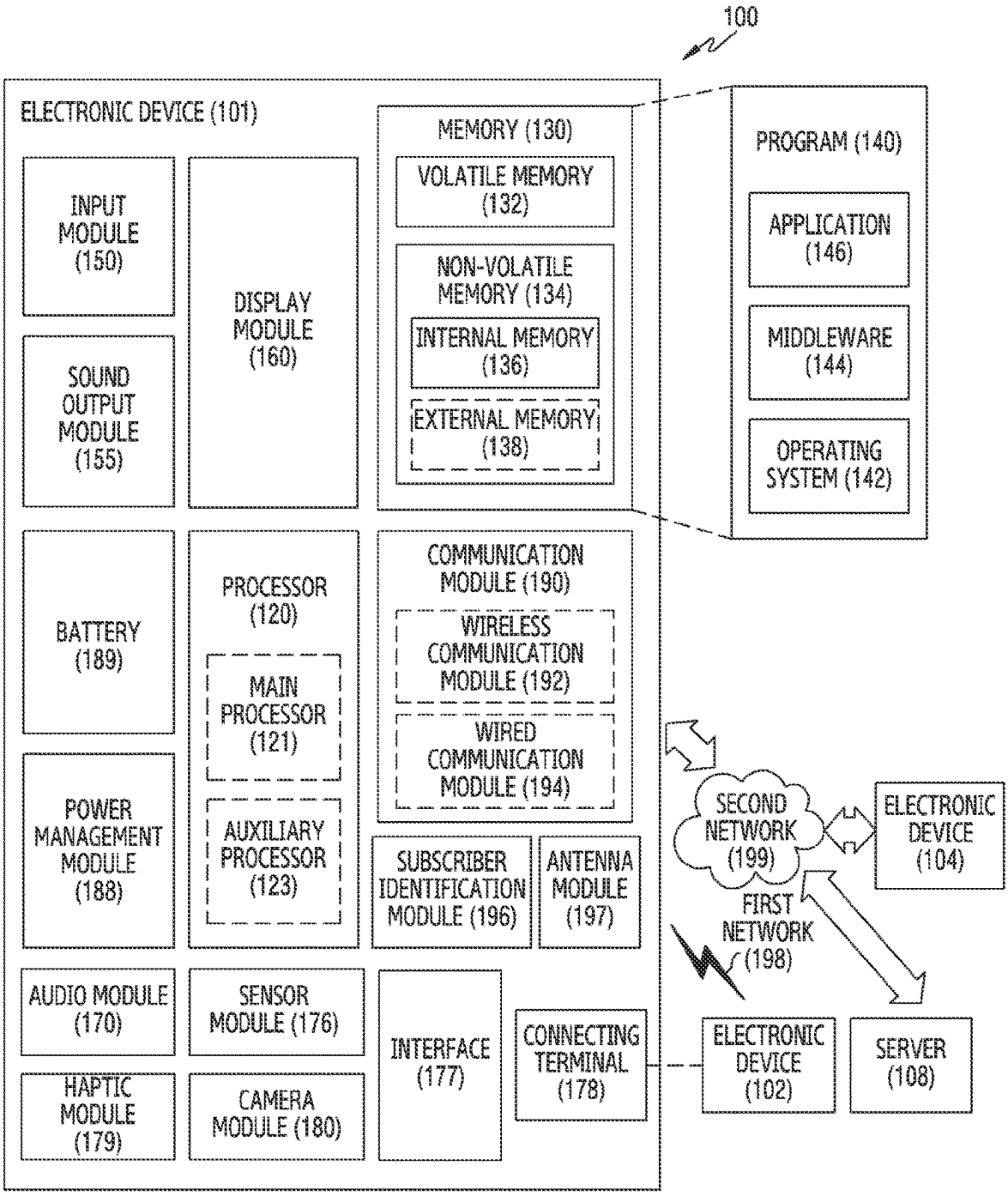
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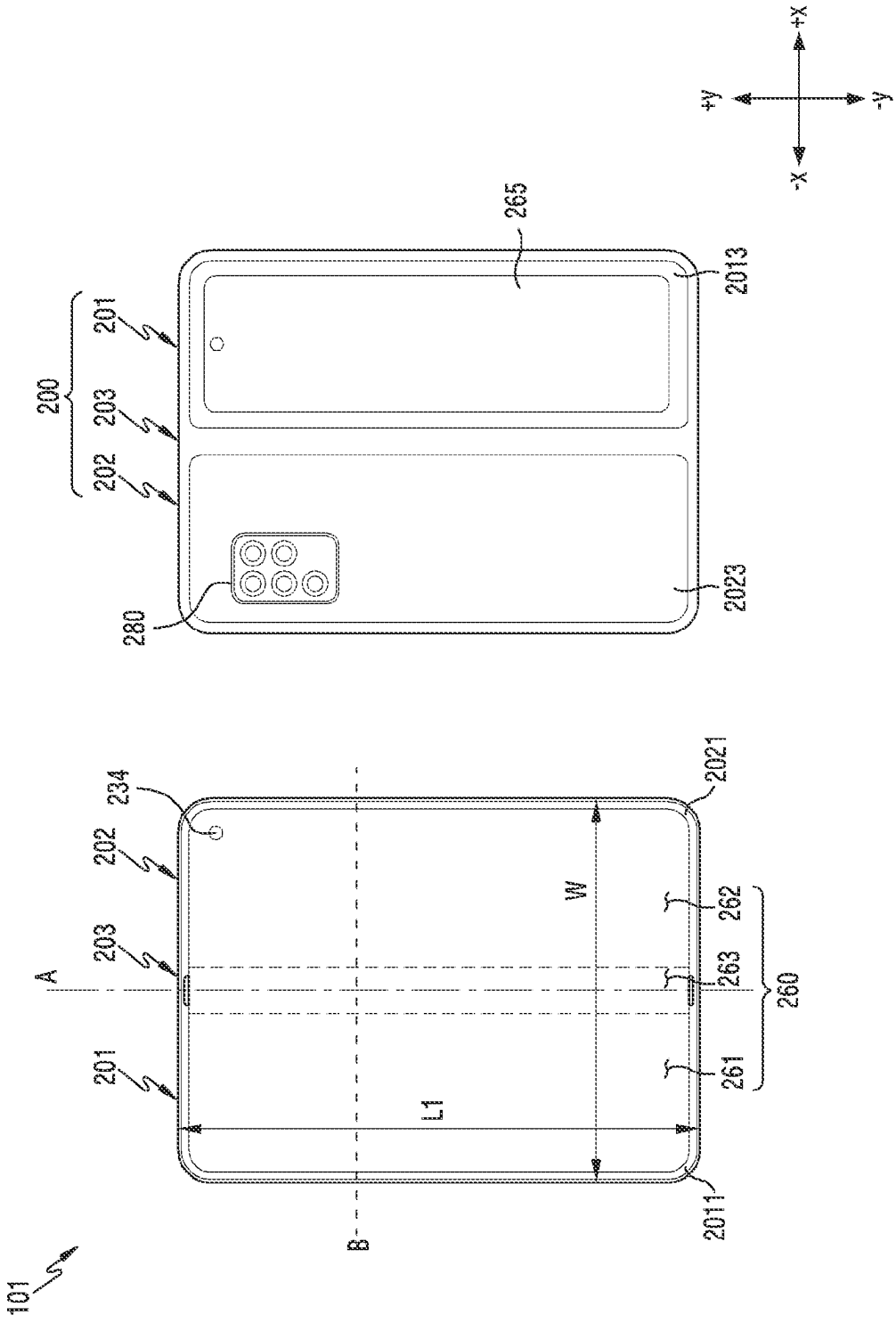
SOUND OUTPUT MODULE (155)
DISPLAY MODULE (160)
BATTERY (189)
POWER MANAGEMENT MODULE (188)
PROCESSOR (120)
MAIN PROCESSOR (121)
AUXILIARY PROCESSOR (123)
MEMORY (130)
VOLATILE MEMORY (132)
NON-VOLATILE MEMORY (134)
INTERNAL MEMORY (136)
EXTERNAL MEMORY (138)
PROGRAM (140)
APPLICATION (146)
MIDDLEWARE (144)
OPERATING SYSTEM (142)
COMMUNICATION MODULE (190)
WIRELESS COMMUNICATION MODULE (192)
WIRED COMMUNICATION MODULE (194)
SUBSCRIBER IDENTIFICATION MODULE (196)
ANTENNA MODULE (197)
AUDIO MODULE (170)
SENSOR MODULE (176)
HAPTIC MODULE (179)
CAMERA MODULE (180)
INTERFACE (177)
CONNECTING TERMINAL (178)
SECOND NETWORK (199)
ELECTRONIC DEVICE (104)
FIRST NETWORK (198)
ELECTRONIC DEVICE (102)
SERVER (108)

FIG.1


+x
-x
+y
-y
265
2013
201
200
203
202
280
2023
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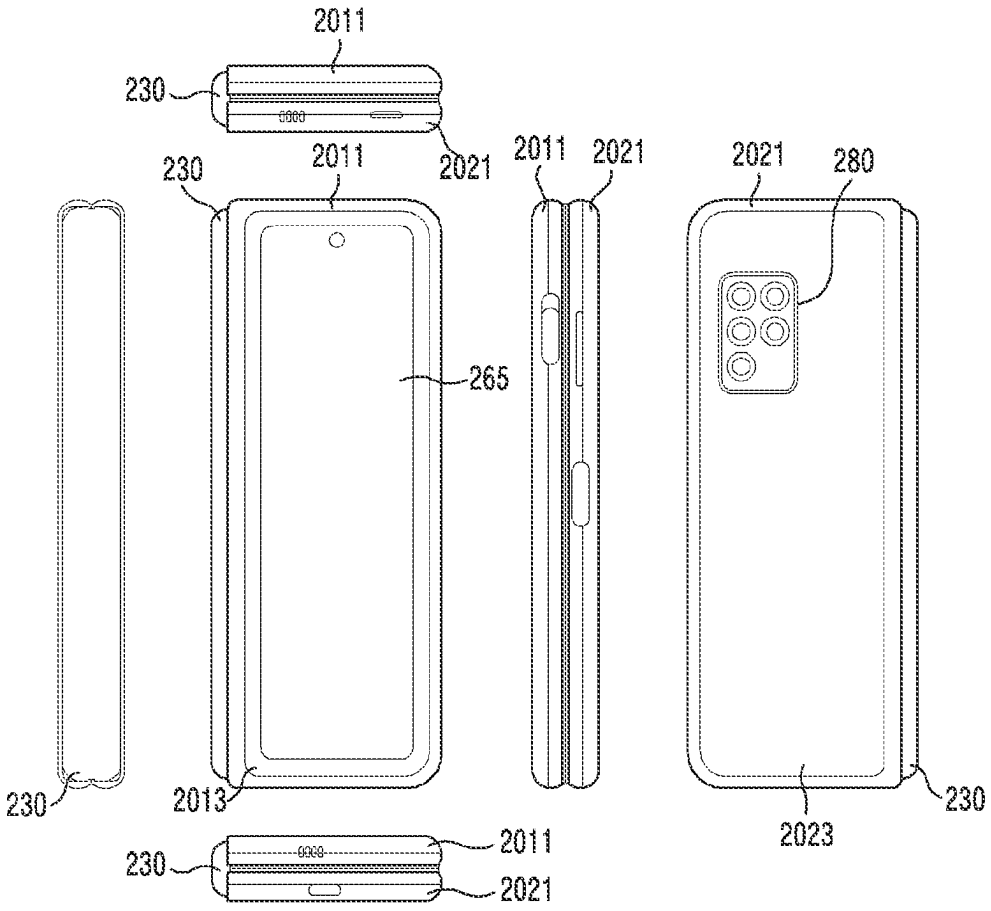
234
202
W
262
203
A
263
260
201
261
L1
2011
B
101

FIG.2A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230
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2011
2011
2021
2021
280
265
230
2013
2011
230
2021
2023
230

FIG.2B

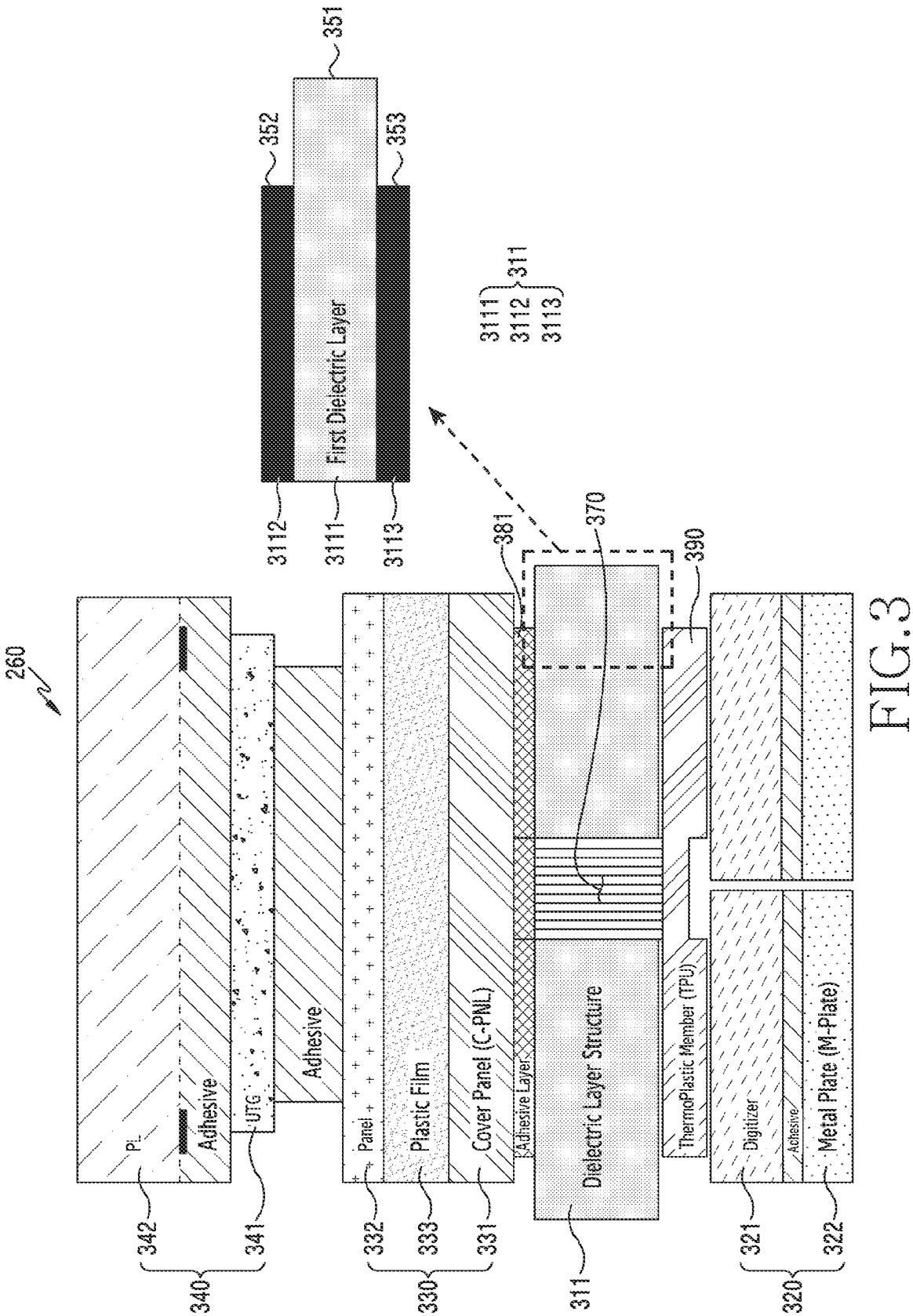

260
PI
Adhesive
UTG
Adhesive
Panel
Plastic Film
Cover Panel (C-PNL)
Adhesive Layer
Dielectric Layer Structure
ThermoPlastic Member (TPU)
Digitizer
Adhesive
Metal Plate (M-Plate)
342
341
340
332
333
331
330
311
321
322
320
381
370
390
351
352
353
First Dielectric Layer
3112
3111
3113
3111
3112
3113
311

FIG.3

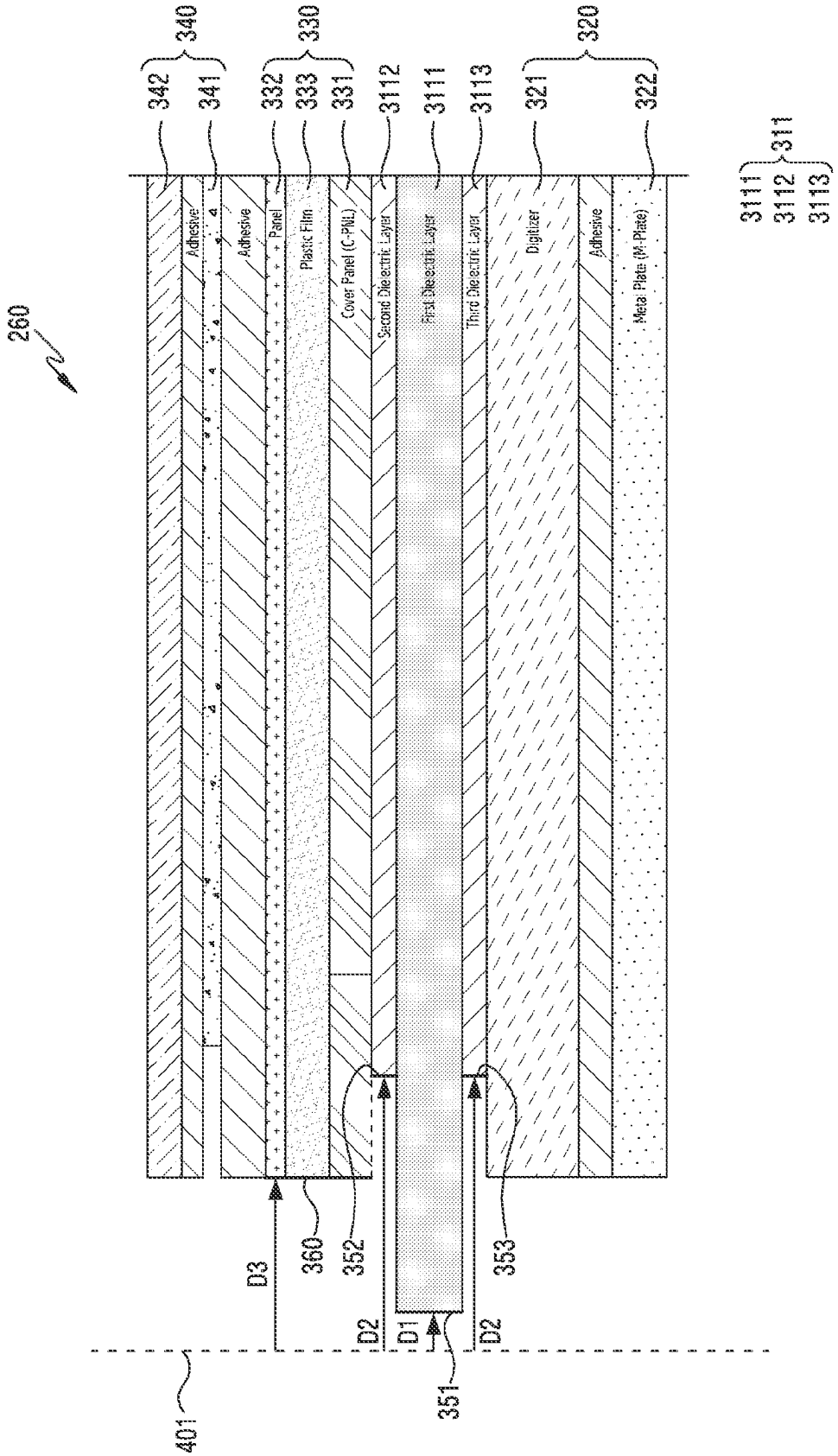

260
340
342
341
330
332
333
331
3112
3111
3113
320
321
322
311
3111
3112
3113
Adhesive
Adhesive
Panel
Plastic Film
Cover Panel (C-PNL)
Second Dielectric Layer
First Dielectric Layer
Third Dielectric Layer
Digitizer
Adhesive
Metal Plate (M-Plate)
D3
360
352
D2
D1
D2
353
351
401

