



US 20260129774 A1

(19) **United States**
(12) **Patent Application Publication**
JEON et al.

(10) **Pub. No.:** **US 2026/0129774 A1**
(43) **Pub. Date:** **May 7, 2026**

(54) **DIGITAL PEN AND ELECTRONIC DEVICE
COMPRISING SAME**

Publication Classification

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

(51) **Int. Cl.**
H05K 5/02 (2006.01)
G06F 3/0354 (2013.01)
H05K 5/00 (2025.01)

(72) Inventors: **Gyuyeon JEON, Suwon-si (KR);
Jongdo PARK, Suwon-si (KR);
Minsu RHEE, Suwon-si (KR);
Gun LIM, Suwon-si (KR)**

(52) **U.S. Cl.**
CPC *H05K 5/0226* (2013.01); *G06F
3/03545* (2013.01); *H05K 5/0086*
(2013.01)

(21) Appl. No.: **19/424,931**

(57) **ABSTRACT**

(22) Filed: **Dec. 18, 2025**

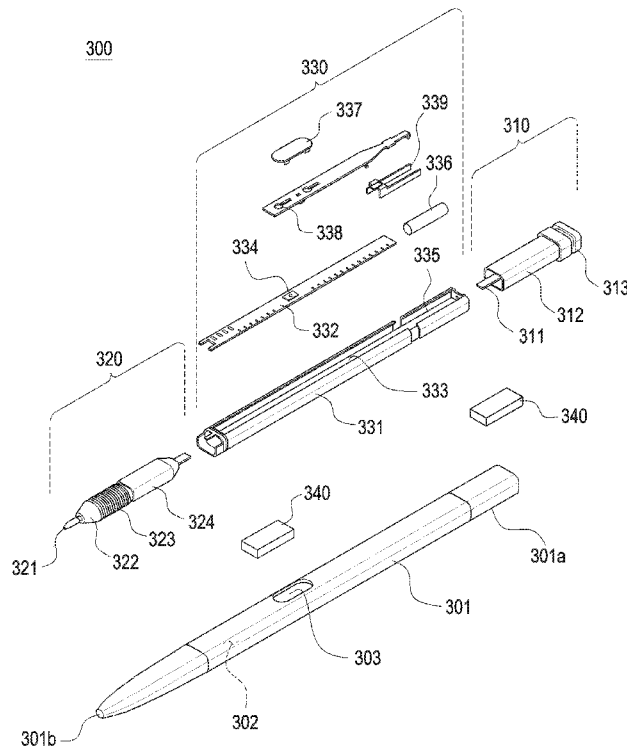
An electronic device is provided. The electronic device includes a housing including a first housing, a second housing and a hinge structure rotatably connecting the first housing and the second housing relative to each other, a display disposed on the housing, and including a first display area disposed on the first housing, a second display area disposed on the second housing, and a folding area configured to be at least partially foldable, and at least one electromagnet disposed between the hinge structure and the folding area, wherein, when the housing is in a folded state, the folding area is configured to form an accommodation space for accommodating a digital pen including at least one magnetic member.

Related U.S. Application Data

(63) Continuation of application No. PCT/KR2024/006474, filed on May 13, 2024.