FIG. 4A

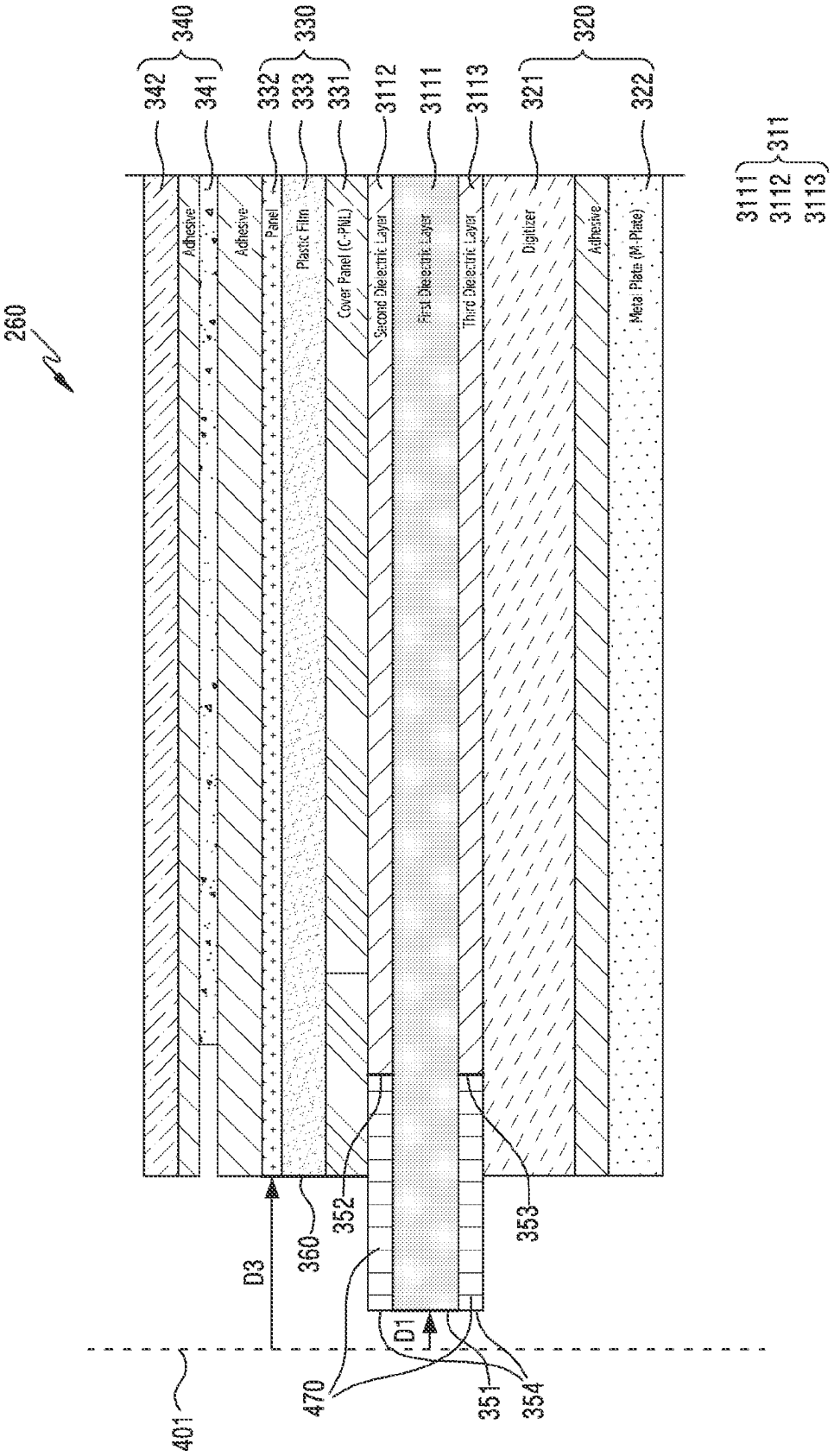

260
340
342
341
330
332
333
331
3112
3111
3113
320
321
322
311
3111
3112
3113
Adhesive
Adhesive
Panel
Plastic Film
Cover Panel (C-PNL)
Second Dielectric Layer
First Dielectric Layer
Third Dielectric Layer
Digitizer
Adhesive
Metal Plate (M-Plate)
D3
360
352
353
D1
470
351
354
401

FIG. 4B

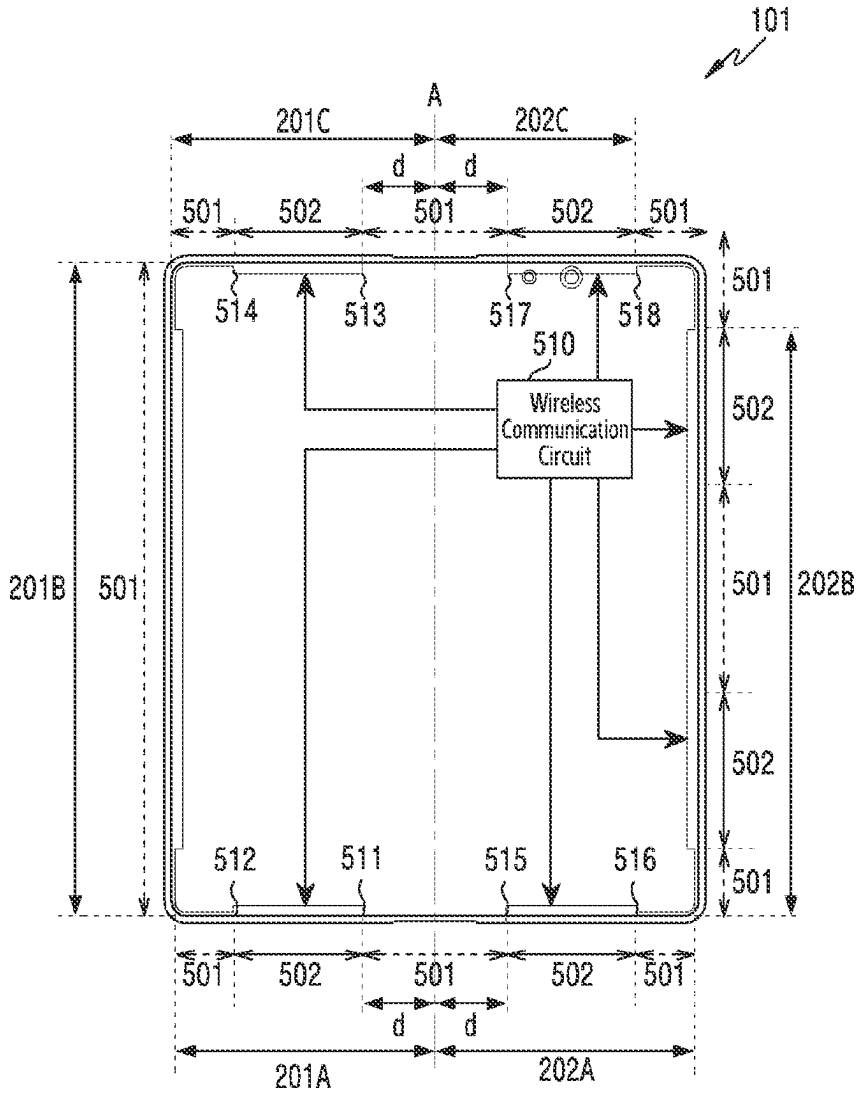

101
A
201C
202C
d
d
501
502
501
502
501
514
513
517
518
501
510
Wireless Communication Circuit
502
201B
501
501
202B
502
512
511
515
516
501
501
502
501
502
501
d
d
201A
202A

FIG.5A

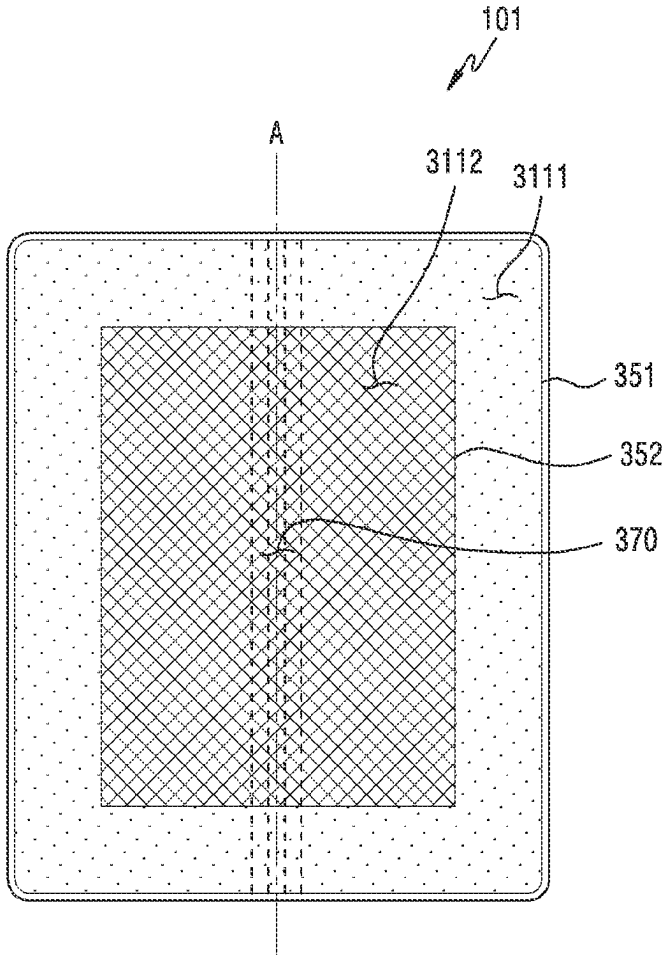


FIG.5B

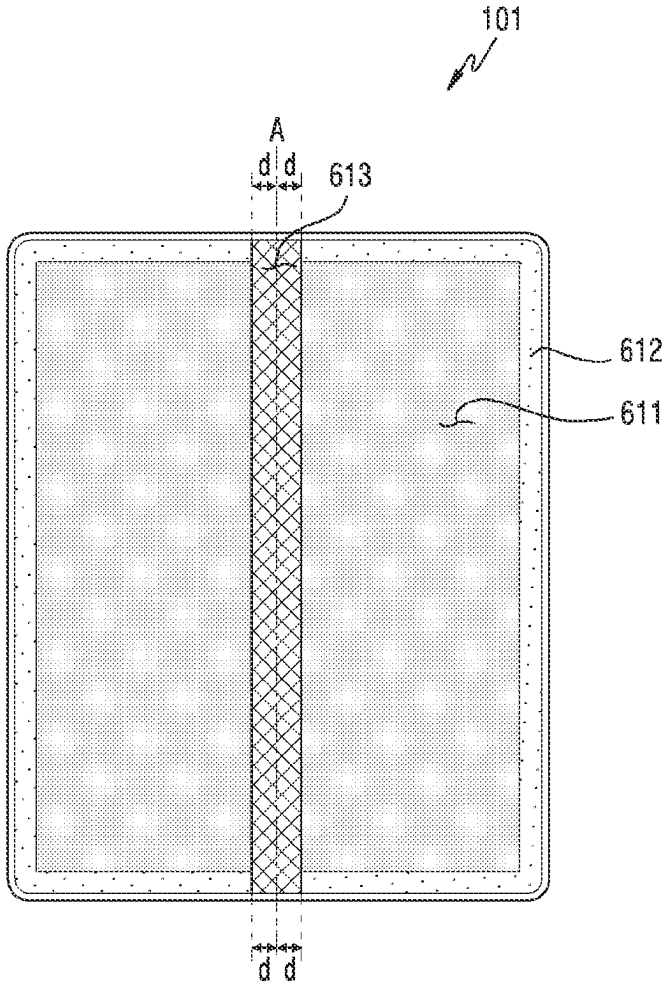


FIG.6A

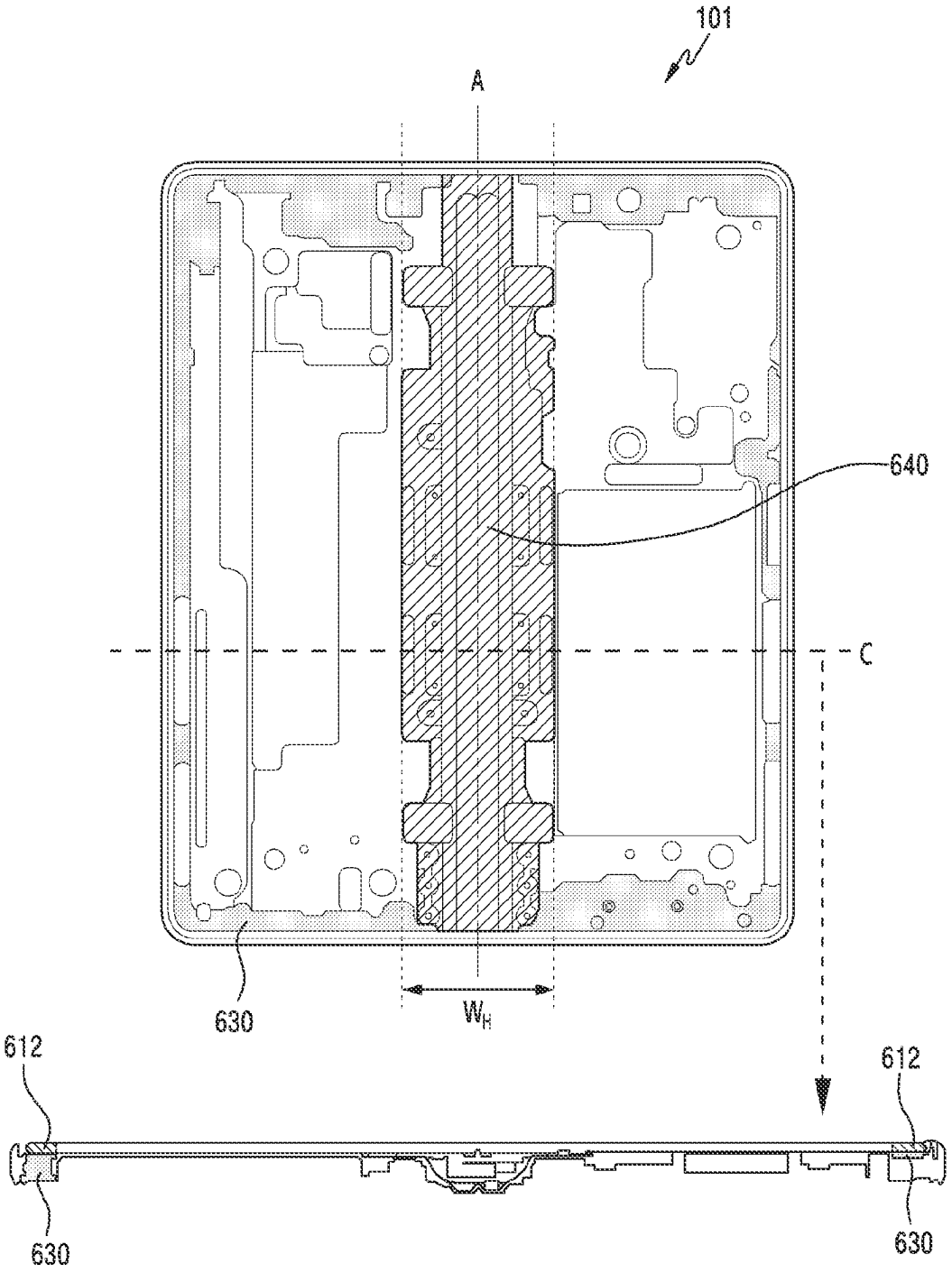


FIG.6B

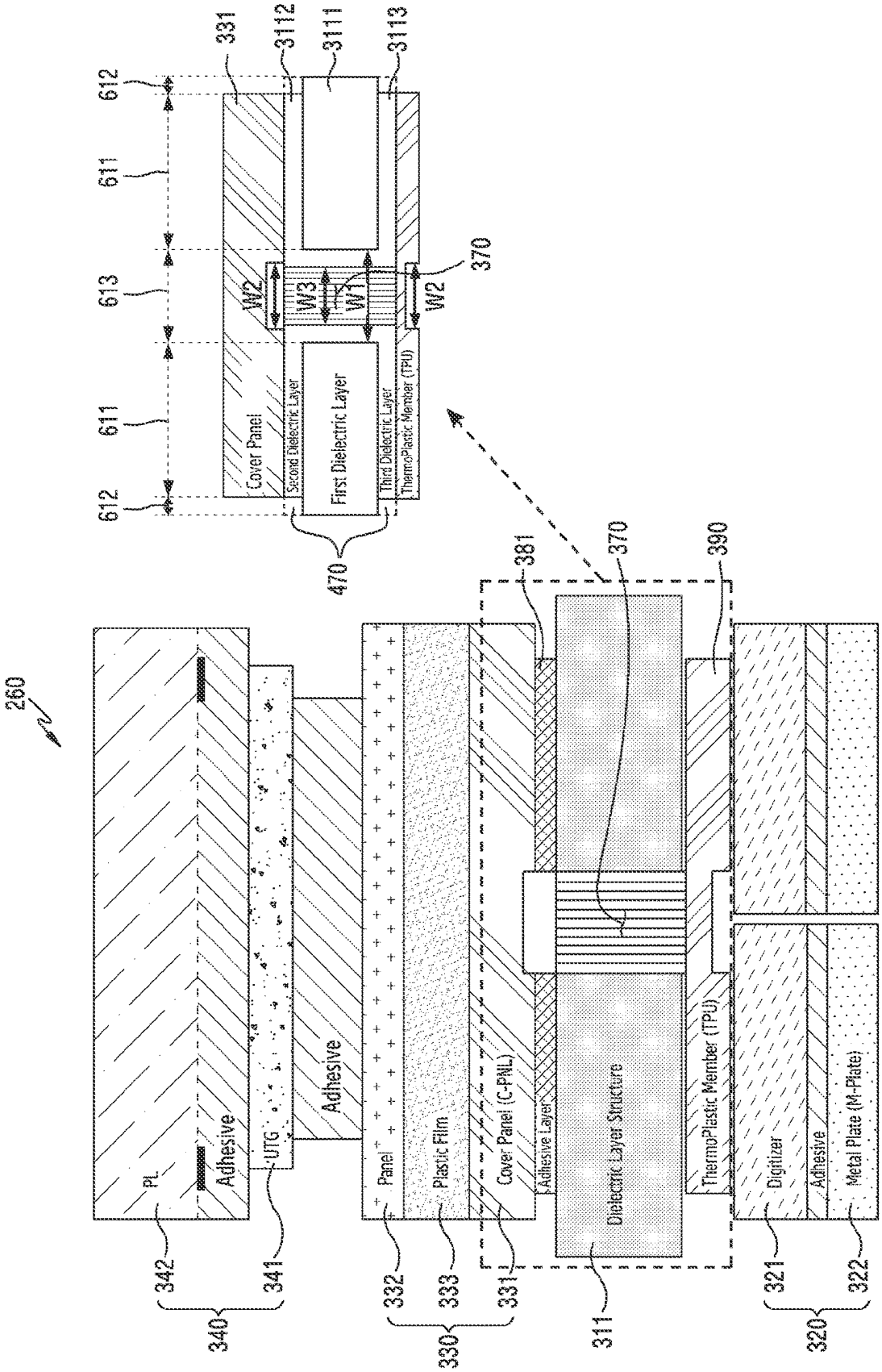

260
PL
Adhesive
UTG
Adhesive
Panel
Plastic Film
Cover Panel (C-PNL)
Adhesive Layer
Dielectric Layer Structure
ThermoPlastic Member (TPU)
Digitizer
Adhesive
Metal Plate (M-Plate)
342
341
332
333
331
311
321
322
340
330
320
381
370
390
470
612
611
613
611
612
331
3112
3111
3113
W2
W3
W1
W2
370
Cover Panel
Second Dielectric Layer
First Dielectric Layer
Third Dielectric Layer
ThermoPlastic Member (TPU)

FIG. 7

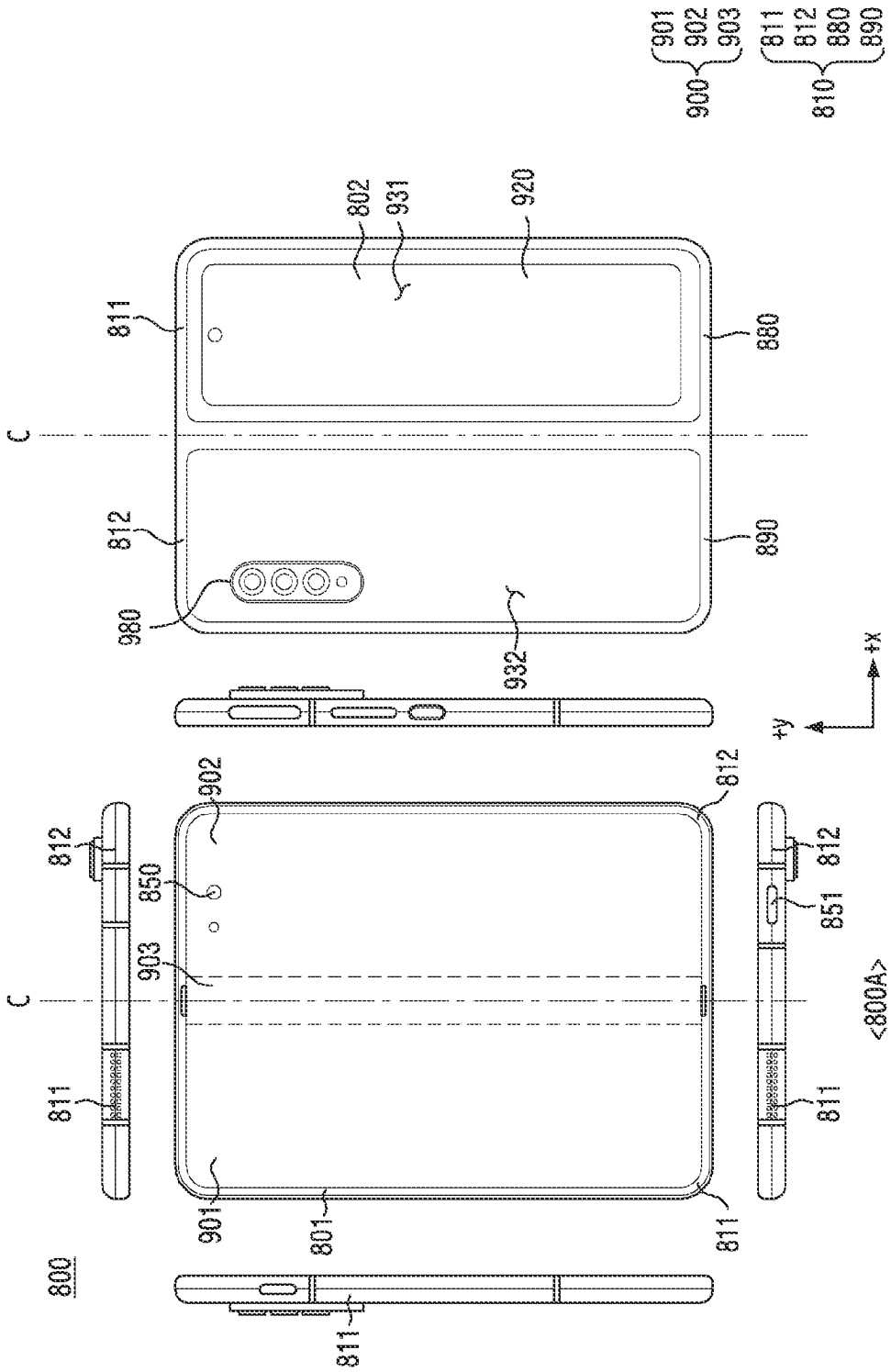
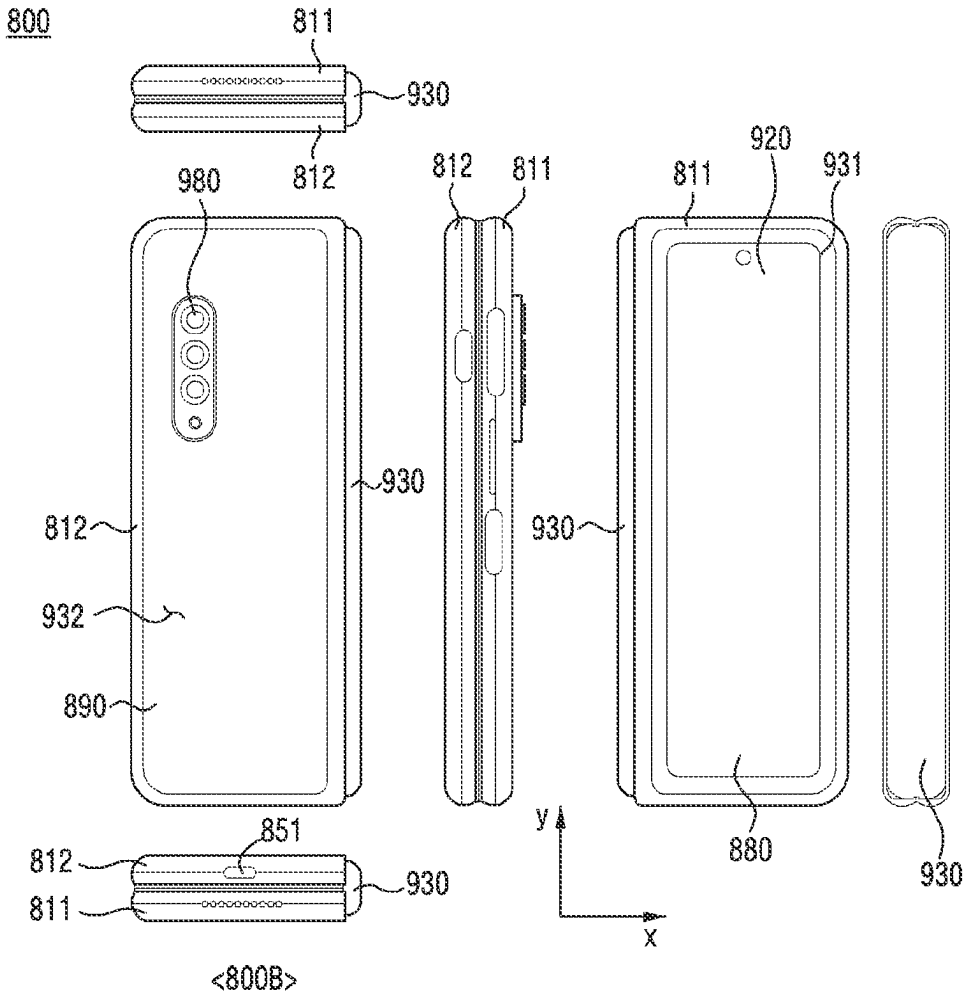

901
902
903
900
811
812
880
890
810
802
931
920
811
880
812
890
980
932
+y
+x
902
812
812
850
851
812
903
811
811
<800A>
901
801
811
800
811

FIG.8


800
811
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980
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930
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811
930
880
930
y
x
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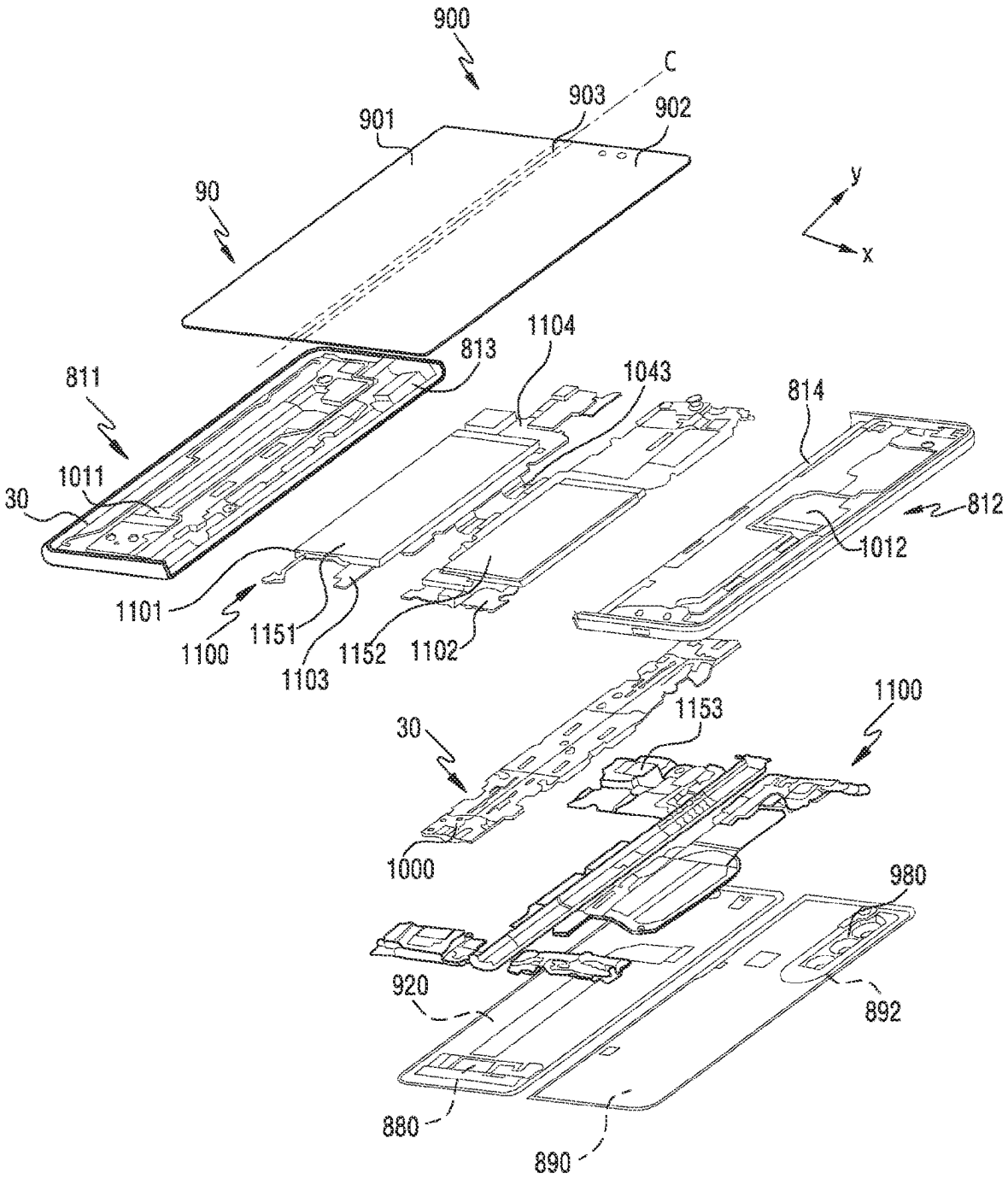
FIG.9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C
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902
901
90
y
x
1104
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1043
811
814
1011
30
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1012
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1100
1151
1152
1102
1103
1100
1153
30
1000
980
920
892
880
890

FIG.10

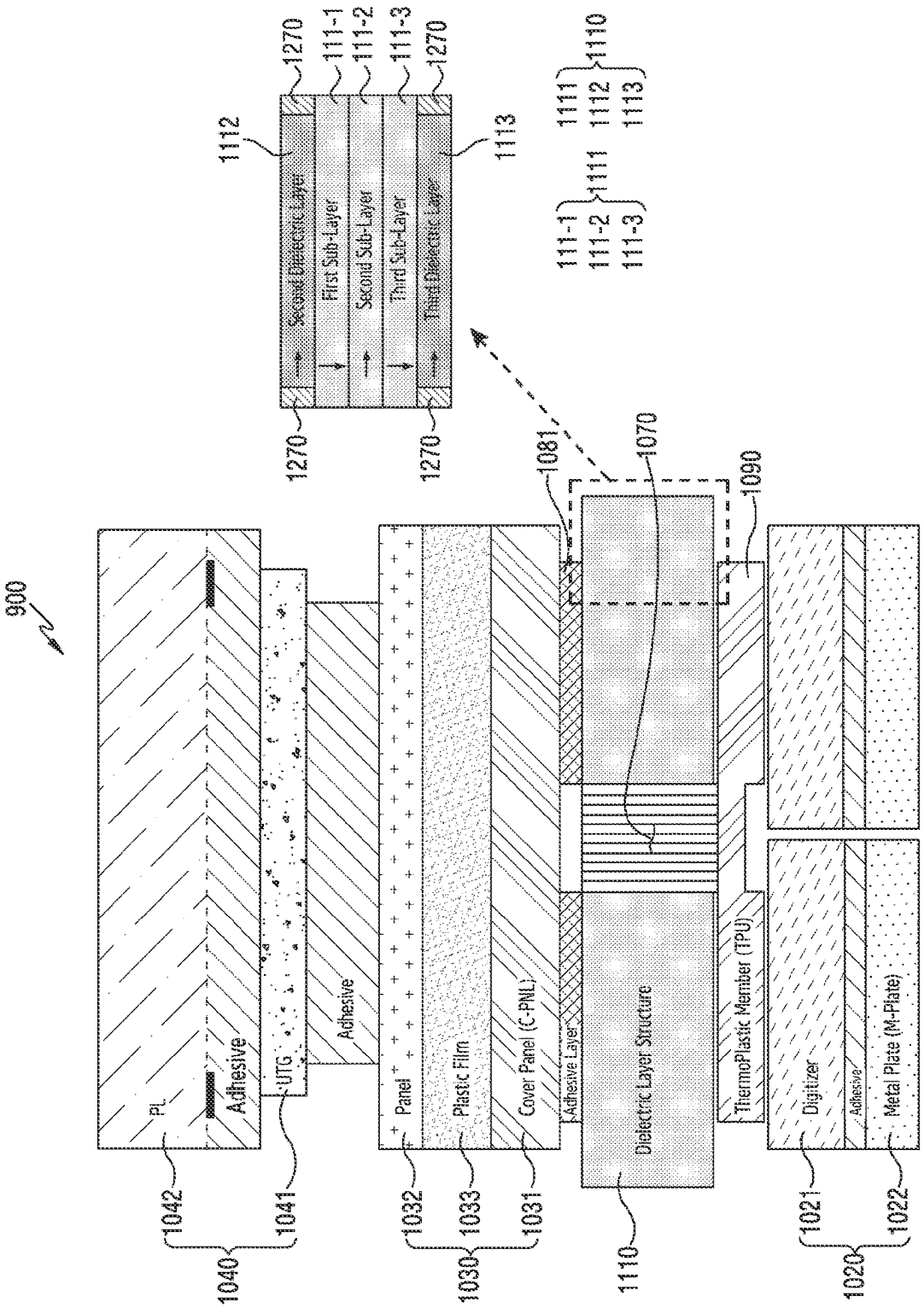
900
1042
PI
Adhesive
1041
UTG
Adhesive
1040
1032
Panel
1033
Plastic Film
1031
Cover Panel (C-PNL)
1030
1081
1070
1090
Adhesive Layer
Dielectric Layer Structure
1110
ThermoPlastic Member (TPU)
1021
Digitizer
Adhesive
1022
Metal Plate (M-Plate)
1020
1112
1270
111-1
111-2
111-3
1270
1113
Second Dielectric Layer
First Sub-Layer
Second Sub-Layer
Third Sub-Layer
Third Dielectric Layer
1270
111-1
111-2
111-3
1111
1111
1112
1113
1110

FIG. 11

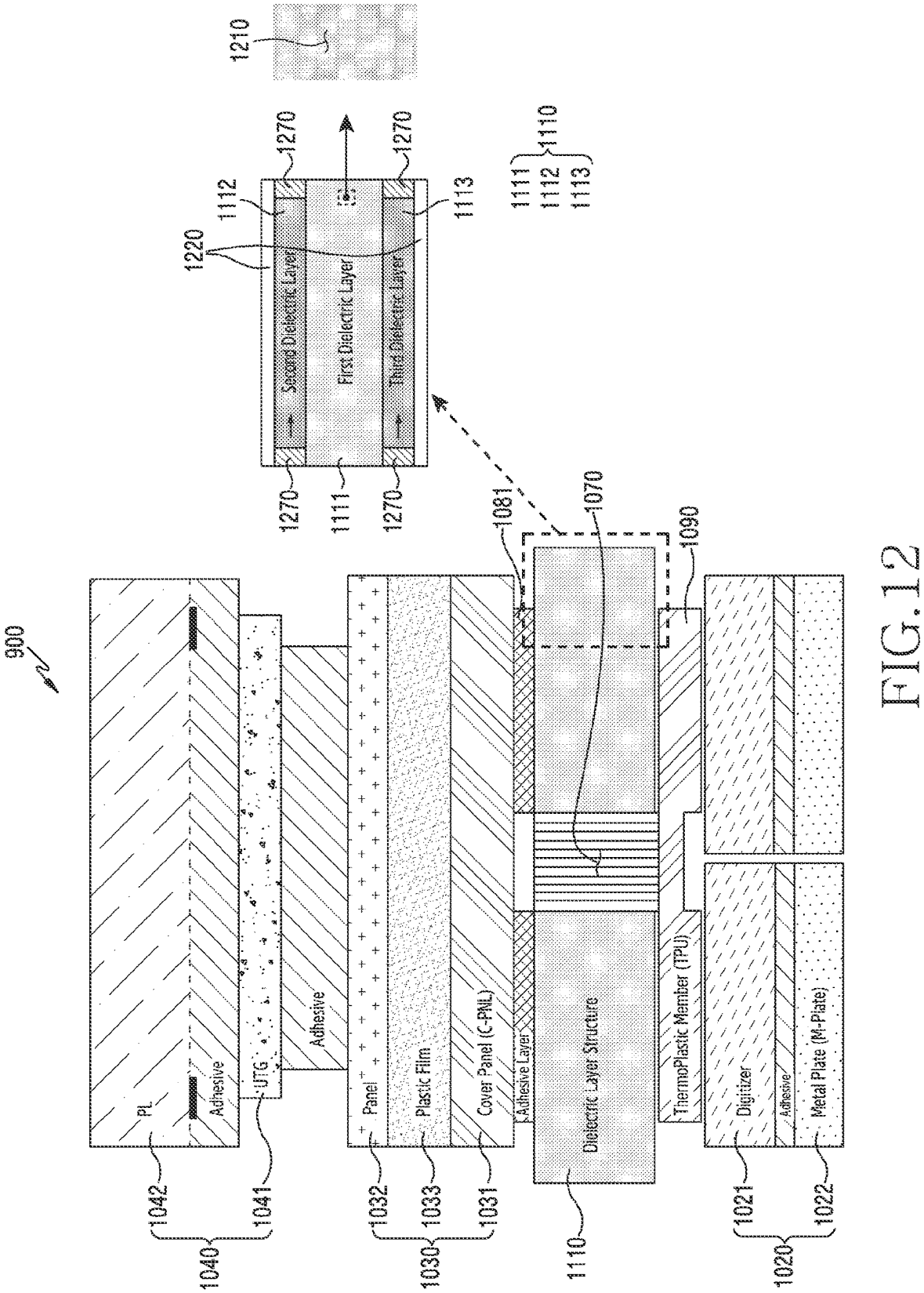
900
PL
Adhesive
UTG
Adhesive
Panel
Plastic Film
Cover Panel (C-PNL)
Adhesive Layer
Dielectric Layer Structure
ThermoPlastic Member (TPU)
Digitizer
Adhesive
Metal Plate (M-Plate)
1042
1041
1040
1032
1033
1031
1030
1110
1021
1022
1020
1081
1070
1090
1210
1220
1270
1112
1113
1111
1110
Second Dielectric Layer
First Dielectric Layer
Third Dielectric Layer

FIG. 12

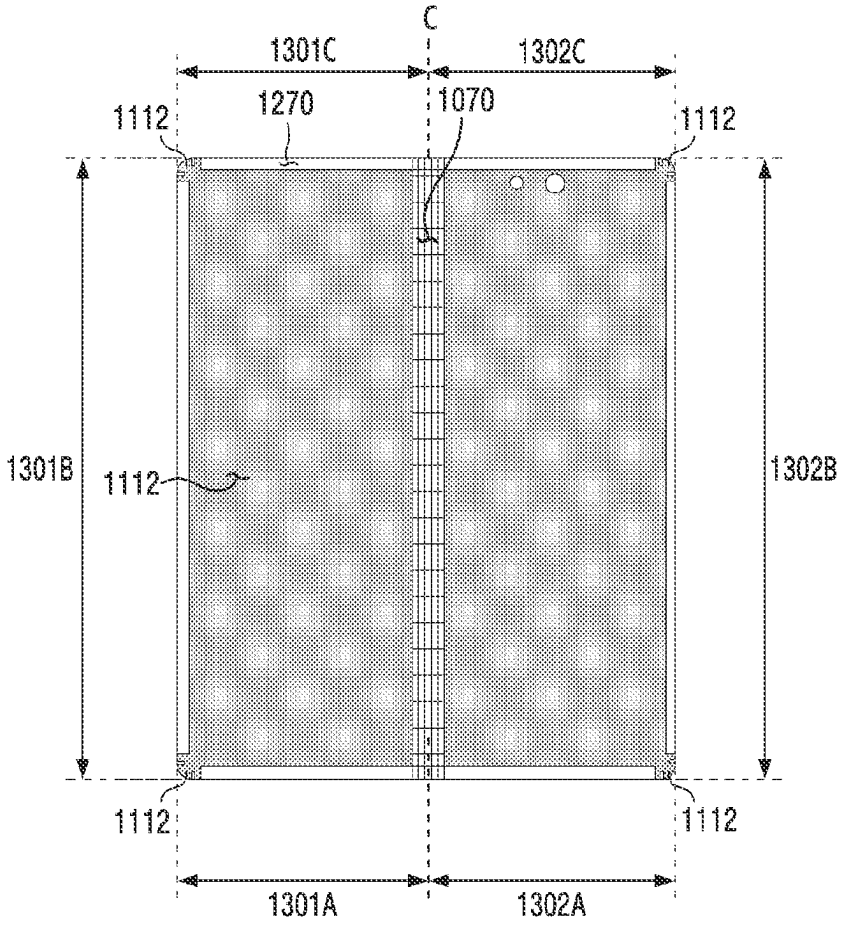
C
1301C
1302C
1112
1270
1070
1112
1301B
1112
1302B
1112
1112
1301A
1302A

FIG.13A

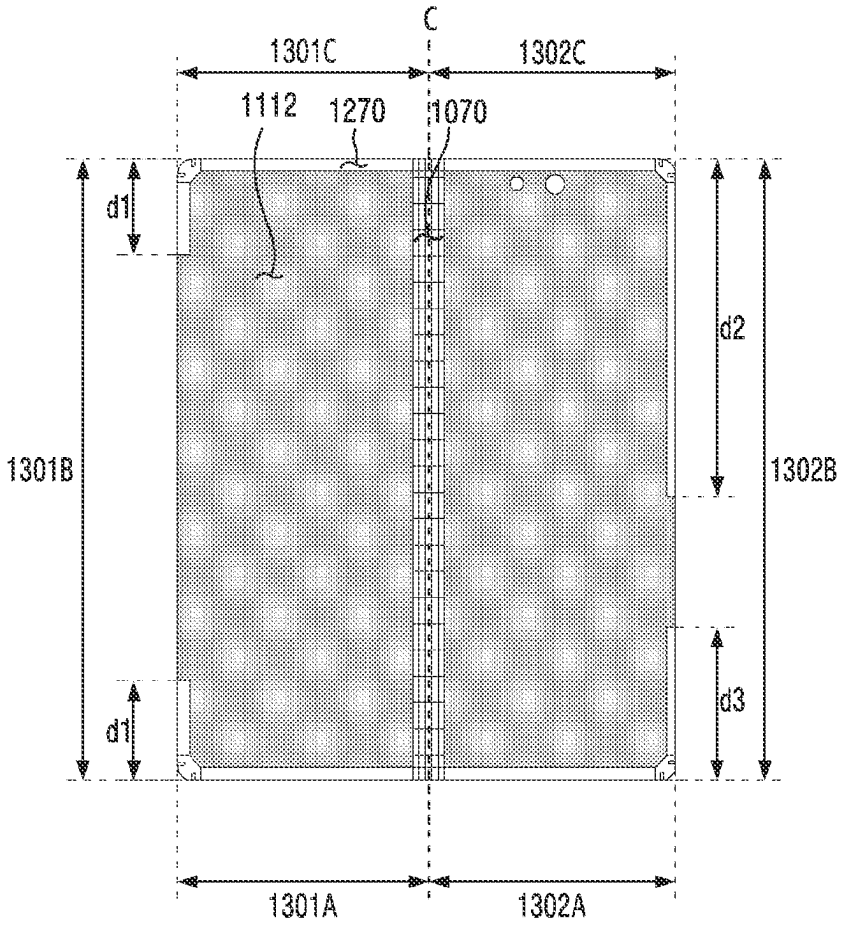
C
1301C
1302C
1112
1270
1070
d1
d2
1301B
1302B
d3
d1
1301A
1302A

FIG.13B

DISPLAY STRUCTURE INCLUDING DIELECTRIC LAYER AND ELECTRONIC DEVICE INCLUDING SAME

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation of International Application No. PCT/KR2022/003095 designating the United States, filed on Mar. 4, 2022, in the Korean Intellectual Property Receiving Office and claiming priority to Korean Patent Application No. 10-2021-0029309, filed on Mar. 5, 2021, in the Korean Intellectual Property Office, Korean Patent Application No. 10-2021-0106174, filed on Aug. 11, 2021, in the Korean Intellectual Property Office and Korean Patent Application No. 10-2021-0186462, filed on Dec. 23, 2021, in the Korean Intellectual Property Office, the disclosures of all of which are incorporated by reference herein in their entireties.