Foreign Application Priority Data

(30) Jun. 19, 2023 (KR) 10-2023-0078264
Jul. 17, 2023 (KR) 10-2023-0092284



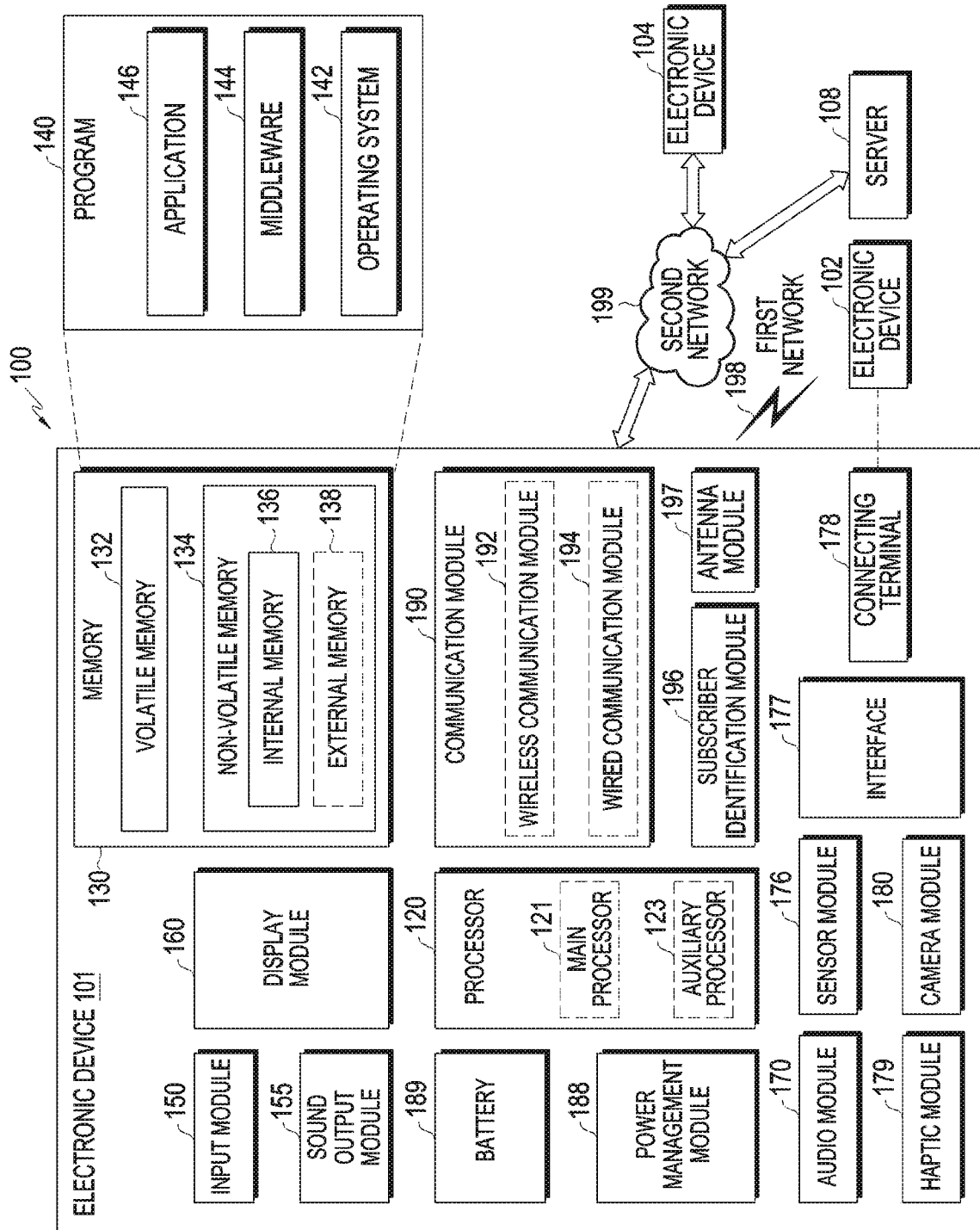


FIG. 1

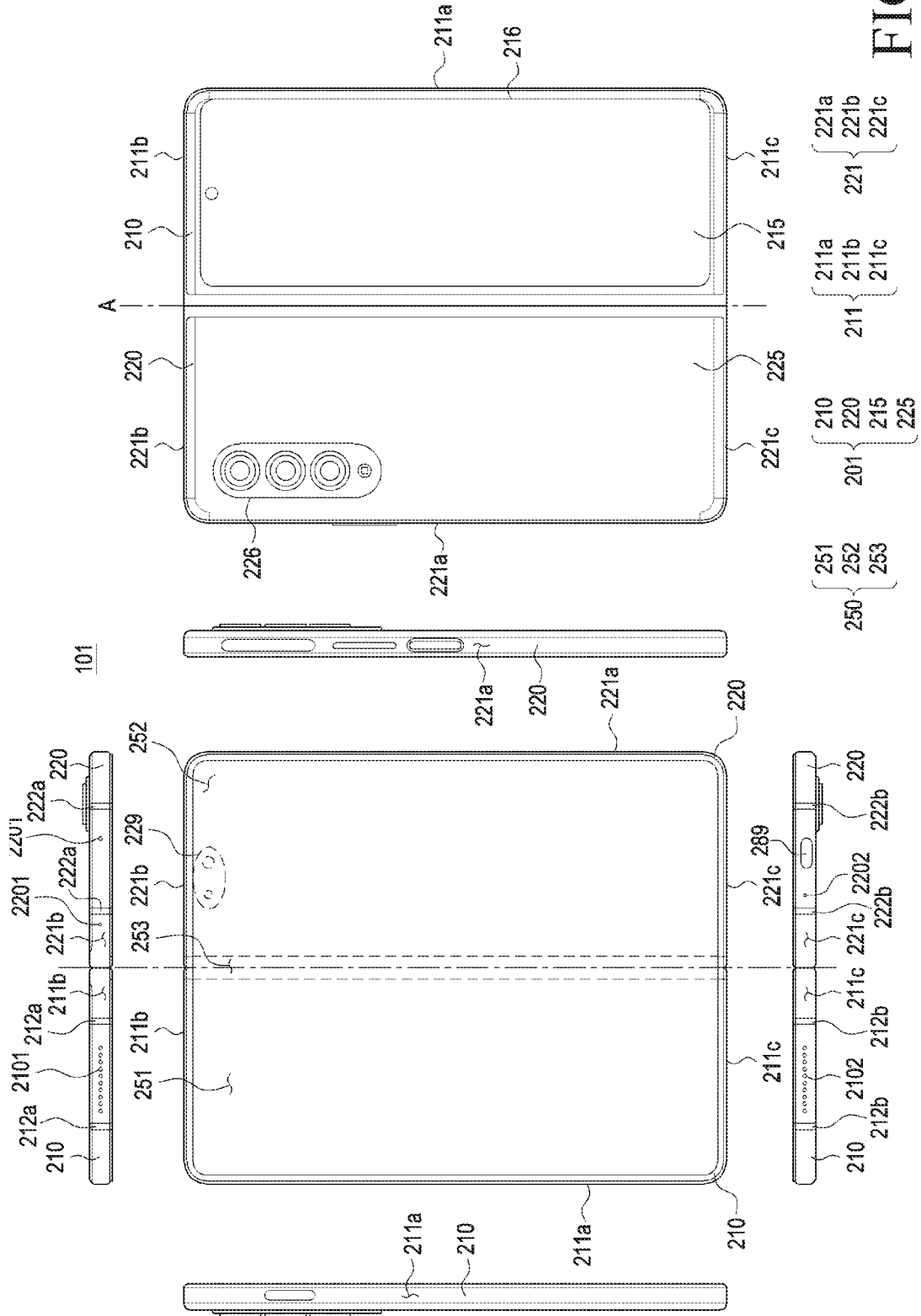


FIG. 2

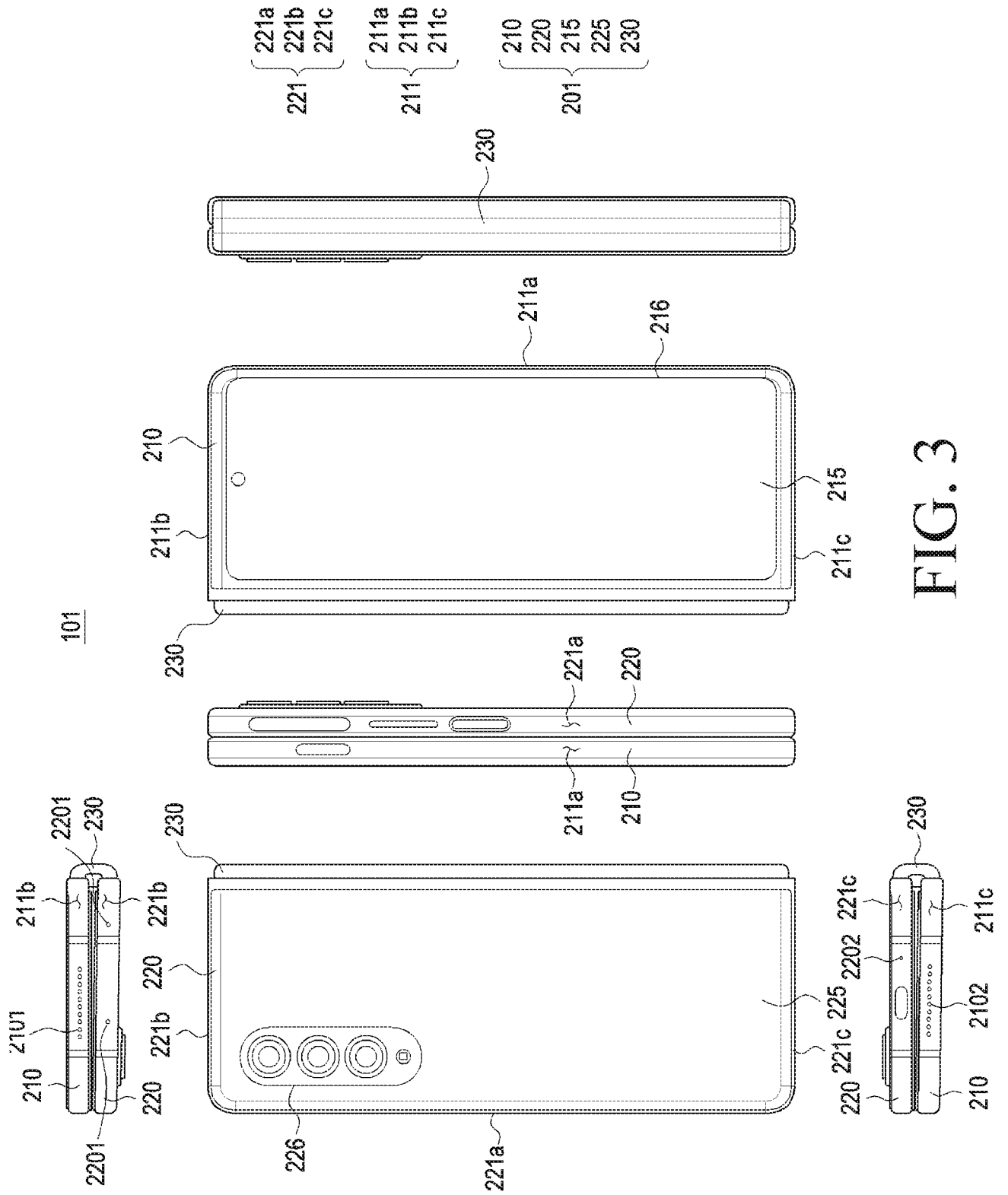


FIG. 3

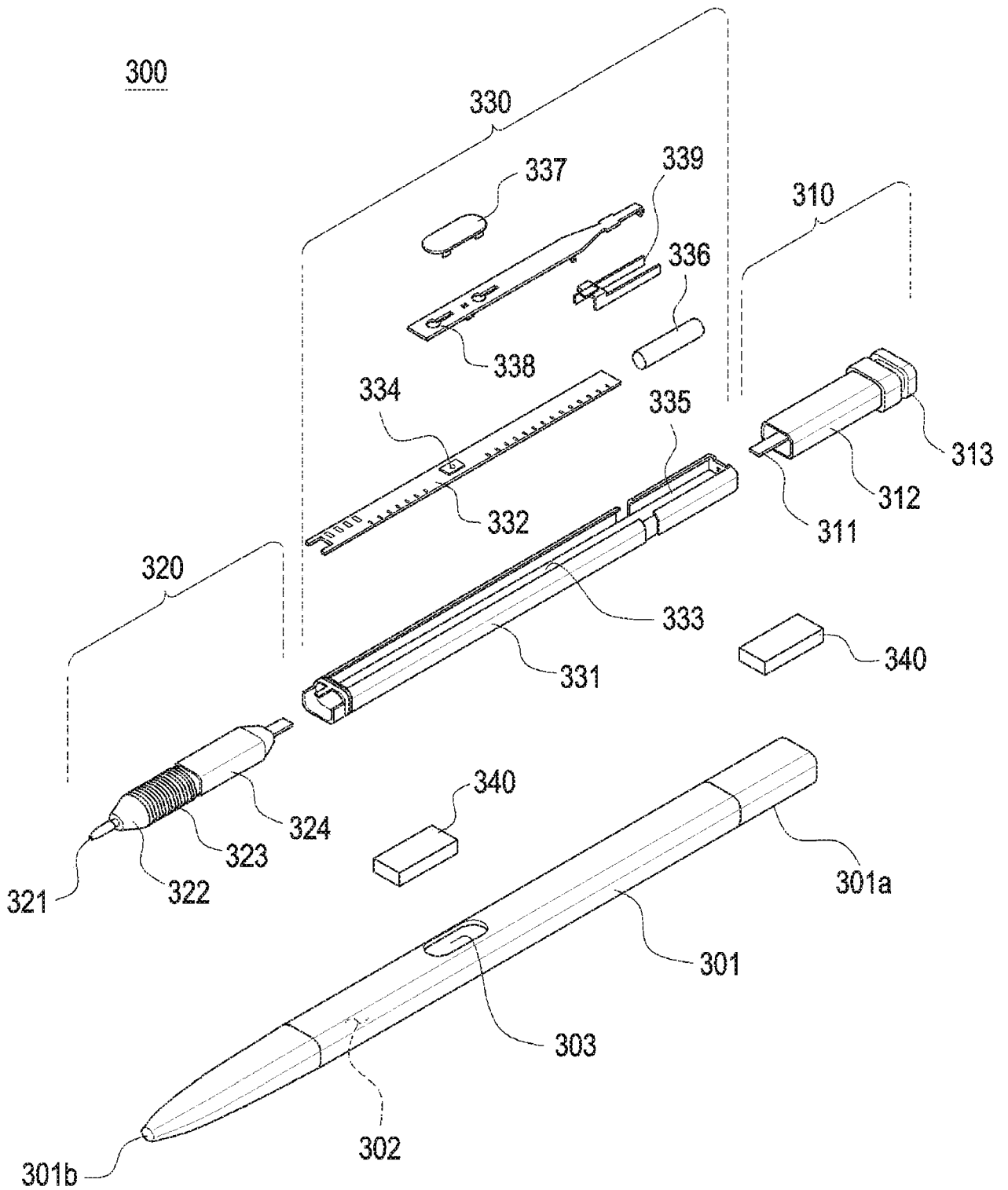


FIG. 5

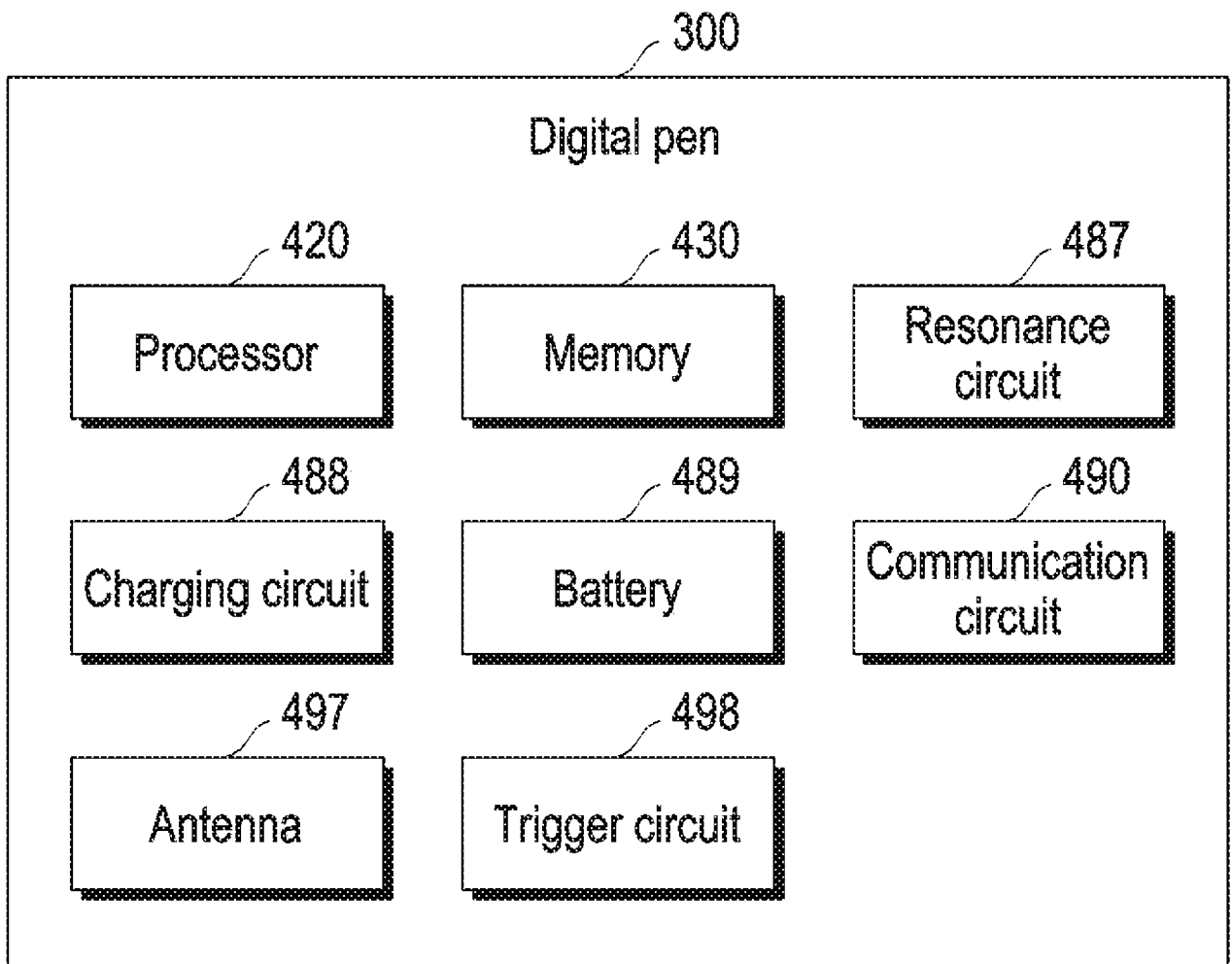


FIG. 6

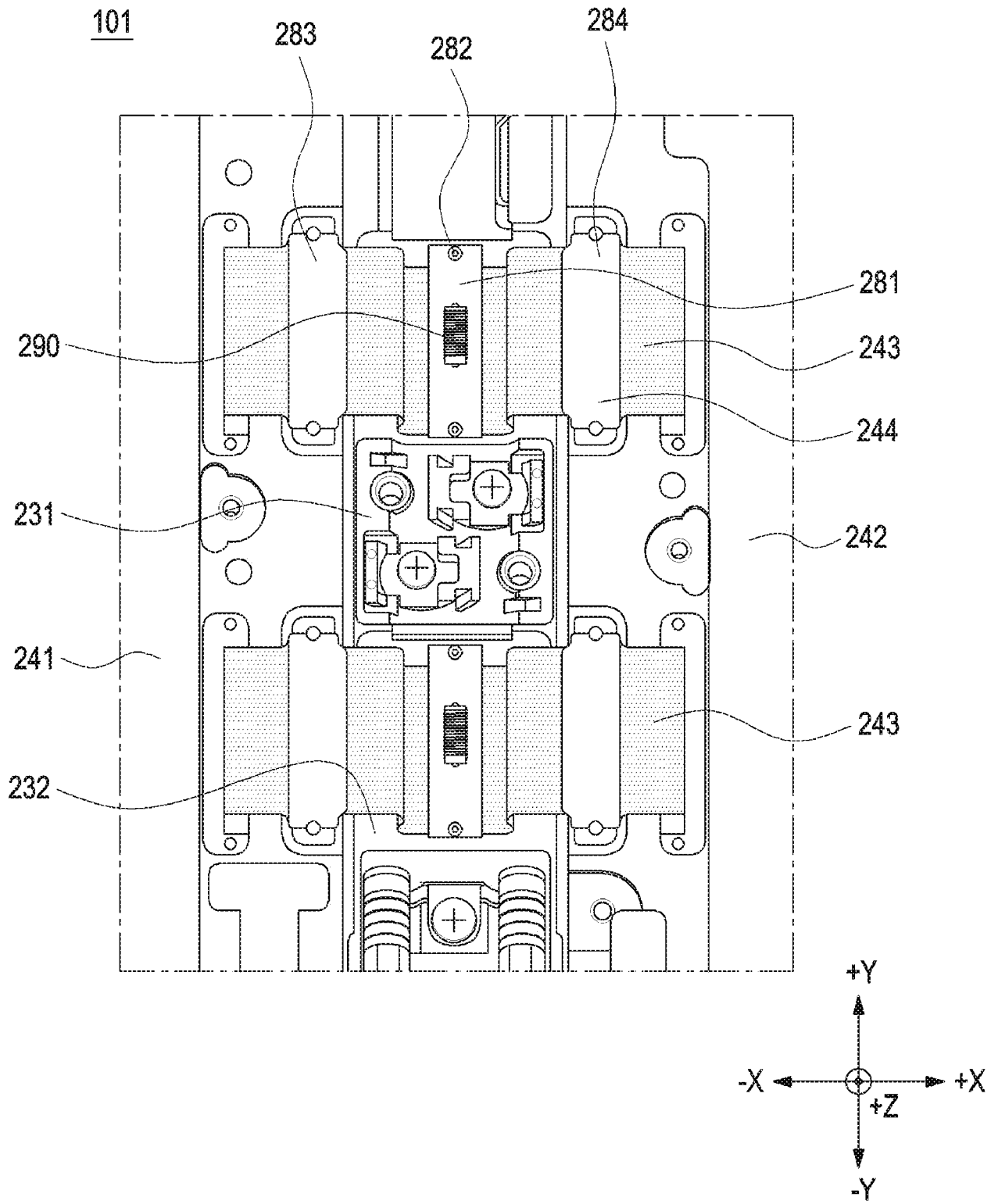


FIG. 7

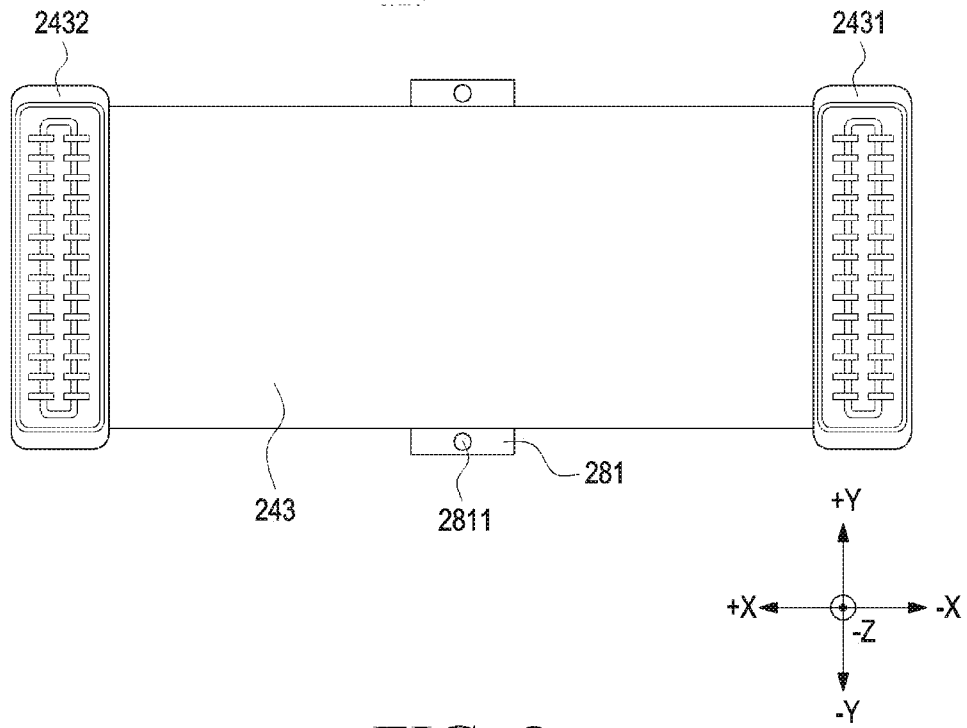


FIG. 8

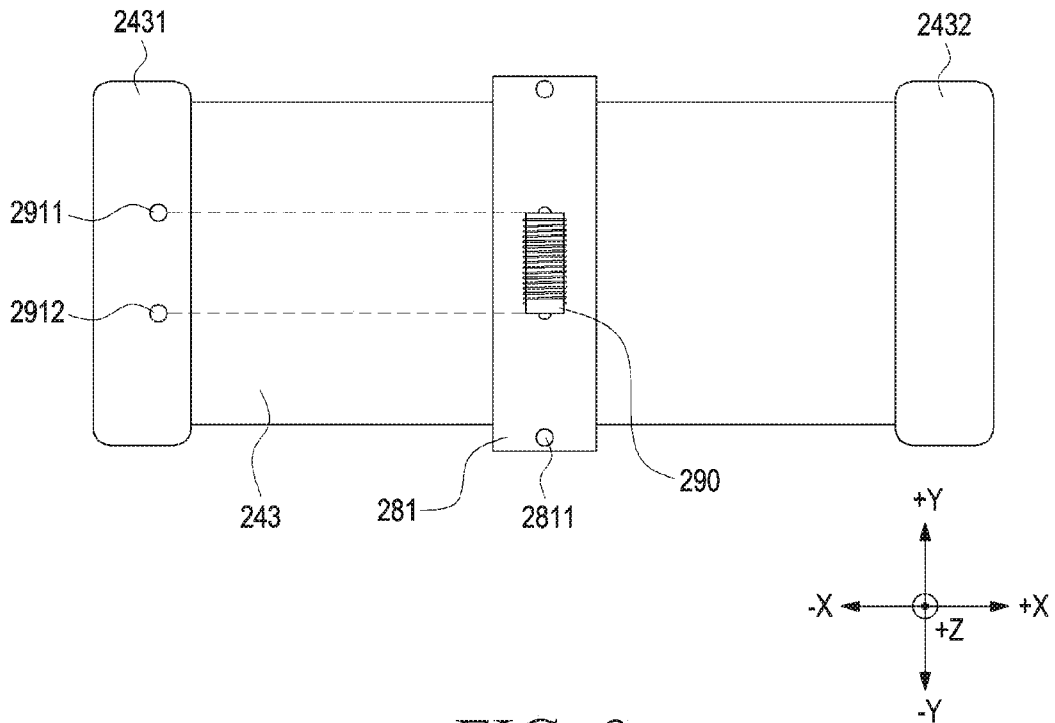


FIG. 9

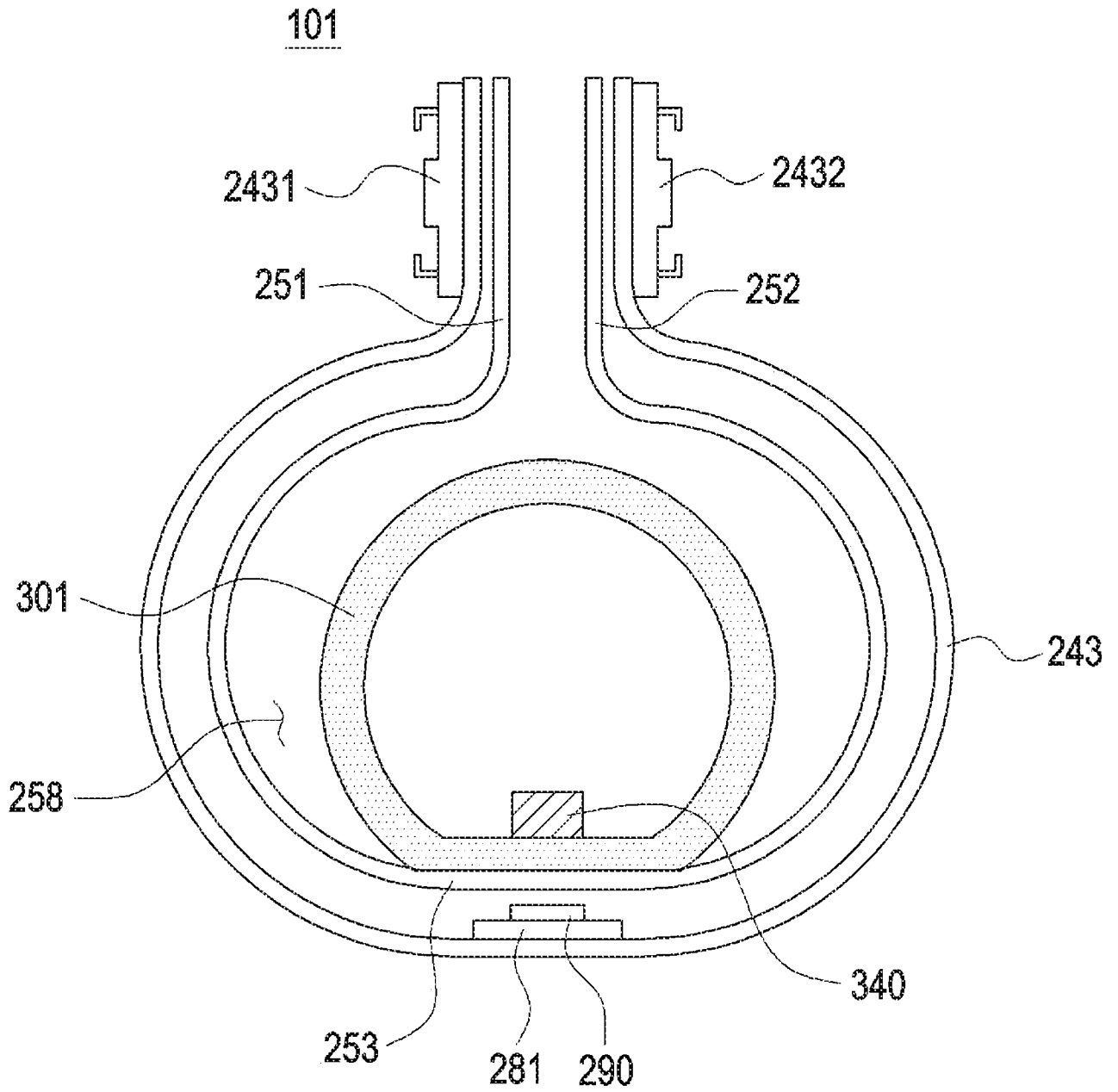


FIG. 10

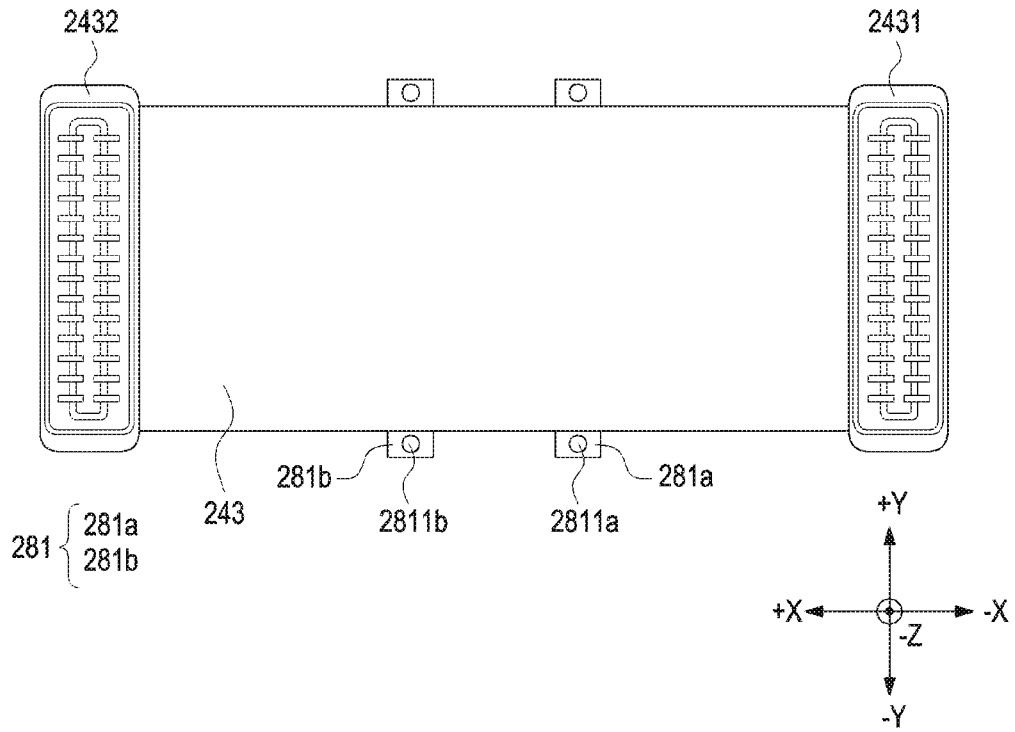


FIG. 11

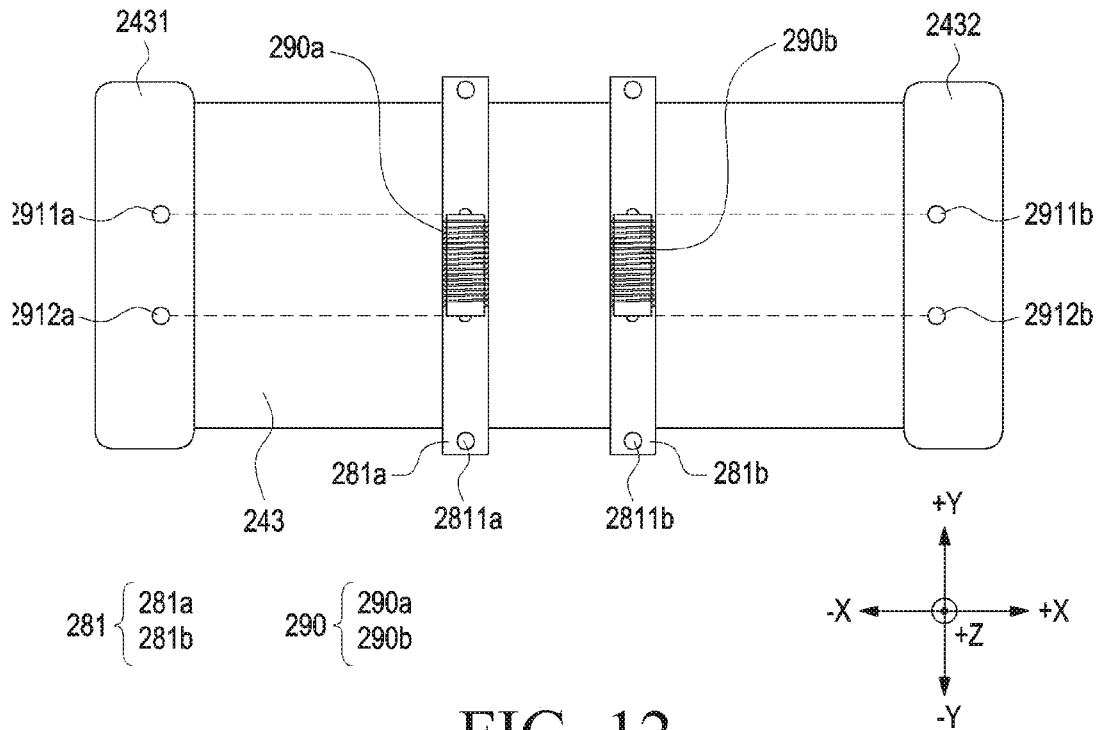


FIG. 12

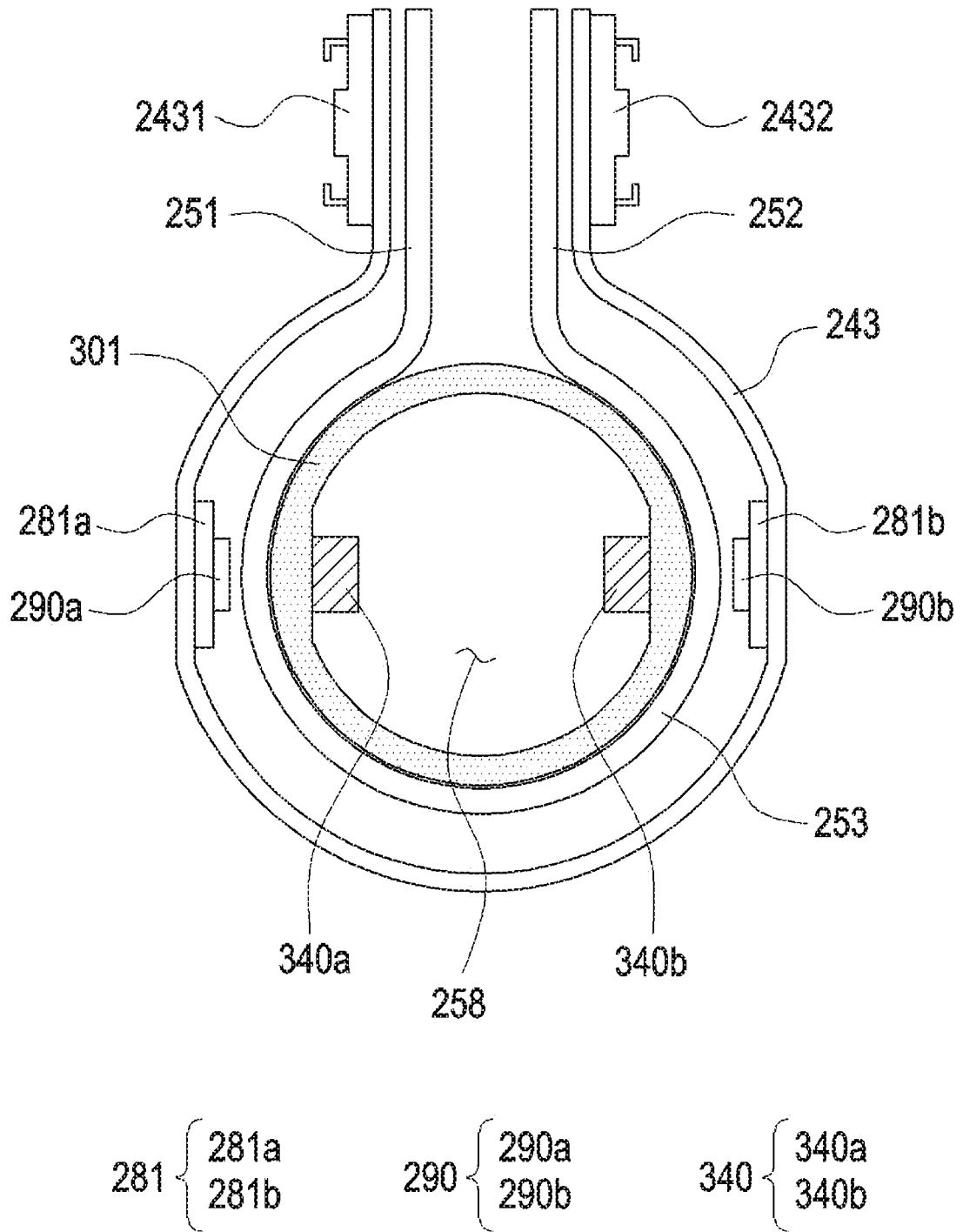


FIG. 13

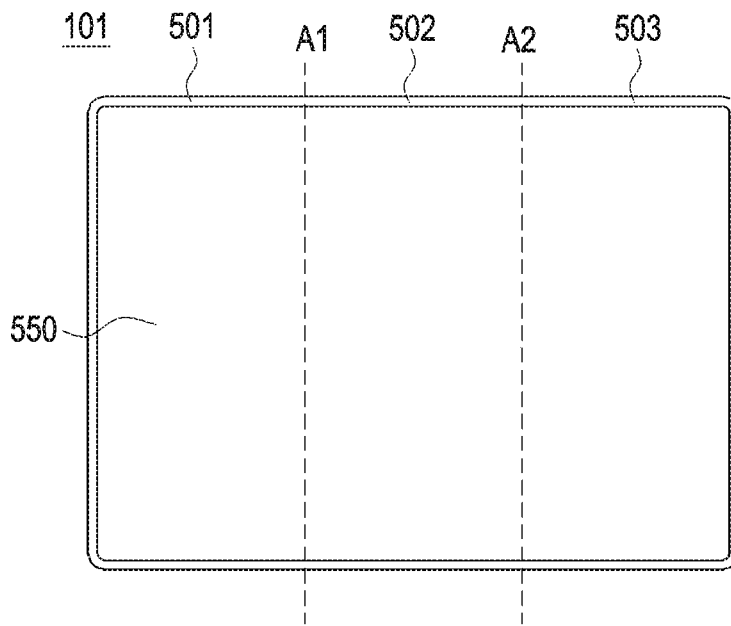


FIG. 14A

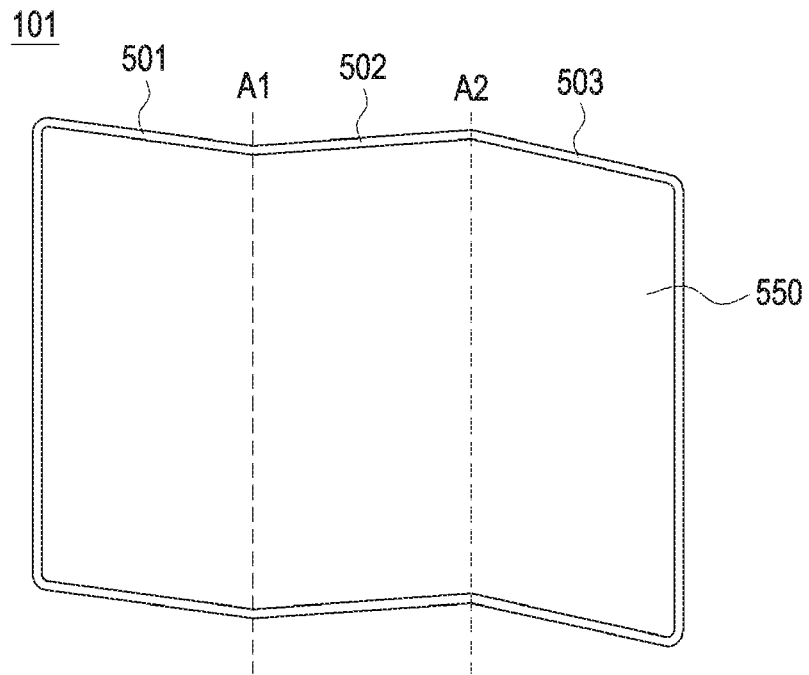


FIG. 14B

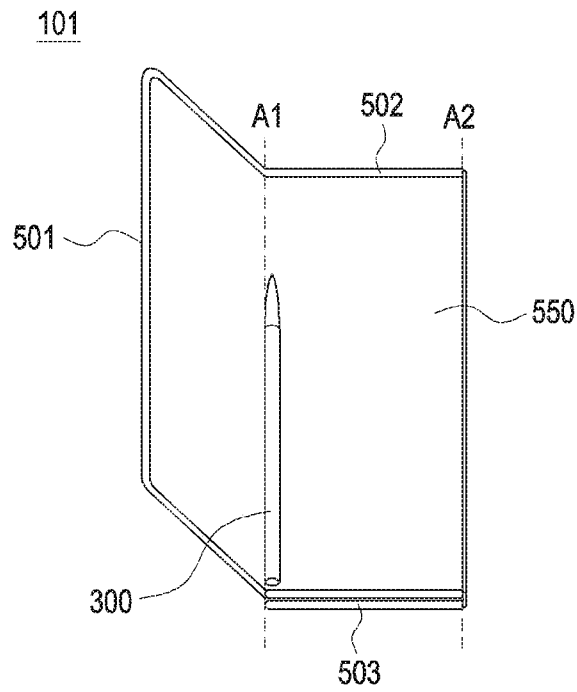


FIG. 14C

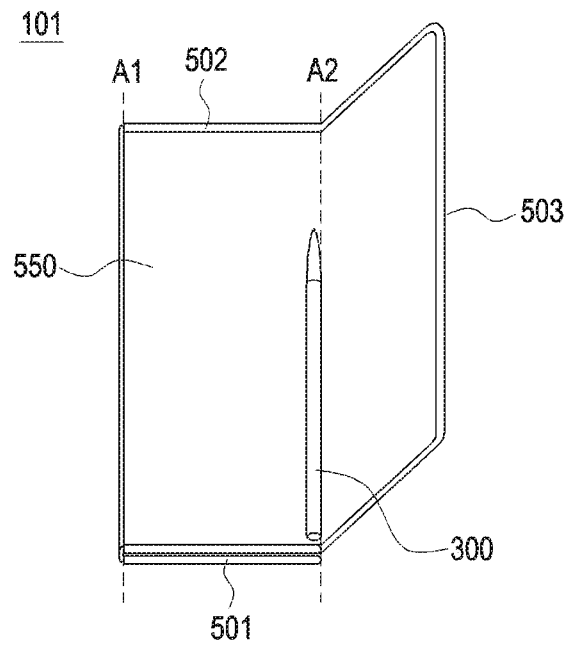


FIG. 14D

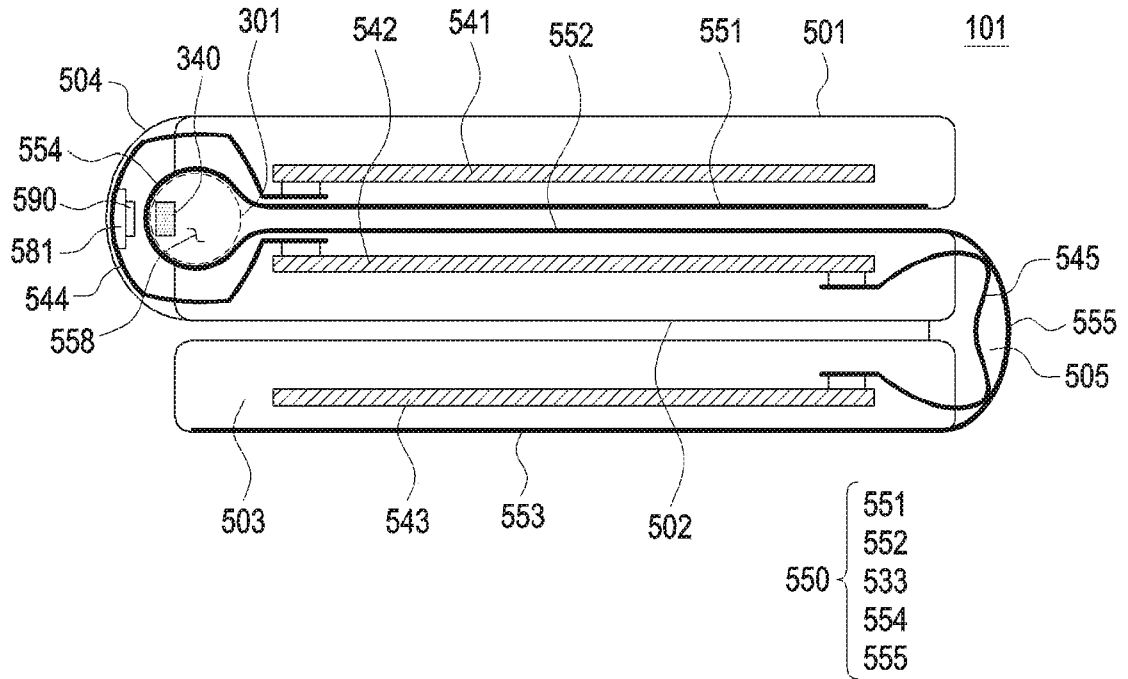


FIG. 15

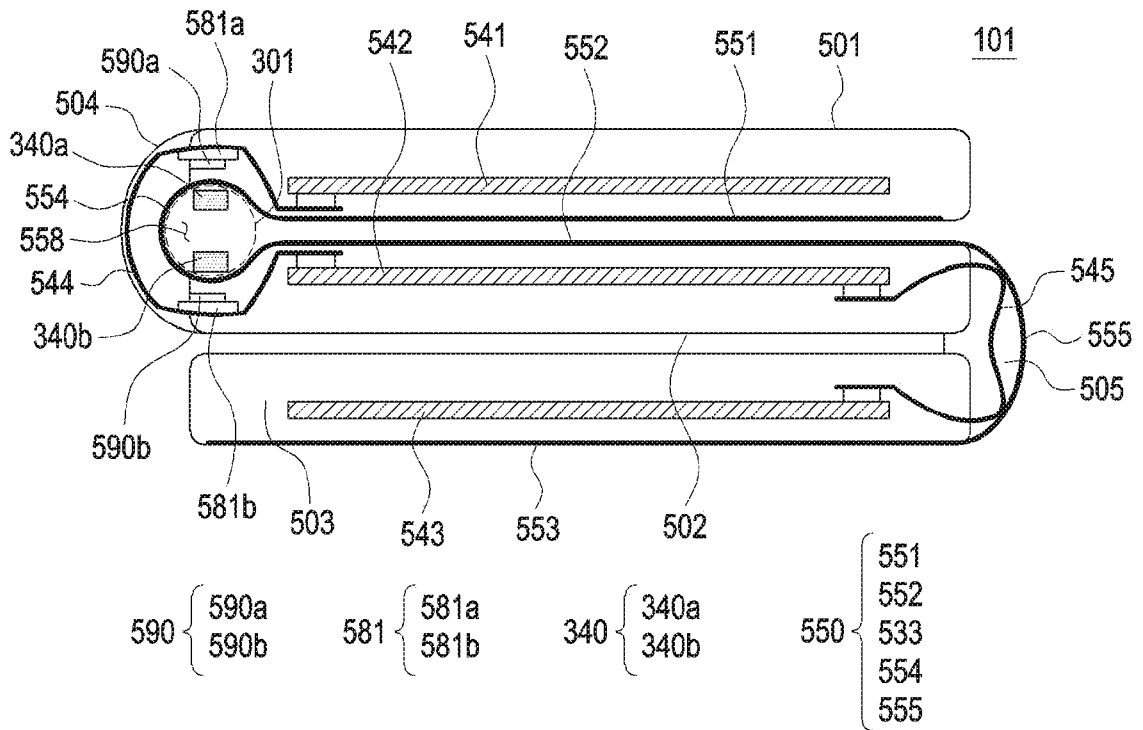


FIG. 16

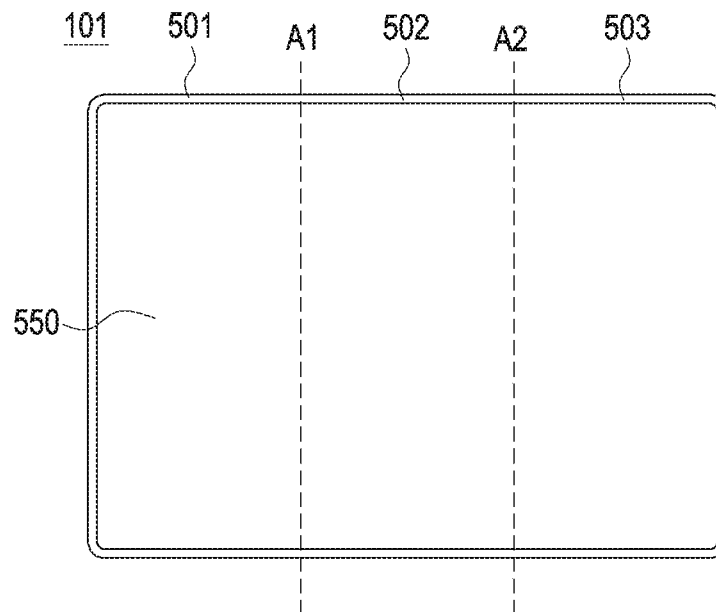


FIG. 17A

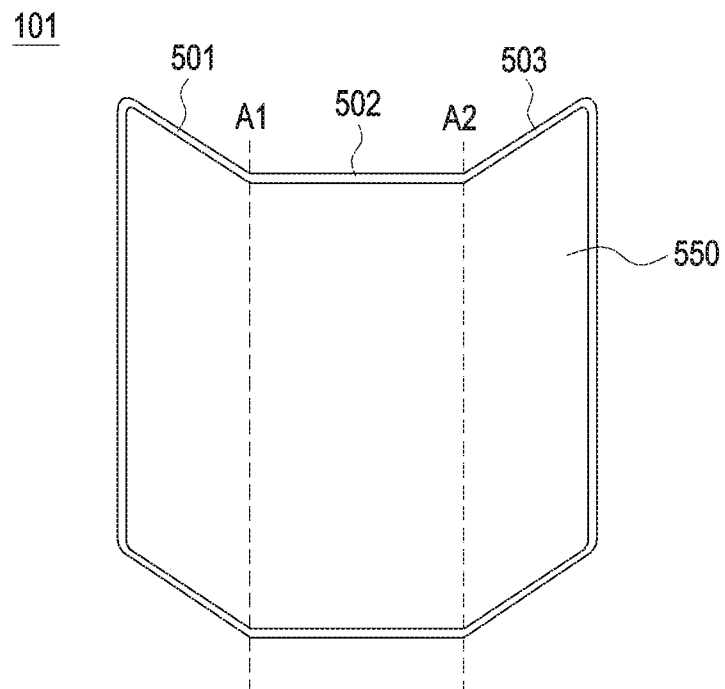


FIG. 17B

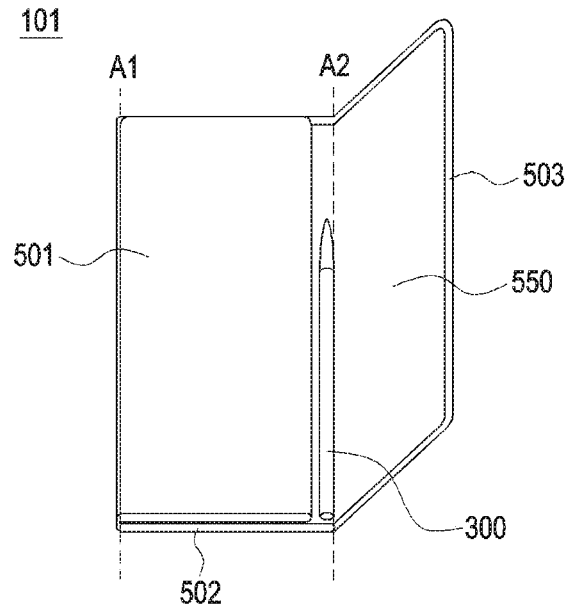


FIG. 17C

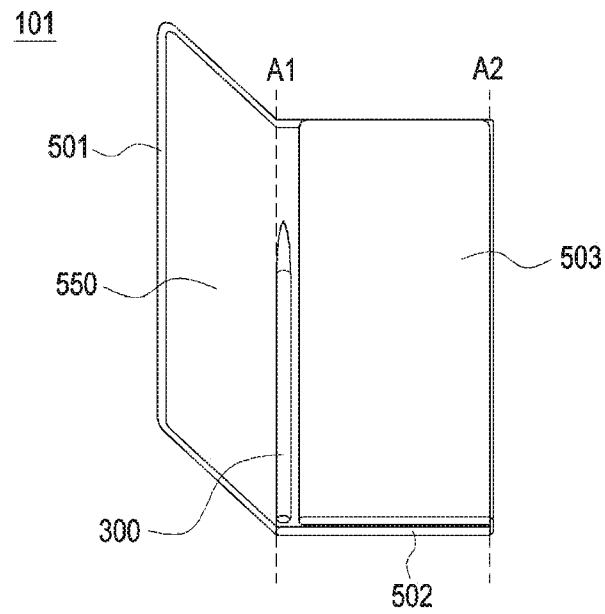


FIG. 17D

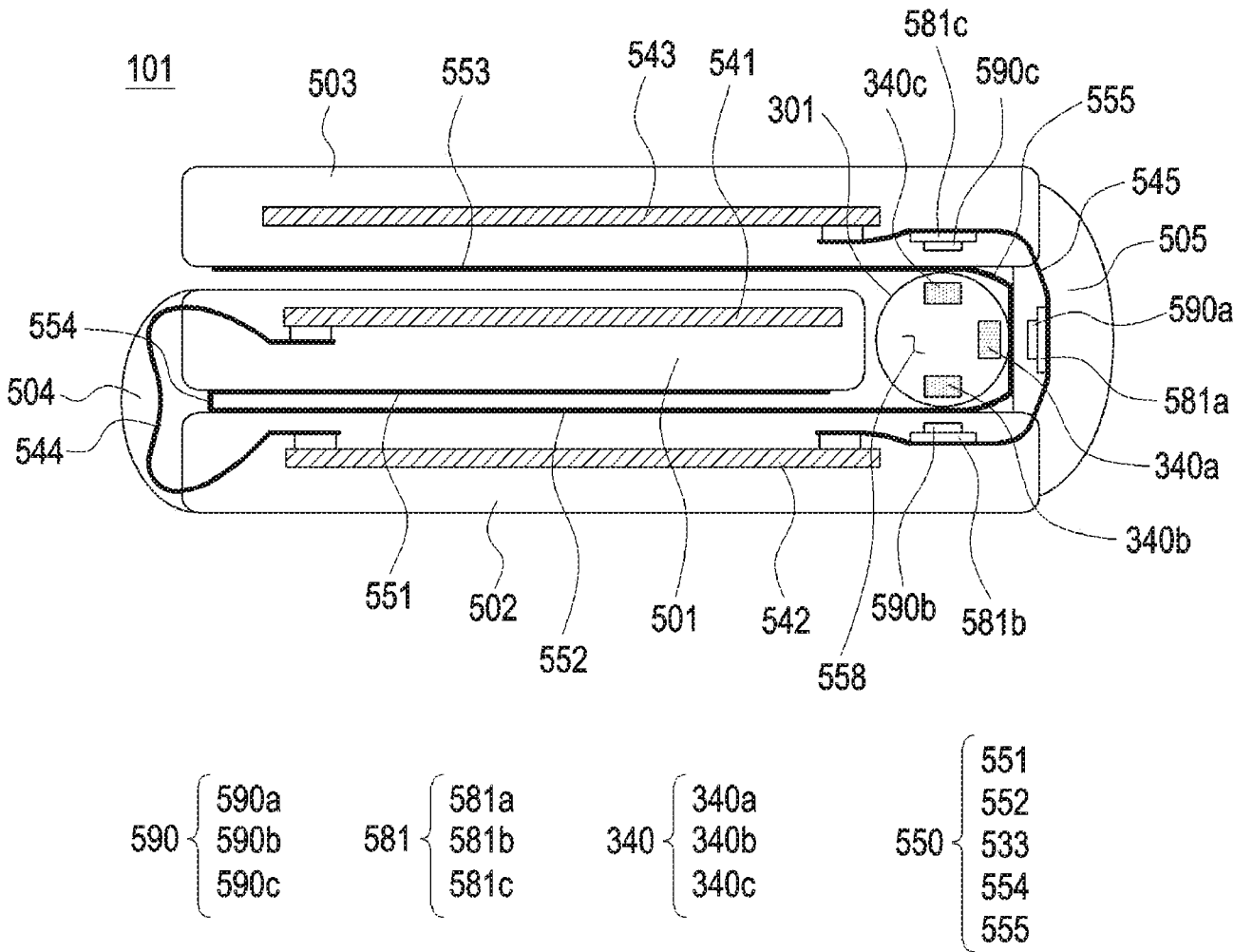


FIG. 18

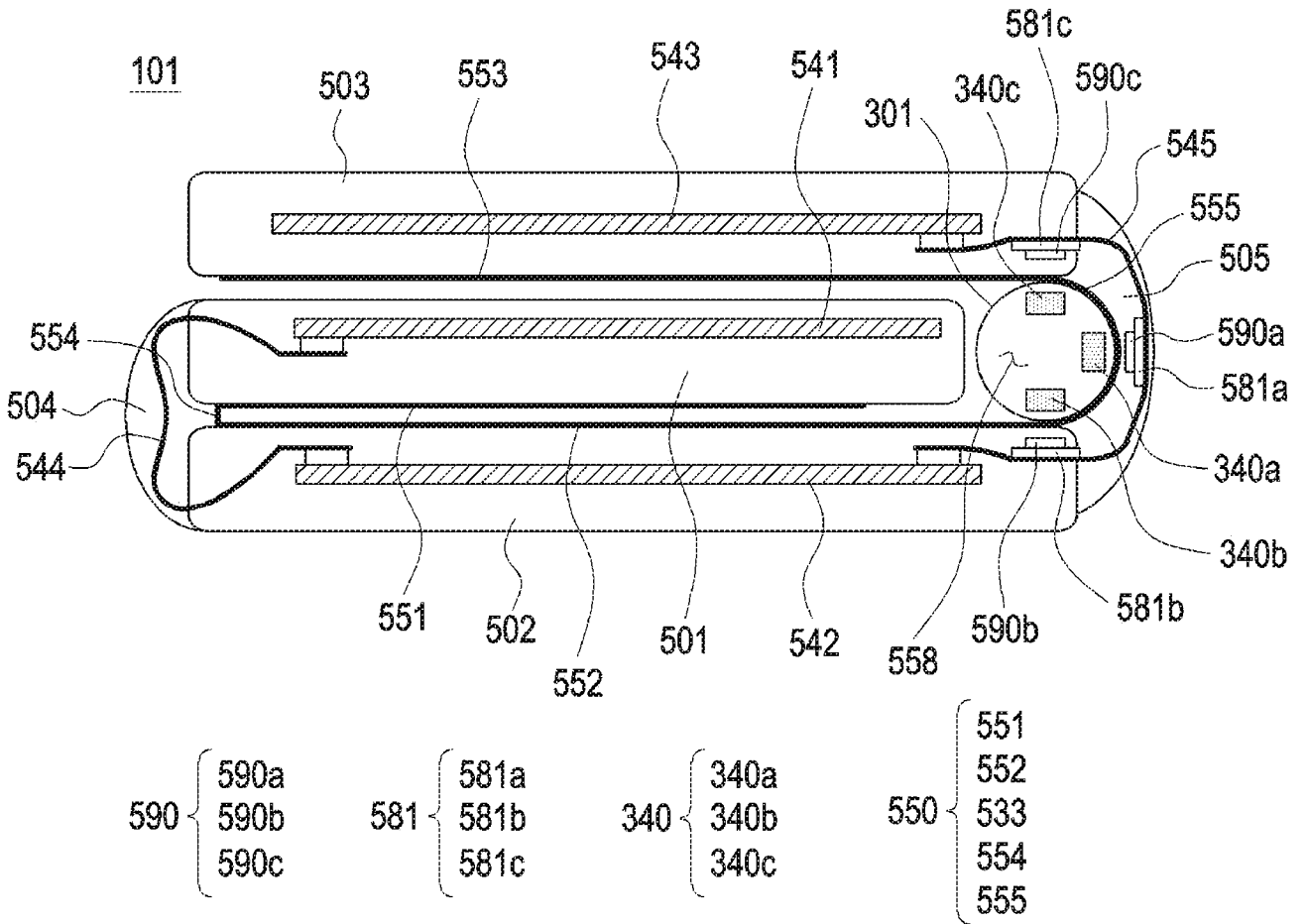


FIG. 19

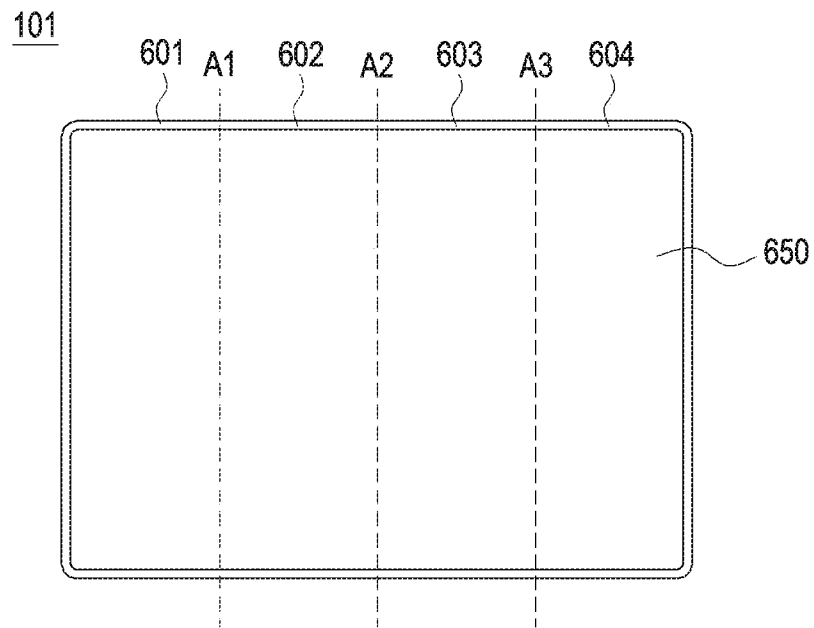


FIG. 20A

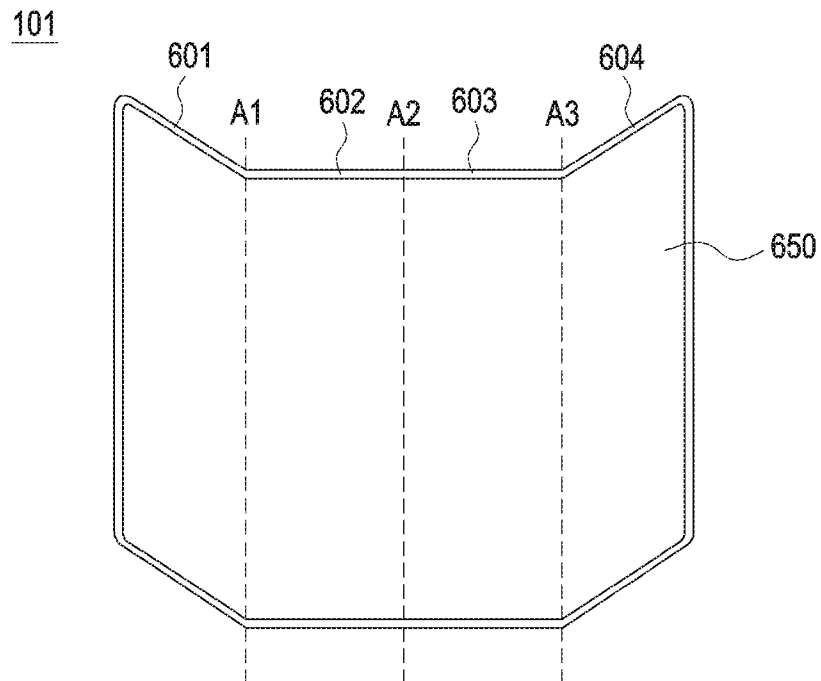


FIG. 20B

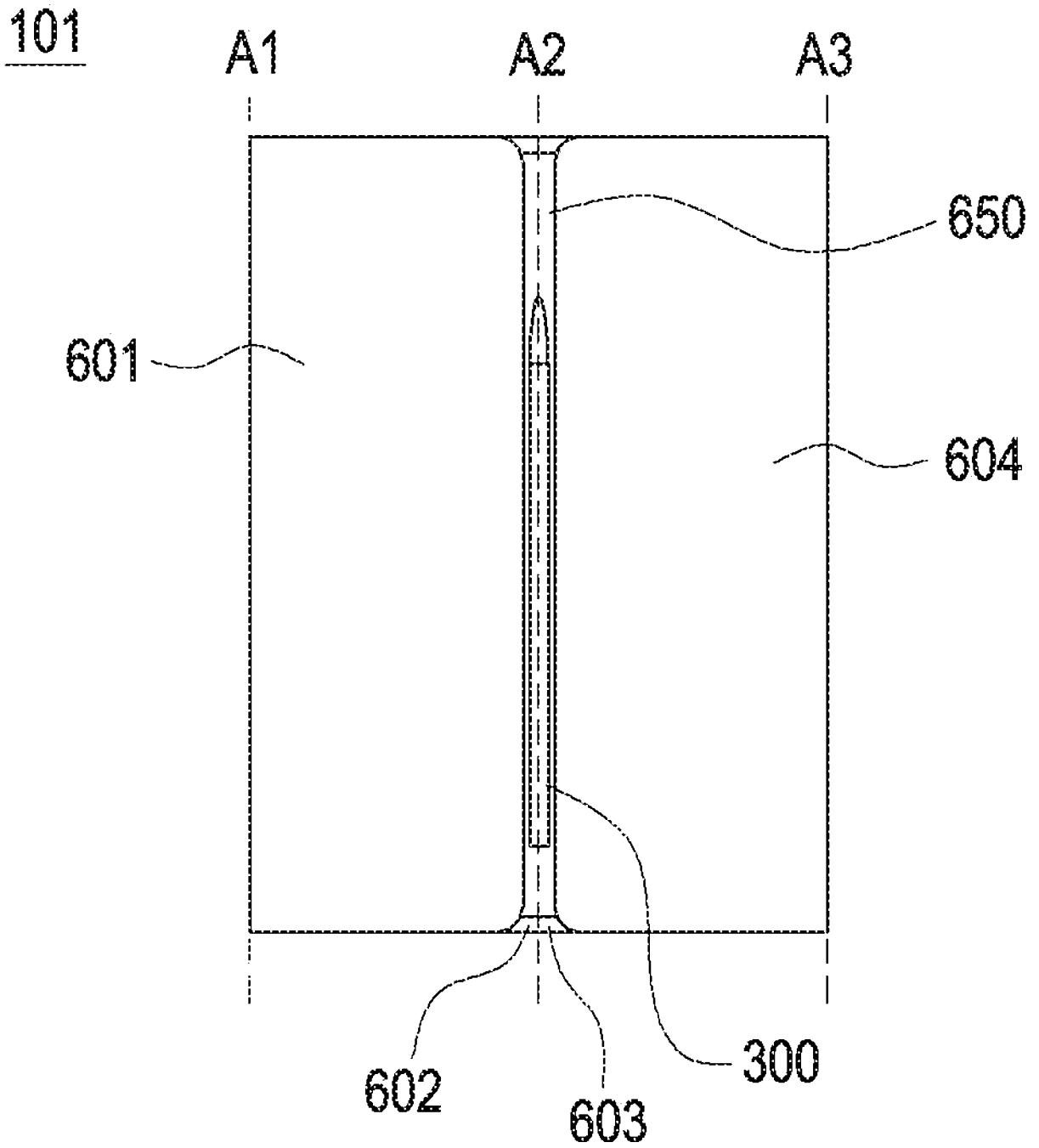


FIG. 20C

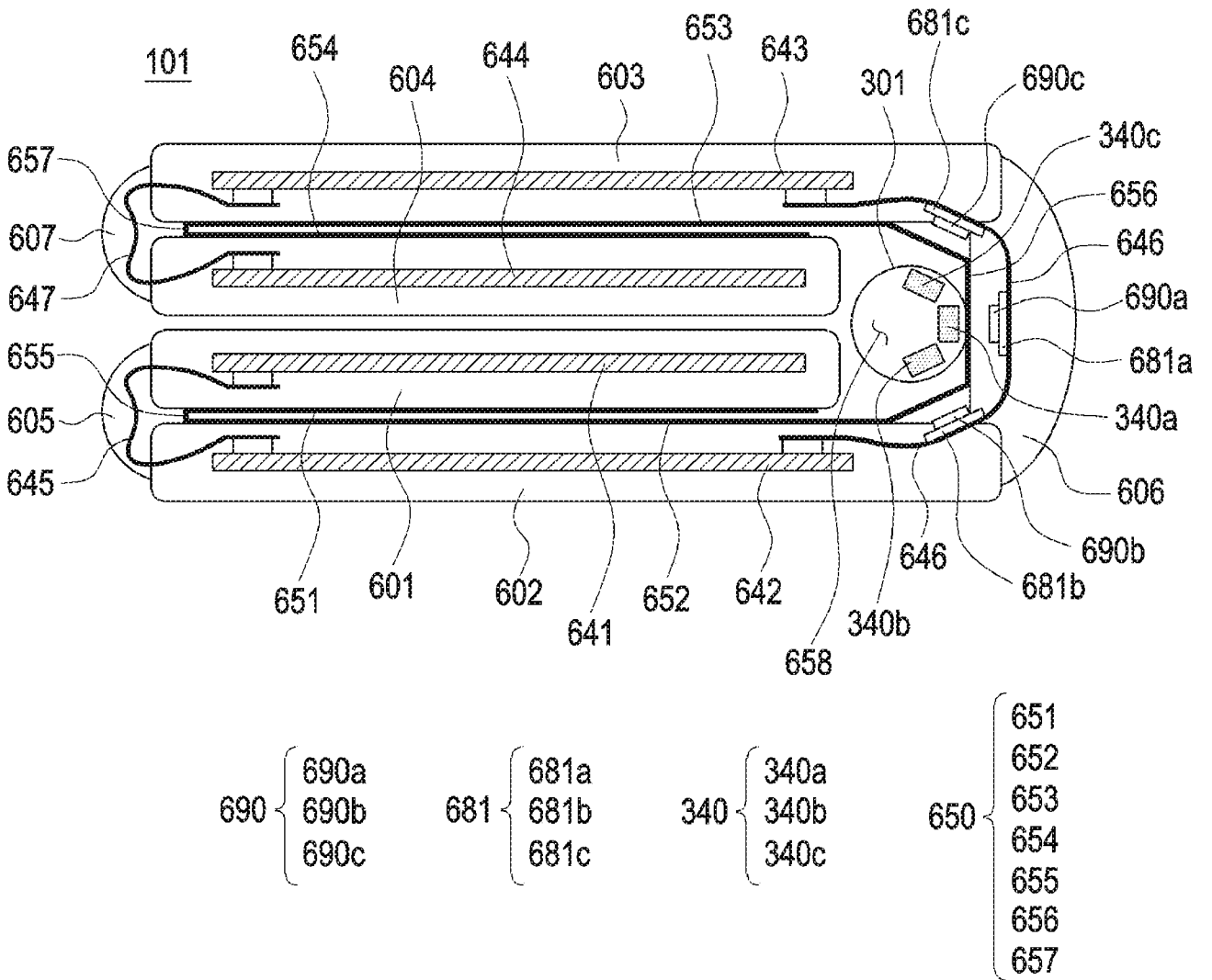


FIG. 21

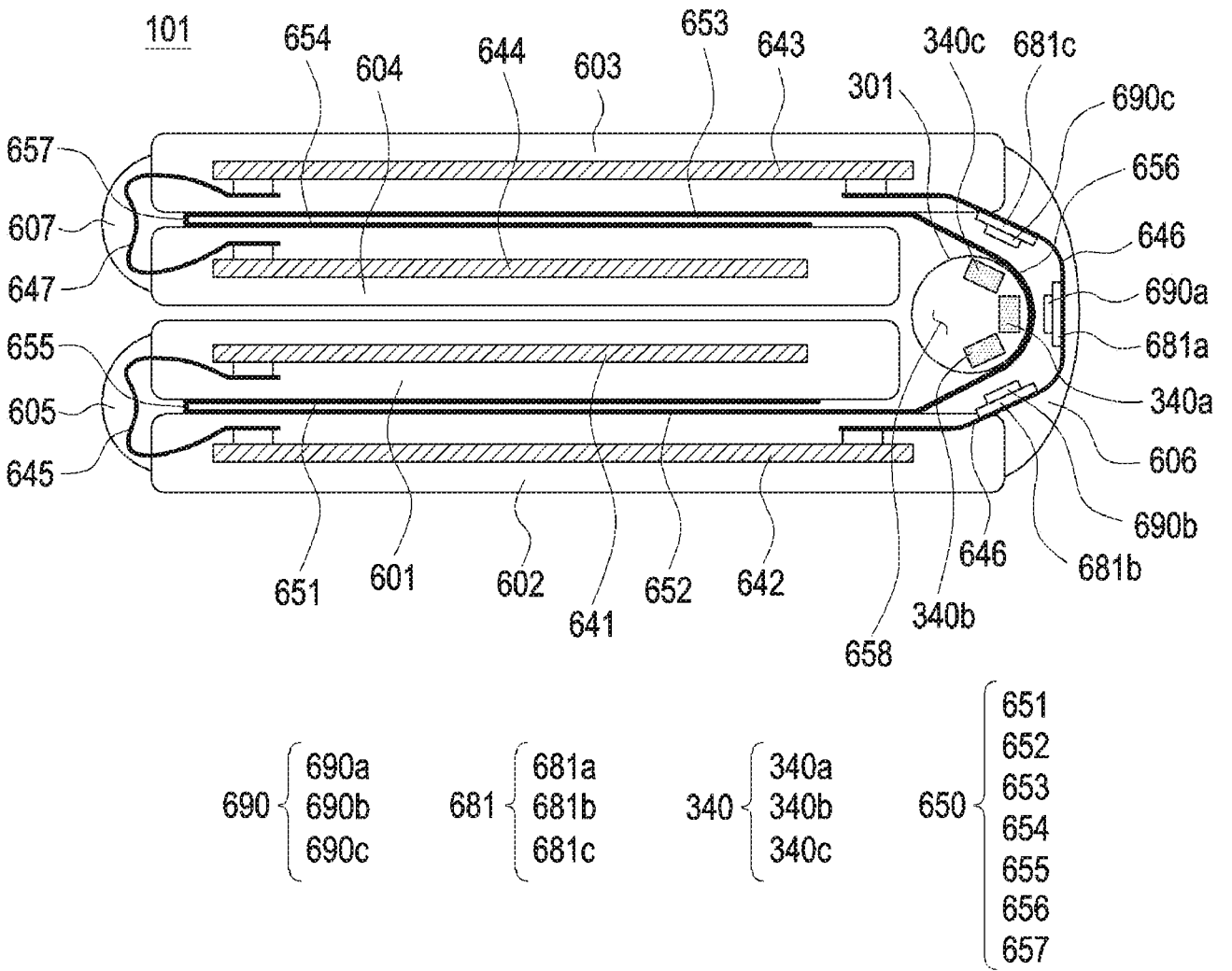


FIG. 22

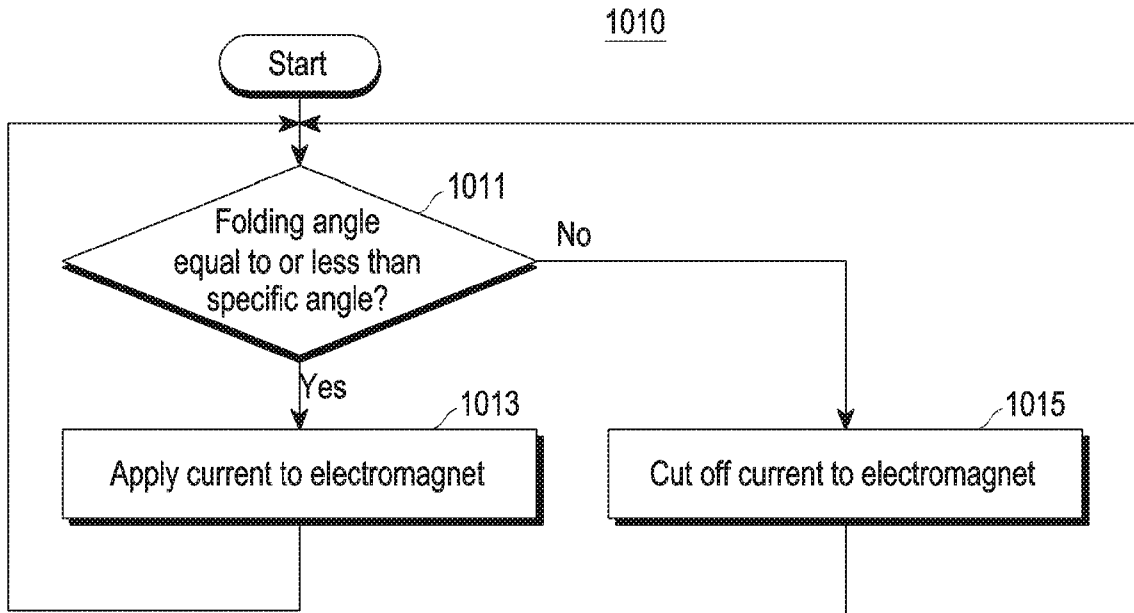


FIG. 23

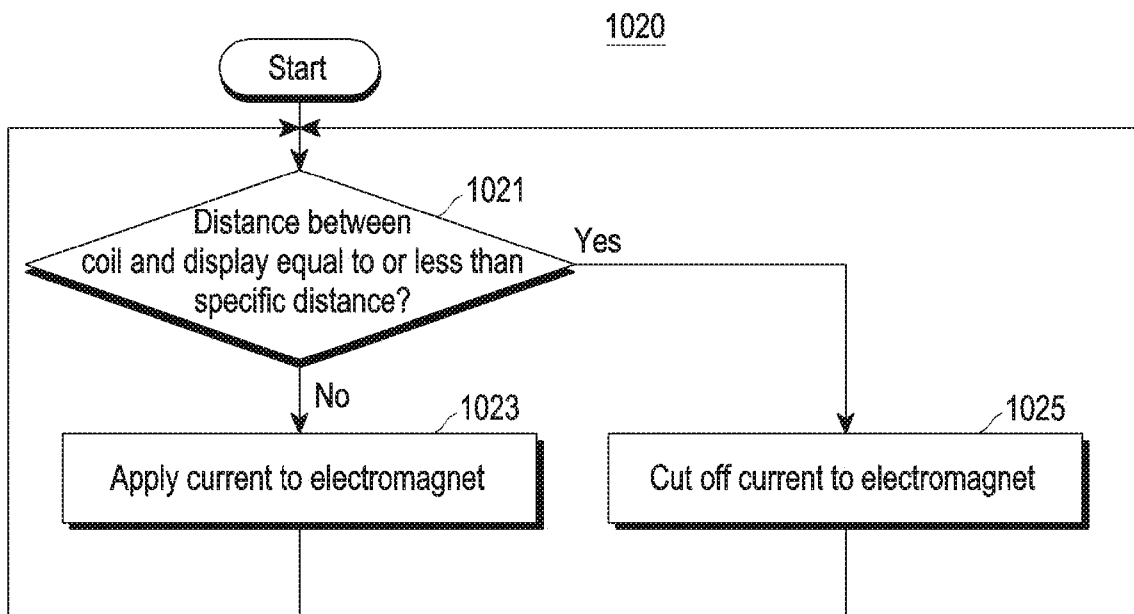


FIG. 24

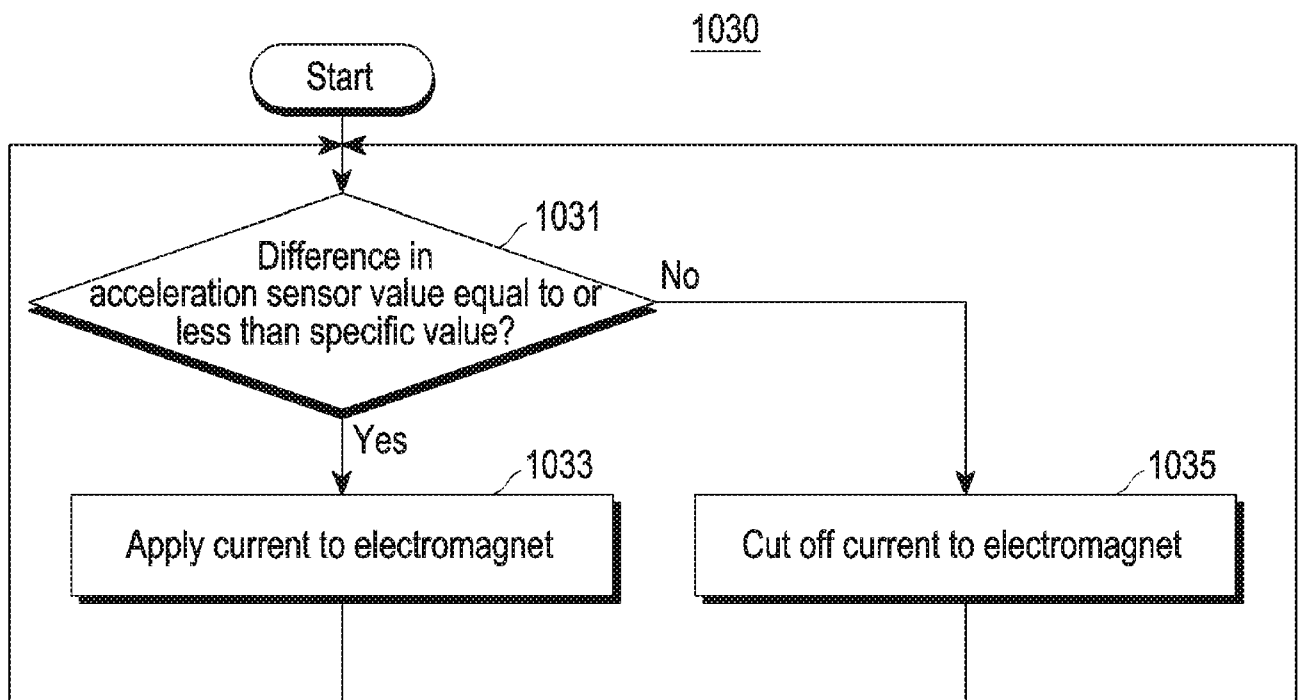


FIG. 25A

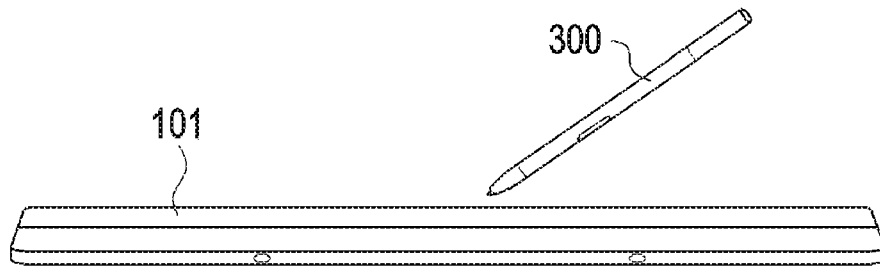


FIG. 25B

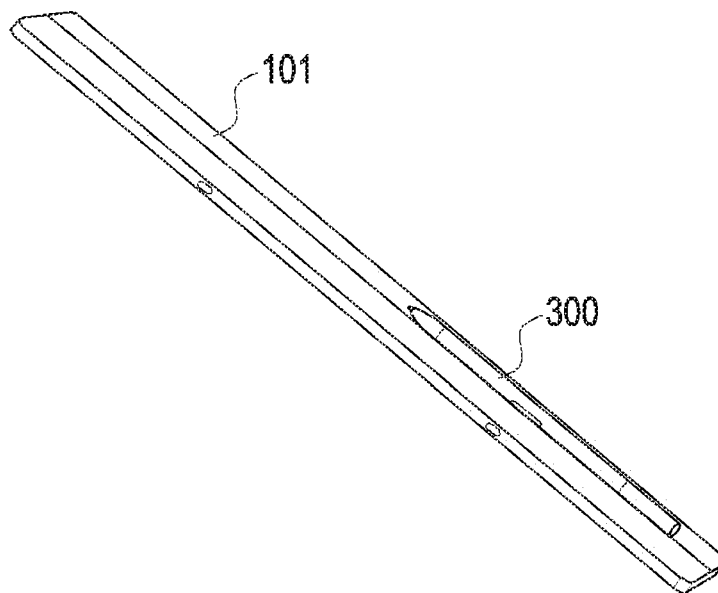


FIG. 25C

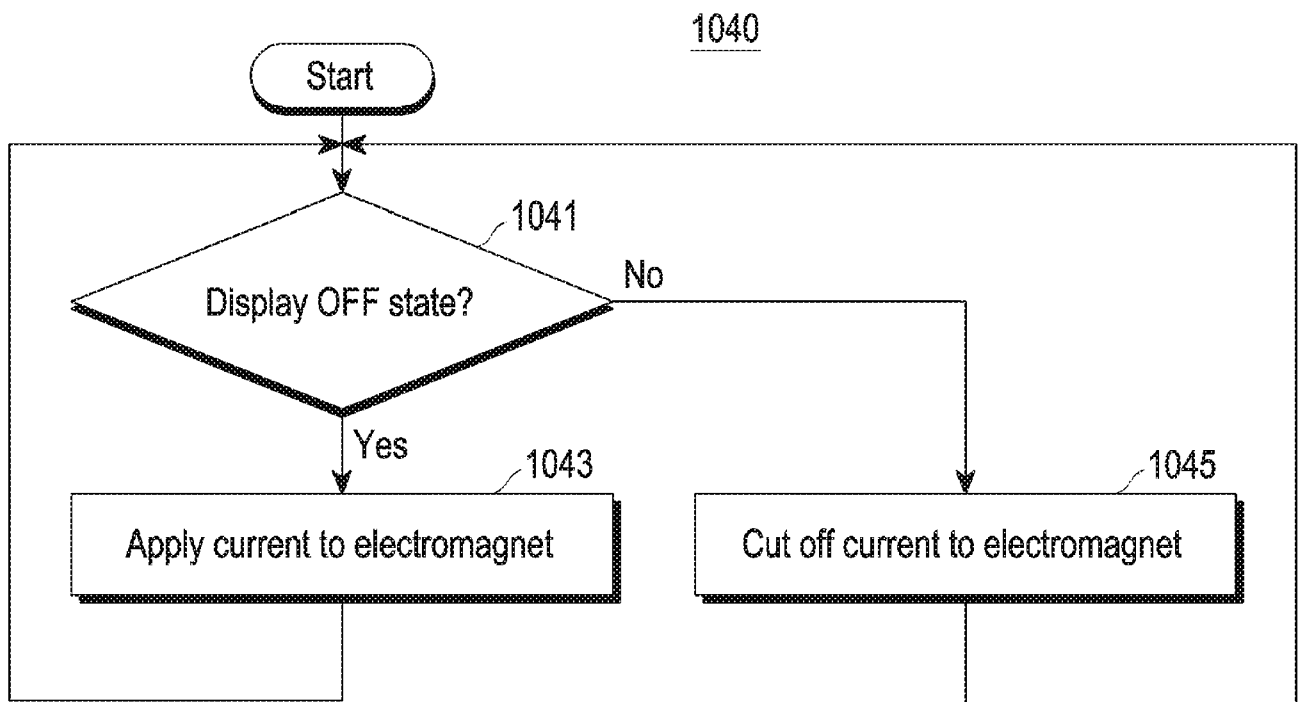


FIG. 26

DIGITAL PEN AND ELECTRONIC DEVICE COMPRISING SAME

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is a continuation application, claiming priority under 35 U.S.C. § 365(c), of an International application No. PCT/KR2024/006474, filed on May 13, 2024, which is based on and claims the benefit of a Korean patent application number 10-2023-0078264, filed on June 19, 2023, in the Korean Intellectual Property Office, and of a Korean patent application number 10-2023-0092284, filed on July 17, 2023, in the Korean Intellectual Property Office, the disclosure of each of which is incorporated by reference herein in its entirety.

BACKGROUND

1. Field

[0002] The disclosure relates to an electronic device. More particularly, the disclosure relates to a digital pen and an electronic device including the same.

2. Description of Related Art

[0003] Advancing information communication and semiconductor technologies accelerate the spread and use of various electronic devices. In particular, recent electronic devices are being developed to carry out communication while carried on.

[0004] The term "electronic device" may mean a device performing a particular function according to its equipped program, such as a home appliance, an electronic scheduler, a portable multimedia player, a mobile communication terminal, a tablet personal computer (PC), a video/sound device, a desktop PC or laptop computer, a navigation for automobile, etc. For example, the electronic devices may output stored information as voices or images. As electronic devices are highly integrated, and high-speed, high-volume wireless communication becomes commonplace, an electronic device, such as a mobile communication terminal, is recently being equipped with various functions. For example, an electronic device comes with the integrated functionality, including an entertainment function, such as playing video games, a multimedia function, such as replaying music/videos, a communication and security function for mobile banking, and a scheduling or e-wallet function. These electronic devices have been downsized to be conveniently carried by users.

[0005] As mobile communication services extend up to multimedia service sectors, the display of the electronic device may be increased to allow the user satisfactory use of multimedia services as well as voice call or text messaging services. Accordingly, a foldable flexible display may be disposed on the entire area of the housing structure separated to be foldable.

[0006] The above information is presented as background information only to assist with an understanding of the disclosure. No determination has been made, and no assertion

is made, as to whether any of the above might be applicable as prior art with regard to the disclosure.

SUMMARY

[0007] Aspects of the disclosure are to address at least the above-mentioned problems and/or disadvantages and to provide at least the advantages described below. Accordingly, an aspect of the disclosure is to provide a digital pen and electronic device comprising same.

[0008] Additional aspects will be set forth in part in the description which follows and, in part, will be apparent from the description, or may be learned by practice of the presented embodiments.

[0009] In accordance with an aspect of the disclosure, an electronic device is provided. The electronic device includes a housing including a first housing, a second housing and a hinge structure rotatably connecting the first housing and the second housing relative to each other, a display disposed on the housing, and including a first display area disposed on the first housing, a second display area disposed on the second housing, and a folding area configured to be at least partially foldable, and at least one electromagnet disposed between the hinge structure and the folding area, wherein, when the housing is in a folded state, the folding area is configured to form an accommodation space for accommodating a digital pen including at least one magnetic member.

[0010] In accordance with another aspect of the disclosure, an electronic device is provided. The electronic device includes a housing including a first housing, a second housing, a third housing, a first hinge structure rotatably connecting the first housing and the second housing relative to each other, and a second hinge structure rotatably connecting the second housing and the third housing relative to each other; a display disposed on the housing, and including a first display area disposed on the first housing, a second display area disposed on the second housing, a third display area disposed on the third housing, and a folding area configured to be at least partially foldable; and at least one electromagnet disposed on the first hinge structure or the second hinge structure, wherein, when the housing is in a folded state, the folding area is configured to form an accommodation space for accommodating a digital pen including at least one magnetic member.