BACKGROUND

Field

The disclosure relates to a display structure including a dielectric layer, and an electronic device including the display structure.

Description of Related Art

With a dramatic increase in processing performance of an electronic device such as a smart phone, a large-area display is preferred to effectively provide various functions. At the same time, a demand for making the electronic device small in size still exists to improve portability. In order to satisfy such a demand, a foldable electronic device has been released. The foldable electronic device capable of being folded or unfolded about a connection portion may provide a user with portability and usability.

Meanwhile, with the development of mobile communication technologies, an electronic device including an antenna has been widely distributed. The electronic device may transmit and/or receive a Radio Frequency (RF) signal including an audio signal or data (e.g., messages, photos, moving pictures, music files, games) using the antenna.

In addition, in order to satisfy consumers' purchasing needs, there is an ongoing effort to increase rigidity of the electronic device and strengthen a design aspect while making it slim. As one way of such an effort, the electronic device supplies power to at least part of a housing of the electronic device, so as to be utilized as at least one antenna device for communication of the electronic device.

A foldable electronic device utilizing at least part of a frame or housing as an antenna radiator may include a metal layer for securing rigidity of a flexible display and protecting a display structure. However, since the metal layer occupies at least 50% of the display structure, a material of the metal layer may be changed to a lightweight material to reduce a weight of the electronic device.

However, when the metal layer is formed of such a lightweight material, the lightweight material may have a high permittivity. When a layer formed of a material having a high permittivity forms an outermost edge of the display structure, radiation performance of an antenna adjacent to this layer may be degraded.

SUMMARY

Embodiments of the disclosure provide a device which maintains antenna performance while including a lightweight material.

An electronic device according to an example embodiment may include: a housing including a first side face, a second side face corresponding to the first side face, and a hinge coupling the first side face and the second side face, and capable of switching to a folded or unfolded state about the hinge, a rear cover forming a rear face of the electronic device, a wireless communication circuit disposed inside the housing and configured to transmit and/or receive a signal of a specified frequency by supplying power to at least part of the housing, and a display structure coupled to the housing. The display structure may include: a cover glass forming at least part of a front face of the electronic device, a display panel disposed adjacent to one face of the cover glass, and a first dielectric layer disposed under the display panel. A first periphery of the first dielectric layer may be spaced apart from the first side face by a first distance. The display structure may further include a second dielectric layer disposed on a first face of the first dielectric layer adjacent to the display panel, and a third dielectric layer disposed on a second face of the first dielectric layer facing the rear cover. A second periphery of the second dielectric layer and a third periphery of the third dielectric layer, corresponding to the first periphery of the first dielectric layer, may be spaced apart from the first side face by a second distance greater than the first distance. The first dielectric layer may have a first permittivity. The second dielectric layer and the third dielectric layer may have a permittivity greater than the first permittivity.

A display structure according to an example embodiment may include: a cover glass forming an outer face of the display structure, a display panel disposed under the cover class, a first dielectric layer having a first periphery formed at least in part on an outer side of a periphery of the display panel and disposed under the display panel, a second dielectric layer disposed on a first face of the first dielectric layer adjacent to the display panel, and a third dielectric layer disposed on a second face corresponding to the first face of the first dielectric layer. A second periphery of the second dielectric layer and a third periphery of the third dielectric layer, corresponding to the first periphery of the first dielectric layer, may be formed on an inner side of the first periphery. The first dielectric layer may have a first permittivity. The second dielectric layer and the third dielectric layer may have a permittivity greater than the first permittivity.

An electronic device according to an example embodiment may include: a housing including a first housing forming a first side face of the electronic device, a second housing forming a second side face corresponding to the first side face, and a hinge coupling the first housing and the second housing, and being capable of switching to a folded or unfolded state about the hinge, a wireless communication circuit disposed inside the housing configured to transmit and/or receive a signal of a specified frequency by supplying power to at least part of the housing, and a display structure coupled to the housing. The display structure may include: a cover glass coupled to the housing and forming at least part of a front face of the electronic device, a display panel disposed adjacent to one face of the cover glass, and a first layer having a first periphery formed at least in part on an outer side of a periphery of the display panel. The first layer may include a first region formed at least in part on an inner

side from the first periphery, and a second region extending to an outer side from the first region to form the first periphery. The first region may have a first permittivity. The second region may have a second permittivity less than the first permittivity.

According to various example embodiments of the disclosure, it is possible to improve (e.g., reduce) a deterioration of antenna performance, caused by applying a lightweight material to a metal layer.

In addition, according to various example embodiments, it is possible to reduce damage or deformation which may occur in a display structure, caused by applying a lightweight material to a metal layer and forming a stacked structure.

In addition thereto, various effects which are directly or indirectly understood through the disclosure may be provided.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other aspects, features and advantages of certain embodiments of the present disclosure will be more apparent from the following detailed description, taken in conjunction with the accompanying drawings, in which:

FIG. **1** is a block diagram illustrating an electronic device in a network environment according to various embodiments;

FIG. **2**A is a diagram illustrating an electronic device in an unfolded state according various embodiments;

FIG. **2**B is a diagram illustrating an electronic device in a folded state according to various embodiments;

FIG. **3** is a cross-sectional view of a display, cut along an axis B of FIG. **2**A, and a dielectric layer structure, according to various embodiments;

FIG. **4**A is a partial cross-sectional view of the display of FIG. **3** according to various embodiments;

FIG. **4**B is a partial cross-sectional view of the display of FIG. **3** according to various embodiments;

FIG. **5**A is a diagram illustrating a periphery of a dielectric layer structure formed in a region corresponding to at least some regions in a housing according to various embodiments;

FIG. **5**B is a diagram illustrating a display structure when viewed from a direction perpendicular to a front face of an electronic device according to various embodiments;

FIG. **6**A is a diagram illustrating a dielectric layer structure formed of a different material depending on a region according to various embodiments;

FIG. **6**B is a diagram including a cross-sectional view illustrating an electronic device and a display structure mounted on a bracket according to various embodiments;

FIG. **7** is a cross-sectional view of a display, cut along an axis C of FIG. **6**B, and a dielectric layer structure, according to various embodiments;

FIG. **8** is a diagram illustrating a first state of an electronic device according to various embodiments;

FIG. **9** is a diagram illustrating a second state of an electronic device according to various embodiments;

FIG. **10** is an exploded perspective view of an electronic device according to various embodiments;

FIG. **11** is a cross-sectional view of a display and a dielectric layer structure according to various embodiments;

FIG. **12** is a cross-sectional view of a display and a dielectric layer structure according to various embodiments;

FIG. **13**A is a diagram illustrating a dielectric layer structure formed in a region corresponding to a corner of a display according to various embodiments; and

FIG. **13**B is a diagram illustrating a dielectric layer structure formed in a region corresponding to some regions of a display according to various embodiments.

With regard to the description of the drawings, similar reference numerals may be used to refer to similar or related elements.

DETAILED DESCRIPTION

Hereinafter, various example embodiments of the disclosure are described with reference to the accompanying drawings. However, it should be appreciated that this is not intended to limit the technological features set forth herein to particular embodiments and includes various changes, equivalents, or replacements for example embodiments of the disclosure.

FIG. **1** is a block diagram illustrating an example electronic device **101** in a network environment **100** according to various embodiments. Referring to FIG. **1**, the electronic device **101** in the network environment **100** may communicate with an electronic device **102** via a first network **198** (e.g., a short-range wireless communication network), or at least one of an electronic device **104** or a server **108** via a second network **199** (e.g., a long-range wireless communication network). According to an embodiment, the electronic device **101** may communicate with the electronic device **104** via the server **108**. According to an embodiment, the electronic device **101** may include a processor **120**, memory **130**, an input module **150**, a sound output module **155**, a display module **160**, an audio module **170**, a sensor module **176**, an interface **177**, a connecting terminal **178**, a haptic module **179**, a camera module **180**, a power management module **188**, a battery **189**, a communication module **190**, a subscriber identification module (SIM) **196**, or an antenna module **197**. In various embodiments, at least one of the components (e.g., the connecting terminal **178**) may be omitted from the electronic device **101**, or one or more other components may be added in the electronic device **101**. In various embodiments, some of the components (e.g., the sensor module **176**, the camera module **180**, or the antenna module **197**) may be implemented as a single component (e.g., the display module **160**).

The processor **120** may execute, for example, software (e.g., a program **140**) to control at least one other component (e.g., a hardware or software component) of the electronic device **101** coupled with the processor **120**, and may perform various data processing or computation. According to an embodiment, as at least part of the data processing or computation, the processor **120** may store a command or data received from another component (e.g., the sensor module **176** or the communication module **190**) in volatile memory **132**, process the command or the data stored in the volatile memory **132**, and store resulting data in non-volatile memory **134**. According to an embodiment, the processor **120** may include a main processor **121** (e.g., a central processing unit (CPU) or an application processor (AP)), or an auxiliary processor **123** (e.g., a graphics processing unit (GPU), a neural processing unit (NPU), an image signal processor (ISP), a sensor hub processor, or a communication processor (CP)) that is operable independently from, or in conjunction with, the main processor **121**. For example, when the electronic device **101** includes the main processor **121** and the auxiliary processor **123**, the auxiliary processor **123** may be adapted to consume less power than the main processor **121**, or to be specific to a specified function. The auxiliary processor **123** may be implemented as separate from, or as part of the main processor **121**.

The auxiliary processor **123** may control at least some of functions or states related to at least one component (e.g., the display module **160**, the sensor module **176**, or the communication module **190**) among the components of the electronic device **101**, instead of the main processor **121** while the main processor **121** is in an inactive (e.g., sleep) state, or together with the main processor **121** while the main processor **121** is in an active state (e.g., executing an application). According to an embodiment, the auxiliary processor **123** (e.g., an image signal processor or a communication processor) may be implemented as part of another component (e.g., the camera module **180** or the communication module **190**) functionally related to the auxiliary processor **123**. According to an embodiment, the auxiliary processor **123** (e.g., the neural processing unit) may include a hardware structure specified for artificial intelligence model processing. An artificial intelligence model may be generated by machine learning. Such learning may be performed, e.g., by the electronic device **101** where the artificial intelligence is performed or via a separate server (e.g., the server **108**). Learning algorithms may include, but are not limited to, e.g., supervised learning, unsupervised learning, semi-supervised learning, or reinforcement learning. The artificial intelligence model may include a plurality of artificial neural network layers. The artificial neural network may be a deep neural network (DNN), a convolutional neural network (CNN), a recurrent neural network (RNN), a restricted boltzmann machine (RBM), a deep belief network (DBN), a bidirectional recurrent deep neural network (BRDNN), deep Q-network or a combination of two or more thereof but is not limited thereto. The artificial intelligence model may, additionally or alternatively, include a software structure other than the hardware structure.

The memory **130** may store various data used by at least one component (e.g., the processor **120** or the sensor module **176**) of the electronic device **101**. The various data may include, for example, software (e.g., the program **140**) and input data or output data for a command related thereto. The memory **130** may include the volatile memory **132** or the non-volatile memory **134**.

The program **140** may be stored in the memory **130** as software, and may include, for example, an operating system (OS) **142**, middleware **144**, or an application **146**.

The input module **150** may receive a command or data to be used by another component (e.g., the processor **120**) of the electronic device **101**, from the outside (e.g., a user) of the electronic device **101**. The input module **150** may include, for example, a microphone, a mouse, a keyboard, a key (e.g., a button), or a digital pen (e.g., a stylus pen).

The sound output module **155** may output sound signals to the outside of the electronic device **101**. The sound output module **155** may include, for example, a speaker or a receiver. The speaker may be used for general purposes, such as playing multimedia or playing record. The receiver may be used for receiving incoming calls. According to an embodiment, the receiver may be implemented as separate from, or as part of the speaker.

The display module **160** may visually provide information to the outside (e.g., a user) of the electronic device **101**. The display module **160** may include, for example, a display, a hologram device, or a projector and control circuitry to control a corresponding one of the display, hologram device, and projector. According to an embodiment, the display module **160** may include a touch sensor adapted to detect a touch, or a pressure sensor adapted to measure the intensity of force incurred by the touch.

The audio module **170** may convert a sound into an electrical signal and vice versa. According to an embodiment, the audio module **170** may obtain the sound via the input module **150**, or output the sound via the sound output module **155** or a headphone of an external electronic device (e.g., an electronic device **102**) directly (e.g., wiredly) or wirelessly coupled with the electronic device **101**. The sensor module **176** may detect an operational state (e.g., power or temperature) of the electronic device **101** or an environmental state (e.g., a state of a user) external to the electronic device **101**, and then generate an electrical signal or data value corresponding to the detected state. According to an embodiment, the sensor module **176** may include, for example, a gesture sensor, a gyro sensor, an atmospheric pressure sensor, a magnetic sensor, an acceleration sensor, a grip sensor, a proximity sensor, a color sensor, an infrared (IR) sensor, a biometric sensor, a temperature sensor, a humidity sensor, or an illuminance sensor.

The interface **177** may support one or more specified protocols to be used for the electronic device **101** to be coupled with the external electronic device (e.g., the electronic device **102**) directly (e.g., wiredly) or wirelessly. According to an embodiment, the interface **177** may include, for example, a high definition multimedia interface (HDMI), a universal serial bus (USB) interface, a secure digital (SD) card interface, or an audio interface.

A connecting terminal **178** may include a connector via which the electronic device **101** may be physically connected with the external electronic device (e.g., the electronic device **102**). According to an embodiment, the connecting terminal **178** may include, for example, a HDMI connector, a USB connector, a SD card connector, or an audio connector (e.g., a headphone connector).

The haptic module **179** may convert an electrical signal into a mechanical stimulus (e.g., a vibration or a movement) or electrical stimulus which may be recognized by a user via his tactile sensation or kinesthetic sensation. According to an embodiment, the haptic module **179** may include, for example, a motor, a piezoelectric element, or an electric stimulator.

The camera module **180** may capture a still image or moving images. According to an embodiment, the camera module **180** may include one or more lenses, image sensors, image signal processors, or flashes.

The power management module **188** may manage power supplied to the electronic device **101**. According to an embodiment, the power management module **188** may be implemented as at least part of, for example, a power management integrated circuit (PMIC).

The battery **189** may supply power to at least one component of the electronic device **101**. According to an embodiment, the battery **189** may include, for example, a primary cell which is not rechargeable, a secondary cell which is rechargeable, or a fuel cell.

The communication module **190** may support establishing a direct (e.g., wired) communication channel or a wireless communication channel between the electronic device **101** and the external electronic device (e.g., the electronic device **102**, the electronic device **104**, or the server **108**) and performing communication via the established communication channel. The communication module **190** may include one or more communication processors that are operable independently from the processor **120** (e.g., the application processor (AP)) and supports a direct (e.g., wired) communication or a wireless communication. According to an embodiment, the communication module **190** may include a wireless communication module **192** (e.g., a cellular com-

munication module, a short-range wireless communication module, or a global navigation satellite system (GNSS) communication module) or a wired communication module **194** (e.g., a local area network (LAN) communication module or a power line communication (PLC) module). A corresponding one of these communication modules may communicate with the external electronic device via the first network **198** (e.g., a short-range communication network, such as Bluetooth™, wireless-fidelity (Wi-Fi) direct, or infrared data association (IrDA)) or the second network **199** (e.g., a long-range communication network, such as a legacy cellular network, a 5G network, a next-generation communication network, the Internet, or a computer network (e.g., LAN or wide area network (WAN)). These various types of communication modules may be implemented as a single component (e.g., a single chip), or may be implemented as multi components (e.g., multi chips) separate from each other. The wireless communication module **192** may identify and authenticate the electronic device **101** in a communication network, such as the first network **198** or the second network **199**, using subscriber information (e.g., international mobile subscriber identity (IMSI)) stored in the subscriber identification module **196**.

The wireless communication module **192** may support a 5G network, after a 4G network, and next-generation communication technology, e.g., new radio (NR) access technology. The NR access technology may support enhanced mobile broadband (eMBB), massive machine type communications (mMTC), or ultra-reliable and low-latency communications (URLLC). The wireless communication module **192** may support a high-frequency band (e.g., the mmWave band) to achieve, e.g., a high data transmission rate. The wireless communication module **192** may support various technologies for securing performance on a high-frequency band, such as, e.g., beamforming, massive multiple-input and multiple-output (massive MIMO), full dimensional MIMO (FD-MIMO), array antenna, analog beam-forming, or large scale antenna. The wireless communication module **192** may support various requirements specified in the electronic device **101**, an external electronic device (e.g., the electronic device **104**), or a network system (e.g., the second network **199**). According to an embodiment, the wireless communication module **192** may support a peak data rate (e.g., 20 Gbps or more) for implementing eMBB, loss coverage (e.g., 164 dB or less) for implementing mMTC, or U-plane latency (e.g., 0.5 ms or less for each of downlink (DL) and uplink (UL), or a round trip of 1 ms or less) for implementing URLLC.

The antenna module **197** may transmit or receive a signal or power to or from the outside (e.g., the external electronic device) of the electronic device **101**.

According to an embodiment, the antenna module **197** may include an antenna including a radiating element including a conductive material or a conductive pattern formed in or on a substrate (e.g., a printed circuit board (PCB)). According to an embodiment, the antenna module **197** may include a plurality of antennas (e.g., array antennas). In such a case, at least one antenna appropriate for a communication scheme used in the communication network, such as the first network **198** or the second network **199**, may be selected, for example, by the communication module **190** (e.g., the wireless communication module **192**) from the plurality of antennas. The signal or the power may then be transmitted or received between the communication module **190** and the external electronic device via the selected at least one antenna. According to an embodiment, another component (e.g., a radio frequency integrated circuit (RFIC)) other than the radiating element may be additionally formed as part of the antenna module **197**.

According to various embodiments, the antenna module **197** may form a mmWave antenna module. According to an embodiment, the mmWave antenna module may include a printed circuit board, a RFIC disposed on a first surface (e.g., the bottom surface) of the printed circuit board, or adjacent to the first surface and capable of supporting a designated high-frequency band (e.g., the mmWave band), and a plurality of antennas (e.g., array antennas) disposed on a second surface (e.g., the top or a side surface) of the printed circuit board, or adjacent to the second surface and capable of transmitting or receiving signals of the designated high-frequency band.

At least some of the above-described components may be coupled mutually and communicate signals (e.g., commands or data) therebetween via an inter-peripheral communication scheme (e.g., a bus, general purpose input and output (GPIO), serial peripheral interface (SPI), or mobile industry processor interface (MIPI)).