[0011] In accordance with another aspect of the disclosure, an electronic device is provided. The electronic device includes a housing including a first housing, a second housing, and a hinge structure rotatably connecting the first housing and the second housing relative to each other, a display disposed on the housing, the display including a first display area disposed on the first housing, a second display area disposed on the second housing, and a folding area configured to be at least partially foldable, at least one electromagnet disposed between the hinge structure and the folding area, a battery configured to apply current to the at least one electromagnet, at least one processor and memory. The at least one processor is configured to control the battery to apply current to the at least one electromagnet when a non-use event of the digital pen occurs, and to con-

trol the battery to cut off current to the at least one electromagnet when a use event of the digital pen occurs.

[0012] Other aspects, advantages, and salient features of the disclosure will become apparent to those skilled in the art from the following detailed description, which, taken in conjunction with the annexed drawings, discloses various embodiments of the disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] The above and other aspects, features, and advantages of certain embodiments of the disclosure will be more apparent from the following description taken in conjunction with the accompanying drawings, in which:

[0014] FIG. 1 is a block diagram illustrating an electronic device in a network environment according to an embodiment of the disclosure;

[0015] FIG. 2 is a view illustrating an unfolded state of an electronic device according to an embodiment of the disclosure;

[0016] FIG. 3 is a view illustrating a folded state of an electronic device according to an embodiment of the disclosure;

[0017] FIG. 4 is an exploded perspective view illustrating an electronic device according to an embodiment of the disclosure;

[0018] FIG. 5 is an exploded perspective view illustrating a digital pen according to an embodiment of the disclosure;

[0019] FIG. 6 is a block diagram illustrating a digital pen according to an embodiment of the disclosure;

[0020] FIG. 7 is a view illustrating a flexible printed circuit board and at least one electromagnet of an electronic device according to an embodiment of the disclosure;

[0021] FIG. 8 is a plan view illustrating a flexible printed circuit board of an electronic device according to an embodiment of the disclosure;

[0022] FIG. 9 is a plan view illustrating a flexible printed circuit board of an electronic device according to an embodiment of the disclosure;

[0023] FIG. 10 is a schematic view illustrating an electronic device and a digital pen according to an embodiment of the disclosure;

[0024] FIG. 11 is a plan view illustrating a flexible printed circuit board of an electronic device according to an embodiment of the disclosure;

[0025] FIG. 12 is a plan view illustrating a flexible printed circuit board of an electronic device according to an embodiment of the disclosure;

[0026] FIG. 13 is a schematic view illustrating an electronic device and a digital pen according to an embodiment of the disclosure;

[0027] FIG. 14A is a view illustrating an electronic device including a plurality of housings according to an embodiment of the disclosure;

[0028] FIG. 14B is a view illustrating an electronic device including a plurality of housings according to an embodiment of the disclosure;

[0029] FIG. 14C is a view illustrating a digital pen and an electronic device according to an embodiment of the disclosure;

[0030] FIG. 14D is a view illustrating a digital pen and an electronic device according to an embodiment of the disclosure;

[0031] FIG. 15 is a cross-sectional view illustrating a folded state of a digital pen and an electronic device according to an embodiment of the disclosure;

[0032] FIG. 16 is a cross-sectional view illustrating a folded state of a digital pen and an electronic device according to an embodiment of the disclosure;

[0033] FIG. 17A is a view illustrating an electronic device including a plurality of housings according to an embodiment of the disclosure;

[0034] FIG. 17B is a view illustrating an electronic device including a plurality of housings according to an embodiment of the disclosure;

[0035] FIG. 17C is a view illustrating a digital pen and an electronic device according to an embodiment of the disclosure;

[0036] FIG. 17D is a view illustrating a digital pen and an electronic device according to an embodiment of the disclosure;

[0037] FIG. 18 is a cross-sectional view illustrating a folded state of a digital pen and an electronic device according to an embodiment of the disclosure;

[0038] FIG. 19 is a cross-sectional view illustrating a folded state of a digital pen and an electronic device according to an embodiment of the disclosure;

[0039] FIG. 20A is a view illustrating an electronic device including a plurality of housings according to an embodiment of the disclosure;

[0040] FIG. 20B is a view illustrating an electronic device including a plurality of housings according to an embodiment of the disclosure;

[0041] FIG. 20C is a view illustrating a digital pen and an electronic device according to an embodiment of the disclosure;

[0042] FIG. 21 is a cross-sectional view illustrating a folded state of a digital pen and an electronic device according to an embodiment of the disclosure;

[0043] FIG. 22 is a cross-sectional view illustrating a folded state of a digital pen and an electronic device according to an embodiment of the disclosure;

[0044] FIG. 23 is a flowchart illustrating a current application process to an electromagnet of an electronic device according to an embodiment of the disclosure;

[0045] FIG. 24 is a flowchart illustrating a current application process to an electromagnet of an electronic device according to an embodiment of the disclosure;

[0046] FIG. 25A is a flowchart illustrating a current application process to an electromagnet of an electronic device according to an embodiment of the disclosure;

[0047] FIG. 25B is a perspective view illustrating a digital pen and an electronic device according to an embodiment of the disclosure;

[0048] FIG. 25C is a perspective view illustrating a digital pen and an electronic device according to an embodiment of the disclosure; and

[0049] FIG. 26 is a flowchart illustrating a current application process to an electromagnet of an electronic device according to an embodiment of the disclosure.

[0050] Throughout the drawings, like reference numerals will be understood to refer to like parts, components, and structures.

DETAILED DESCRIPTION

[0051] The following description with reference to the accompanying drawings is provided to assist in a comprehensive understanding of various embodiments of the disclosure as defined by the claims and their equivalents. It includes various specific details to assist in that understanding but these are to be regarded as merely exemplary. Accordingly, those of ordinary skill in the art will recognize that various changes and modifications of the various embodiments described herein can be made without departing from the scope and spirit of the disclosure. In addition, descriptions of well-known functions and constructions may be omitted for clarity and conciseness.

[0052] The terms and words used in the following description and claims are not limited to the bibliographical meanings, but, are merely used by the inventor to enable a clear and consistent understanding of the disclosure. Accordingly, it should be apparent to those skilled in the art that the following description of various embodiments of the disclosure is provided for illustration purpose only and not for the purpose of limiting the disclosure as defined by the appended claims and their equivalents.

[0053] It is to be understood that the singular forms “a,” “an,” and “the” include plural referents unless the context clearly dictates otherwise. Thus, for example, reference to “a component surface” includes reference to one or more of such surfaces.

[0054] It should be appreciated that the blocks in each flowchart and combinations of the flowcharts may be performed by one or more computer programs which include instructions. The entirety of the one or more computer programs may be stored in a single memory device or the one or more computer programs may be divided with different portions stored in different multiple memory devices.

[0055] Any of the functions or operations described herein can be processed by one processor or a combination of processors. The one processor or the combination of processors is circuitry performing processing and includes circuitry like an application processor (AP, e.g. a central processing unit (CPU)), a communication processor (CP, e.g., a modem), a graphics processing unit (GPU), a neural processing unit (NPU) (e.g., an artificial intelligence (AI) chip), a wireless fidelity (Wi-Fi) chip, a Bluetooth® chip, a global positioning system (GPS) chip, a near field communication (NFC) chip, connectivity chips, a sensor controller, a touch controller, a finger-print sensor controller, a display driver integrated circuit (IC), an audio CODEC chip, a universal serial bus (USB) controller, a camera controller, an image processing IC, a microprocessor unit (MPU), a system on chip (SoC), an IC, or the like.

[0056] FIG. 1 is a block diagram illustrating an electronic device **101** in a network environment **100** according to an embodiment of the disclosure.

[0057] Referring to FIG. 1, the electronic device **101** in the network environment **100** may communicate with at

least one of an electronic device **102** via a first network **198** (e.g., a short-range wireless communication network), or 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 an embodiment, at least one (e.g., the connecting terminal **178**) of the components may be omitted from the electronic device **101**, or one or more other components may be added in the electronic device **101**. According to an embodiment, some (e.g., the sensor module **176**, the camera module **180**, or the antenna module **197**) of the components may be integrated into a single component (e.g., the display module **160**).

[0058] The processor **120** may execute, for example, software (e.g., the 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 configured to use lower power than the main processor **121** or to be specified for a designated function. The auxiliary processor **123** may be implemented as separate from, or as part of the main processor **121**.

[0059] 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 commun-

ation 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. The artificial intelligence model may be generated via 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.

[0060] 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**.

[0061] 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**.

[0062] The input module **150** may receive a command or data to be used by other 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, keys (e.g., buttons), or a digital pen (e.g., a stylus pen).

[0063] 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.

[0064] 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 configured to detect a touch, or a pressure sensor configured to measure the intensity of a force generated by the touch.

[0065] The audio module **170** may convert a sound into an electrical signal and vice versa. According to an embodi-

ment, 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**.

[0066] The sensor module **176** may detect an operation state (e.g., power or temperature) of the electronic device **101** or an external environmental state (e.g., the user's state), 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 accelerometer, 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.

[0067] 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.

[0068] 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, an HDMI connector, a USB connector, an SD card connector, or an audio connector (e.g., a headphone connector).

[0069] The haptic module **179** may convert an electrical signal into a mechanical stimulus (e.g., a vibration or motion) 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.

[0070] 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.

[0071] 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).

[0072] 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.

[0073] 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 direct (e.g., wired) communication or wireless communication. According to an embodiment, the communication module **190** may include a wireless communication module **192** (e.g., a cellular communication 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 **104** via a first network **198** (e.g., a short-range communication network, such as Bluetooth™, wireless-fidelity (Wi-Fi) direct, or infrared data association (IrDA)) or a 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., local area network (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 or 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**.