According to an embodiment, commands or data may be transmitted or received between the electronic device **101** and the external electronic device **104** via the server **108** coupled with the second network **199**. Each of the electronic devices **102** or **104** may be a device of a same type as, or a different type, from the electronic device **101**. According to an embodiment, all or some of operations to be executed at the electronic device **101** may be executed at one or more of the external electronic devices **102**, **104**, or **108**. For example, if the electronic device **101** should perform a function or a service automatically, or in response to a request from a user or another device, the electronic device **101**, instead of, or in addition to, executing the function or the service, may request the one or more external electronic devices to perform at least part of the function or the service. The one or more external electronic devices receiving the request may perform the at least part of the function or the service requested, or an additional function or an additional service related to the request, and transfer an outcome of the performing to the electronic device **101**. The electronic device **101** may provide the outcome, with or without further processing of the outcome, as at least part of a reply to the request. To that end, a cloud computing, distributed computing, mobile edge computing (MEC), or client-server computing technology may be used, for example. The electronic device **101** may provide ultra low-latency services using, e.g., distributed computing or mobile edge computing. In an embodiment, the external electronic device **104** may include an internet-of-things (IoT) device. The server **108** may be an intelligent server using machine learning and/or a neural network. According to an embodiment, the external electronic device **104** or the server **108** may be included in the second network **199**. The electronic device **101** may be applied to intelligent services (e.g., smart home, smart city, smart car, or healthcare) based on 5G communication technology or IoT-related technology.

The electronic device according to various embodiments may be one of various types of electronic devices. The electronic devices may include, for example, a portable communication device (e.g., a smartphone), a computer device, a portable multimedia device, a portable medical device, a camera, a wearable device, a home appliance, or the like. According to an embodiment of the disclosure, the electronic devices are not limited to those described above.

It should be appreciated that various embodiments of the disclosure and the terms used therein are not intended to limit the technological features set forth herein to particular

embodiments and include various changes, equivalents, or replacements for a corresponding embodiment. With regard to the description of the drawings, similar reference numerals may be used to refer to similar or related elements. It is to be understood that a singular form of a noun corresponding to an item may include one or more of the things, unless the relevant context clearly indicates otherwise. As used herein, each of such phrases as "A or B," "at least one of A and B," "at least one of A or B," "A, B, or C," "at least one of A, B, and C," and "at least one of A, B, or C," may include any one of, or all possible combinations of the items enumerated together in a corresponding one of the phrases. As used herein, such terms as "1st" and "2nd," or "first" and "second" may be used to simply distinguish a corresponding component from another, and does not limit the components in other aspect (e.g., importance or order). It is to be understood that if an element (e.g., a first element) is referred to, with or without the term "operatively" or "communicatively", as "coupled with," "coupled to," "connected with," or "connected to" another element (e.g., a second element), the element may be coupled with the other element directly (e.g., wiredly), wirelessly, or via a third element.

As used in connection with various embodiments of the disclosure, the term "module" may include a unit implemented in hardware, software, or firmware, or any combination thereof, and may interchangeably be used with other terms, for example, "logic," "logic block," "part," or "circuitry". A module may be a single integral component, or a minimum unit or part thereof, adapted to perform one or more functions. For example, according to an embodiment, the module may be implemented in a form of an application-specific integrated circuit (ASIC).

Various embodiments as set forth herein may be implemented as software (e.g., the program **140**) including one or more instructions that are stored in a storage medium (e.g., internal memory **136** or external memory **138**) that is readable by a machine (e.g., the electronic device **101**). For example, a processor (e.g., the processor **120**) of the machine (e.g., the electronic device **101**) may invoke at least one of the one or more instructions stored in the storage medium, and execute it, with or without using one or more other components under the control of the processor. This allows the machine to be operated to perform at least one function according to the at least one instruction invoked. The one or more instructions may include a code generated by a complier or a code executable by an interpreter. The machine-readable storage medium may be provided in the form of a non-transitory storage medium. Wherein, the "non-transitory" storage medium is a tangible device, and may not include a signal (e.g., an electromagnetic wave), but this term does not differentiate between where data is semi-permanently stored in the storage medium and where the data is temporarily stored in the storage medium.

According to an embodiment, a method according to various embodiments of the disclosure may be included and provided in a computer program product. The computer program product may be traded as a product between a seller and a buyer. The computer program product may be distributed in the form of a machine-readable storage medium (e.g., compact disc read only memory (CD-ROM)), or be distributed (e.g., downloaded or uploaded) online via an application store (e.g., PlayStore™), or between two user devices (e.g., smart phones) directly. If distributed online, at least part of the computer program product may be temporarily generated or at least temporarily stored in the machine-readable storage medium, such as memory of the manufacturer's server, a server of the application store, or a relay server.

According to various embodiments, each component (e.g., a module or a program) of the above-described components may include a single entity or multiple entities, and some of the multiple entities may be separately disposed in different components. According to various embodiments, one or more of the above-described components may be omitted, or one or more other components may be added. Alternatively, or additionally, a plurality of components (e.g., modules or programs) may be integrated into a single component. In such a case, according to various embodiments, the integrated component may still perform one or more functions of each of the plurality of components in the same or similar manner as they are performed by a corresponding one of the plurality of components before the integration. According to various embodiments, operations performed by the module, the program, or another component may be carried out sequentially, in parallel, repeatedly, or heuristically, or one or more of the operations may be executed in a different order or omitted, or one or more other operations may be added.

FIG. **2**A is a diagram illustrating an example electronic device in an unfolded state according to various embodiments. FIG. **2**B is a diagram illustrating an example electronic device in a folded state according to various embodiments.

Referring to FIG. **2**A and FIG. **2**B together, in an embodiment, an electronic device **101** may include a foldable housing (hereinafter, simply referred to as a "housing") **200** and a flexible or foldable display (hereinafter, simply referred to as a "display") **260** disposed inside a space formed by the housing **200**. In this disclosure, a face on which the display **260** is disposed may be referred to, for example, as a first face or front face of the electronic device **101**. In addition, a face opposed to the front face may be referred to, for example, as a second face or rear face of the electronic device **101**. Further, a face surrounding a space between the front face and the rear face may be referred to, for example, as a third face or side face of the electronic device **101**.

In an embodiment, in the unfolded state of FIG. **2**A, the housing **200** may have a substantially rectangular shape. For example, the housing **200** may have a specified width W and a specified length L**1** longer than the specified width W. As another example, the housing **200** may have the specified width W and the specified length L**1** substantially equal to, or shorter than, the specified width W. For example, the specified width W may be a width of the display **260**. In an embodiment, the housing **200** of the electronic device **101** may be folded or unfolded about a folding axis A substantially parallel to a long periphery (e.g., a periphery facing a y-axis among peripheries of the housing **200** of the electronic device **101** in FIG. **2**A) of the rectangle.

In an embodiment, the housing **200** may include a first housing **201**, a second housing **202**, and a connection portion **203**. The connection portion **203** may be disposed between the first housing **201** and the second housing **202**. The connection portion **203** may be coupled to the first housing **201** and the second housing **202**, and the first housing **201** and/or the second housing **202** may rotate about the connection portion **203** (or the folding axis A).

In an embodiment, the first housing **201** may include a first side face member **2011** and a first rear face cover **2013**.

In an embodiment, the second housing **202** may include a second side face member **2021** and a second rear face cover **2023**.

In an embodiment, the first side face member **2011** may extend along a periphery of the first housing **201**, and may form at least part of a side face of the electronic device **101**. The first side face member **2011** may include at least one conductive portion formed of a conductive material (e.g., metal). The conductive portion may act as an antenna radiator for transmitting and/or receiving an RF signal. Similarly to the first side face member **2011**, the second side face member **2021** may form part of a side face of the electronic device **101**, and at least part of the second side face member **2021** may be formed of a conductive material to act as an antenna radiator.

In an embodiment, the first side face member **2011** and the second side face member **2021** may be disposed at both sides about the folding axis A, and may have a shape generally symmetric about the folding axis A.

In an embodiment, an angle or distance between the first side face member **2011** and the second side face member **2021** may vary depending on whether a state of the electronic device **101** is the unfolded state, the folded state, or an intermediate state.

In an embodiment, the housing **200** may form a recess which accommodates the display **260**. The recess may correspond to a shape of the display **260**.

In various embodiments, the aforementioned components may include various types of sensors. The sensor may include, for example, at least one of a front camera, a receiver, and a proximity sensor.

In an embodiment, the first rear face cover **2013** may be disposed to the first housing **201** on the rear face of the electronic device **101**. The first rear face cover **2013** may have a substantially rectangular periphery. Similarly to the first rear face cover **2013**, the second rear face cover **2023** may be disposed to the second housing **202** on the rear face of the electronic device **101**.

In an embodiment, the first rear face cover **2013** and the second rear face cover **2023** may have a shape generally symmetric about the folding axis A. However, shapes of the first rear face cover **2013** and the second rear face cover **2023** are not necessarily symmetric to each other. In an embodiment, the electronic device **101** may include the first rear face cover **2013** and/or second rear face cover **2023** having various shapes. In an embodiment, the first rear face cover **2013** may be formed integrally with the first side face member **2011**, and the second rear face cover **2023** may be formed integrally with the second side face member **2021**.

In an embodiment, the first rear face cover **2013**, the second rear face cover **2023**, the first side face member **2011**, and the second side face member **2021** may form a space in which various components (e.g., a Printed Circuit Board (PCB) or a battery) of the electronic device **101** may be disposed.

In an embodiment, one or more components may be disposed or visually exposed on the rear face of the electronic device **101**. For example, at least part of a sub-display **265** may be visually exposed (e.g., visible) through at least one region of the first rear face cover **2013**. For example, the sub-display **265** may be visually exposed through the entire region of the first rear face cover **2013**, but the region through which the sub-display **265** is visible is not limited to the aforementioned example. As another example, a rear camera **280** may be visually exposed through at least one region of the second rear face cover **2023**. As another example, the rear camera **280** may be disposed to one region of the rear face of the electronic device **101**.

The housing **200** of the electronic device **101** is not limited to the shape or coupling shown in FIG. **2**A and FIG. **2**B, and may be implemented in another shape or in another combination and/or coupling of components.

Referring to FIG. **2**B, the connection portion **203** may be implemented such that the first housing **201** and the second housing **202** are mutually rotatable. For example, the connection portion **203** may include a hinge structure coupled to the first housing **201** and the second housing **202**. In an embodiment, the connection portion **203** may be disposed between the first side face member **2011** and the second side face member **2021** to hide an internal component (e.g., the hinge structure). In an embodiment, the hinge cover **230** may be hidden by part of the first side face member **2011** and second side face member **2021** or may be exposed to the outside according to a state (a flat state or a folded state) of the electronic device **101**. For example, in the hinge cover **230**, a size of a region exposed to the outside may vary depending on the state (the flat state or the folded state) of the electronic device **101**.

For example, when the electronic device **101** is in the flat state as shown in FIG. **2**A, the hinge cover **230** may be not be exposed since it is hidden by the first side face member **2011** and the second side face member **2021**. For example, when the electronic device **201** is in the folded state as shown in FIG. **2**B, the hinge cover **230** may be exposed to the outside between the second side face member **2021** and the second side face member **2021**. For example, in case of the intermediate state in which the first side face member **2011** and the second side face member **2021** are folded with a certain angle, the hinge cover **230** may be partially exposed to the outside between the first side face member **2011** and the second side face member **2021**. However, in this case, an area in which the hinge cover **230** is exposed may be smaller than that in a fully folded state of FIG. **2**B.

In an embodiment, the display **260** may be disposed in a space formed by the housing **200**. For example, the display **260** may be mounted on a recess formed by the housing **200**, and may form most of the front face of the electronic device **101**. For example, the front face of the electronic device **101** may include the display **260**, some regions of the first side face member **2011** adjacent to the display **260**, and some regions of the second side face member **2021**. In addition, the rear face of the electronic device **101** may include the first rear cover **2013**, some regions of the first side face member **2011** adjacent to the first rear cover **2013**, and some regions of the second side face member **2021** adjacent to the second rear cover **2023**.

In an embodiment, the display **260** may include a flexible display in which at least some regions are transformable to a flat face or a curved face. In an embodiment, the display **260** may include a folding region **263**, a first region **261**, and a second region **262**. The folding region **263** may extend along the folding axis A. The first region **261** may be disposed to one side (e.g., a left side of the folding region **263** of FIG. **2**A) with respect to the folding region **263**, and the second region **262** may be disposed to the other side (e.g., a right side of the folding region **263** of FIG. **2**A). As another example, the first region **261** may be a region disposed to the first housing **201**, and the second region **262** may be a region disposed to the second housing **202**. The folding region **263** may be a region disposed to the connection portion **203**.

A region of the display **260** of FIG. **2**A and FIG. **2**B is divided by way of non-limiting example, and the display **260**

may be divided into a plurality of regions (e.g., at least 4 or 2) according to a structure or a function. For example, although the region of the display **260** may be divided by the folding region **263** and the folding axis A in the embodiment of FIG. **2**A, in an embodiment, the region of the display **260** may be divided according to another folding region or another folding axis.

In an embodiment, the first region **261** and the second region **262** may have a shape generally symmetric about the folding region **263**. For example, the first region **261** and the second region **262** may include portions having shapes symmetric to each other and portions having shapes asymmetric to each other.

Hereinafter, an operation of the first side face member **2011** and second side face member **2021** according to the state (e.g., the flat state and the folded state) of the electronic device **101** and each region of the display **260** will be described.

In an embodiment, when the electronic device **101** is in the unfolded state (e.g., FIG. **2**A), the first side face member **2011** and the second side face member **2021** may be disposed to form an angle of 180 degrees and to face substantially the same direction. A surface of the first region **261** of the display **260** and a surface of the second region **262** may form about 180 degrees to each other, and may face substantially the same direction (e.g., a front direction of the electronic device). For example, the folding region **263** may be coplanar with the first region **261** and the second region **262**.

In an embodiment, when the electronic device **101** is in the folded state (e.g., FIG. **2**B), the first side face member **2011** and the second side face member **2021** may be disposed to face each other. A surface of the first region **261** of the display **260** and a surface of the second region **262** may form a narrow angle (e.g., between 0 to 10 degrees) and may face each other. At least part of the folding region **263** may be formed of a curved face having a specific curvature.

In an embodiment, when the electronic device **101** is in an intermediate state, the first side face member **2011** and the second side face member **2021** may be disposed to have a certain angle with each other. A surface of the first region **261** of the display **260** and a surface of the second region **262** may have an angle greater than that in the folded state and less than that in the flat state. At least part of the folding region **263** may be formed of a curved face having a certain curvature. In this case, the curvature may be less than that in the folded state.

FIG. **3** is a cross-sectional view of a display, cut along the axis B of FIG. **2**A, and a dielectric layer structure, according to various embodiments.

Referring to FIG. **3**, the display **260** (or the display structure) according to an embodiment may include a plurality of layers. According to an embodiment, the display **260** may include a cover glass **340**, a display panel **330** disposed adjacent to one face of the cover glass **340**, a dielectric layer structure **311** disposed under the display panel **330**, and a first layer **320** disposed under the dielectric layer structure **311**. According to an embodiment (not shown), among the aforementioned components, some components (e.g., a thermoplastic member **390**) may be omitted, and another component may be added.

According to an embodiment, the display **260** may include an adhesive (e.g., a Pressure Sensitive Adhesive (PSA)) for coupling the aforementioned plurality of layers. According to an embodiment, in addition to the PSA, the adhesive may include an Optically Clear Adhesive (OCA), a heat-reactive adhesive, or a double-sided tape, but is not limited thereto.

According to an embodiment, the cover glass **340** may include a film layer **342** and a transparent plate **341** (e.g., an Ultra-Thin Glass (UTG)), which are exposed or visible at least in part through the front face of the electronic device **101**. The film layer **342** and transparent plate **341** according to an embodiment may be coupled by an adhesive. According to an embodiment, the film layer **342** and the transparent plate **341** may be folded or bent with flexibility. For example, the film layer **342** may be referred to as a polarization film, but is not limited thereto.

According to an embodiment, the display panel **330** may include a panel **332**, a plastic film **333** disposed under the panel **332**, and a cover panel **331** disposed under the plastic film **333**. According to an embodiment, the plastic film **333** may include an adhesive (e.g., PSA) so that the panel **332** and the cover panel **331** are attached to each other. According to an embodiment, the plastic film **333** may be referred to as a polarization film.

According to an embodiment, the panel **332** may be implemented with a touch panel on which electrodes for receiving a touch input, fingerprint recognition, or pen input are disposed. According to an embodiment, the panel **332** may include, for example, and without limitation, an Organic Light Emitting Diode (OLED) panel, a Liquid Crystal Display (LCD), or a Quantum dot Light Emitting Diode (OLED) panel. For example, the display panel **330** may include a plurality of pixels for displaying an image, and one pixel may include a plurality of sub-pixels. For example, one pixel may include three-color sub-pixels, e.g., a red sub-pixel, a green sub-pixel, and a blue sub-pixel. As another example, one pixel may be formed in an RGBG PenTile type, including one red sub-pixel, two green sub-pixels, and one blue sub-pixel.

According to an embodiment, the display **260** may include the dielectric layer structure **311** disposed under the display panel **330**. According to an embodiment, at least part of a periphery of the dielectric layer structure **311** may be formed on an outer side of a periphery of the display panel **330**. Detailed descriptions thereof will be described below.

According to an embodiment, since an adhesive layer **381** is disposed between the display panel **330** and the dielectric layer structure **311**, the dielectric layer structure **311** may be attached under the display panel **330**. According to an embodiment, the adhesive layer **381** may be disposed such that a shape of the adhesive layer **381** corresponds to a shape of the dielectric layer structure **311** or a periphery of the adhesive layer **381** is formed on an inner side of a periphery of the dielectric layer structure **311**. According to an embodiment, the adhesive layer **381** may be disposed such that at least part of the periphery of the adhesive layer **381** corresponds to the periphery of the dielectric layer structure **311**.

According to an embodiment, the dielectric layer structure **311** may include a lattice pattern **370** in at least some regions. For example, the dielectric layer structure **311** may include the lattice pattern **370** in a region adjacent to a folding axis (e.g., the folding axis A of FIG. **2**A). According to an embodiment, since the dielectric layer structure **311** includes the lattice pattern **370** in the region adjacent to the folding axis, when the electronic device **101** switches to a folded state (e.g., FIG. **2**B) or an unfolded state (e.g., FIG. **2**A), the dielectric layer structure **311** and a plurality of layers to which the dielectric layer structure **311** is attached may be folded or unfolded according to each state.

According to an embodiment, the display **260** may further include the thermoplastic member **390** (e.g., a Thermoplastic Poly Urethane (TPU)) disposed under the dielectric layer structure **311**. According to an embodiment, since the display **260** includes the thermoplastic member **390**, damage to the display panel **330**, the dielectric layer structure **311**, and/or the first layer **320** may be prevented and/or reduced. For example, since the display **260** includes the thermoplastic member **390**, bubbles produced between the plurality of layers disposed to the display **260** may be prevented and/or reduced. In addition, since the display **260** includes the thermoplastic member **390**, foreign substances may be prevented and/or reduced from entering into the plurality of layers disposed to the display **260**.

According to an embodiment, the display **260** may include the first layer **320** disposed under the dielectric layer structure **311**. According to an embodiment, the first layer **320** may include at least one of a digitizer **321** and a metal plate **322**. For example, the first layer **320** may include the metal plate **322** disposed under the dielectric layer structure **311**.

According to an embodiment, the digitizer **321** and the metal plate **322** may be adhered by an adhesive. For example, the adhesive may be attached under the digitizer **321**, and the metal plate **322** may be attached under the digitizer **321** by the adhesive.

According to an embodiment, the first layer **320** may be formed in a disconnected manner in a region corresponding to the folding axis (e.g., the folding axis A of FIG. **2**A). According to an embodiment, since the first layer **320** is formed in the disconnected manner in the region corresponding to the folding axis (e.g., the folding axis A of FIG. **2**A), when the electronic device **101** switches to the folded state (e.g., FIG. **2**B) or the unfolded state (e.g., FIG. **2**A), the first layer **320** may be folded or unfolded according to each state. According to an embodiment (not shown), the first layer **320** may have flexibility and may be formed across the folding axis.

According to an embodiment, the digitizer **321** may include a device capable of detecting an input for an x-position and/or a y-position, and may detect an input device (e.g., an electronic pen) of a magnetic field type. For example, at least one processor (e.g., the processor **120** of FIG. **1**) may provide current to the digitizer **321**, and the digitizer **321** may generate an electromagnetic field. When the electronic pen approaches the electromagnetic field of the digitizer **321**, electromagnetic induction occurs and a resonance circuit of the electronic pen may generate current. The resonance circuit of the electronic pen may use the generated current to produce a magnetic field. The at least one processor may detect a position by scanning strength of the magnetic field applied from the electronic pen to the digitizer **321** throughout the entire region. The at least one processor may perform an operation based on the detected position.

According to an embodiment, the metal plate **322** may be referred to as a shielding layer. According to an embodiment, the metal plate **322** may be formed by applying Magnetic Metal Powder (MMP) to a lower portion of the digitizer **321**. The metal plate **322** according to an embodiment may reduce noise by shielding magnetic force caused by surrounding electronic components in addition to a signal which is input from the electronic pen.

According to an embodiment, the dielectric layer structure **311** may include a material for securing rigidity and a lightweight material. According to an embodiment, the dielectric layer structure **311** may have a structure in which a layer for securing rigidity and a layer formed of the lightweight material are stacked. According to an embodiment, since the dielectric layer structure **311** has rigidity, the flexible display **260** may secure rigidity. According to an embodiment, since at least part of the dielectric layer structure **311** is formed of the lightweight material, the flexible display **260** may be reduced in weight.

According to an embodiment, the dielectric layer structure **311** may include a first dielectric layer **3111**, a second dielectric layer **3112** disposed on one face of the first dielectric layer **3111** adjacent to the display panel **330**, and a third dielectric layer **3113** disposed under the first dielectric layer **3111**. According to an embodiment (not shown), one of the second dielectric layer **3112** and the third dielectric layer **3113** may be omitted.

According to an embodiment, the first dielectric layer **3111** may be formed of a lightweight material. According to an embodiment, the first dielectric layer **3111** may include a dielectric material having a permittivity less than or equal to a specified value. For example, the first dielectric layer **3111** may be formed of a Glass Fiber Reinforced Plastic (GFRP) having a permittivity less than or equal to 6, but is not limited thereto.

According to an embodiment, at least part of the second dielectric layer **3112** and/or the third dielectric layer **3113** may be formed of a material having rigidity greater than or equal to a specified value. For example, the second dielectric layer **3112** and the third dielectric layer **3113** may have rigidity greater than a rigidity of the first dielectric layer **3111**. According to an embodiment, since the second dielectric layer **3112** and the third dielectric layer **3113** are formed of a Carbon Fiber Reinforced Plastic (CFRP) having a high permittivity, it is possible to secure the rigidity of the flexible display **260**.

According to an embodiment, at least part of the second dielectric layer **3112** and/or third dielectric layer **3113** may include a dielectric material having a permittivity greater than or equal to a specified value. For example, the second dielectric layer **3112** and the third dielectric layer **3113** may be formed of a CFRP having a permittivity greater than or equal to 200, but is not limited thereto. For another example, the second dielectric layer **3112** and the third dielectric layer **3113** may have different permittivities.

According to an embodiment, a second periphery **352** of the second dielectric layer **3112** and a third periphery **353** of the third dielectric layer **3113** may be formed on an inner side of a first periphery **351** of the first dielectric layer **3111**. According to an embodiment, the second periphery **352** of the second dielectric layer **3112** and the third periphery **353** of the third dielectric layer **3113** may be formed to correspond to each other. Detailed descriptions thereof will be described below.

FIG. **4**A is a partial cross-sectional view of the display of FIG. **3** according to various embodiments. FIG. **4**B is a partial cross-sectional view of the display of FIG. **3** according to various embodiments.

Referring to FIG. **4**A and FIG. **4**B together, the display **260** according to an embodiment may include a plurality of layers, and each of the plurality of layers may be disposed to be spaced apart by a specific distance from a first side face **401** (e.g., the side face of the electronic device **101** of FIG. **2**A).

According to an embodiment, the display **260** may include the cover glass **340** forming at least part of a front face of the electronic device, the display panel **330** disposed adjacent to one face of the cover glass **340**, the dielectric

layer structure **311** disposed under the display panel **330**, and the first layer **320** disposed under the dielectric layer structure **311**.

According to an embodiment, the dielectric layer structure **311** may include the first dielectric layer **3111**, the second dielectric layer **3112** disposed on one face of the first dielectric layer **3111** adjacent to a display panel **330**, and the third dielectric layer **3113** disposed on one face of the first dielectric layer **3111** facing a rear face of the electronic device (e.g., the rear face of the electronic device **101** of FIG. **2**A). The same reference numerals are used for the same or substantially the same components as those described above, and redundant descriptions may not be repeated.

According to an embodiment, the first side face **401** may be referred to as a side face of the electronic device, formed by a first housing (e.g., the first housing **201** of FIG. **2**A). According to an embodiment, the first housing may be referred to as a first side face member.

According to an embodiment, the first dielectric layer **3111** may include the first periphery **351** spaced apart by a first distance D**1** from the first side face **401**. For example, the first periphery **351** of the first dielectric layer **3111** may be spaced apart by a specific distance (e.g., about 0.2 mm) from the first side face **401**. According to an embodiment, since the first periphery **351** is spaced apart by the first distance D**1** from the first side face **401**, it may be spaced apart by at least part of the first housing **201**.

Referring to FIG. **4**A, the second dielectric layer **3112** according to an embodiment may include the second periphery **352** spaced apart by a second distance D**2** greater than the first distance D**1** from the first side face **401**. For example, the second periphery **352** of the second dielectric layer **3112** may be spaced apart by a specific distance (e.g., about 1 mm) from the first side face **401**, but is not limited thereto.

According to an embodiment, the third dielectric layer **3113** may include the third periphery **353** spaced apart by the second distance D**2** greater than the first distance D**1** from the first side face **401**. For example, the third periphery **353** of the third dielectric layer **3113** may be spaced apart by a specific distance (e.g., about 1 mm) from the first side face **401**, but is not limited thereto. For example, the second periphery **352** and the third periphery **353** may be spaced apart by the second distance D**2** from the first side face **401**.

According to an embodiment, the second periphery **352** and the third periphery **353** may be spaced apart by a distance greater than the first distance D**1** from the first side face **401**. Distances by which the second periphery **352** and the third periphery **353** are spaced apart from the first side face **401** may be different from each other.

According to an embodiment, the display panel **330** may include a periphery **360** spaced apart by a third distance D**3** greater than the first distance D**1** and less than the second distance D**2** from the first side face **401**. For example, the periphery **360** of the display panel **330** may be spaced apart by about 0.5 mm from the first side face **401**, but is not limited thereto. According to an embodiment, a periphery of the cover panel **331** may be formed to be spaced apart by a distance greater than the third distance D**3** from the first side face **401**, but is not limited thereto.

According to an embodiment, at least part of the first periphery **351** of the first dielectric layer **3111** may be formed on an outer side of the periphery **360** of the display panel **330**. According to an embodiment, at least part of the second periphery **352** of the second dielectric layer **3112** and at least part of the third periphery **353** of the third dielectric layer **3113** may be formed on an inner side of the periphery **360** of the display panel **330**.

According to an embodiment, the first periphery **351** of the first dielectric layer **3111** may form an outermost edge of the display **260**. According to an embodiment, the second periphery **352** of the second dielectric layer **3112** and/or the third periphery **353** of the third dielectric layer **3113** may form an innermost periphery of the display **260**.

Referring to FIG. **4**B, according to an embodiment, the display **260** may further include a dielectric **470** extending to an outer side from the second periphery **352** of the second dielectric layer **3112** and/or the third periphery **353** of the third dielectric layer **3113**. According to an embodiment, the display **260** may include the dielectric **470** extending from the second periphery **352** of the second dielectric layer **3112** and/or the third periphery **353** of the third dielectric layer **3113** and having a periphery **354** spaced apart by the first distance D**1** from the first side face **401**.

According to an embodiment, the dielectric **470** may be formed of a dielectric material having a permittivity less than or equal to a specified value. According to an embodiment, the dielectric **470** may be formed of a dielectric material having a permittivity less than or equal to about 6, but is not limited thereto. For example, the dielectric **470** may include a resin having a permittivity of 2.54.

According to an embodiment, at least part of the periphery **354** of the dielectric **470** may be spaced apart by the first distance D**1** from the first side face **401**. According to an embodiment (not shown), at least part of the periphery **354** of the dielectric **470** may be formed to be spaced apart by a distance (e.g., the third distance D**3**) greater than the first distance D**1** from the first side face **401**.

According to an embodiment, the periphery **354** of the dielectric **470** may be formed on an outer side of the periphery **360** of the display panel **330**. According to an embodiment (not shown), at least part of the periphery **354** of the dielectric **470** may be formed to correspond to the periphery **360** of the display panel **330**.

According to an embodiment, the periphery **354** of the dielectric **470** may be formed to correspond to the first periphery **351** of the first dielectric **3111**. The periphery **354** of the dielectric **470** according to an embodiment may form the outermost edge of the display **260** together with the first periphery **351** of the first dielectric layer **311**.

FIG. **5**A is a diagram illustrating a periphery of a dielectric layer structure formed in a region corresponding to at least some regions in a housing according to various embodiments. FIG. **5**B is a diagram illustrating a display structure when viewed from a direction perpendicular to a front face of an electronic device according to various embodiments.

Referring to FIG. **5**A and FIG. **5**B together, the first dielectric layer **3111** according to an embodiment may include the first periphery **351** formed in a region corresponding to at least some regions of the periphery of the housing **200**. According to an embodiment, the second dielectric layer **3112** and the third dielectric layer **3113** may respectively include the second periphery **352** and the third periphery **353**, corresponding to the first periphery **351** of the first dielectric layer **3111**.

According to an embodiment, when viewed in the direction perpendicular to the front face of the electronic device **101**, the second dielectric layer **3112** and the third dielectric layer **3113** may be disposed to overlap at least in part. According to an embodiment, when viewed in the direction perpendicular to the front face of the electronic device **101**, the second periphery **352** and the third periphery **353** may be

disposed to overlap at least in part. For convenience of explanation, hereinafter, descriptions on the second dielectric layer **3112** and the second periphery **352** may be referred to as descriptions on the third dielectric layer **3113** and the third periphery **353**, respectively.

Referring to FIG. **5**A, the first housing **201** (or the first side face member **2011**) according to an embodiment may include a first portion **201**A, a second portion **201**B extending substantially vertically from the first portion **201**A, and a third portion **201**C extending substantially vertically from the second portion **201**B and substantially parallel to the first portion **201**A.

According to an embodiment, the second housing **202** (or the second side face member **2021**) according to an embodiment may include a fourth portion **202**A, a fifth portion **202**B extending substantially vertically from the fourth portion **202**A, and a sixth portion **202**C extending substantially vertically from the fifth portion **202**B and substantially parallel to the first fourth **202**A.

According to an embodiment, the first periphery **351** may be formed in a region corresponding to the first region **501** not acting as an antenna radiator in the first housing **201** and/or the second housing **202**.

According to an embodiment, the second periphery **352** may be formed in a region corresponding to at least some regions of the first portion **201**A and/or third portion **201**C of the first housing **201**.

According to an embodiment, the second periphery **352** may be formed in a region corresponding to the second region **502** in which power is supplied from a wireless communication circuit **510** (e.g., the wireless communication module **192** of FIG. **1**) in the first housing **201** and/or the second housing **202**. According to an embodiment, the second periphery **352** may be formed in a region corresponding to the second region **502** acting as an antenna radiator by supplying power from the wireless communication circuit **510** in the first housing **201** and/or the second housing **202**. According to an embodiment, the second periphery **352** may be formed to be spaced apart by a specified distance D**2** (e.g., 1 mm) from a side face of the electronic device **101**, in a region corresponding to the second region **502** in which power is applied by the wireless communication circuit **510** in the first housing **201** and/or the second housing **202**.

According to an embodiment, the second periphery **352** may be formed from a first point **511** spaced apart by a specific distance d from a folding axis A on the first portion **201**A of the first housing **201** to a second portion **512** on the first portion **201**A. According to an embodiment, the second periphery **352** may be formed from a third point **513** spaced apart by the specific distance d from the folding axis A on the third portion **201**C of the first housing **201** to a fourth portion **514** on the third portion **201**C.

According to an embodiment, the second periphery **352** may be formed to be spaced apart by a specified distance D**2** (e.g., about 1 mm) from the side face of the electronic device **101**, in a region corresponding to a region except for a corner where the first portion **201**A and the second portion **201**B meet in the first housing **102** and a corner where the second portion **201**B and the third portion **201**C meet.

According to an embodiment, the second periphery **352** may be formed in a region corresponding to some regions of the fourth portion **202**A, fifth portion **202**B, and/or sixth portion **202**C of the second housing **202**. According to an embodiment, the second periphery **352** may be formed from a fifth point **515** spaced apart by the specific distance d from the folding axis A on the fourth portion **202**A of the second housing **202** to a sixth point **516** on the fourth portion **202**A. According to an embodiment, the second periphery **352** may be formed from a seventh point **517** spaced apart by the specific distance d from the folding axis Aon the sixth portion **202**C of the second housing **202** to an eighth portion **518** on the sixth portion **202**C. According to an embodiment, the second periphery **352** may be formed in a region corresponding to at least some regions in the fifth portion **202**B. According to an embodiment, the second periphery **352** may be formed to be spaced apart by a specified distance D**2** (e.g., about 1 mm) from the side face of the electronic device **101**, in a region corresponding to a region except for a corner where the fourth portion **202**A and the fifth portion **202**B meet in the second housing **202** and a corner where the fifth portion **202**B and the sixth portion **202**C meet.

Referring to FIG. **5**B, the first periphery **351** of the first dielectric layer **3111** and the second periphery **352** of the second dielectric layer **3112** according to an embodiment may be formed to have a shape corresponding to the periphery of the display **260**.

When viewed from a direction perpendicular to a front face of the electronic device **101** according to an embodiment, the second periphery **352** of the second dielectric layer **3112** may be disposed to an inner side of the first periphery **351** of the first dielectric layer **3111**.

According to an embodiment, the first dielectric layer **3111** and the second dielectric layer **3112** may include the lattice pattern **370** in at least some regions. According to an embodiment, the first dielectric layer **3111** and the second dielectric layer **3112** may include the lattice pattern **370** in some regions adjacent to the folding axis A. According to an embodiment, since the first dielectric layer **3111** and the second dielectric layer **3112** include the lattice pattern **370** in some regions adjacent to the folding axis A, when the electronic device **101** switches to the folded state (e.g., FIG. **2**B) or the unfolded state (e.g., FIG. **2**A), the display **260** and the dielectric layer structure **311** may be folded or unfolded according to each state.

According to an embodiment, at least part of the first dielectric layer **3111** and second dielectric layer **3112** may have a shape corresponding to the front face of the electronic device **101**, and may be formed across the folding axis A. According to an embodiment, the first dielectric layer **3111** may be formed by being split about the folding axis A. Detailed descriptions thereof will be described below.

FIG. **6**A is a diagram illustrating a dielectric layer structure formed of a different material depending on a region according to various embodiments. FIG. **6**B is a diagram including a cross-sectional view of an electronic device and a display structure mounted on a bracket according to various embodiments.

Referring to FIG. **6**A and FIG. **6**B together, the electronic device **101** according to an embodiment may include a bracket **630** on which a display structure (e.g., the display **260** of FIG. **3**) is mounted, and at least some regions of the display may be disposed to correspond to the bracket **630**. According to an embodiment, when viewed from a direction perpendicular to a front face of the electronic device **101**, the display may include a plurality of dielectric layers (e.g., the dielectric layer structure **311** of FIG. **3**) formed of a material distinctive depending on a region.

The electronic device **101** according to an embodiment may include the bracket **630** and the display structure mounted on the bracket **630**. According to an embodiment, the bracket **630** may be formed through ejaculation. Accord-

ing to an embodiment, the bracket **630** may be formed inside a housing (e.g., the housing **200** of FIG. **2**A) through ejaculation.

According to an embodiment, a first dielectric layer (e.g., the first dielectric layer **3111** of FIG. **3**) may include a first region **611** formed on an inner side from a first periphery (e.g., the first periphery **351** of FIG. **3**) and a second region **612** extending to an outer side from the first region **611** to form the first periphery. According to an embodiment, the first dielectric layer may include the second region **612** adjacent to a side face of the electronic device **101** and the first region **611** formed on an inner side of the second region **612** and adjacent to a center of the electronic device **101**.

According to an embodiment, the first region **611** may be formed of a material having high thermal conductivity. For example, the first region **611** may be formed of at least one of a soft graphite resin and a thermal conductive flexible composite resin, but is not limited thereto. According to an embodiment, since the first region **611** may be formed of the material having high thermal conductivity, heat generated from electronic components inside the electronic device **101** may be transferred to a housing or a separate space disposed inside the electronic device **101**.

According to an embodiment, the second region **612** may be formed of a dielectric material having a permittivity less than or equal to a specified value. For example, the second region **612** may include a GFRP having a permittivity less than or equal to about 6, but is not limited thereto.

Referring to a cross-sectional view, cut along an axis C, of the electronic device **101** according to an embodiment, the second region **612** may be disposed to be formed in a region corresponding to the bracket **630**. According to an embodiment, at least part of the second region **612** of the first dielectric layer may be disposed to the region corresponding to the bracket **630**.

According to an embodiment, a second dielectric layer (e.g., the second dielectric layer **3112** of FIG. **3**) may be disposed to a third region **613** spaced apart by a specific distance d from the folding axis A.

According to an embodiment, the electronic device **101** may include a hinge structure **640** (e.g., the connection portion **203** of FIG. **2**A). According to an embodiment, when viewed from a direction perpendicular to a front face of the electronic device **101**, at least part of the third region **613** spaced apart by the specific distance d from the folding axis A may overlap a region in which the hinge structure **640** is disposed. According to an embodiment, the second dielectric layer and/or the third dielectric layer (e.g., the third dielectric layer **3113** of FIG. **3**) may be disposed at least in part in the third region **613**.

For example, a width W_H of the region in which the hinge structure **640** is disposed may be less than or equal to twice the specific distance d by which the third region **613** is formed from the folding axis A.

$$W_H<2d \quad \text{[Equation 1]}$$

However, a relationship between the width W_H of the region in which the hinge structure **640** is disposed and the specific distance d by which the third region **613** is formed from the folding axis A is not limited to the equation above. Detailed descriptions thereof will be described below.

FIG. **7** is a cross-sectional view of a display, cut along the axis C of FIG. **6**B, and a dielectric layer structure, according to various embodiments.

Referring to FIG. **7**, the display **260** according to an embodiment may include the cover glass **340** forming at least part of a front face of the electronic device **101**, the display panel **330** disposed adjacent to one face of the cover glass **340**, the dielectric layer structure **311** disposed under the display panel **330**, and the first layer **320** disposed under the dielectric layer structure **311**. The same reference numerals are used for the same or substantially the same components as those described above, and redundant descriptions may not be repeated here.

According to an embodiment, the dielectric layer structure **311** may include the lattice pattern **370** in at least some regions. According to an embodiment, the lattice pattern **370** may be disposed adjacent to the folding axis A. According to an embodiment, the lattice pattern **370** may be disposed to have a third width W**3**. According to an embodiment, the lattice pattern **370** may be disposed, adjacent to the folding axis A, to have the third width W**3**.

According to an embodiment, the first dielectric layer **3111** may be formed to be spaced apart by a first width W**1** about the lattice pattern **370** or the folding axis A. According to an embodiment, the first dielectric layer **3111** may be formed across at least part of the first region **611** and the second region **612**. According to an embodiment, the first dielectric layer **3111** may form at least part of the first region **611** and second region **612**. For example, the first dielectric layer **3111** may include a GFRP having a permittivity less than or equal to a specified value (e.g., 6), and may form the first region **611** and the second region **612**.

According to an embodiment, the second dielectric layer **3112** and/or the third dielectric layer **3113** may form at least part of the first region **611** and third region **613**. For example, the second dielectric layer **3112** and the third dielectric layer **3112** may have a permittivity greater than or equal to about 200, and may form the third region **613**.

According to an embodiment, the second dielectric layer **3112** may be disposed to at least partially overlap the first dielectric layer **3111** in the first region **611**, when viewed from the direction perpendicular to the front face of the electronic device **101**. According to an embodiment, the second dielectric layer **3112** may be disposed to at least partially overlap the first dielectric layer **3111** in the third region **613**, when viewed from the direction perpendicular to the front face of the electronic device **101**.

According to an embodiment, the cover panel **331** and/or the TPU may include a groove in at least some regions. According to an embodiment, the cover panel **331** and/or the TPU may include a groove having a second width W**2** in the at least some regions. However, a width of a groove of the cover panel **331** may not be equal to a width of a groove of the TPU.

According to an embodiment, since the cover panel **331** and/or the TPU include the grooves in the at least some regions, when the electronic device **101** switches to the folded state (e.g., FIG. **2**B) or the unfolded state (e.g., FIG. **2**A), the cover panel **331** and/or the TPU may be easily folded or unfolded.

According to an embodiment, a relationship of the first width W**1**, the second width W**2**, and the third width W**3** may be referred according to the following equation.

$$W1>W2>W3 \quad \text{[Equation 2]}$$

However, the relationship of the first width W**1**, the second width W**2**, and the third width W**3** is not limited to the aforementioned equation. At least two of the first width W**1**, the second width W**2**, and the third width W**3** may be formed to have the same width.

According to an embodiment (not shown), when the TPU is formed in a region adjacent to the folding region **263**, W**2** may be formed to be greater than W**1**.

According to an embodiment, the display **260** may further include the dielectric **470** extending to an outer side from the second dielectric layer **3112** and/or the third dielectric layer **3113**.

According to an embodiment, the dielectric **470** may be formed of a dielectric material having a permittivity less than or equal to a specified value. According to an embodiment, the dielectric **470** may be formed of a dielectric material having a permittivity less than or equal to about 6, but is not limited thereto. For example, the dielectric **470** may include a resin having a permittivity of 2.54.

FIG. **8** is a diagram illustrating a first state of an electronic device according to various embodiments. FIG. **9** is a diagram illustrating a second state of an electronic device according to various embodiments.

Referring to FIG. **8** and FIG. **9**, in an embodiment, an electronic device **800** may include a housing **810**, a hinge cover **930** which covers a foldable portion of the housing **810**, and a flexible or foldable display (hereinafter, simply referred to as a "main display") **900** disposed inside a space formed by the housing **810**. In this disclosure, a face on which the main display **900** is disposed may be referred to, for example, as a first face or a front face **801** of the electronic device **800**. In addition, a face opposed to the front face **801** may be referred to, for example, as a second face or a rear face **802** of the electronic device **800**. Further, a face surrounding a space between the front face **801** and the rear face **802** may be referred to, for example, as a third face or a side face **803** of the electronic device **800**.