[0074] The wireless communication module **192** may support a fifth-generation (5G) network, after a fourth-generation (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 millimeter wave (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., **20Gbps** or more) for implementing eMBB, loss coverage (e.g., **164dB** or less) for implementing mMTC, or U-plane latency (e.g., 0.5ms or less for each of downlink (DL) and uplink (UL), or a round trip of **1ms** or less) for implementing URLLC.

[0075] The antenna module **197** may transmit or receive a signal or power to or from the outside (e.g., the external electronic device). According to an embodiment, the antenna module **197** may include one antenna including a radiator formed of a conductor or conductive pattern

formed 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., an antenna array). In this case, at least one antenna appropriate for a communication scheme used in a communication network, such as the first network **198** or the second network **199**, may be selected from the plurality of antennas by, e.g., the communication module **190**. 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, other parts (e.g., radio frequency integrated circuit (RFIC)) than the radiator may be further formed as part of the antenna module **197**.

[0076] 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.

[0077] 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)).

[0078] 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**. The external electronic devices **102** or **104** each may be a device of the same 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** or **104**, or the server **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 comput-

ing. In another 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.

[**0079**] The electronic device according to various embodiments of the disclosure 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, or a home appliance. According to an embodiment of the disclosure, the electronic devices are not limited to those described above.

[**0080**] 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 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), it means that the element may be coupled with the other element directly (e.g., wiredly), wirelessly, or via a third element.

[**0081**] As used herein, the term "module" may include a unit implemented in hardware, software, or firmware, 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).

[**0082**] 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 compiler or a code executable by an interpreter. The storage medium readable by the machine may be provided in the form of a non-transitory storage medium. Wherein, the term "non-transitory" simply means that the storage medium is a tangible device, and does 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.

[**0083**] 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 products may be traded as commodities between sellers and buyers. 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., Play Store™), 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.

[**0084**] 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. Some of the plurality of 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.

[**0085**] FIG. 2 is a view illustrating an unfolded state of an electronic device according to an embodiment of the disclosure.

[**0086**] FIG. 3 is a view illustrating a folded state of an electronic device according to an embodiment of the disclosure.

[**0087**] FIG. 2 is a view illustrating an unfolded status among folding states of an electronic device (or a foldable electronic device) according to an embodiment of the disclosure. FIG. 3 is a view illustrating a folded status of the

electronic device (or a foldable electronic device) according to an embodiment of the disclosure. The electronic device **101** of FIGS. **2** and **3**, as an example of the electronic device **101** shown in FIG. **1**, may be a foldable or bendable electronic device.

[**0088**] The embodiments of FIGS. **2** and **3** may be combined with the embodiment of FIG. **1** or the embodiments of FIGS. **4** to **26**.

[**0089**] The configuration of the electronic device **101** of FIGS. **2** and **3** may be identical in whole or part to the configuration of the electronic device **101** of FIG. **1**.

[**0090**] Referring to FIGS. **2** and **3**, according to an embodiment, an electronic device **101** may include a foldable housing **201** and a flexible or foldable display **250** (hereinafter, simply “flexible display **250**”) (e.g., the display module **160** of FIG. **1**) disposed in a space formed by the foldable housing **201**. According to an embodiment, the surface where the flexible display **250** is disposed (or the surface where the flexible display **250** is viewed from the outside of the electronic device **101**) may be defined as the front surface of the electronic device **101**. The opposite surface of the front surface may be defined as a rear surface of the electronic device **101**. The surface surrounding the space between the front and back surfaces may be defined as a side surface of the electronic device **101**.

[**0091**] According to an embodiment, the foldable housing **201** may include a first housing **210**, a second housing **220** including a sensor area **229**, a first rear cover **215**, a second rear cover **225**, and a hinge assembly **230**. According to an embodiment, the hinge assembly **230** may include a hinge cover (e.g., the hinge cover **232** of FIG. **4**) that covers the foldable portion of the foldable housing **201**. The foldable housing **201** of the electronic device **101** are not limited to the shape and coupling shown in FIGS. **2** and **3** but may rather be implemented in other shapes or via a combination and/or coupling of other components. For example, in an embodiment, the first housing **210** and the first rear cover **215** may be integrally formed with each other, and the second housing **220** and the second rear cover **225** may be integrally formed with each other.

[**0092**] According to an embodiment, an illuminance sensor and an image sensor may be disposed in the sensor area **229**. The illuminance sensor may detect the amount of light around the electronic device **101**, and the image sensor may convert light incident through the camera lens into a digital signal. The illuminance sensor and the image sensor may be visually exposed through the flexible display **250**. According to an embodiment, the illuminance sensor and the image sensor may not be visually exposed. For example, the camera may be configured as an under display camera (UDC). Pixels in one area of the flexible display **250** corresponding to the location of the UDC may be configured to differ from pixels in other areas, so that the image sensor and/or camera may not be visually exposed.

[**0093**] According to an embodiment, the first housing **210** may be connected to the hinge assembly **230** and may include a first front surface facing in a first direction and a first rear surface facing in a direction opposite to the first direction. The second housing **220** may be connected to the hinge assembly **230** and may include a second front surface

facing in a second direction and a second rear surface facing in a direction opposite to the second direction. The first housing **210** may rotate about the hinge assembly **230** with respect to the second housing **220**. The second housing **220** may rotate about the hinge assembly **230** with respect to the first housing **210**. The electronic device **101** may transform to a folded status or an unfolded status. For example, the folded state of the electronic device **101** may be defined and/or referred to as a folded state of the housing **201**. The unfolded state of the electronic device **101** may be defined and/or referred to as an unfolded state of the housing **201**.

[**0094**] According to an embodiment, the first housing **210** may include a 1-1th side surface **211a** disposed to be spaced apart from and in parallel to the folding axis A of the hinge assembly **230** between the first front surface and the first rear surface, and the second housing **220** may include a 2-1th side surface **221a** disposed to be spaced apart from and in parallel to the folding axis A of the hinge assembly **230** between the second front surface and the second rear surface. Further, the first housing **210** may include a 1-2th side surface **211b** perpendicular to the 1-1th side surface **211a** and having an end connected with the 1-1th side surface **211a** and another end connected with the hinge assembly **230** and a 1-3th side surface **211c** perpendicular to the 1-1th side surface **211a** and having an end connected with the 1-1th side surface **211a** and another end connected with the hinge assembly **230** and spaced apart from and in parallel to the 1-2th side surface **211b**. The second housing **220** may include a 2-2th side surface **221b** perpendicular to the 2-1th side surface **221a** and having an end connected with the 2-1th side surface **221a** and another end connected with the hinge assembly **230** and a 2-3th side surface **221c** perpendicular to the 2-1th side surface **221a** and having an end connected with the 2-1th side surface **221a** and another end connected with the hinge assembly **230** and spaced apart from and in parallel to the 2-2th side surface **221b**. When the first housing **210** is folded about the hinge assembly **230** with respect to the second housing **220** (e.g., FIG. **3**), the 1-1th side surface **211a** may approach the 2-1th side surface **221a** and, when the first housing **210** is unfolded about the hinge assembly **230** with respect to the second housing **220** (e.g., FIG. **2**), the 1-1th side surface **211a** may move away from the 2-1th side surface **221a**.

[**0095**] According to an embodiment, in the fully folded state of the electronic device **101**, the first front surface may face the second front surface and, in the fully unfolded state, the first direction may be identical to the second direction. In the fully unfolded state, the distance between the 1-1th side surface **211a** and the 2-1th side surface **221a** may be the largest.

[**0096**] According to an embodiment, the first housing **210** and the second housing **220** are disposed on two opposite sides of the folding axis A and be overall symmetrical in shape with respect to the folding axis A. As described below, the angle or distance between the first housing **210** and the second housing **220** may be varied depending on whether the electronic device **101** is in the unfolded state,

the folded state, or the partially unfolded (or partially folded) intermediate state.

[0097] According to an embodiment, as shown in FIG. 2, the first housing 210 and the second housing 220 together may form a recess to receive the flexible display 250. According to an embodiment, at least a portion of the first housing 210 and the second housing 220 may be formed of a metallic material or a non-metallic material having rigidity of a selected size for supporting the flexible display 250. At least a portion formed of metal may provide a ground plane of the electronic device 101 and may be electrically connected with a ground line formed on the printed circuit board disposed in the foldable housing 201.

[0098] According to an embodiment, a protection member may be disposed outside the flexible display 250. The protection member may be formed integrally with the side surface of the foldable housing 201 or as a separate structure. The flexible display 250 may not adhere to the side surface of the foldable housing 201 and/or the protection member. A gap may be formed between the flexible display 250 and the protection member. The protection member may be configured to cover the internal configuration of the electronic device 101 from the outside or to protect the internal configuration of the electronic device 101 from external impact. According to an embodiment, the protection member may be configured to cover the line disposed on the flexible display 250 from the outside or to protect it from an external impact.

[0099] According to an embodiment, the first rear cover 215 may be disposed on one side of the folding axis A on the rear surface of the electronic device 101 and have, e.g., a substantially rectangular periphery which may be surrounded by the first housing 210. Similarly, the second rear cover 225 may be disposed on the opposite side of the folding axis A on the rear surface of the electronic device 101 and its periphery may be surrounded by the second housing 220.

[0100] According to an embodiment, the first rear cover 215 and the second rear cover 225 may be substantially symmetrical in shape with respect to the folding axis A. However, the first rear cover 215 and the second rear cover 225 are not necessarily symmetrical in shape. In an embodiment, the electronic device 101 may include the first rear cover 215 and the second rear cover 225 in various shapes. In an embodiment, the first rear cover 215 may be integrally formed with the first housing 210, and the second rear cover 225 may be integrally formed with the second housing 220.

[0101] According to an embodiment, the first rear cover 215, the second rear cover 225, the first housing 210, and the second housing 220 may form a space where various components (e.g., a printed circuit board or battery) of the electronic device 101 may be disposed. According to an embodiment, one or more components may be disposed or visually exposed on the rear surface of the electronic device 101. For example, at least a portion of a sub display (e.g., the sub display 218 of FIG. 4) may be visually exposed through a first back surface area 216 of the first back cover 215. For example, one or more components or sensors may be visually exposed through a second rear surface area 226

of the second rear cover 225. In an embodiment, the sensor may include a proximity sensor and/or a rear camera.

[0102] According to an embodiment, the front camera disposed on the front surface (e.g., the second front surface) of the electronic device 101 or the rear camera exposed through the second rear surface area 226 of the second rear cover 225 may include one or more lenses, an image sensor, and/or an image signal processor. The flash may include, e.g., a light emitting diode or a xenon lamp. In an embodiment, two or more lenses (infrared cameras, wide-angle and telephoto lenses) and image sensors may be disposed on one surface of the electronic device 101.

[0103] Referring to FIG. 3, the hinge cover (e.g., the hinge cover 232 of FIG. 4) included in the hinge assembly 230 may be disposed between the first housing 210 and the second housing 220 to hide the internal components (e.g., the hinge structure 231 of FIG. 4). According to an embodiment, the hinge assembly 230 may be hidden by a portion of the first housing 210 and second housing 220 or be exposed to the outside depending on the state (the unfolded state, intermediate state, or folded state) of the electronic device 101.

[0104] According to an embodiment, as shown in FIG. 2, in the unfolded state (e.g., a fully unfolded state) of the electronic device 101, the hinge assembly 230 may be hidden not to be exposed by the first housing 210 and the second housing 220. According to an embodiment, as shown in FIG. 3, in the folded state (e.g., a fully folded state) of the electronic device 101, the hinge assembly 230 may be exposed to the outside between the first housing 210 and the second housing 220. As an embodiment, in the intermediate state in which the first housing 210 and the second housing 220 are folded with a certain angle, the hinge assembly 230 may be partially exposed to the outside between the first housing 210 and the second housing 220. However, in this case, the exposed area may be smaller than that in the completely folded state. In an embodiment, the hinge assembly 230 may include a curved surface.

[0105] In an embodiment, the flexible display 250 may be disposed in a space formed by the foldable housing 201. For example, the flexible display 250 may be seated in a recess formed by the foldable housing 201 and may be seen from the outside through the front surface (e.g., the first front surface and/or the second front surface) of the electronic device 101. According to an embodiment, the flexible display 250 may constitute most of the front surface (e.g., the first front surface and/or the second front surface) of the electronic device 101. Accordingly, the front surface (e.g., the first front surface and/or the second front surface) of the electronic device 101 may include the flexible display 250 and a partial area of the first housing 210 and a partial area of the second housing 220 adjacent to the flexible display 250. The rear surface (e.g., the first rear surface and/or second rear surface) of the electronic device 101 may include the first rear cover 215, a partial area of the first housing 210 adjacent to the first rear cover 215, the second rear cover 225, and a partial area of the second housing 220 adjacent to the second rear cover 225.

[0106] According to an embodiment, the flexible display 250 may refer to a display in which at least a partial area

thereof may be deformed into a flat surface or a curved surface. According to an embodiment, the flexible display **250** may include a folding area **253**, a first display area **251** disposed on one side of the folding area **253** (e.g., the left side of the folding area **253** of FIG. 2), and a second display area **252** disposed on the opposite side of the folding area **253** (e.g., the right side of the folding area **253** of FIG. 2).

[0107] According to an embodiment, the first display area **251** may be disposed on the first housing **210**, and the second display area **252** may be disposed on the second housing **220**. According to an embodiment, the folding area **253** may connect the first display area **251** and the second display area **252**, and may be disposed on the hinge assembly **230**.

[0108] The segmentation of the flexible display **250** as shown in FIG. 2 is merely an example, and the display **250** may be divided into a plurality of (e.g., four or more, or two) areas depending on the structure or function of the display **250**. For example, in the embodiment illustrated in FIG. 2, the area of the flexible display **250** may be divided by the folding area **253** extending parallel to the folding axis A, but the area of the flexible display **250** may be divided by another folding axis (e.g., a folding axis parallel to the width direction of the electronic device).

[0109] According to an embodiment, the flexible display **250** may be coupled or disposed adjacent to a touch panel provided with a touch sensing circuit and a pressure sensor capable of measuring the intensity (pressure) of the touch. For example, as an example of the touch panel, the flexible display **250** may be coupled to or disposed adjacent to an electromagnetic induction panel for detecting an electromagnetic resonance (EMR)-type stylus pen (e.g., the digital pen **300** of FIGS. 5 and 6).

[0110] According to an embodiment, the first display area **251** and the second display area **252** may be overall symmetrical in shape with respect to the folding area **253**.

[0111] Described below are the operation of the first housing **210** and the second housing **220** and each area of the flexible display **250** depending on the state (e.g., the folded state, unfolded state, or intermediate state) of the electronic device **101**.

[0112] According to an embodiment, when the electronic device **101** is in the unfolded state (e.g., FIG. 2), the first housing **210** and the second housing **220** may be disposed to face in the same direction while forming an angle of 180 degrees. The surface of the first display area **251** and the surface of the second display area **252** of the flexible display **250** may be angled at 180 degrees therebetween while facing in the same direction (e.g., forward of the front surface of the electronic device). In this case, the folding area **253** may form the same plane with the first display area **251** and the second display area **252**.

[0113] According to an embodiment, when the electronic device **101** is in the folded state (e.g., FIG. 3), the first housing **210** and the second housing **220** may be disposed to face each other. The surface of the first display area **251** and the surface of the second display area **252** of the flexible display **250** may face each other while forming a narrow angle (e.g., between 0 degrees and 10 degrees). At

least a portion of the folding area **253** may be formed as a curve having a predetermined curvature.

[0114] According to an embodiment, when the electronic device **101** is in the intermediate state, the first housing **210** and the second housing **220** may be disposed at a certain angle. The surface of the first display area **251** and the surface of the second display area **252** of the flexible display **250** may form an angle larger than that in the folded state and smaller than that in the unfolded state. The folding area **253** may at least partially have a curved surface with a predetermined curvature and, in this case, the curvature may be smaller than that when it is in the folded state.

[0115] According to an embodiment, the first housing **210** may include first housing holes **2101** and **2102**. According to an embodiment, the first housing holes **2101** and **2102** may include a 1-1th housing hole **2101** formed in the 1-2th side surface **211b** of the first housing **210** and a 1-2th housing hole **2102** formed in the 1-3th side surface **211c** of the first housing **210**.

[0116] According to an embodiment, the 1-2th side surface **211b** of the first housing **210** may include a 1-1th segmenter **212a** formed of a non-metallic material. According to an embodiment, a pair of 1-1th segmenters **212a** spaced apart from each other may be provided. According to an embodiment, the 1-1th housing hole **2101** may be formed between the pair of 1-1th segmenters **212a**.

[0117] According to an embodiment, the 1-3th side surface **211c** of the first housing **210** may include a 1-2th segmenter **212b** formed of a non-metallic material. According to an embodiment, a pair of 1-2th segmenters **212b** spaced apart from each other may be provided. According to an embodiment, the 1-2th housing hole **2102** may be formed between the pair of 1-2th segmenters **212b**.

[0118] According to an embodiment, the number of at least one 1-1th housing hole **2101** may be equal to the number of at least one 1-2th housing hole **2102**.

[0119] According to an embodiment, the 1-2th side surface **211b** and the 1-3th side surface **211c** may be disposed in parallel. According to an embodiment, the plurality of 1-1th housing holes **2101** and the plurality of 1-2th housing holes **2102** may be disposed to overlap each other with respect to the length direction (e.g., Y-axis direction of FIG. 4) of the electronic device **101**. For example, the plurality of 1-1th housing holes **2101** may be disposed to correspond to the plurality of 1-2th housing holes **2102**, respectively, in the length direction (e.g., the Y axis direction of FIG. 4) of the electronic device **101**.

[0120] According to an embodiment, the plurality of 1-1th housing holes **2101** may be disposed on a straight line with respect to the width direction (e.g., the X axis direction of FIG. 4) of the electronic device **101** (or first housing **210**). According to an embodiment, the plurality of 1-2th housing holes **2102** may be disposed on a straight line with respect to the width direction (e.g., the X axis direction of FIG. 4) of the electronic device **101** (or first housing **210**).

[0121] According to an embodiment, the second housing **220** may include second housing holes **2201** and **2202**. According to an embodiment, the second housing holes **2201** and **2202** may include a 2-1th housing hole **2201** formed in the 2-2th side surface **221b** of the second housing

220 and a 2-2th housing hole **2202** formed in the 2-3th side surface **221c** of the second housing **220**.

[0122] According to an embodiment, the 2-2th side surface **221b** of the second housing **220** may include a 2-1th segmenter **222a** formed of a non-metallic material. According to an embodiment, a pair of 2-1th segmenters **222a** spaced apart from each other may be provided. According to an embodiment, a portion of the 2-1th housing hole **2201** may be formed between the pair of 2-1th segmenters **222a**, and the remaining portion of the 2-1th housing hole **2201** may be formed between the folding axis A (or the hinge assembly **230**) and any one of the 2-1th segmenters **222a**.

[0123] According to an embodiment, the 2-3th side surface **221c** of the second housing **220** may include a 2-2th segmenter **222b** formed of a non-metallic material. According to an embodiment, a pair of 2-2th segmenters **222b** spaced apart from each other may be provided. According to an embodiment, the 2-1th housing hole **2201** may be formed between the pair of 2-2th segmenters **222b**.

[0124] According to an embodiment, the 2-3th side surface **221c** of the second housing **220** may include a connection terminal **289** (e.g., the connection terminal **178** of FIG. 1).

[0125] In the following description of the drawings, illustrated is a spatial coordinate system defined by an X-axis, a Y-axis and a Z-axis orthogonal to each other. Here, the X-axis may indicate the width direction of the components of the electronic device or the electronic device, the Y-axis may indicate the length direction of the components of the electronic device or the electronic device, and the Z-axis may indicate the height (or thickness) direction of the components of the electronic device or the electronic device. In describing an embodiment of the disclosure, the 'first direction and the second direction' may mean directions parallel to the Z-axis.

[0126] FIG. 4 is an exploded perspective view illustrating an electronic device according to an embodiment of the disclosure.

[0127] The embodiment of FIG. 4 may be combinable with the embodiments of FIGS. 1 to 3, or the embodiments of FIGS. 5 to 26.

[0128] Referring to FIG. 4, an electronic device **101** (e.g., the electronic device **101** of FIGS. 1 to 3) may include a foldable housing **201**, a first housing **210**, a second housing **220**, a hinge assembly **230**, a flexible display **250**, a first printed circuit board **241**, a second printed circuit board **242**, a waterproofing member **260**, a first battery **271**, or a second battery **272**.

[0129] The configuration of the foldable housing **201**, the first housing **210**, the second housing **220**, the hinge assembly **230**, and the flexible display **250** of FIG. 4 may be identical in whole or part to the configuration of the foldable housing **201**, the first housing **210**, the second housing **220**, the hinge assembly **230**, and the flexible display **250** of FIGS. 2 and 3.

[0130] According to an embodiment, the electronic device **101** may include various electronic components (or electrical components) disposed inside or outside the first housing **210** and the second housing **220**. The various electronic components may include, e.g., a processor (e.g., the pro-

cessor **120** of FIG. 1), memory (e.g., the memory **130** of FIG. 1), an input module (e.g., the input module **150** of FIG. 1), a sound output module (e.g., sound output module **155** of FIG. 1), a display **250** (e.g., the display module **160** of FIG. 1), an audio module (e.g., the audio module **170** of FIG. 1), a sensor (e.g., the sensor module **176** of FIG. 1), an interface (e.g., the interface **177** of FIG. 1), a connecting terminal (e.g., the connecting terminal **178** of FIG. 1 or the connecting terminal **289** of FIG. 2), a haptic module (e.g., the haptic module **179** of FIG. 1), a camera module (e.g., the camera module **180** of FIG. 1), a power management module (e.g., the power management module **188** of FIG. 1), batteries **271** and **272** (e.g., the battery **189** of FIG. 1), a communication module (e.g., the communication module **190** of FIG. 1), a subscriber identification module (e.g., the subscriber identification module **196** of FIG. 1), or an antenna module (e.g., the antenna module **197** of FIG. 1). The electronic components may be appropriately separated and disposed in the inner or outer space of the first housing **210** and the second housing **220**. At least one (e.g., the connecting terminal **178**) of the components may be omitted from the electronic device **101**, or one or more other components may be added in the electronic device **101**. Further, some of these components may be integrated into one component.

[0131] According to an embodiment, the electronic device **101** is a foldable electronic device, and may include a plurality of batteries to supply and store power required for driving to electronic components. For example, the electronic device **101** may include a first battery **271** and a second battery **272** disposed in the first housing **210** and the second housing **220**, respectively.

[0132] According to an embodiment, the first housing **210** may include a 1-1th side surface **211a** (e.g., the 1-1th side surface **211a** of FIGS. 2 to 3), a 1-2th side surface **211b** (e.g., the 1-2th side surface **211b** of FIGS. 2 to 3), a 1-3th side surface **211c** (e.g., the 1-3th side surface **211c** of FIGS. 2 to 3), and/or a first plate **213**.

[0133] According to an embodiment, the second housing **220** may include a 2-1th side surface **221a** (e.g., the 2-1th side surface **221a** of FIGS. 2 to 3), a 2-2th side surface **221b** (e.g., the 2-2th side surface **221b** of FIGS. 2 to 3), a 2-3th side surface **221c** (e.g., the 2-3th side surface **221c** of FIGS. 2 to 3), and/or a second plate **223**.

[0134] According to an embodiment, the electronic device **101** is a foldable electronic device, and may include a first plate **213** and/or a second plate **223** for disposing components in the first housing **210** and the second housing **220**. In an embodiment, the first plate **213** may be interpreted as a component of the first housing **210**, and the second plate **223** may be interpreted as a component of the second housing **220**. In an embodiment, the first plate **213** may be interpreted as a separate component from the first housing **210**, and the second plate **223** may be interpreted as a separate component from the second housing **220**. Various electronic components and/or printed circuit boards **241** and **242** may be disposed on the first plate **213** and/or the second plate **223**. According to an embodiment, the first plate **213** and the first printed circuit board **241** may be disposed in the first housing **210**, and the second plate **223** and

the second printed circuit board **242** may be disposed in the second housing **220**. The first plate **213** may include a first surface facing in a first direction (e.g., the +Z direction of FIG. 4), and the second plate **223** may include a second surface facing in a second direction (e.g., the -Z direction of FIG. 4). The first plate **213** and the second plate **223** may be folded or unfolded with respect to each other by the hinge structure **231** formed corresponding to the folding area **253** of the flexible display **250** and be formed to face each other in the folded state and, in the unfolded state, be formed so that the first surface and the second surface face in the same direction.

[0135] According to an embodiment, the first printed circuit board **241** may be disposed in the first waterproof area **261-1** formed by the first waterproof member **261**.

[0136] According to an embodiment, the flexible display **250** may be disposed in the first housing **210** and the second housing **220**. According to an embodiment, the first display area **251** may be disposed on the first housing **210** (or the first plate **213**), and the second display area **252** may be disposed on the second housing **220** (or the second plate **223**). According to an embodiment, the folding area **253** may connect the first display area **251** and the second display area **252** and may be disposed on the hinge structure **231**.

[0137] According to an embodiment, the first printed circuit board **241** may be disposed under the first plate **213** (in the -Z-axis direction), and the second printed circuit board **242** may be disposed under the second plate **223** (in the -Z-axis direction).

[0138] According to an embodiment, signals of the processor for implementing various functions and operations of the electronic device **101** may be transferred through various conductive lines and/or connecting member (connector) formed on the printed circuit boards **241** and **242**.

[0139] According to an embodiment, the foldable housing **201** may include a first housing **210**, a second housing **220**, a first rear cover **215**, a second rear cover **225**, and a hinge assembly **230**.

[0140] According to an embodiment, the flexible display **250** may include a display panel. In an embodiment, the first plate **213** and the second plate **223** may be disposed between the display panel and the first printed circuit board **241** and the second printed circuit board **242**. The hinge assembly **230** may be disposed between the first plate **213** and the second plate **223**.

[0141] According to an embodiment, the electronic device **101** may include a flexible printed circuit board **243** (FPCB) that electrically connects the first printed circuit board **241** and the second printed circuit board **242**. At least a portion of the flexible printed circuit board **243** may be disposed on the hinge assembly **230** (or the hinge structure **231**). At least one electromagnet (e.g., the electromagnet **290** of FIG. 7) configured to provide a magnetic force to a digital pen (e.g., the digital pen **300** of FIGS. 5 to 6) may be disposed on the flexible printed circuit board **243**.

[0142] According to an embodiment, the electronic device **101** may further include a sub display **218** (e.g., the display module **160** of FIG. 1) disposed between the first housing **210** and the first rear cover **215**. According to an embodi-

ment, the sub display **218** may include a display panel. According to an embodiment, the sub display **218** may be coupled to the first rear cover **215**. According to an embodiment, the sub display **218** may be coupled to the first printed circuit board **241**. For example, the sub display **218** may be visually exposed to the outside of the electronic device **101** through a first rear area (e.g., the first rear area **216** of FIG. 2) of the first rear cover **215**.