According to an embodiment, the housing **810** may include a foldable housing. In an embodiment, the housing **810** may include a first housing **811**, a second housing **812**, a first rear cover **880**, and a second rear cover **890**. The housing **810** of the electronic device **800** is not limited to the shape and coupling shown in FIG. **8** and FIG. **9**, and may be implemented in another shape or in another combination and/or coupling of components. For example, in an embodiment, the first housing **811** and the first rear cover **880** may be formed integrally, and the second housing **812** and the second rear cover **890** may be formed integrally.

According to an embodiment, a state where the electronic device **800** is unfolded may imply a flat state **800**A or a first state **800**A. For example, a state where the first housing **811** and the second housing **812** are unfolded may correspond to the flat state **800**A or the first state **800**A. In addition, a state where the electronic device **800** is folded may imply a folded state **800**B or a second state **800**B. For example, a state where the second housing **812** rotates to be folded with respect to the first housing **811** may correspond to the folded state **800**B or the second state **800**B.

According to an embodiment, the first housing **811** and the second housing **812** may have different angles or different distances depending on whether the state of the electronic device **101** is the flat state, the folded state, or an intermediate state.

In the illustrated embodiment, the first housing **811** and the second housing **812** may be disposed at both sides about a folding axis (hereinafter, an "axis C"), and may have a shape substantially symmetric about the axis C. However, the first housing **811** and the second housing **812** may have asymmetric shapes in some regions. For example, unlike the first housing **811**, the second housing **812** may further include a USB hole **851**. In other words, the first housing **811** and the second housing **812** may include portions having shapes symmetric to each other and portions having shapes asymmetric to each other.

According to an embodiment, the main display **900** may be disposed symmetrically throughout the first housing **811** and the second housing **812**.

In an embodiment, at least part of the first housing **811** and second housing **812** may be formed of a metal material or non-metal material having a rigidity and size selected to support the main display **900**.

In an embodiment, the first rear cover **880** may be disposed to one side of the axis C of the rear face of the electronic device. For example, the first rear cover **880** may have a substantially rectangular periphery, and the periphery may be enclosed by the first housing **811**. Similarly, the second rear cover **890** may be disposed to the other side of the axis C of the rear face of the electronic device, and a periphery thereof may be enclosed by the second housing **812**.

In the illustrated embodiment, the first rear cover **880** and the second rear cover **890** may have a substantially symmetric shape about the axis C. However, the first rear cover **880** and the second rear cover **890** do not necessarily have a mutually symmetric shape, and thus in an embodiment, the first rear cover **880** and second rear cover **890** included in the electronic device **800** may have various shapes.

In an embodiment, the first rear cover **880**, the second rear cover **890**, the first housing **811**, and the second housing **812** may form a space in which various components (e.g., a PCB or a battery) of the electronic device **800** may be disposed. In an embodiment, one or more components may be disposed or visually exposed on the rear face of the electronic device **800**. For example, at least part of a sub-display **920** may be visually exposed (e.g., visible) through a first rear region **931** of the first rear cover **880**. In an embodiment, the sub-display **920** may be disposed to the entirety of the first rear region **931** of the first rear cover **880**.

In an embodiment, one or more components or a sensor may be visually exposed through a second rear region **932** of the second rear cover **890**. In various embodiments, the sensor may include a proximity sensor and/or a rear camera **980**.

The main display **900** may be disposed in a space formed by the housing **810**. For example, the main display **900** may be mounted on a recess formed by the housing **810**, and may form most of the front face **801** of the electronic device **800**.

Accordingly, the front face **801** of the electronic device **800** may include the main display **900**, some regions of the first housing **811** adjacent to the main display **900**, and some regions of the second housing **812**. In addition, the rear face **802** of the electronic device **800** may include the first rear cover **880**, some regions of the first housing **811** adjacent to the first rear cover **880**, and some regions of the second housing **812** adjacent to the second rear cover **890**.

The main display **900** may refer to a display in which at least some regions may be transformed to a flat face or a curved face. In an embodiment, the main display **900** may include a folding region **903**, a first display region **901** disposed to one side (e.g., a left side of the folding region **903** of FIG. **8**) with respect to the folding region **903**, and a second display region **902** disposed to the other side (e.g., a right side of the folding region **903** of FIG. **8**).

A region of the main display **900** of FIG. **8** is divided by way of non-limiting example, and the main display **900** may be divided into a plurality of regions (e.g., at least 4 or 2) according to a structure or a function. For example, although the region of the main display **900** may be divided by the axis C (folding axis) or the folding region **903** extending parallel to a y-axis in the embodiment of FIG. **8**, in an embodiment, the region of the main display **900** may be

divided according to another folding region (e.g., a folding region parallel to an x-axis) or another folding axis (e.g., a folding axis parallel to the x-axis).

In an embodiment, the first display region **901** and the second display region **902** may have a shape substantially symmetric about the folding region **903**. However, unlike the first display region **901**, the second display region **902** may include a camera hole **850**, but in the other regions, may have a shape symmetric to the first display region **901**. In other words, the first display region **901** and the second display region **902** may include portions having shapes symmetric to each other and portions having shapes asymmetric to each other.

According to an embodiment, the camera hole **850** may be visually exposed to the outside of the electronic device **800**. According to an embodiment, the camera hole **850** may be disposed under the main display **900** and thus may not be visually exposed.

Hereinafter, an operation of the first housing **811** and second housing **812** and each region of the main display **900** according to a state (e.g., a flat state **800**A and a folded state **800**B) of the electronic device **800** and each region of the main display **900** will be described.

In an embodiment, when the electronic device **800** is in the flat state **800**A (e.g., FIG. **8**), the first housing **811** and the second housing **812** may be disposed to form an angle of 180 degrees and to face the same direction. A surface of the first display region **901** of the main display **900** and a surface of the second display region **902** may form 180 degrees to each other, and may face the same direction (e.g., a front direction of the electronic device). The folding region **903** may be coplanar with the first display region **901** and the second display region **902**.

In an embodiment, when the electronic device **800** is in the folded state **800**B (e.g., FIG. **9**), the first housing **811** and the second housing **812** may be disposed to face each other. A surface of the first display region **901** of the main display **900** and a surface of the second display region **902** may form a narrow angle (e.g., between 0 to 10 degrees) and may face each other. At least part of the folding region **903** may be formed of a curved face having a specific curvature.

In an embodiment, when the electronic device **800** is in the intermediate state, the first housing **811** and the second housing **812** may be disposed to have a certain angle with each other. A surface of the first display region **901** of the main display **900** and a surface of the second display region **902** may have an angle greater than that in the folded state and less than that in the flat state. At least part of the folding region **903** may be formed of a curved face having a certain curvature. In this case, the curvature may be less than that in the folded state.

FIG. **10** is an exploded perspective view of an electronic device according to various embodiments.

Referring to FIG. **10**, in an embodiment, the electronic device **800** may include a display unit **90**, a bracket assembly **30**, a substrate **400**, the first housing **811**, the second housing **812**, the first rear cover **880**, and the second rear cover **890**. In this disclosure, the display unit **90** may also be called a display module or a display assembly.

The display unit **90** may include the main display **900** and one or more plates or layers (not shown) to which the main display **900** is mounted. In an embodiment, the plate may be disposed between the main display **900** and the bracket assembly **30**. The main display **900** may be disposed on at least part of one face (e.g., an upper face of FIG. **12**) of the plate. The plate may be formed in a shape corresponding to the main display **900**.

The bracket assembly **30** may include a bracket **1010** including a first bracket **1011** and a second bracket **1012**, a hinge structure **1000** disposed between the first bracket **1011** and the second bracket **1012**, a hinge housing **830** which covers the hinge structure **1000** when viewed from the outside, and a wiring member **1043** (e.g., a Flexible Printed Circuit (FPC)) which traverses the first bracket **1011** and the second bracket **1012**.

Referring to FIG. **10**, the hinge housing **830** may be disposed between the first housing **811** and the second housing **812** to hide an internal component (e.g., the hinge structure **1000**). In an embodiment, the hinge housing **830** may be hidden by part of the first housing **811** and second housing **812** or may be exposed to the outside according to a state (the flat state **800**A or the folded state **800**B) of the electronic device **800**.

For example, when the electronic device **800** is in the flat state **800**A as shown in FIG. **8**, the hinge housing **830** may not be exposed since it is hidden by the first housing **811** and the second housing **812**. For example, when the electronic device **800** is in the folded state **800**B (e.g., a fully folded state) as shown in FIG. **9**, the hinge housing **830** may be exposed to the outside between the first housing **811** and the second housing **812**. For example, in case of the intermediate state in which the first housing **811** and the second housing **812** are folded with a certain angle, the hinge housing **830** may be partially exposed to the outside between the first housing **811** and the second housing **812**. However, in this case, a region to be exposed may be smaller than that in the fully folded state. In an embodiment, the hinge housing **830** may include a curved face.

In an embodiment, the bracket assembly **30** may be disposed between the main display **900** and a substrate **1100**. For example, the first bracket **1011** may be disposed between a first substrate **1101** and the first display region **901** of the main display **900**. The second bracket **1012** may be disposed between a second substrate **1102** and the second display region **902** of the main display **900**.

In an embodiment, the wiring member **1043** and the hinge structure **1000** may be partially disposed inside the bracket assembly **30**. The wiring member **1043** may be disposed in a direction (e.g., x-axis direction) which traverses the first bracket **1011** and the second bracket **1012**. The wiring member **1043** may be disposed in a direction (e.g., x-axis direction) perpendicular to a folding axis (e.g., y-axis or the folding axis (axis C) of FIG. **9**) of the folding region **903** of the electronic device **800**.

As mentioned above, the substrate **1100** may include the first substrate **1101** disposed to the first bracket **1011** and the second substrate **1102** disposed to the second bracket **1012**. The first substrate **1101** and the second substrate **1102** may be disposed inside a space formed by the bracket assembly **30**, the first housing **811**, the second housing **812**, the first rear cover **180**, and the second rear cover **190**. Components for implementing various functions of the electronic device **800** may be mounted on the first substrate **1101** and the second substrate **1102**.

According to an embodiment, the first substrate **1101** may be formed of a plurality of substrates. According to an embodiment, the first substrate **1101** may be formed such that the plurality of substrates are separated. For example, the first substrate **1101** may be formed to be divided into a first PCB **1103** and a second PCB **1104**. The first housing **811** and the second housing **812** may be assembled to be coupled at both sides of the bracket assembly **30** in a state where the display unit **90** is coupled to the bracket assembly **30**. As described below, the first housing **811** and the second

housing **812** may be coupled to the bracket assembly **30** by being slid at both sides of the bracket assembly **30**.

In an embodiment, the first housing **811** may include a first rotation support face **813**, and the second housing **812** may include a second rotation support face **814** corresponding to the first rotation support face **813**. The first rotation support face **813** and the second rotation support face **814** may include a curved face corresponding to a curved face included in the hinge housing **830**.

In an embodiment, when the electronic device **800** is in the flat state **800**A (e.g., the electronic device of FIG. **8**), the first rotation support face **813** and the second rotation support face **814** may cover the hinge housing **830**, and thus the hinge housing **830** may not be exposed to the rear face of the electronic device **800** or may be exposed to the minimum extent possible. Meanwhile, when the electronic device **800** is in the folded state **800**B (e.g., the electronic device of FIG. **9**), the first rotation support face **813** and the second rotation support face **814** may rotate along a curved face included in the hinge housing **830**, and thus the hinge housing **830** may be exposed to the rear face of the electronic device **800** to the maximum extent possible.

According to an embodiment, the electronic device **800** may further include a first battery **1151**, a second battery **1152**, and a speaker module **1153**.

According to an embodiment, the first battery **1151** and the second battery **1152** may be mounted inside the housing **810** of the electronic device **800** so as not to be exposed to the outside. For example, the first battery **1151** may be mounted inside the first housing **811**. In addition, the second battery **1152** may be mounted inside the second housing **812**.

According to an embodiment, the first battery **1151** and the second battery **1152** may be electrically coupled by the wiring member **1043** (e.g., an FPC) disposed between the first housing **811** and the second housing **812**.

According to an embodiment, the speaker module **1153** may be disposed inside the first housing **811**. For example, the speaker module **1153** may be disposed to one region adjacent to the first battery **1151** inside the first housing **811**. According to an embodiment, the speaker module **1153** may not be exposed to the outside of the electronic device **800**. According to an embodiment, the speaker module **1153** may be mounted on the second PCB **1104** of the first substrate **1101**.

FIG. **11** is a cross-sectional view of a display and a dielectric layer structure according to various embodiments.

Referring to FIG. **11**, a display **900** (or a display structure) of FIG. **11** may be referred to as the display **260** (or the display structure) of FIG. **3**. In addition, components (e.g., the display **1030**) of the display **900** of FIG. **11** may be respectively referred to as components of the display **260** of FIG. **3**. Redundant descriptions on substantially the same components may not be repeated here.

According to an embodiment, a dielectric layer structure **1110** may include a material for securing rigidity and a lightweight material. According to an embodiment, the dielectric layer structure **1110** may have a structure in which a layer for securing rigidity and a layer formed of the lightweight material are stacked. According to an embodiment, since the dielectric layer structure **1110** has rigidity, the flexible display **900** may secure rigidity. According to an embodiment, since at least part of the dielectric layer structure **1110** is formed of the lightweight material, the flexible display **900** may be reduced in weight.

According to an embodiment, the dielectric layer structure **1110** may include a first dielectric layer **1111**, a second dielectric layer **1112** disposed on one face of the first dielectric layer **1111** adjacent to the display panel **1030**, and a third dielectric layer **1113** disposed under the first dielectric layer **1111**. According to an embodiment (not shown), one of the second dielectric layer **1112** and the third dielectric layer **1113** may be omitted.

According to an embodiment, the first dielectric layer **1111** may be formed of a lightweight material. According to an embodiment, the first dielectric layer **1111** may include a dielectric material having a permittivity less than or equal to a specified value. For example, the first dielectric layer **1111** may be formed of a GFRP having a permittivity less than or equal to 6, but is not limited thereto.

According to an embodiment, at least part of the second dielectric layer **1112** and/or the third dielectric layer **1113** may be formed of a material having rigidity greater than or equal to a specified value. For example, the second dielectric layer **1112** and the third dielectric layer **1113** may have rigidity greater than the first dielectric layer **1111**. According to an embodiment, since the second dielectric layer **1112** and the third dielectric layer **1113** are formed of a CFRP having a high permittivity, it is possible to secure the rigidity of the flexible display **900**.

According to an embodiment, at least part of the second dielectric layer **1112** and/or third dielectric layer **1113** may include a dielectric material having a permittivity greater than or equal to a specified value. For example, the second dielectric layer **1112** and the third dielectric layer **1113** may be formed of a CFRP having a permittivity greater than or equal to 200, but is not limited thereto. For another example, the second dielectric layer **1112** and the third dielectric layer **1113** may have different permittivities.

According to an embodiment, a second periphery of the second dielectric layer **1112** and a third periphery of the third dielectric layer **1113** may be formed on an inner side of a first periphery of the first dielectric layer **1111**. According to an embodiment, the second periphery of the second dielectric layer **1112** and the third periphery of the third dielectric layer **1113** may be formed to correspond to each other.

According to an embodiment, the dielectric layer structure **1110** may further include a dielectric **1270** extending to an outer side from the second periphery of the second dielectric layer **1112** and/or the third periphery of the third dielectric layer **1113**. For example, the dielectric layer structure **1110** may include the dielectric **1270** extending from the second periphery of the second dielectric layer **1112** and/or the third periphery of the third dielectric layer **1113** and having a periphery spaced apart by a first distance (e.g., DO from a first side face (e.g., the first side face **401** of FIG. **4**B) of the housing **810**.

According to an embodiment, the first dielectric layer **1111** may include a plurality of sub-layers. The first dielectric layer **1111** according to an embodiment may include a plurality of sub-layers having structures oriented in different directions. For example, the first dielectric layer **1111** may include a plurality of sub-layers having structures oriented in a direction substantially perpendicular to each other between sub-layers adjacent to each other.

According to an embodiment, the first dielectric layer **1111** may include a first sub-layer **1111-1** disposed adjacent the second dielectric layer **1112** and having a structure oriented in a first direction facing a rear cover (e.g., the first rear cover **880** or second rear cover **890** of FIG. **8**).

According to an embodiment, the first dielectric layer **1111** may include a second sub-layer **1111-2** disposed under the first sub-layer **1111-1** and having a structure oriented in a second direction substantially perpendicular to the first direction. In this case, the second direction may be referred

to as a direction facing a side face member (e.g., the first side face member **2011** or second side face member **2021** of FIG. **2**A) inside the housing **810**.

According to an embodiment, the first dielectric layer **1111** may include a third sub-layer **1111-3** disposed under the second sub-layer **1111-2** and having a structure oriented in the first direction.

According to an embodiment, the second dielectric layer **1112** and/or the third dielectric layer **1113** may have a structure oriented in the second direction.

FIG. **12** is a cross-sectional view of a display and a dielectric layer structure according to various embodiments.

Referring to FIG. **12**, a display **900** (or a display structure) of FIG. **12** may be referred to as the display **260** of FIG. **3** or the display **900** of FIG. **11**. In addition, components (e.g., a display **1030**) of the display **900** of FIG. **12** may be respectively referred to as components of the display **260** of FIG. **3** or the display **900** of FIG. **11**. Redundant descriptions on substantially the same components may not be repeated here.

According to an embodiment, the dielectric layer structure **1110** may include the first dielectric layer **1111**, the second dielectric layer **1112** disposed on one face of the first dielectric layer **1111** adjacent to the display panel **1030**, and the third dielectric layer **1113** disposed under the first dielectric layer **1111**. According to an embodiment (not shown), one of the second dielectric layer **1112** and the third dielectric layer **1113** may be omitted.

According to an embodiment, the first dielectric layer **1111** may be formed of a lightweight material. According to an embodiment, the first dielectric layer **1111** may include a dielectric material having a permittivity less than or equal to a specified value. For example, the first dielectric layer **1111** may be formed of a GFRP having a permittivity less than or equal to 6, but is not limited thereto.

According to an embodiment, at least part of the second dielectric layer **1112** and/or the third dielectric layer **1113** may be formed of a material having rigidity greater than or equal to a specified value. For example, the second dielectric layer **1112** and the third dielectric layer **1113** may have rigidity greater than the first dielectric layer **1111**. According to an embodiment, since the second dielectric layer **1112** and the third dielectric layer **1113** are formed of a CFRP having a high permittivity, it is possible to secure the rigidity of the flexible display **900**.

According to an embodiment, at least part of the second dielectric layer **1112** and/or third dielectric layer **1113** may include a dielectric material having a permittivity greater than or equal to a specified value. For example, the second dielectric layer **1112** and the third dielectric layer **1113** may be formed of a CFRP having a permittivity greater than or equal to 200, but is not limited thereto. For another example, the second dielectric layer **1112** and the third dielectric layer **1113** may have different permittivities.

According to an embodiment, a second periphery of the second dielectric layer **1112** and a third periphery of the third dielectric layer **1113** may be formed on an inner side of a first periphery of the first dielectric layer **1111**. According to an embodiment, the second periphery of the second dielectric layer **1112** and the third periphery of the third dielectric layer **1113** may be formed to correspond to each other.

According to an embodiment, the dielectric layer structure **1110** may further include the dielectric **1270** extending to an outer side from the second periphery of the second dielectric layer **1112** and/or the third periphery of the third dielectric layer **1113**. For example, the dielectric layer structure **1110** may include the dielectric **1270** extending from the second periphery of the second dielectric layer **1112** and/or the third periphery of the third dielectric layer **1113** and having a periphery spaced apart by a first distance (e.g., the first distance D**1** of FIG. **4**B) from a first side face (e.g., the first side face **401** of FIG. **4**B) of the housing **810**.

According to an embodiment, the first dielectric layer **1111** may include a woven structure **1210**. According to an embodiment, at least some region of the first dielectric layer **1111** may have the woven structure **1210**. According to an embodiment, the first dielectric layer **1111** may be referred to as a dielectric layer in which a dielectric is woven. For example, the first dielectric layer **1111** may have the woven structure **1210** in which a plurality of dielectrics are formed to cross each other. According to an embodiment, since the first dielectric layer **1111** is formed to have the woven structure **1210** of a single layer, a thickness and weight of the dielectric layer structure **1110** may be minimized or reduced.

According to an embodiment, the dielectric layer structure **1110** may include a coating layer **1220** disposed on one face of the second dielectric layer **1112** adjacent to the display panel **1030** and/or one face of the third dielectric layer **1113** adjacent to a rear cover. According to an embodiment, the dielectric layer structure **1110** includes the coating layer **1220** disposed on one face of the second dielectric layer **1112** and/or one face of the third dielectric layer **1113**, thereby improving surface quality of the dielectric layer structure **1110**.

FIG. **13**A is a diagram illustrating a dielectric layer structure formed in a region corresponding to a corner of a display according to various embodiments. FIG. **13**B is a diagram illustrating a dielectric layer structure formed in a region corresponding to some regions of a display according to an embodiment.