[0143] According to an embodiment, the hinge assembly **230** may include a hinge structure **231** and a hinge cover **232**. According to an embodiment, the first housing **210** and the second housing **220** may be connected to each other through the hinge structure **231**, and may rotate relative to each other. According to an embodiment, the hinge cover **232** may cover the hinge structure **231**.

[0144] According to an embodiment, it may connect the first housing **210** and the second housing **220** to be rotatable relative to each other.

[0145] According to an embodiment, the electronic device **101** may include a first printed circuit board **241** and a second printed circuit board **242**. The first printed circuit board **241** and the second printed circuit board **242** may be disposed in a space formed by the first plate **213**, the second plate **223**, the first housing **210**, the second housing **220**, the first rear cover **215**, and the second rear cover **225**. Components for implementing various functions of the electronic device **101** may be disposed on the first printed circuit board **241** and the second printed circuit board **242**. According to an embodiment, each of the first printed circuit board **241** and the second printed circuit board **242** may include any one of a printed circuit board (PCB), a flexible printed circuit board (PCB), or a rigid-flexible PCB (RF-PCB).

[0146] According to an embodiment, the first housing **210** and the second housing **220** may be assembled to be coupled to two opposite sides of the hinge assembly **230** in a state in which the first plate **213** and the second plate **223** and the flexible display **250** are coupled. For example, the first housing **210** may be coupled by sliding on one side of the hinge assembly **230**, and the second housing **220** may be coupled by sliding on the other side of the hinge assembly **230**.

[0147] According to an embodiment, the waterproof member **260** may be disposed inside the electronic device **101**. According to an embodiment, the waterproof member **260** may include a first waterproof member **261**, a second waterproof member **262**, a third waterproof member **263**, and/or a fourth waterproof member **264**.

[0148] According to an embodiment, the first waterproof member **261** may be disposed between the first housing **210** and the flexible display **250**. According to an embodiment, the first waterproof member **261** may be disposed between the first plate **213** and the first display area **251**. According to an embodiment, the first waterproof member **261** may be formed of a waterproof tape. According to an embodiment, the first waterproof member **261** may be bonded to the first housing **210** and/or the first plate **213**, and may be bonded to the flexible display **250** (e.g., the first display area **251**). According to an embodiment, the first waterproof member **261** may have a closed loop shape. For

example, the first waterproof member **261** may include at least one closed loop area. According to an embodiment, the first waterproof member **261** may include a waterproof tape, and may restrict liquid inflow from the outside of the closed loop area of the first waterproof member **261** to the inside of the closed loop area.

[0149] According to an embodiment, the first waterproof member **261** may include at least one first waterproof area **261-1**. According to an embodiment, the at least one first waterproof area **261-1** may be defined and interpreted as an inside of the closed loop area of the first waterproof member **261**.

[0150] According to an embodiment, the second waterproof member **262** may be disposed between the second housing **220** and the flexible display **250**. According to an embodiment, the second waterproof member **262** may be disposed between the second plate **223** and the second display area **252**. According to an embodiment, the second waterproof member **262** may be formed of a waterproof tape. According to an embodiment, the second waterproof member **262** may be bonded to the second housing **220** and/or the second plate **223**, and may be bonded to the flexible display **250** (e.g., the second display area **252**). According to an embodiment, the second waterproof member **262** may have a closed loop shape. For example, the second waterproof member **262** may include at least one closed loop area. According to an embodiment, the second waterproof member **262** may include a waterproof tape, and may restrict liquid inflow from the outside of the closed loop area of the second waterproof member **262** to the inside of the closed loop area.

[0151] According to an embodiment, the second waterproof member **262** may include at least one second waterproof area **262-1**. According to an embodiment, the at least one second waterproof area **262-1** may be defined and interpreted as the inside of a closed loop area of the second waterproof member **262**.

[0152] According to an embodiment, the third waterproof member **263** may be disposed between the first housing **210** and the first rear cover **215**. According to an embodiment, the third waterproof member **263** may be disposed between the first plate **213** and the sub display **218**. According to an embodiment, the third waterproof member **263** may be formed of a waterproof tape. According to an embodiment, the third waterproof member **263** may be bonded to the first housing **210** and/or the first plate **213**, and may be bonded to the first rear cover **215** and/or the sub display **218**. According to an embodiment, the third waterproof member **263** may have a closed loop shape. For example, the third waterproof member **263** may include at least one closed loop area. According to an embodiment, the third waterproof member **263** may include a waterproof tape, and may restrict liquid inflow from the outside of the closed loop area of the third waterproof member **263** to the inside of the closed loop area.

[0153] According to an embodiment, the third waterproof member **263** may include at least one third waterproof area **263-1**. According to an embodiment, the at least one third waterproof area **263-1** may be defined and interpreted as an

inside of the closed loop area of the third waterproof member **263**.

[0154] According to an embodiment, the fourth waterproof member **264** may be disposed between the second housing **220** and the second rear cover **225**. According to an embodiment, the fourth waterproof member **264** may be disposed between the second plate **223** and the second rear cover **225**. According to an embodiment, the fourth waterproof member **264** may be formed of a waterproof tape. According to an embodiment, the fourth waterproof member **264** may be bonded to the second housing **220** and/or the second plate **223**, and may be bonded to the second rear cover **225**. According to an embodiment, the fourth waterproof member **264** may have a closed loop shape. For example, the fourth waterproof member **264** may include at least one closed loop area. According to an embodiment, the fourth waterproof member **264** may include a waterproof tape, and may restrict liquid inflow from the outside of the closed loop area of the fourth waterproof member **264** to the inside of the closed loop area.

[0155] According to an embodiment, the fourth waterproof member **264** may include at least one fourth waterproof area **264-1**. According to an embodiment, the at least one fourth waterproof area **264-1** may be defined and interpreted as an inside of the closed loop area of the fourth waterproof member **264**.

[0156] According to an embodiment, the first waterproof member **261**, the second waterproof member **262**, the third waterproof member **263**, and the fourth waterproof member **264** may be disposed not to contact the hinge assembly **230**.

[0157] According to an embodiment, as the waterproof member **260** is disposed inside the electronic device **101**, the electronic device **101** may restrict the inflow of liquid from the outside of the electronic device **101** into the electronic device **101**.

[0158] FIG. 5 is an exploded perspective view illustrating a digital pen according to an embodiment of the disclosure.

[0159] FIG. 6 is a block diagram illustrating a digital pen according to an embodiment of the disclosure.

[0160] The embodiments of FIGS. 5 and 6 may be combinable with the embodiments of FIGS. 1 to 4, or the embodiments of FIGS. 7 to 26.

[0161] Referring to FIGS. 5 to 6, the electronic device (e.g., the electronic device **101** of FIGS. 1 to 4) may include a digital pen **300**. The digital pen **300** may be defined and/or interpreted as a component of the electronic device but, without limitations thereto, may be defined and/or interpreted as a separate component from the electronic device.

[0162] The configuration of the digital pen **300** of FIGS. 5 to 6 may be identical in whole or part to the configuration of the electronic device **101** or the input module **150** of FIG. 1.

[0163] According to an embodiment, the digital pen **300** may include a separate resonance circuit (e.g., the resonance circuit **487** of FIG. 6) built-in and may be linked with an electromagnetic induction panel (e.g., digitizer) of the electronic device **101**. For example, the digital pen **300** may include an electro-magnetic resonance (EMR) method,

an active electrical stylus (AES), or an electric coupled resonance (ECR) method.

[0164] According to an embodiment, the digital pen 300 may include a button portion 313 (e.g., the button portion 313 of FIG. 5) disposed at one end to facilitate removal of the digital pen 300 from the accommodation space of the electronic device 101. For example, when the button portion 313 is pressed by a user, a repulsion mechanism (e.g., at least one spring) associated with the button portion 313 operates, and the digital pen 300 may be released from the accommodation space of the electronic device 101.

[0165] According to an embodiment, the digital pen 300 may enable a handwriting input to the electronic device 101. For example, the digital pen 300 may provide various input functions in conjunction with an electromagnetic induction panel (e.g., digitizer).

[0166] Referring to FIG. 5, the digital pen 300 may include a pen housing 301 forming the exterior of the digital pen 300 and an inner assembly inside the pen housing 301. According to an embodiment, the inner assembly may include all various components disposed inside the pen and may be inserted into the pen housing 301 in a single assembly operation.

[0167] According to an embodiment, the pen housing 301 may have an elongated shape between a first end 301a and a second end 301b and may include an accommodation space 302 inside. The pen housing 301 may have an elliptical cross-section with a major axis and a minor axis, and may be formed in the shape of an elliptical cylinder overall. According to an embodiment, the cross-sectional shape of the pen housing 301 may be formed in various shapes such as circular or polygonal. The pen housing 301 may include a synthetic resin (e.g., plastic) and/or a metallic material (e.g., aluminum). According to an embodiment, the second end 301b of the pen housing 301 may be formed of a synthetic resin material.

[0168] According to an embodiment, the inner assembly may have an elongated shape corresponding to the shape of the pen housing 301. The inner assembly may largely be divided into three components along the lengthwise direction. For example, the inner assembly may include an ejection member 310 disposed at a position corresponding to the first end 301a of the pen housing 301, a coil portion 320 disposed at a position corresponding to the second end 301b of the pen housing 301, a circuit board portion 330 disposed at a position corresponding to the body of the pen housing 301, and at least one magnetic member 340.

[0169] According to an embodiment, the ejection member 310 may include a configuration for removing the digital pen 300 from the accommodation space 258 of the electronic device 101. According to an embodiment, the ejection member 310 may include a shaft 311, an ejection body 312 disposed around the shaft 311 and forming the overall exterior of the ejection member 310, and a button portion 313. When the inner assembly is fully inserted into the pen housing 301, the portion including the shaft 311 and the ejection body 312 is surrounded by the first end 301a of the pen housing 301, and the button portion 313 (e.g., the button portion 313 of FIG. 5) may be exposed to the outside of the first end 301a. A plurality of components not illus-

trated, e.g., cam members or elastic members, may be disposed in the ejection body 312 to form a push-pull structure. According to an embodiment, the button portion 313 may be substantially coupled with the shaft 311 to perform linear reciprocating motion with respect to the ejection body 312. According to an embodiment, the button portion 313 may include a button with a catching structure formed so that a user may pull out the digital pen 300 using a fingernail. According to an embodiment, the digital pen 300 may include a sensor to detect the linear motion of the shaft 311 to thereby provide another input scheme.

[0170] According to an embodiment, the coil portion 320 may include a pen tip 321 exposed to the outside of the second end 301b when the inner assembly is fully inserted into the pen housing 301, a packing ring 322, a coil 323 wound multiple times, or a pressure sensing portion 324 for obtaining a change in pressure according to pressing of the pen tip 321. The packing ring 322 may include epoxy, rubber, urethane, or silicone. The packing ring 322 may be provided for waterproof or dustproof purposes and protect the coil portion 320 and the circuit board portion 330 from water or dust. According to an embodiment, the coil 323 may form a resonance frequency within a preset frequency band (e.g., 500kHz) and may be combined with at least one device (e.g., a capacitor) to adjust the resonance frequency produced by the coil 323 within a predetermined range.

[0171] According to an embodiment, the circuit board portion 330 may include a printed circuit board 332, a base 331 surrounding at least one surface of the printed circuit board 332, or an antenna. According to an embodiment, a board seating portion 333 where the printed circuit board 332 is disposed may be formed on the upper surface of the base 331, and the printed circuit board 332 may be fixed while seated in the board seating portion 333. According to an embodiment, the printed circuit board 332 may include a top surface and a bottom surface. A variable capacitor or a switch 334 may be disposed on the top surface of the printed circuit board 332, and a charging circuit, a battery, or a communication circuit may be disposed on the bottom surface of the printed circuit board 332. The battery may include an electric double layered capacitor (EDLC). The charging circuit is positioned between the coil 323 and the battery and may include voltage detector circuitry or a rectifier.

[0172] According to an embodiment, the antenna may include an antenna structure and/or an antenna embedded in the printed circuit board 332. According to embodiments, a switch 334 may be provided on the printed circuit board 332. A side button 337 provided to the digital pen 300 may be used to press the switch 334 and may be exposed to the outside through a side opening 303 of the pen housing 301. The side button 337 may be supported by the supporting member 338 and, if no external force is applied to the side button 337, the supporting member 338 may provide an elastic restoration force to allow the side button 337 to remain or go back to a predetermined position.

[0173] According to an embodiment, the circuit board portion 330 may include another packing ring such as an O-ring. For example, an O-ring formed of an elastic material may be disposed at two opposite ends of the base 331 to

form a sealing structure between the base **331** and the pen housing **301**. According to an embodiment, the supporting member **338** may partially adhere to the inner wall of the pen housing **301** around the side opening **303** to form a sealing structure. For example, the circuit board portion **330** may also form a waterproof and dustproof structure similar to the packing ring **322** of the coil portion **320**.

[0174] According to an embodiment, the digital pen **300** may include a battery seating portion **335** where a battery **336** is disposed on the upper surface of the base **331**. The battery **336** that may be mounted in the battery seating portion **335** may include, e.g., a cylinder type battery.

[0175] According to an embodiment, the digital pen **300** may include at least one magnetic member **340** disposed inside the pen housing **301**. The at least one magnetic member **340** may be provided as a pair spaced apart from each other but, without limitations thereto, may be provided as one magnetic member **340** or may be provided as three or more magnetic members **340**.

[0176] According to an embodiment, the at least one magnetic member **340** may include a permanent magnet or a Halbach array magnet. The at least one magnetic member **340** may allow the digital pen **300** to be fixed to at least a portion of the electronic device **101** based on the magnetic force provided from the electromagnet (e.g., the electromagnet **290** of FIG. 7) of the electronic device **101**.

[0177] According to an embodiment, the digital pen **300** may include a microphone. The microphone may be directly connected to the printed circuit board **332** or may be connected to a separate flexible printed circuit board (FPCB) connected to the printed circuit board **332**. According to an embodiment, the microphone may be disposed at a position parallel to the side button **337** in the length direction of the digital pen **300**.

[0178] Referring to FIG. 6, according to an embodiment, the digital pen **300** may include a processor **420**, memory **430**, a resonance circuit **487**, a charging circuit **488**, a battery **489**, a communication circuit **490**, an antenna **497**, and/or a trigger circuit **498**. In an embodiment, the processor **420** of the digital pen **300**, at least a portion of the resonance circuit **487**, and/or at least a portion of the communication circuit **490** may be configured on the printed circuit board (e.g., the printed circuit board **332** of FIG. 6) or in chip form. The processor **420**, the resonance circuit **487**, and/or the communication circuit **490** may be electrically connected with the memory **430**, the charging circuit **488**, the battery **489**, the antenna **497**, or the trigger circuit **498**. According to an embodiment, the digital pen **300** may be configured only of a resonance circuit and a button.

[0179] According to an embodiment, the processor **420** may include a customized hardware module or a generic processor configured to execute software (e.g., an application program). The processor may include a hardware component (function) or software element (program) including at least one of a communication module or a module to manage the state or environment of the digital pen **300**, an input/output interface, a data measuring module, and various sensors provided in the digital pen **300**. The processor **420** may include, e.g., a hardware module, a software module, a firmware module, or a combination of two or more

thereof. According to an embodiment, the processor **420** may receive a proximity signal corresponding to an electromagnetic field signal generated from a digitizer of the electronic device **101** through the resonance circuit **487**. When the proximate signal is identified, the processor **420** may control the resonance circuit **487** to transmit an electromagnetic resonance (EMR) input signal to the electronic device **101**.

[0180] According to an embodiment, the memory **430** may store information related to the operation of the digital pen **300**. For example, the information may include information for communication with the electronic device **101** and frequency information related to the input operation of the digital pen **300**.

[0181] According to an embodiment, the resonance circuit **487** may include at least one of a coil, an inductor, or a capacitor. The resonance circuit **487** may be used for the digital pen **300** to generate a signal having a resonance frequency. For example, to generate the signal, the digital pen **300** may use at least one of an electro-magnetic resonance (EMR) scheme, an active electrostatic (AES) scheme, or an electrically coupled resonance (ECR) scheme. When the digital pen **300** transmits signals via the EMR scheme, the digital pen **300** may generate a signal having a resonance frequency based on an electromagnetic field generated from the inductive panel of the electronic device **101**. When the digital pen **300** transmits signals via the AES scheme, the digital pen **300** may generate a signal using a capacitive coupling with the electronic device **101**. When the digital pen **300** transmits signals via the ECR scheme, the digital pen **300** may generate a signal having a resonance frequency based on an electric field generated from a capacitive device of the electronic device. According to an embodiment, the resonance circuit **487** may be used to vary the frequency or strength of electromagnetic field according to the user's manipulation state. For example, the resonance circuit **487** may provide a frequency to recognize a hovering input, drawing input, button input, or erasing input.

[0182] According to an embodiment, when connected with the resonance circuit **487** based on a switching circuit, the charging circuit **488** may rectify a resonance signal generated from the resonance circuit **487** into a direct current (DC) signal and provide the DC signal to the battery **489**. According to an embodiment, the digital pen **300** may identify whether the digital pen **300** is inserted into the electronic device **101** using a voltage level of a DC signal sensed by the charging circuit **488**.

[0183] According to an embodiment, the battery **489** may be configured to store power required to operate the digital pen **300**. The battery may include, e.g., a lithium-ion battery or a capacitor and may be recharged or replaced. According to an embodiment, the battery **489** may be charged with power (e.g., DC signal (DC power)) received from the charging circuit **488**.

[0184] According to an embodiment, the communication circuit **490** may be configured to perform wireless communication between the digital pen **300** and the communication module **190** of the electronic device **101**. According to an embodiment, the communication circuit **490** may trans-

mit input information and state information about the digital pen **300** to the electronic device **101** using a short-range communication scheme. For example, the communication circuit **490** may transmit direction information (e.g., motion sensor data) about the digital pen **300** obtained through the trigger circuit **498**, voice information entered through the microphone, or remaining power information about the battery **489** to the electronic device **101**. As an example, the short-range communication scheme may include at least one of Bluetooth low energy (BLE) or wireless local area network (WLAN).

[0185] According to an embodiment, the antenna **497** may be used to transmit signals or power to the outside (e.g., the electronic device **101**) or receive signals or power from the outside. According to an embodiment, the digital pen **300** may include a plurality of antennas **497** and select at least one antenna **497** appropriate for the communication scheme from among the plurality of antennas. The communication circuit **490** may exchange signals or power with an external electronic device through the at least one selected antenna **497**.

[0186] According to an embodiment, the trigger circuit **498** may include at least one button or sensor circuit. According to an embodiment, the processor **420** may identify the input scheme (e.g., touch or press) or kind (e.g., EMR button or BLE button) of the button of the digital pen **300**. According to an embodiment, the sensor circuit may generate an electrical signal or data value corresponding to an internal operating state or external environmental state of the digital pen **300**. For example, the sensor circuit may include at least one of a motion sensor, a remaining battery sensor, a pressure sensor, a light sensor, a temperature sensor, a geomagnetic sensor, or a biometric sensor. According to an embodiment, the trigger circuit **498** may transmit a trigger signal to the electronic device **101** using a signal through a sensor or a button input signal.

[0187] FIG. 7 is a view illustrating a flexible printed circuit board and at least one electromagnet of an electronic device according to an embodiment of the disclosure.

[0188] FIG. 8 is a plan view illustrating a flexible printed circuit board of an electronic device according to an embodiment of the disclosure.

[0189] FIG. 9 is a plan view illustrating a flexible printed circuit board of an electronic device according to an embodiment of the disclosure.

[0190] FIG. 10 is a schematic view illustrating an electronic device and a digital pen according to an embodiment of the disclosure.

[0191] The embodiments of FIGS. 7 to 10 may be combined with the embodiments of FIGS. 1 to 6 or the embodiments of FIGS. 11 to 26.

[0192] Referring to FIGS. 7 to 10, the electronic device **101** (e.g., the electronic device **101** of FIGS. 1 to 4) may include a hinge structure **231**, a hinge cover **232**, a first printed circuit board **241**, a second printed circuit board **242**, a flexible printed circuit board **243**, at least one reinforcing member **281**, **283**, **284**, or at least one electromagnet **290**.

[0193] The configuration of the hinge structure **231**, the hinge cover **232**, the first printed circuit board **241**, the

second printed circuit board **242**, or the flexible printed circuit board **243** of FIG. 7 may be identical in whole or part to the configuration of the hinge structure **231**, the hinge cover **232**, the first printed circuit board **241**, the second printed circuit board **242**, or the flexible printed circuit board **243** of FIG. 4.

[0194] According to an embodiment, the flexible printed circuit board **243** may be electrically connected to the first printed circuit board **241** and the second printed circuit board **242**. For example, the flexible printed circuit board **243** may be electrically connected to the first printed circuit board **241** disposed inside the first housing (e.g., the first housing **210** of FIG. 4). The flexible printed circuit board **243** may be electrically connected to the second printed circuit board **242** disposed inside the second housing (e.g., the second housing **220** of FIG. 4).

[0195] According to an embodiment, the flexible printed circuit board **243** may include a first connector (e.g., the first connector **2431** of FIGS. 8 to 10) or a second connector (e.g., the second connector **2432** of FIGS. 8 to 10). The first connector **2431** of the flexible printed circuit board **243** may be electrically connected to the connector of the first printed circuit board **241**, and the second connector **2432** of the flexible printed circuit board **243** may be electrically connected to the connector of the second printed circuit board **242**.

[0196] According to an embodiment, at least a portion of the flexible printed circuit board **243** may be disposed on the hinge structure **231** (or the hinge cover **232**).

[0197] According to an embodiment, the flexible printed circuit board **243** may extend from the inside of the first housing (e.g., the first housing **210** of FIG. 4) to the inside of the second housing (e.g., the second housing **220** of FIG. 4). For example, at least a portion of the flexible printed circuit board **243** may be disposed to cross the hinge structure **231**.

[0198] According to an embodiment, at least a portion of the flexible printed circuit board **243** may be disposed between the folding area (e.g., the folding area **253** of FIG. 4) of the flexible display (e.g., the flexible display **250** of FIG. 4) and the hinge structure **231**.

[0199] According to an embodiment, the flexible printed circuit board **243** may be at least partially bent or unfolded according to the internal structure of the electronic device **101** or the state change of the electronic device **101**. For example, when the electronic device **101** changes from an unfolded state (e.g., FIG. 2) to a folded state (e.g., FIG. 3) or when the electronic device **101** changes from a folded state (e.g., FIG. 3) to an unfolded state (e.g., FIG. 2), the flexible printed circuit board **243** may be at least partially bent or unfolded according to the relative rotational movement of the first housing (e.g., the first housing **210** of FIG. 4) and the second housing (e.g., the second housing **220** of FIG. 4).

[0200] According to an embodiment, the electronic device **101** may further include at least one reinforcing member **281**, **283**, **284**. The at least one reinforcing member **281**, **283**, **284** may be configured to at least partially limit the movement of the flexible printed circuit board **243**.

[0201] According to an embodiment, the at least one reinforcing member **281**, **283**, **284** may include a first reinforcing member **281**, a second reinforcing member **283**, or a third reinforcing member **284**.

[0202] According to an embodiment, at least a portion of the first reinforcing member **281** may be fixed to the hinge structure **231** (or the hinge cover **232**). For example, the first reinforcing member **281** may be coupled to the hinge structure **231** through a fastening member **282** (e.g., bolt or pin). The fastening member **282** may be inserted into a pair of holes **2811** formed at positions adjacent to two opposite ends of the first reinforcing member **281**, respectively. At least a portion of the flexible printed circuit board **243** may be disposed between the hinge structure **231** (or the hinge cover **232**) and the first reinforcing member **281**. The first reinforcing member **281** may limit the movement or flow of the flexible printed circuit board **243** when the flexible printed circuit board **243** is bent or unfolded according to the state change of the electronic device **101**.

[0203] According to an embodiment, at least a portion of the second reinforcing member **283** may be fixed to the first printed circuit board **241**. For example, the second reinforcing member **283** may be coupled to the first printed circuit board **241** through a fastening member (e.g., bolt or pin). A partial area of the flexible printed circuit board **243** may be disposed between the first printed circuit board **241** and the second reinforcing member **283**. The second reinforcing member **283** may limit the movement or flow of the flexible printed circuit board **243** when the flexible printed circuit board **243** is bent or unfolded according to the state change of the electronic device **101**.

[0204] According to an embodiment, at least a portion of the third reinforcing member **284** may be fixed to the second printed circuit board **242**. For example, the third reinforcing member **284** may be coupled to the second printed circuit board **242** through a fastening member (e.g., bolt or pin). A partial area of the flexible printed circuit board **243** may be disposed between the second printed circuit board **242** and the third reinforcing member **284**. The third reinforcing member **284** may limit the movement or flow of the flexible printed circuit board **243** when the flexible printed circuit board **243** is bent or unfolded according to the state change of the electronic device **101**.

[0205] According to an embodiment, at least one electromagnet **290** may be disposed on the flexible printed circuit board **243**. For example, at least one electromagnet **290** may be disposed between the flexible printed circuit board **243** and the folding area (e.g., the folding area **253** of FIG. 4 or FIG. 10) of the display (e.g., the display **250** of FIG. 4). At least one electromagnet **290** may be disposed or positioned on at least a partial area of the flexible printed circuit board **243** disposed on the hinge structure **231** (or the hinge cover **232**). For example, at least one electromagnet **290** may be disposed or positioned on at least a partial area of the flexible printed circuit board **243** disposed on the hinge assembly (e.g., the hinge assembly **230** of FIGS. 2 to 4).

[0206] According to an embodiment, at least one electromagnet **290** may be disposed on the first reinforcing mem-

ber **281**. For example, at least one electromagnet **290** may be fixed to the first reinforcing member **281**.

[0207] According to an embodiment, at least one electromagnet **290** may also be directly disposed on at least a portion of the flexible printed circuit board **243**.

[0208] The at least one electromagnet **290** may be applied with current provided from the first battery (e.g., the first battery **271** of FIG. 4) disposed inside the first housing (e.g., the first housing **210** of FIG. 4). For example, at least one electromagnet **290** may be applied with current from the first battery through a conductive line included in the flexible printed circuit board **243**. For example, a pair of power supply portions **2911**, **2912** included in the first connector **2431** may be electrically connected to the first printed circuit board **241**, and current provided from the first battery **271** may be provided to at least one electromagnet **290** through the first printed circuit board **241** and the pair of power supply portions **2911**, **2912**. According to an embodiment, the at least one electromagnet **290** may be applied with current from the second battery (e.g., the second battery **272** of FIG. 4) disposed inside the second housing (e.g., the second housing **220** of FIG. 4).