Referring to FIG. **13**A and FIG. **13**B together, the second dielectric layer **1112** and third dielectric layer **1113** according to an embodiment may be formed in a region corresponding to at least part of a periphery of the housing **810** so as to be spaced apart by a specific distance (e.g., D**1**) from the periphery of the housing **810**. The second dielectric layer **1112** and third dielectric layer **1113** according to an embodiment may be formed in the region corresponding to the at least part of the periphery of the housing **810** so as to be adjacent to the periphery of the housing **810**.

According to an embodiment, the first housing **811** (or the first side face member **801**) according to an embodiment may include a first portion **1301**A, a second portion **1301**B extending substantially vertically from the first portion **1301**A, and a third portion **1301**C extending substantially vertically from the second portion **1301**B and substantially parallel to the first portion **1301**A.

According to an embodiment, the second housing **812** (or the second side face member **802**) according to an embodiment may include a fourth portion **1302**A, a fifth portion **1302**B extending substantially vertically from the fourth portion **1302**A, and a sixth portion **1302**C extending substantially vertically from the fifth portion **1302**B and substantially parallel to the first fourth **1302**A.

Referring to FIG. **13**A, the second dielectric layer **1112** and third dielectric layer **1113** according to an embodiment may be formed in a region corresponding to a periphery of the housing **810** so as to be adjacent to the periphery of the housing **810**. According to an embodiment, the second dielectric layer **1112** and the third dielectric layer **1113** may be formed in a region except for the region corresponding to the corner of the housing **810** so as to be spaced apart by a specific distance (e.g., D**1**) from the periphery of the housing **810**.

For example, the second dielectric layer **1112** and third dielectric layer **1113** according to an embodiment may be formed in a region corresponding to a corner where the first portion **1301**A and second portion **1301**B of the first housing **811** meet, so as to be adjacent to the periphery of the first housing **811**. For example, the second dielectric layer **1112** and third dielectric layer **1113** according to an embodiment may be formed in a region corresponding to a corner where the second portion **1301**B and third portion **1301**C of the first housing **811** meet, so as to be adjacent to the periphery of the first housing **811**. For example, the second dielectric layer **1112** and third dielectric layer **1113** according to an embodiment may be formed in a region except for a region corresponding to the corner where the first portion **1301**A and second portion **1301**B of the first housing **811** meet, so as to be spaced by at least the specific distance (e.g., D**1**) from the periphery of the first housing **811**. For example, the second dielectric layer **1112** and third dielectric layer **1113** according to an embodiment may be formed in a region except for a region corresponding to the corner where the second portion **1301**B and third portion **1301**C of the first housing **811** meet, so as to be spaced by at least the specific distance (e.g., D**1**) from the periphery of the first housing **811**.

According to an embodiment, the second dielectric layer **1112** and/or the third dielectric layer **1113** may be formed on the second housing **812** to correspond to a shape formed on the first housing **811**.

Referring to FIG. **13**B, the second dielectric layer **1112** and third dielectric layer **1113** according to an embodiment may be formed in the region corresponding to the at least part of the periphery of the housing **810** so as to be adjacent to the periphery of the housing **810**. According to an embodiment, the second dielectric layer **1112** and the third dielectric layer **1113** may be formed in a region except for the region corresponding to the at least part of the housing **810** so as to be spaced apart by the specific distance (e.g., D**1**) from the housing **810**.

For example, the second dielectric layer **1112** and/or the third dielectric layer **1113** may be formed adjacent to the periphery of the first housing **811**, in a region corresponding to a region from a point spaced apart by a first distance d**1** from a corner where the second portion **1301**B of the first housing **811** meets the first portion **1301**A to a point spaced apart by the first distance d**1** from a corner where it meets the third portion **1301**C. For example, the second dielectric layer **1112** and/or the third dielectric layer **1113** may be formed spaced apart by at least the specific distance (e.g., D**1**) from the periphery of the first housing **811** until a point spaced apart by the first distance d**1** from a corner where the second portion **1301**B of the first housing **811** meets the first portion **1301**A. For example, the second dielectric layer **1112** and/or the third dielectric layer **1113** may be formed spaced apart by at least the specific distance (e.g., D**1**) of the first housing **811** until a point spaced apart by the first distance d**1** from a corner where the second portion **1301**B of the first housing **811** meets the third portion **1301**C.

As another example, the second dielectric layer **1112** and/or the third dielectric layer **1113** may be formed adjacent to the periphery of the second housing **812**, in a region corresponding to a region from a point spaced apart by a third distance d**3** from a corner where the fifth portion **1302**B of the second housing **812** meets the fourth portion **1302**A to a point spaced apart by a second distance d**2** from a corner where it meets the sixth portion **1302**C. The second dielectric layer **1112** and/or the third dielectric layer **1113** may be formed spaced apart by at least the specific distance (e.g., D**1**) from the periphery of the second housing **812** until a point spaced apart by the second distance d**2** from a corner where the fifth portion **1302**B of the second housing **812** meets the fourth portion **1302**A. For example, the second dielectric layer **1112** and/or the third dielectric layer **1113** may be formed spaced apart by at least the specific distance (e.g., D**1**) of the second housing **812** until a point spaced apart by the third distance d**3** from a corner where the fifth portion **1302**B of the second housing **812** meets the sixth portion **1302**C.

The electronic device according to an example embodiment may include: a housing including a first side face, a second side face, and a hinge coupling the first side face and the second side face, and capable of switching to a folded or unfolded state about the hinge, a rear cover forming a rear face of the electronic device, a wireless communication circuit disposed inside the housing and configured to transmit and/or receive a signal of a specified frequency by supplying power to at least part of the housing, and a display structure coupled to the housing. The display structure may include a cover glass forming at least part of a front face of the electronic device, a display panel disposed adjacent to one face of the cover glass, a first dielectric layer disposed under the display panel. A first periphery of the first dielectric layer may be spaced apart from the first side face by a first distance. The display structure may further include a second dielectric layer disposed on a first face of the first dielectric layer adjacent to the display panel, and a third dielectric layer disposed on a second face of the first dielectric layer facing the rear cover. A second periphery of the second dielectric layer and a third periphery of the third dielectric layer, corresponding to the first periphery of the first dielectric layer, may be spaced apart from the first side face by a second distance greater than the first distance. The first dielectric layer may have a first permittivity, and the second dielectric layer and the third dielectric layer may have a permittivity greater than the first permittivity.

The display structure according to an example embodiment may further include a dielectric extending to an outer side from the second periphery and/or the third periphery. A periphery of the dielectric may be spaced apart from the first side face by the first distance.

According to an example embodiment, the first permittivity of the first dielectric layer may be less than or equal to 6. The second dielectric layer and the third dielectric layer may have a permittivity greater than or equal to 150.

According to an example embodiment, peripheries of the cover glass and display panel may be spaced apart from the first side face by a third distance greater than the first distance and less than the second distance.

According to an example embodiment, the electronic device may include the first layer disposed under the third dielectric layer. The first layer may include at least one of a digitizer and a metal plate.

According to an example embodiment, the first dielectric layer may include a Glass Fiber Reinforced Plastic (GFRP).

According to an example embodiment, the second dielectric layer and/or the third dielectric layer may include a Carbon Fiber Reinforced Plastic (CFRP).

According to an example embodiment, a periphery of the display panel may be disposed between the first periphery and the second periphery, when viewed from a direction perpendicular to the front face of the electronic device.

According to an embodiment, at least one of the first dielectric layer, the second dielectric layer, and the third dielectric layer may have a lattice pattern in at least some regions adjacent to the hinge.

According to an embodiment, the first periphery of the first dielectric layer, the second periphery of the second dielectric layer, and the third periphery of the third dielectric layer may be formed in a region configured as an antenna radiator in the housing wherein power is supplied from the wireless communication circuit.

A display structure according to an example embodiment may include: a cover glass forming an outer face of the display structure, a display panel disposed under the cover class, a first dielectric layer having a first periphery formed at least in part on an outer side of a periphery of the display panel, and disposed under the display panel, a second dielectric layer disposed on a first face of the first dielectric layer adjacent to the display panel, and a third dielectric layer disposed on a second face of the first dielectric layer corresponding to the first face of the first dielectric layer. The second periphery of the second dielectric layer and the third periphery of the third dielectric layer, corresponding to the first periphery of the first dielectric layer, may be formed on an inner side of the first periphery. The first dielectric layer may have a first permittivity. The second dielectric layer and the third dielectric layer may have a permittivity greater than the first permittivity.

According to an example embodiment, the display structure may further include a dielectric extending to an outer side from the second periphery and/or the third periphery. The dielectric may have a periphery corresponding to the first periphery.

According to an example embodiment, the first dielectric layer may include a GFRP. The second dielectric layer and the third dielectric layer may include a CFRP.

According to an example embodiment, the display structure may include the first layer disposed under the third dielectric layer. The first layer may include at least one of a digitizer and a metal plate.

Peripheries of the cover glass and display panel according to an example embodiment may be formed on an inner side of the first periphery and an outer side of the second periphery.

The electronic device according to an example embodiment may include: a housing including a first housing forming the first side face of the electronic device, a second housing forming a second side face of the electronic device corresponding to the first side face, and a hinge coupling the first housing and the second housing, and being capable of switching to a folded or unfolded state about the hinge, a wireless communication circuit disposed inside the housing and configured to transmit and/or receive a signal of a specified frequency by supplying power to at least part of the housing, and a display structure coupled to the housing. The display structure may include a cover glass coupled to the housing and forming at least part of a front face of the electronic device, a display panel disposed adjacent to one face of the cover glass, and a first layer having a first periphery formed at least in part on an outer side of a periphery of the display panel. The first layer may include a first region formed at least in part on an inner side from the first periphery, and a second region extending to an outer side from the first region to form the first periphery. The first region may have a first permittivity. The second region may have a second permittivity less than the first permittivity.

According to an example embodiment, the first region may be formed of at least one of a soft graphite resin and a thermal conductive flexible composite resin.

According to an example embodiment, the second region may include a GFRP.

According to an example embodiment, the electronic device may further include a bracket having the display structure mounted thereon. At least part of the second region may be disposed to correspond to the bracket.

According to an example embodiment, the display structure may include a second layer disposed under the first layer. The second layer may include at least one of a digitizer and a metal plate.

The electronic device according to an example embodiment may include: a housing including a first side face, a second side face corresponding to the first side face, and a hinge coupling the first side face and the second side face, and being capable of switching to a folded or unfolded state about the hinge, a rear cover forming a rear face of the electronic device, a wireless communication circuit disposed inside the housing and configured to transmit and/or receive a signal of a specified frequency by supplying power to at least part of the housing, and a display structure coupled to the housing.

The display structure according to an example embodiment may include: a display panel, a first dielectric layer disposed under the display panel and having a first permittivity. A first periphery of the first dielectric layer may be spaced apart from the first side face by a first distance. The display structure may further include the second dielectric layer disposed on a first face of the first dielectric layer adjacent to the display panel, and the third dielectric layer disposed on a second face of the first dielectric layer facing the rear cover. The first dielectric layer may include a first sub-layer disposed adjacent to the second dielectric layer and having a structure oriented in a first direction facing the rear cover, a second sub-layer disposed under the first sub-layer and having a structure oriented in a second direction substantially perpendicular to the first direction, and a third sub-layer disposed under the second sub-layer and having a structure oriented in the first direction. The second dielectric layer having a permittivity greater than the first permittivity and the third dielectric layer having a permittivity greater than the first permittivity may have a structure oriented in the second direction.

According to an example embodiment, the display structure may further include a dielectric extending to an outer side from the second periphery of the second dielectric layer and/or the third periphery of the third dielectric layer. A periphery of the dielectric may be spaced apart from the first side face by the first distance.

The electronic device according to an example embodiment may include: a housing including a first side face, a second side face corresponding to the first side face, and a hinge coupling the first side face and the second side face, and being capable of switching to a folded or unfolded state about the hinge, a rear cover forming a rear face of the electronic device, a wireless communication circuit disposed inside the housing and configured to transmit and/or receive a signal of a specified frequency by supplying power to at least part of the housing, and a display structure coupled to the housing. The display structure may include: a display panel, a first dielectric layer disposed under the display panel. A first periphery of the first dielectric layer may be spaced apart from the first side face by a first distance. The display structure may further include a second dielectric layer disposed on a first face of the first dielectric layer adjacent to the display panel and having a second periphery corresponding to the first periphery, and the third dielectric layer disposed on a second face of the first dielectric layer

facing the rear cover and having a third periphery corresponding to the first periphery. The first dielectric layer may have a woven structure.

According to an example embodiment, the display structure may further include a coating layer disposed on one face of the second dielectric layer adjacent to the display panel and/or one face of the third dielectric layer facing the rear cover.

According to an example embodiment, the display structure may further include a dielectric extending to an outer side from the second periphery and/or the third periphery. A periphery of the dielectric may be spaced apart from the first side face by the first distance.

While the disclosure has been illustrated and described with reference to various example embodiments, it will be understood that the various example embodiments are intended to be illustrative, not limiting. It will be further understood by those skilled in the art that various changes in form and detail may be made without departing from the true spirit and full scope of the disclosure, including the appended claims and their equivalents. It will also be understood that any of the embodiment(s) described herein may be used in conjunction with any other embodiment(s) described herein.

What is claimed is:

1. An electronic device comprising:

a housing including a first side face, a second side face corresponding to the first side face, and a hinge coupling the first side face and the second side face, and being capable of switching to a folded or unfolded state about the hinge;

a rear cover forming a rear face of the electronic device;

a wireless communication circuit disposed inside the housing and configured to transmit and/or receive a signal of a specified frequency by supplying power to at least part of the housing; and

a display structure coupled to the housing, wherein the display structure comprises:

a cover glass forming at least part of a front face of the electronic device;

a display panel disposed adjacent to one face of the cover glass;

a first dielectric layer disposed under the display panel, wherein a first periphery of the first dielectric layer is spaced apart from the first side face by a first distance;

a second dielectric layer disposed on a first face of the first dielectric layer adjacent to the display panel; and

a third dielectric layer disposed on a second face of the first dielectric layer facing the rear cover, wherein a second periphery of the second dielectric layer and a third periphery of the third dielectric layer, corresponding to the first periphery of the first dielectric layer, are spaced apart from the first side face by a second distance, the second distance being greater than the first distance,

wherein the first dielectric layer has a first permittivity, and the second dielectric layer and the third dielectric layer each have a permittivity greater than the first permittivity.

2. The electronic device of claim **1**,

wherein the display structure further comprises a dielectric extending to an outer side from the second periphery and/or the third periphery, and

wherein a periphery of the dielectric is spaced apart from the first side face by the first distance.

3. The electronic device of claim **1**,

wherein the first permittivity of the first dielectric layer is less than or equal to 6, and

wherein the second dielectric layer and the third dielectric layer each have a permittivity greater than or equal to 150.

4. The electronic device of claim **1**, wherein peripheries of the cover glass and display panel are spaced apart from the first side face by a third distance, the third distance being greater than the first distance and less than the second distance.

5. The electronic device of claim **1**, further comprising

a first layer disposed under the third dielectric layer,

wherein the first layer includes at least one of a digitizer and a metal plate.

6. The electronic device of claim **1**, wherein the first dielectric layer includes a Glass Fiber Reinforced Plastic (GFRP).

7. The electronic device of claim **1**, wherein the second dielectric layer and/or the third dielectric layer include a Carbon Fiber Reinforced Plastic (CFRP).

8. The electronic device of claim **1**, wherein a periphery of the display panel is disposed between the first periphery and the second periphery when viewed from a direction perpendicular to the front face of the electronic device.

9. The electronic device of claim **1**, wherein at least one of the first dielectric layer, the second dielectric layer, and the third dielectric layer has a lattice pattern in at least some regions proximate the hinge.

10. The electronic device of claim **1**, wherein the first periphery of the first dielectric layer, the second periphery of the second dielectric layer, and the third periphery of the third dielectric layer are formed in a region configured to act as an antenna radiator in the housing wherein power is configured to be received from the wireless communication circuit.

11. A display structure comprising:

a cover glass forming an outer face of the display structure;

a display panel disposed under the cover class;

a first dielectric layer having a first periphery formed at least in part on an outer side of a periphery of the display panel, and disposed under the display panel;

a second dielectric layer disposed on a first face of the first dielectric layer adjacent to the display panel; and

a third dielectric layer disposed on a second face of the first dielectric layer corresponding to the first face of the first dielectric layer, wherein a second periphery of the second dielectric layer and a third periphery of the third dielectric layer, corresponding to the first periphery of the first dielectric layer, is formed on an inner side of the first periphery,

wherein the first dielectric layer has a first permittivity, and the second dielectric layer and the third dielectric layer each have a permittivity greater than the first permittivity.

12. The display structure of claim **11**, further comprising

a dielectric extending to an outer side from the second periphery and/or the third periphery,

wherein the dielectric has a periphery corresponding to the first periphery.

13. The display structure of claim **11**,

wherein the first dielectric layer includes a Glass Fiber Reinforced Plastic GFRP, and

wherein the second dielectric layer and the third dielectric layer include a Carbon Fiber Reinforced Plastic (CFRP).

14. The display structure of claim 11, further comprising a first layer disposed under the third dielectric layer, wherein the first layer includes at least one of a digitizer and a metal plate.

15. The display structure of claim 11, wherein peripheries of the cover glass and display panel are formed on an inner side of the first periphery and an outer side of the second periphery.

16. An electronic device comprising:

a housing including a first housing forming a first side face of the electronic device, a second housing forming a second side face of the electronic device corresponding to the first side face, and a hinge coupling the first housing and the second housing, and being capable of switching to a folded or unfolded state about the hinge;

a wireless communication circuit disposed inside the housing and configured to transmit and/or receive a signal of a specified frequency by supplying power to at least part of the housing; and

a display structure coupled to the housing, wherein the display structure comprises:

a cover glass coupled to the housing and forming at least part of a front face of the electronic device;

a display panel disposed adjacent to one face of the cover glass; and

a first layer having a first periphery formed at least in part on an outer side of a periphery of the display panel,

wherein the first layer comprises:

a first region formed at least in part on an inner side from the first periphery; and

a second region extending to an outer side from the first region to form the first periphery,

wherein the first region has a first permittivity, and the second region has a second permittivity less than the first permittivity.

17. The electronic device of claim 16, wherein the first region includes at least one of a soft graphite resin and a thermal conductive flexible composite resin.

18. The electronic device of claim 16, wherein the second region includes a Glass Fiber Reinforced Plastic (GFRP).

19. The electronic device of claim 16, further comprising a bracket having the display structure mounted thereon, wherein at least part of the second region is disposed to correspond to the bracket.

20. The electronic device of claim 16, further comprising a second layer disposed under the first layer, wherein the second layer includes at least one of a digitizer and a metal plate.

21. An electronic device comprising:

a housing including a first side face of the electronic device, a second side face of the electronic device corresponding to the first side face, and a hinge coupling the first side face and the second side face, and being capable of switching to a folded or unfolded state about the hinge;

a rear cover forming a rear face of the electronic device;

a wireless communication circuit disposed inside the housing and configured to transmit and/or receive a signal of a specified frequency by supplying power to at least part of the housing; and

a display structure coupled to the housing, wherein the display structure comprises:

a display panel;

a first dielectric layer disposed under the display panel and having a first permittivity, wherein a first periphery of the first dielectric layer is spaced apart from the first side face by a first distance;

a second dielectric layer disposed on a first face of the first dielectric layer adjacent to the display panel; and

a third dielectric layer disposed on a second face of the first dielectric layer facing the rear cover,

wherein the first dielectric layer comprises:

a first sub-layer disposed adjacent to the second dielectric layer and having a structure oriented in a first direction facing the rear cover;

a second sub-layer disposed under the first sub-layer and having a structure oriented in a second direction substantially perpendicular to the first direction; and

a third sub-layer disposed under the second sub-layer and having a structure oriented in the first direction,

wherein the second dielectric layer has a permittivity greater than the first permittivity and the third dielectric layer has a permittivity greater than the first permittivity and having a structure oriented in the second direction.

22. The electronic device of claim 21,

wherein the display structure further comprises a dielectric extending to an outer side from the second periphery of the second dielectric layer and/or the third periphery of the third dielectric layer, and

wherein a periphery of the dielectric is spaced apart from the first side face by the first distance.

23. An electronic device comprising:

a housing including a first side face, a second side face corresponding to the first side face, and a hinge coupling the first side face and the second side face, and being capable of switching to a folded or unfolded state about the hinge structure;

a rear cover forming a rear face of the electronic device;

a wireless communication circuit disposed inside the housing and configured to transmit and/or receive a signal of a specified frequency by supplying power to at least part of the housing; and

a display structure coupled to the housing, wherein the display structure comprises:

a display panel;

a first dielectric layer disposed under the display panel, wherein a first periphery of the first dielectric layer is spaced apart from the first side face by a first distance;

a second dielectric layer disposed on a first face of the first dielectric layer adjacent to the display panel and having a second periphery corresponding to the first periphery; and

a third dielectric layer disposed on a second face of the first dielectric layer facing the rear cover and having a third periphery corresponding to the first periphery,

wherein the first dielectric layer has a woven structure.

24. The electronic device of claim 23, wherein the display structure further comprises a coating layer disposed on one face of the second dielectric layer adjacent to the display panel and/or one face of the third dielectric layer facing the rear cover.

25. The electronic device of claim 23,

wherein the display structure further comprises a dielectric extending to an outer side from the second periphery and/or the third periphery, and

wherein a periphery of the dielectric is spaced apart from the first side face by the first distance.

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