[0209] According to an embodiment, at least one electromagnet **290** may generate magnetic force when current is applied and may not generate magnetic force when current is not applied (e.g., when current is cut off). The at least one electromagnet **290** may provide magnetic force to at least one magnetic member (e.g., the at least one magnetic member **340** of FIG. 5 or FIG. 10) of the digital pen (e.g., the digital pen **300** of FIGS. 5 to 6). The attractive force formed between the at least one electromagnet **290** and the at least one magnetic member **340** may fix the digital pen (e.g., the digital pen **300** of FIGS. 5 to 6) to at least a portion of the electronic device **101**.

[0210] FIG. 10 illustrates the electronic device **101** in a folded state (e.g., FIG. 3). Referring to FIG. 10, the electronic device **101** may include a flexible display (e.g., the flexible display **250** of FIG. 4) including a first display area **251** (e.g., the first display area **251** of FIG. 4), a second display area **252** (e.g., the second display area **252** of FIG. 4), and a folding area **253** (e.g., the folding area **253** of FIG. 4).

[0211] According to an embodiment, the folding area **253** may form an accommodation space **258** capable of accommodating a digital pen (e.g., the digital pen **300** of FIG. 5) including at least one magnetic member **340** (e.g., the at least one magnetic member **340** of FIG. 5) when the electronic device **101** is in a folded state (e.g., FIG. 3) (or when the housing (e.g., the housing **201** of FIG. 3) is in a folded state). According to an embodiment, the folding area **253** may define at least a portion of the accommodation space **258** capable of accommodating the digital pen when the electronic device **101** is in a folded state.

[0212] According to an embodiment, the pen housing **301** (e.g., the pen housing **301** of FIG. 5) of the digital pen may be positioned in the accommodation space **258**. For example, a user may store the digital pen in the accommodation space **258** when the electronic device **101** is in a folded state.

[0213] According to an embodiment, at least one magnetic member **340** disposed inside the pen housing **301** may form an attractive force with the at least one electromagnet **290**. According to an embodiment, the attractive force may fix the pen housing **301** to the folding area **253**. Accordingly, in the process of using the electronic device **101**, the release of the digital pen from the accommodation space **258** defined by the folding area **253** is decreased or limited, thereby enhancing the usability of the electronic device **101** and the digital pen.

[0214] According to an embodiment, when the digital pen is accommodated in the accommodation space **258**, at least a portion of the folding area **253** may be positioned between the at least one magnetic member **340** and the at least one electromagnet **290**. The flexible display **250** may include an electromagnetic induction panel (e.g., digitizer). The electromagnetic induction panel may be provided integrally with the flexible display or may be provided by being stacked on one surface (e.g., a surface facing the inside of the electronic device **101**) of the flexible display. When the digital pen is accommodated in the accommodation space **258**, at least a portion of the electromagnetic induction panel of the flexible display (e.g., the flexible display **250** of FIG. 4) may be positioned between the at least one magnetic member **340** and the at least one electromagnet **290**.

[0215] FIG. 11 is a plan view illustrating a flexible printed circuit board of an electronic device according to an embodiment of the disclosure.

[0216] FIG. 12 is a plan view illustrating a flexible printed circuit board of an electronic device according to an embodiment of the disclosure.

[0217] FIG. 13 is a schematic view illustrating an electronic device and a digital pen according to an embodiment of the disclosure.

[0218] The embodiments of FIGS. 11 to 13 may be combined with the embodiments of FIGS. 1 to 10 or the embodiments of FIGS. 14A to 26.

[0219] Referring to FIGS. 11 to 13, the electronic device **101** (e.g., the electronic device **101** of FIGS. 1 to 4) may include a flexible printed circuit board **243**, a flexible display (e.g., the flexible display **250** of FIG. 4), at least one first reinforcing member **281**, or at least one electromagnet **290**. The flexible printed circuit board **243** may include a first connector **2431** or a second connector **2432**.

[0220] The configuration of the flexible printed circuit board **243**, the at least one first reinforcing member **281**, or the at least one electromagnet **290** of FIGS. 11 to 13 may be identical in whole or part to the configuration of the flexible printed circuit board **243**, the at least one first reinforcing member **281**, or the at least one electromagnet **290** of FIGS. 7 to 10. The configuration of the first connector **2431** or the second connector **2432** of FIGS. 11 to 13 may be identical in whole or part to the configuration of the first connector **2431** or the second connector **2432** of FIGS. 7 to 10.

[0221] According to an embodiment, at least one first reinforcing member **281a**, **281b** may be configured to at least partially limit the movement of the flexible printed circuit board **243**.

[0222] According to an embodiment, at least one first reinforcing member **281** may include a 1-1th reinforcing member **281a** or a 1-2th reinforcing member **281b** spaced apart from each other. The 1-1th reinforcing member **281a** and/or the 1-2th reinforcing member **281b** may be defined and/or referred to as a first reinforcing member **281a** and/or a second reinforcing member **281b**.

[0223] According to an embodiment, at least a portion of the 1-1th reinforcing member **281a** may be fixed to the hinge structure **231** (or the hinge cover **232**). For example, the 1-1th reinforcing member **281a** may be coupled to the hinge structure **231** through a fastening member (e.g., bolt or pin). The fastening member may be inserted into a pair of holes **2811a** formed at positions adjacent to two opposite ends of the 1-1th reinforcing member **281a**, respectively. At least a portion of the flexible printed circuit board **243** may be disposed between the hinge structure **231** (or the hinge cover **232**) and the 1-1th reinforcing member **281a**. The 1-1th reinforcing member **281a** may limit the movement of the flexible printed circuit board **243** when the flexible printed circuit board **243** is bent or unfolded according to the state change of the electronic device **101**.

[0224] According to an embodiment, at least a portion of the 1-2th reinforcing member **281b** may be fixed to the hinge structure **231** (or the hinge cover **232**). For example, the 1-2th reinforcing member **281b** may be coupled to the hinge structure **231** through a fastening member (e.g., bolt or pin). The fastening member may be inserted into a pair of holes **2811b** formed at positions adjacent to two opposite ends of the 1-2th reinforcing member **281b**, respectively. At least a portion of the flexible printed circuit board **243** may be disposed between the hinge structure **231** (or the hinge cover **232**) and the 1-2th reinforcing member **281b**. The 1-2th reinforcing member **281b** may limit the movement (or flow) of the flexible printed circuit board **243** when the flexible printed circuit board **243** is bent or unfolded according to the state change of the electronic device **101**.

[0225] According to an embodiment, at least one electromagnet **290** may be disposed on the flexible printed circuit board **243**. For example, at least one electromagnet **290** may be disposed between the flexible printed circuit board **243** and the folding area (e.g., the folding area **253** of FIG. 4 or FIG. 13) of the display (e.g., the display **250** of FIG. 4).

[0226] According to an embodiment, at least one electromagnet **290** may include a first electromagnet **290a** or a second electromagnet **290b** spaced apart from each other.

[0227] According to an embodiment, the first electromagnet **290a** may be disposed on the 1-1th reinforcing member **281a**. For example, the first electromagnet **290a** may be fixed to the 1-1th reinforcing member **281a**. The first electromagnet **290a** may be applied with current provided from the first battery (e.g., the first battery **271** of FIG. 4) disposed inside the first housing (e.g., the first housing **210** of FIG. 4). For example, the first electromagnet **290a** may be applied with current from the first battery through a conductive line included in the flexible printed circuit board **243**. For example, a pair of power supply portions **2911a**, **2912a** included in the first connector **2431** may be electric-

ally connected to the first printed circuit board (e.g., the first printed circuit board **241** of FIG. **4**), and current provided from the first battery (e.g., the first battery **271** of FIG. **4**) may be provided to the first electromagnet **290a** through the first printed circuit board **241** and the pair of power supply portions **2911a**, **2912a**. According to an embodiment, the first electromagnet **290a** may be applied with current from the second battery (e.g., the second battery **272** of FIG. **4**) disposed inside the second housing (e.g., the second housing **220** of FIG. **4**).

[0228] According to an embodiment, the second electromagnet **290b** may be disposed on the 1-2th reinforcing member **281b**. For example, the second electromagnet **290b** may be fixed to the 1-2th reinforcing member **281b**. The second electromagnet **290b** may be applied with current provided from the second battery (e.g., the second battery **272** of FIG. **4**) disposed inside the second housing (e.g., the second housing **220** of FIG. **4**). For example, the second electromagnet **290b** may be applied with current from the second battery through a conductive line included in the flexible printed circuit board **243**. For example, a pair of power supply portions **2911b**, **2912b** included in the second connector **2432** may be electrically connected to the second printed circuit board (e.g., the second printed circuit board **242** of FIG. **4**), and current provided from the second battery (e.g., the second battery **272** of FIG. **4**) may be provided to the second electromagnet **290b** through the second printed circuit board **242** and the pair of power supply portions **2911b**, **2912b**. According to an embodiment, the second electromagnet **290b** may be applied with current from the second battery (e.g., the second battery **272** of FIG. **4**) disposed inside the second housing (e.g., the second housing **220** of FIG. **4**).

[0229] According to an embodiment, the first electromagnet **290a** and/or the second electromagnet **290b** may generate magnetic force when current is applied and may not generate magnetic force when current is not applied (e.g., when current is cut off). The first electromagnet **290a** and/or the second electromagnet **290b** may provide magnetic force to at least one magnetic member (e.g., the at least one magnetic member **340** of FIG. **5** or the at least one magnetic member **340** of FIG. **13**) of the digital pen (e.g., the digital pen **300** of FIGS. **5** to **6**). The attractive force formed between the at least one electromagnet **290** and the at least one magnetic member **340** may fix the digital pen (e.g., the digital pen **300** of FIGS. **5** to **6**) to at least a portion of the electronic device **101**.

[0230] FIG. **13** illustrates the electronic device **101** in a folded state (e.g., FIG. **3**). Referring to FIG. **13**, the electronic device **101** may include a flexible display (e.g., the flexible display **250** of FIG. **4**) including a first display area **251** (e.g., the first display area **251** of FIG. **4**), a second display area **252** (e.g., the second display area **252** of FIG. **4**), and a folding area **253** (e.g., the folding area **253** of FIG. **4**).

[0231] According to an embodiment, the folding area **253** may form an accommodation space **258** capable of accommodating a digital pen (e.g., the digital pen **300** of FIG. **5**) including at least one magnetic member **340** (e.g., the at least one magnetic member **340** of FIG. **5**) when the elec-

tronic device **101** is in a folded state (e.g., FIG. **3**) (or when the housing (e.g., the housing **201** of FIG. **3**) is in a folded state). According to an embodiment, the folding area **253** may define at least a portion of the accommodation space **258** capable of accommodating the digital pen when the electronic device **101** is in a folded state.

[0232] According to an embodiment, the pen housing **301** (e.g., the pen housing **301** of FIG. **5**) of the digital pen may be positioned in the accommodation space **258**. For example, a user may store the digital pen in the accommodation space **258** when the electronic device **101** is in a folded state.

[0233] According to an embodiment, at least one magnetic member **340** (e.g., the at least one magnetic member **340** of FIG. **5**) disposed inside the pen housing **301** may include a first magnetic member **340a** or a second magnetic member **340b** spaced apart from each other inside the pen housing **301**.

[0234] According to an embodiment, the first magnetic member **340a** and/or the second magnetic member **340b** may form an attractive force with the first electromagnet **290a** and/or the second electromagnet **290b**. According to an embodiment, the attractive force may fix the pen housing **301** to the folding area **253**. Accordingly, in the process of using the electronic device **101**, the release of the digital pen from the accommodation space defined by the folding area **253** is decreased or limited, thereby enhancing the usability of the electronic device **101** and the digital pen.

[0235] According to an embodiment, when the digital pen is accommodated in the accommodation space **258**, at least a portion of the folding area **253** may be positioned between the at least one magnetic member **340** and the at least one electromagnet **290**. Further, when the digital pen is accommodated in the accommodation space **258**, at least a portion of the electromagnetic induction panel (e.g., digitizer) of the flexible display (e.g., the flexible display **250** of FIG. **4**) may be positioned between the at least one magnetic member **340** and the at least one electromagnet **290**.

[0236] FIG. **14A** is a view illustrating an electronic device including a plurality of housings according to an embodiment of the disclosure.

[0237] FIG. **14B** is a view illustrating an electronic device including a plurality of housings according to an embodiment of the disclosure.

[0238] FIG. **14C** is a view illustrating a digital pen and an electronic device according to an embodiment of the disclosure.

[0239] FIG. **14D** is a view illustrating a digital pen and an electronic device according to an embodiment of the disclosure.

[0240] FIG. **15** is a cross-sectional view illustrating a folded state of a digital pen and an electronic device according to an embodiment of the disclosure.

[0241] FIG. **16** is a cross-sectional view illustrating a folded state of a digital pen and an electronic device according to an embodiment of the disclosure.

[0242] The embodiments of FIGS. **14A**, **14B**, **14C**, **14D**, **15** and **16** may be combined with the embodiments of FIGS. **1** to **13** or the embodiments of FIGS. **17A** to **26**.

[0243] Referring to FIGS. 14A, 14B, 14C, 14D, 15 and 16, the electronic device 101 (e.g., the electronic device 101 of FIGS. 1 to 4) may include a first housing 501, a second housing 502, a third housing 503, a first hinge structure 504, a second hinge structure 505, a first printed circuit board 541, a second printed circuit board 542, a third printed circuit board 543, a first flexible printed circuit board 544, a second flexible printed circuit board 545, a flexible display 550, at least one first reinforcing member 581, or at least one electromagnet 590.

[0244] The configuration of the first housing 501, the second housing 502, the third housing 503, the first hinge structure 504, the second hinge structure 505, the first printed circuit board 541, the second printed circuit board 542, the third printed circuit board 543, the first flexible printed circuit board 544, the second flexible printed circuit board 545, or the flexible display 550 of FIGS. 14A to 16 may be identical in whole or part to the configuration of the first housing 210, the second housing 220, the hinge structure 231, the first printed circuit board 241, the second printed circuit board 242, the flexible printed circuit board 243, or the flexible display 250 of FIG. 4.

[0245] The configuration of the first flexible printed circuit board 544, the at least one first reinforcing member 581, or the at least one electromagnet 590 of FIGS. 14A to 16 may be identical in whole or part to the configuration of the flexible printed circuit board 243, the at least one first reinforcing member 281, or the at least one electromagnet 290 of FIGS. 7 to 13.

[0246] Referring to FIGS. 14A to 14D, the electronic device 101 may include a first housing 501, a second housing 502, a third housing 503, or a flexible display 550.

[0247] According to an embodiment, the first housing 501 and the second housing 502 may be rotatable relative to each other with respect to a first folding axis A1. For example, the first housing 501 and the second housing 502 may be disposed to be folded or unfolded relative to each other with respect to the first hinge structure (e.g., the first hinge structure 504 of FIGS. 15 to 16).

[0248] According to an embodiment, the second housing 502 and the third housing 503 may be rotatable relative to each other with respect to a second folding axis A2. For example, the second housing 502 and the third housing 503 may be disposed to be folded or unfolded relative to each other with respect to the second hinge structure (e.g., the second hinge structure 505 of FIGS. 15 to 16).

[0249] According to an embodiment, the flexible display 550 may be disposed on the first housing 501, the second housing 502, and the third housing 503. The flexible display 550 may be at least partially folded or unfolded according to the state of the electronic device 101 (e.g., the folded state or unfolded state of the housings).

[0250] Referring to FIGS. 14B and 14C, the electronic device 101 may be provided with the first housing 501 and the second housing 502 in an in-folding type, and the second housing 502 and the third housing 503 may be provided in an out-folding type. Referring to FIGS. 14B and 14C, the digital pen 300 may be configured to be stored on the first folding axis A1 when the first housing 501 and the second housing 502 are folded.

[0251] Referring to FIG. 14D, the electronic device 101 may be provided with the first housing 501 and the second housing 502 in an out-folding type, and the second housing 502 and the third housing 503 may be provided in an in-folding type. Referring to FIG. 14D, the digital pen 300 may be configured to be stored on the second folding axis A2 when the second housing 502 and the third housing 503 are folded.

[0252] The in-folding type may be defined and/or referred to as a type in which the angle formed by the outer surface of the flexible display 550 disposed on the housings gradually decreases when the housings are folded relative to each other. The out-folding type may be defined and/or referred to as a type in which the angle formed by the outer surface of the flexible display 550 disposed on the housings gradually increases when the housings are folded relative to each other.

[0253] Hereinafter, FIGS. 15 to 16 are described using the electronic device 101 of FIGS. 14B to 14C as an example, but this description may be equally applied and understood to the electronic device 101 of FIG. 14D.

[0254] Referring to FIGS. 15 to 16, the electronic device 101 may include a first hinge structure 504, a second hinge structure 505, a first printed circuit board 541, a second printed circuit board 542, a third printed circuit board 543, a first flexible printed circuit board 544, a second flexible printed circuit board 545, at least one first reinforcing member 581, or at least one electromagnet 590.

[0255] According to an embodiment, the flexible display 550 may include a first display area 551 disposed on the first housing 501, a second display area 552 disposed on the second housing 502, a third display area 553 disposed on the third housing 503, a first folding area 554 connecting the first display area 551 and the second display area 552, or a second folding area 555 connecting the second display area 552 and the third display area 553.

[0256] According to an embodiment, the first hinge structure 504 may rotatably connect the first housing 501 and the second housing 502 relative to each other. The second hinge structure 505 may rotatably connect the second housing 502 and the third housing 503 relative to each other.

[0257] According to an embodiment, the first printed circuit board 541 may be disposed inside the first housing 501. The second printed circuit board 542 may be disposed inside the second housing 502. The third printed circuit board 543 may be disposed inside the third housing 503.

[0258] According to an embodiment, the first flexible printed circuit board 544 may be electrically connected to the first printed circuit board 541 and the second printed circuit board 542. The second flexible printed circuit board 545 may be electrically connected to the second printed circuit board 542 and the third printed circuit board 543.

[0259] Referring to FIG. 15, at least one first reinforcing member 581 may be disposed on the first flexible printed circuit board 544. At least one electromagnet 590 may be disposed on the at least one first reinforcing member 581. The at least one electromagnet 590 may also be directly disposed on the first flexible printed circuit board 544. The at least one electromagnet 590 may be positioned between the first hinge structure 504 and the first folding area 554.

[0260] According to an embodiment, at least one electromagnet **590** may generate magnetic force when current is applied and may not generate magnetic force when current is not applied (e.g., when current is cut off). The at least one electromagnet **590** may provide magnetic force to at least one magnetic member **340** (e.g., the at least one magnetic member **340** of FIG. **10**) of the digital pen **300**. The attractive force formed between the at least one electromagnet **590** and the at least one magnetic member **340** may fix the digital pen **300** to at least a portion of the electronic device **101**.

[0261] According to an embodiment, the first folding area **554** may form an accommodation space **558** capable of accommodating the digital pen **300** including at least one magnetic member **340** when the electronic device **101** is in a folded state (or when the first housing **501** and the second housing **502** are in a folded state). According to an embodiment, the first folding area **554** may define at least a portion of the accommodation space **558** capable of accommodating the digital pen **300** when the electronic device **101** is in a folded state.

[0262] According to an embodiment, the pen housing **301** (e.g., the pen housing **301** of FIG. **5**) of the digital pen **300** may be positioned in the accommodation space **558**. For example, a user may store the digital pen **300** in the accommodation space **558** when the first housing **501** and the second housing **502** are folded relative to each other.

[0263] According to an embodiment, at least one magnetic member **340** disposed inside the pen housing **301** may form an attractive force with the at least one electromagnet **590**. According to an embodiment, the attractive force may fix the pen housing **301** to the first folding area **554**. Accordingly, in the process of using the electronic device **101**, the release of the digital pen **300** from the accommodation space **558** defined by the first folding area **554** is decreased or limited, thereby enhancing the usability of the electronic device **101** and the digital pen **300**.

[0264] Referring to FIG. **16**, at least one first reinforcing member **581** may include a 1-1th reinforcing member **581a** and a 1-2th reinforcing member **581b** spaced apart from the 1-1th reinforcing member **581a**. At least one electromagnet **590** may include a first electromagnet **590a** disposed on the 1-1th reinforcing member **581a** and a second electromagnet **590b** disposed on the 1-2th reinforcing member **581b**. The 1-1th reinforcing member **581a** and/or the 1-2th reinforcing member **581b** may be defined and/or referred to as a first reinforcing member **581a** and/or a second reinforcing member **581b**.

[0265] According to an embodiment, the first electromagnet **590a** and/or the second electromagnet **590b** may be positioned between the first hinge structure **504** and the first folding area **554**.

[0266] According to an embodiment, the pen housing **301** (e.g., the pen housing **301** of FIG. **5**) of the digital pen **300** may be positioned in the accommodation space. For example, a user may store the digital pen **300** in the accommodation space **558** when the first housing **501** and the second housing **502** are folded relative to each other.

[0267] According to an embodiment, at least one magnetic member **340** disposed inside the pen housing **301** may

form an attractive force with the at least one electromagnet **590**. For example, the first magnetic member **340a** may form an attractive force with the first electromagnet **590a**, and the second magnetic member **340b** may form an attractive force with the second electromagnet **590b**. According to an embodiment, the attractive force may fix the pen housing **301** to the first folding area **554**. Accordingly, in the process of using the electronic device **101**, the release of the digital pen **300** from the accommodation space **558** defined by the first folding area **554** is decreased or limited, thereby enhancing the usability of the electronic device **101** and the digital pen **300**.

[0268] FIG. **17A** is a view illustrating an electronic device including a plurality of housings according to an embodiment of the disclosure.

[0269] FIG. **17B** is a view illustrating an electronic device including a plurality of housings according to an embodiment of the disclosure.

[0270] FIG. **17C** is a view illustrating a digital pen and an electronic device according to an embodiment of the disclosure.

[0271] FIG. **17D** is a view illustrating a digital pen and an electronic device according to an embodiment of the disclosure.

[0272] FIG. **18** is a cross-sectional view illustrating a folded state of a digital pen and an electronic device according to an embodiment of the disclosure.

[0273] FIG. **19** is a cross-sectional view illustrating a folded state of a digital pen and an electronic device according to an embodiment of the disclosure.

[0274] The embodiments of FIGS. **17A**, **17B**, **17C**, **17D**, **18** and **19** may be combined with the embodiments of FIGS. **1** to **16** or the embodiments of FIGS. **20A** to **26**.

[0275] Referring to FIGS. **17A**, **17B**, **17C**, **17D**, **18** and **19**, an electronic device **101** (e.g., the electronic device **101** of FIGS. **1** to **4**) may include a first housing **501**, a second housing **502**, a third housing **503**, a first hinge structure **504**, a second hinge structure **505**, a first printed circuit board **541**, a second printed circuit board **542**, a third printed circuit board **543**, a first flexible printed circuit board **544**, a second flexible printed circuit board **545**, a flexible display **550**, at least one first reinforcing member **581**, or at least one electromagnet **590**.

[0276] The configuration of the first housing **501**, the second housing **502**, the third housing **503**, the first hinge structure **504**, the second hinge structure **505**, the first printed circuit board **541**, the second printed circuit board **542**, the third printed circuit board **543**, the first flexible printed circuit board **544**, the second flexible printed circuit board **545**, the flexible display **550**, the at least one first reinforcing member **581**, or the at least one electromagnet **590** of FIGS. **17A** to **19** may be identical in whole or part to the first housing **501**, the second housing **502**, the third housing **503**, the first hinge structure **504**, the second hinge structure **505**, the first printed circuit board **541**, the second printed circuit board **542**, the third printed circuit board **543**, the first flexible printed circuit board **544**, the second flexible printed circuit board **545**, the flexible display **550**, the at least one first reinforcing member **581**, or the at least one electromagnet **590** of FIGS. **14A** to **16**.

[0277] Referring to FIGS. 17A to 17D, the electronic device 101 may include a first housing 501, a second housing 502, a third housing 503, or a flexible display 550.

[0278] According to an embodiment, the first housing 501 and the second housing 502 may be rotatable relative to each other with respect to a first folding axis A1. For example, the first housing 501 and the second housing 502 may be disposed to be folded or unfolded relative to each other with respect to the first hinge structure (e.g., the first hinge structure 504 of FIGS. 18 to 19).

[0279] According to an embodiment, the second housing 502 and the third housing 503 may be rotatable relative to each other with respect to a second folding axis A2. For example, the second housing 502 and the third housing 503 may be disposed to be folded or unfolded relative to each other with respect to the second hinge structure (e.g., the second hinge structure 505 of FIGS. 18 to 19).

[0280] According to an embodiment, the flexible display 550 may be disposed on the first housing 501, the second housing 502, and the third housing 503. The flexible display 550 may be at least partially folded or unfolded according to the state of the electronic device 101 (e.g., the folded state or unfolded state of the housings).

[0281] According to an embodiment, the electronic device 101 may be provided with the first housing 501 and the second housing 502 in an in-folding type, and the second housing 502 and the third housing 503 may be provided in an in-folding type. Referring to FIG. 17C, the digital pen 300 may be configured to be stored on the second folding axis A2 when the second housing 502 and the third housing 503 are folded. Referring to FIG. 17D, the digital pen 300 may be configured to be stored on the first folding axis A1 when the first housing 501 and the second housing 502 are folded.

[0282] The in-folding type may be defined and/or referred to as a type in which the angle formed by the outer surface of the flexible display 550 disposed on the housings gradually decreases when the housings are folded relative to each other.

[0283] Hereinafter, FIGS. 18 and 19 are described using the electronic device 101 of FIG. 17C as an example, but this description may be equally applied and understood to the electronic device 101 of FIG. 17D.

[0284] Referring to FIGS. 18 to 19, an electronic device 101 may include a first hinge structure 504, a second hinge structure 505, a first printed circuit board 541, a second printed circuit board 542, a third printed circuit board 543, a first flexible printed circuit board 544, a second flexible printed circuit board 545, at least one first reinforcing member 581, or at least one electromagnet 590.

[0285] According to an embodiment, the flexible display 550 may include a first display area 551 disposed on the first housing 501, a second display area 552 disposed on the second housing 502, a third display area 553 disposed on the third housing 503, a first folding area 554 connecting the first display area 551 and the second display area 552, or a second folding area 555 connecting the second display area 552 and the third display area 553.

[0286] According to an embodiment, the first hinge structure 504 may rotatably connect the first housing 501 and

the second housing 502 relative to each other. The second hinge structure 505 may rotatably connect the second housing 502 and the third housing 503 relative to each other.

[0287] According to an embodiment, the first printed circuit board 541 may be disposed inside the first housing 501. The second printed circuit board 542 may be disposed inside the second housing 502. The third printed circuit board 543 may be disposed inside the third housing 503.

[0288] According to an embodiment, the first flexible printed circuit board 544 may be electrically connected to the first printed circuit board 541 and the second printed circuit board 542. The second flexible printed circuit board 545 may be electrically connected to the second printed circuit board 542 and the third printed circuit board 543.

[0289] According to an embodiment, when the electronic device 101 is fully folded, the first housing 501 may be disposed between the second housing 502 and the third housing 503.

[0290] According to an embodiment, when the electronic device 101 is fully folded, an accommodation space 558 capable of accommodating the digital pen 300 may be formed between the second folding area 555 and the edge of the first housing 501.

[0291] According to an embodiment (e.g., FIG. 18), in the electronic device 101, when the second folding area 555 is folded, at least a partial area of the second folding area 555 may be positioned inside the second hinge structure 505. According to an embodiment (e.g., FIG. 19), in the electronic device 101, when the second folding area 555 is folded, all areas of the second folding area 555 may not be positioned inside the second hinge structure 505.

[0292] Referring to FIGS. 18 and 19, at least one first reinforcing member 581 may be disposed on the second flexible printed circuit board 545. At least one electromagnet 590 may be disposed on the at least one first reinforcing member 581. The at least one electromagnet 590 may also be directly disposed on the second flexible printed circuit board 545.

[0293] According to an embodiment, at least one first reinforcing member 581 may include a 1-1th reinforcing member 581a, a 1-2th reinforcing member 581b, and a 1-3th reinforcing member 581c. The 1-1th reinforcing member 581a may be disposed on the second hinge structure 505. The 1-2th reinforcing member 581b may be disposed on the third housing 503. The 1-3th reinforcing member 581c may be disposed on the second housing 502. The 1-1th reinforcing member 581a, the 1-2th reinforcing member 581b, and/or the 1-3th reinforcing member 581c may be defined and/or referred to as a first reinforcing member 581a, a second reinforcing member 581b, and a 1-3th reinforcing member 581c.

[0294] According to an embodiment, at least one electromagnet 590 may include a first electromagnet 590a, a second electromagnet 590b, and a third electromagnet 590c. The first electromagnet 590a may be disposed on the 1-1th reinforcing member 581a. The second electromagnet 590b may be disposed on the 1-2th reinforcing member 581b. The third electromagnet 590c may be disposed on the 1-3th reinforcing member 581c. The at least one electro-

magnet **590** may be positioned between the second hinge structure **505** and the second folding area **555**.

[0295] According to an embodiment, at least one electromagnet **590** may generate magnetic force when current is applied and may not generate magnetic force when current is not applied (e.g., when current is cut off). The at least one electromagnet **590** may provide magnetic force to at least one magnetic member **340** (e.g., the at least one magnetic member **340** of FIG. **10**) of the digital pen **300**. The attractive force formed between the at least one electromagnet **590** and the at least one magnetic member **340** may fix the digital pen **300** to at least a portion of the electronic device **101**.

[0296] According to an embodiment, the second folding area **555** may form an accommodation space **558** capable of accommodating the digital pen **300** including at least one magnetic member **340** when the electronic device **101** is in a folded state (or when the second housing **502** and the third housing **503** are in a folded state). According to an embodiment, the second folding area **555** may define at least a portion of the accommodation space **558** capable of accommodating the digital pen **300** when the electronic device **101** is in a folded state.

[0297] According to an embodiment, the pen housing **301** (e.g., the pen housing **301** of FIG. **5**) of the digital pen **300** may be positioned in the accommodation space **558**. For example, a user may store the digital pen **300** in the accommodation space when the second housing **502** and the third housing **503** are folded relative to each other.

[0298] According to an embodiment, at least one magnetic member **340** disposed inside the pen housing **301** may form an attractive force with the at least one electromagnet **590**. For example, the first magnetic member **340a** may form an attractive force with the first electromagnet **590a**, the second magnetic member **340b** may form an attractive force with the second electromagnet **590b**, and the third magnetic member **340c** may form an attractive force with the third electromagnet **590c**. According to an embodiment, the attractive force may fix the pen housing **301** to the second folding area **555**. Accordingly, in the process of using the electronic device **101**, the release of the digital pen **300** from the accommodation space **558** defined by the second folding area **555** is decreased or limited, thereby enhancing the usability of the electronic device **101** and the digital pen **300**.

[0299] FIG. **20A** is a view illustrating an electronic device including a plurality of housings according to an embodiment of the disclosure.

[0300] FIG. **20B** is a view illustrating an electronic device including a plurality of housings according to an embodiment of the disclosure.

[0301] FIG. **20C** is a view illustrating a digital pen and an electronic device according to an embodiment of the disclosure.

[0302] FIG. **21** is a cross-sectional view illustrating a folded state of a digital pen and an electronic device according to an embodiment of the disclosure.

[0303] FIG. **22** is a cross-sectional view illustrating a folded state of a digital pen and an electronic device according to an embodiment of the disclosure.

[0304] The embodiments of FIGS. **20A**, **20B**, **20C**, **21** and **22** may be combined with the embodiments of FIGS. **1** to **19** or the embodiments of FIGS. **23** to **26**.

[0305] Referring to FIGS. **20A**, **20B**, **20C** and **21**, an electronic device **101** (e.g., the electronic device **101** of FIGS. **1** to **4**) may include a first housing **601**, a second housing **602**, a third housing **603**, a fourth housing **604**, a first hinge structure **605**, a second hinge structure **606**, a third hinge structure **607**, a first printed circuit board **641**, a second printed circuit board **642**, a third printed circuit board **643**, a fourth printed circuit board **644**, a first flexible printed circuit board **645**, a second flexible printed circuit board **646**, a third flexible printed circuit board **647**, a flexible display **650**, at least one first reinforcing member **681**, or at least one electromagnet **690**.

[0306] The configuration of the first housing **601**, the second housing **602**, the third housing **603**, the fourth housing **604**, the first hinge structure **605**, the second hinge structure **606**, the third hinge structure **607**, the first printed circuit board **641**, the second printed circuit board **642**, the third printed circuit board **643**, the fourth printed circuit board **644**, the first flexible printed circuit board **645**, the second flexible printed circuit board **646**, the third flexible printed circuit board **647**, the flexible display **650**, the at least one first reinforcing member **681**, or the at least one electromagnet **690** of FIGS. **20A** to **22** may be identical in whole or part to the first housing **501**, the second housing **502**, the third housing **503**, the first hinge structure **504**, the second hinge structure **505**, the first printed circuit board **541**, the second printed circuit board **542**, the third printed circuit board **543**, the first flexible printed circuit board **544**, the second flexible printed circuit board **545**, the flexible display **550**, the at least one first reinforcing member **581**, or the at least one electromagnet **590** of FIGS. **14A** to **16**.

[0307] Referring to FIGS. **20A** to **22**, the electronic device **101** may include a first housing **601**, a second housing **602**, a third housing **603**, a fourth housing **604**, or a flexible display **650**.

[0308] According to an embodiment, the first housing **601** and the second housing **602** may be rotatable relative to each other with respect to a first folding axis **A1**. For example, the first housing **601** and the second housing **602** may be disposed to be folded or unfolded relative to each other with respect to the first hinge structure (e.g., the first hinge structure **605** of FIG. **21**).

[0309] According to an embodiment, the second housing **602** and the third housing **603** may be rotatable relative to each other with respect to a second folding axis **A2**. For example, the second housing **602** and the third housing **603** may be disposed to be folded or unfolded relative to each other with respect to the second hinge structure (e.g., the second hinge structure **606** of FIG. **21**).

[0310] According to an embodiment, the third housing **603** and the fourth housing **604** may be rotatable relative to each other with respect to a third folding axis **A3**. For example, the third housing **603** and the fourth housing **604** may be disposed to be folded or unfolded relative to each other with respect to the third hinge structure (e.g., the third hinge structure **607** of FIG. **21**).

[0311] According to an embodiment, the flexible display **650** may be disposed on the first housing **601**, the second housing **602**, the third housing **603**, and the fourth housing **604**. The flexible display **650** may be at least partially folded or unfolded according to the state of the electronic device **101** (e.g., the folded state or unfolded state of the housings).

[0312] According to an embodiment, the electronic device **101** may be provided with the first housing **601** and the second housing **602** in an in-folding type, the second housing **602** and the third housing **603** may be provided in an in-folding type, and the third housing **603** and the fourth housing **604** may be provided in an in-folding type. Referring to FIG. **21**, the digital pen **300** may be configured to be stored on the third folding axis **A3**.

[0313] The in-folding type may be defined and/or referred to as a type in which the angle formed by the outer surface of the flexible display **650** disposed on the housings gradually decreases when the housings are folded relative to each other.

[0314] Referring to FIGS. **21** and **22**, an electronic device **101** may include a first hinge structure **605**, a second hinge structure **606**, a third hinge structure **607**, a first printed circuit board **641**, a second printed circuit board **642**, a third printed circuit board **643**, a fourth printed circuit board **644**, a first flexible printed circuit board **645**, a second flexible printed circuit board **646**, a third flexible printed circuit board **647**, at least one first reinforcing member **681**, or at least one electromagnet **690**.

[0315] According to an embodiment, the flexible display **650** may include a first display area **651** disposed on the first housing **601**, a second display area **652** disposed on the second housing **602**, a third display area **653** disposed on the third housing **603**, a fourth display area **654** disposed on the fourth housing **604**, a first folding area **655** connecting the first display area **651** and the second display area **652**, a second folding area **656** connecting the second display area **652** and the third display area **653**, or a third folding area **657** connecting the third display area **653** and the fourth display area **654**.

[0316] According to an embodiment, the first hinge structure **605** may rotatably connect the first housing **601** and the second housing **602** relative to each other. The second hinge structure **606** may rotatably connect the second housing **602** and the third housing **603** relative to each other.

[0317] According to an embodiment, the first printed circuit board **641** may be disposed inside the first housing **601**. The second printed circuit board **642** may be disposed inside the second housing **602**. The third printed circuit board **643** may be disposed inside the third housing **603**. The fourth printed circuit board **644** may be disposed inside the fourth housing **604**.

[0318] According to an embodiment, the first flexible printed circuit board **645** may be electrically connected to the first printed circuit board **641** and the second printed circuit board **642**. The second flexible printed circuit board **646** may be electrically connected to the second printed circuit board **642** and the third printed circuit board **643**. The second flexible printed circuit board **646** may be electrically

ally connected to the second printed circuit board **642** and the third printed circuit board **643**.

[0319] According to an embodiment, when the electronic device **101** is fully folded, the first housing **601** and the fourth housing **604** may be disposed between the second housing **602** and the third housing **603**.

[0320] According to an embodiment, when the electronic device **101** is fully folded, an accommodation space **658** capable of accommodating the digital pen **300** may be formed between the second folding area **656** and the edge of the first housing **601** and the edge of the fourth housing **604**.

[0321] According to an embodiment (e.g., FIG. **21**), in the electronic device **101**, when the second folding area **656** is folded, all areas of the second folding area **656** may not be positioned inside the second hinge structure **606**. According to an embodiment (e.g., FIG. **22**), in the electronic device **101**, when the second folding area **656** is folded, at least a partial area of the second folding area **656** may be positioned inside the second hinge structure **606**.

[0322] Referring to FIGS. **21** and **22**, at least one first reinforcing member **681** may be disposed on the second flexible printed circuit board **646**. At least one electromagnet **690** may be disposed on the at least one first reinforcing member **681**. The at least one electromagnet **690** may also be directly disposed on the second flexible printed circuit board **646**.

[0323] According to an embodiment, at least one first reinforcing member **681** may include a 1-1th reinforcing member **681a**, a 1-2th reinforcing member **681b**, and a 1-3th reinforcing member **681c**. The 1-1th reinforcing member **681a** may be disposed on the second hinge structure **606**. The 1-2th reinforcing member **681b** may be disposed on the second hinge structure **606** or the second housing **602**. The 1-3th reinforcing member **681c** may be disposed on the second hinge structure **606** or the third housing **603**. The 1-1th reinforcing member **681a**, the 1-2th reinforcing member **681b**, and/or the 1-3th reinforcing member **681c** may be defined and/or referred to as a first reinforcing member **681a**, a second reinforcing member **681b**, and a third reinforcing member **681c**.

[0324] According to an embodiment, at least one electromagnet **690** may include a first electromagnet **690a**, a second electromagnet **690b**, and a third electromagnet **690c**. The first electromagnet **690a** may be disposed on the 1-1th reinforcing member **681a**. The second electromagnet **690b** may be disposed on the 1-2th reinforcing member **681b**. The third electromagnet **690c** may be disposed on the 1-3th reinforcing member **681c**. The at least one electromagnet **690** may be positioned between the second hinge structure **606** and the second folding area **656**.

[0325] According to an embodiment, at least one electromagnet **690** may generate magnetic force when current is applied and may not generate magnetic force when current is not applied (e.g., when current is cut off). The at least one electromagnet **690** may provide magnetic force to at least one magnetic member **340** (e.g., the at least one magnetic member **340** of FIG. **10**) of the digital pen **300**. The attractive force formed between the at least one electromagnet **690** and the at least one magnetic member **340** may fix

the digital pen **300** to at least a portion of the electronic device **101**.

[0326] According to an embodiment, the second folding area **656** may form an accommodation space **658** capable of accommodating the digital pen **300** including at least one magnetic member **340** when the electronic device **101** is in a folded state (or when the second housing **602** and the third housing **603** are in a folded state). According to an embodiment, the second folding area **656** may define at least a portion of the accommodation space **658** capable of accommodating the digital pen **300** when the electronic device **101** is in a folded state.

[0327] According to an embodiment, the pen housing **301** (e.g., the pen housing **301** of FIG. **5**) of the digital pen **300** may be positioned in the accommodation space **658**. For example, a user may store the digital pen **300** in the accommodation space **658** when the second housing **602** and the third housing **603** are folded relative to each other.

[0328] According to an embodiment, at least one magnetic member **340** disposed inside the pen housing **301** may form an attractive force with the at least one electromagnet **690**. For example, the first magnetic member **340a** may form an attractive force with the first electromagnet **690a**, the second magnetic member **340b** may form an attractive force with the second electromagnet **690b**, and the third magnetic member **340c** may form an attractive force with the third electromagnet **690c**. According to an embodiment, the attractive force may fix the pen housing **301** to the second folding area **656**. Accordingly, in the process of using the electronic device **101**, the release of the digital pen **300** from the accommodation space **658** defined by the second folding area **656** is decreased or limited, thereby enhancing the usability of the electronic device **101** and the digital pen **300**.

[0329] Hereinafter, the embodiments of FIGS. **23** to **26** are described as examples to describe the current application operation or current cut-off operation for at least one electromagnet of the electronic device. For convenience of description, the electronic device, flexible display, or electromagnet of FIGS. **4**, **7**, and **10** is described as examples, but this description may be equally applied and understood to the electronic device, flexible display, or at least one electromagnet of FIGS. **11** to **22**.

[0330] The flexible display **250** of FIGS. **4**, **7**, and **10** may include an electromagnetic induction panel (e.g., digitizer). The electromagnetic induction panel may detect a resonance frequency formed in the coil portion (e.g., the coil portion **320** of FIG. **5**) of the digital pen **300**, and the processor (e.g., the processor **120** of FIG. **1**) of the electronic device **101** may receive information about the detected resonance frequency and may detect a user's handwriting input based on the information.

[0331] The processor **120** of the electronic device **101** may be configured to control the first battery (e.g., the first battery **271** of FIG. **4**) so that current is not applied to at least one electromagnet **290** when a user uses the digital pen **300**. For example, when current is applied to at least one electromagnet **290**, the magnetic force generated from at least one electromagnet **290** may form noise in the electromagnetic induction panel for detecting the coil portion

320 of the digital pen **300**. To prevent the formation of the noise, the processor **120** of the electronic device **101** may control the first battery (e.g., the first battery **271** of FIG. **4**) so that current is cut off to at least one electromagnet **290** when a user uses the digital pen **300** for a handwriting input.

[0332] The processor **120** of the electronic device **101** may be configured to control the first battery so that current is applied to at least one electromagnet **290** when a user does not use the digital pen **300**. For example, when current is applied to at least one electromagnet **290**, the magnetic force generated from at least one electromagnet **290** may form an attractive force with at least one magnetic member **340** of the digital pen **300**. To fix the digital pen **300** to the folding area **253**, or to fix the digital pen **300** accommodated in the accommodation space **258** to the folding area **253**, the processor **120** of the electronic device **101** may control the first battery so that current is applied to at least one electromagnet **290**.

[0333] FIG. **23** is a flowchart **1010** for describing a current application process for an electromagnet of an electronic device according to an embodiment of the disclosure.

[0334] The embodiment of FIG. **23** may be combinable with the embodiments of FIGS. **1** to **22**, or the embodiments of FIGS. **24** to **26**.

[0335] Referring to FIGS. **4**, **7**, **10**, and **23**, the processor (e.g., the processor **120** of FIG. **1**) of the electronic device **101** may be configured to identify whether the folding angle of the electronic device **101** is equal to or less than a specific angle at the operation **1011**. For example, the folding angle of the electronic device **101** may be an angle formed between the first housing **210** and the second housing **220**. The folding angle of the electronic device **101** may be defined and/or referred to as the folding angle of the housing (e.g., the housing **201** of FIGS. **2** to **3**). For example, the specific angle may be a predesignated angle (or a preset angle) stored in the memory (e.g., the memory **130** of FIG. **1**). For example, the specific angle may be defined and/or interpreted as a threshold angle stored in the memory.

[0336] According to an embodiment, the processor **120** of the electronic device **101** may receive information about the current folding angle of the electronic device **101**.

[0337] The information about the current folding angle of the electronic device **101** may be generated through the difference between acceleration sensor values measured from an acceleration sensor (e.g., the sensor module **176** of FIG. **1**) disposed (or mounted) on the first display area (e.g., the first display area **251** of FIG. **4**) and an acceleration sensor (e.g., the sensor module **176** of FIG. **1**) disposed (or mounted) on the second display area (e.g., the second display area **252** of FIG. **4**).

[0338] The processor **120** of the electronic device **101** may map a difference value, which is the difference between a first value measured from the acceleration sensor disposed on the first display area **251** and a second value measured from the acceleration sensor disposed on the second display area **252**, with a value for the folding angle stored in the memory **130**. For example, information about the folding angle corresponding to the difference value may

be stored in the memory **130** of the electronic device **101**. The processor **120** of the electronic device **101** may obtain or identify the folding angle value stored in the memory **130** that is mapped with the difference value. The processor **120** of the electronic device **101** may be configured to recognize the obtained folding angle value as the current folding angle of the electronic device **101**.

[0339] The information about the current folding angle of the electronic device **101** may be generated through a distance value to the second display area **252** detected from a touch sensor (e.g., the sensor module **176** of FIG. **1**) disposed (or mounted) on the first display area **251**, and a distance value to the first display area **251** detected from a touch sensor (e.g., the sensor module **176** of FIG. **1**) disposed (or mounted) on the second display area **252**.

[0340] The processor **120** of the electronic device **101** may map a difference value, which is the difference between a first value measured from the touch sensor disposed on the first display area **251** and a second value measured from the touch sensor disposed on the second display area **252**, with a value for the folding angle stored in the memory **130**. For example, information about the folding angle corresponding to the difference value may be stored in the memory **130** of the electronic device **101**. The processor **120** of the electronic device **101** may obtain or identify the folding angle value stored in the memory **130** that is mapped with the difference value. The processor **120** of the electronic device **101** may be configured to recognize the obtained folding angle value as the current folding angle of the electronic device **101**.

[0341] The information about the current folding angle of the electronic device **101** may be generated through a magnet disposed on the 1-1th side surface **211a** and a hall sensor (e.g., the sensor module **176** of FIG. **1**) disposed on the 2-1th side surface **221a**. The magnet may be disposed on the 2-1th side surface **221a**, and the hall sensor may be disposed on the 1-1th side surface **211a**. The hall sensor may be configured to detect the magnet.

[0342] The processor **120** of the electronic device **101** may map a magnetic force value detected by the hall sensor with a value for the folding angle stored in the memory **130**. For example, information about the folding angle corresponding to the magnetic force value may be stored in the memory **130** of the electronic device **101**. The processor **120** of the electronic device **101** may obtain or identify the folding angle value stored in the memory **130** that is mapped with the magnetic force value. The processor **120** of the electronic device **101** may be configured to recognize the obtained folding angle value as the current folding angle of the electronic device **101**.

[0343] The processor **120** of the electronic device **101** may be configured to recognize the obtained folding angle value through a resistance value detected from a variable resistance sensor (e.g., the sensor module **176** of FIG. **1**) disposed on the hinge structure **231**.

[0344] The processor **120** of the electronic device **101** may map a resistance value detected by the variable resistance sensor with a value for the folding angle stored in the memory **130**. For example, information about the folding angle corresponding to the resistance value may be stored

in the memory **130** of the electronic device **101**. The processor **120** of the electronic device **101** may obtain or identify the folding angle value stored in the memory **130** that is mapped with the resistance value. The processor **120** of the electronic device **101** may be configured to recognize the obtained folding angle value as the current folding angle of the electronic device **101**.

[0345] The processor **120** of the electronic device **101** may control the first battery **271** to apply current to at least one electromagnet **290** when the folding angle of the electronic device **101** is equal to or less than a specific angle at the operation **1013**. For example, when the folding angle of the electronic device **101** is equal to or less than a specific angle, it may be a state in which a user is not using the digital pen **300** of the electronic device **101**. When the folding angle of the electronic device **101** is equal to or less than a specific angle, the processor **120** of the electronic device **101** may be configured to determine that a non-use event of the digital pen **300** occurs. When a non-use event of the digital pen **300** occurs, the processor **120** of the electronic device **101** may control the first battery **271** so that current is applied to at least one electromagnet **290**. At least one electromagnet **290** may generate magnetic force to form an attractive force with at least one magnetic member **340** of the digital pen **300** when current is applied. For example, a state in which the folding angle of the electronic device **101** is equal to or less than a specific angle may be defined and/or interpreted as a state in which the housing (e.g., the housing **201** of FIGS. **2** to **3**) of the electronic device **101** is folded. For example, the processor **120** of the electronic device **101** may be configured to determine that a non-use event of the digital pen **300** occurs when the housing of the electronic device **101** is in a folded state. For example, the processor **120** of the electronic device **101** may control the first battery **271** so that current is applied to at least one electromagnet **290** when the housing is in a folded state.

[0346] The processor **120** of the electronic device **101** may control the first battery **271** to cut off current to at least one electromagnet **290** when the folding angle of the electronic device **101** exceeds a specific angle at the operation **1015**. For example, when the folding angle of the electronic device **101** exceeds a specific angle, it may be a state in which a user is using or intending to use the digital pen **300** of the electronic device **101**. When the folding angle of the electronic device **101** exceeds a specific angle, the processor **120** of the electronic device **101** may be configured to determine that a use event of the digital pen **300** occurs. When a use event of the digital pen **300** occurs, the processor **120** of the electronic device **101** may control the first battery **271** so that current is not applied to at least one electromagnet **290**. At least one electromagnet **290** may not generate magnetic force when current is not applied. For example, a state in which the folding angle of the electronic device **101** exceeds a specific angle may be defined and/or interpreted as a state in which the housing (e.g., the housing **201** of FIGS. **2** to **3**) of the electronic device **101** is unfolded. For example, the processor **120** of the electronic device **101** may be configured to determine that a use event of the digital pen **300** occurs when the housing of the elec-

tronic device **101** is in an unfolded state. For example, the processor **120** of the electronic device **101** may control the first battery **271** so that current is not applied to at least one electromagnet **290** when the housing is in an unfolded state. [0347] According to an embodiment, the processor **120** of the electronic device **101** may be configured to control the first battery **271** or the power management module (e.g., the power management module **188** of FIG. 1) to apply current to at least one electromagnet **290** or to cut off current to at least one electromagnet **290**.

[0348] FIG. 24 is a flowchart **1020** for describing a current application process for an electromagnet of an electronic device according to an embodiment of the disclosure.

[0349] The embodiment of FIG. 24 may be combined with the embodiments of FIGS. 1 to 23 or the embodiments of FIGS. 25A to 26.

[0350] Referring to FIGS. 4, 7, 10, and 24, the processor (e.g., the processor **120** of FIG. 1) of the electronic device **101** may be configured to identify whether the distance between the coil (e.g., the coil **323** of FIG. 5) of the digital pen (e.g., the digital pen **300** of FIG. 5) and the display **250** is equal to or less than a specific distance at the operation **1021**. For example, the distance between the coil **323** of the digital pen **300** and the display **250** of the electronic device **101** may be the minimum distance between the coil **323** and the display **250**. Information about the distance between the coil **323** and the display **250** may be generated based on information detected by the electromagnetic induction panel of the display **250**. The specific distance may be a predesignated value in the memory **130**. For example, the specific distance may be defined and/or interpreted as a threshold distance stored in the memory.

[0351] According to an embodiment, the processor **120** of the electronic device **101** may receive information about the distance between the coil **323** and the display **250**.

[0352] The processor **120** of the electronic device **101** may control the first battery **271** so that current is cut off to at least one electromagnet **290** when the distance between the coil **323** and the display **250** is equal to or less than a specific distance at the operation **1025**. For example, when the distance between the coil **323** and the display **250** is equal to or less than a specific distance, it may be a state in which a user is using or intending to use the digital pen **300** of the electronic device **101**. When the distance between the coil **323** and the display **250** is equal to or less than a specific distance, the processor **120** of the electronic device **101** may be configured to determine that a use event of the digital pen **300** occurs. When a use event of the digital pen **300** occurs, the processor **120** of the electronic device **101** may control the first battery **271** so that current is not applied to at least one electromagnet **290**. At least one electromagnet **290** may not generate magnetic force when current is not applied.

[0353] The processor **120** of the electronic device **101** may control the first battery **271** so that current is applied to at least one electromagnet **290** when the distance between the coil **323** and the display **250** exceeds a specific distance at the operation **1023**. For example, when the distance between the coil **323** and the display **250** exceeds a specific distance, it may be a state in which a user is not

using the digital pen **300** of the electronic device **101**. When the distance between the coil **323** and the display **250** exceeds a specific distance, the processor **120** of the electronic device **101** may be configured to determine that a non-use event of the digital pen **300** occurs. When a non-use event of the digital pen **300** occurs, the processor **120** of the electronic device **101** may control the first battery **271** so that current is applied to at least one electromagnet **290**. At least one electromagnet **290** may generate magnetic force to form an attractive force with at least one magnetic member **340** of the digital pen **300** when current is applied.

[0354] According to an embodiment, the processor **120** of the electronic device **101** may be configured to control the first battery **271** or the power management module (e.g., the power management module **188** of FIG. 1) to apply current to at least one electromagnet **290** or to cut off current to at least one electromagnet **290**.

[0355] FIG. 25A is a flowchart **1030** for describing a current application process for an electromagnet of an electronic device according to an embodiment of the disclosure.

[0356] FIG. 25B is a perspective view illustrating a digital pen and an electronic device according to an embodiment of the disclosure.

[0357] FIG. 25C is a perspective view illustrating a digital pen and an electronic device according to an embodiment of the disclosure.

[0358] The embodiments of FIGS. 25A, 25B, and 25C may be combined with the embodiments of FIGS. 1 to 24 or the embodiment of FIG. 26.

[0359] Referring to FIGS. 4, 7, 10, 25A, 25B, and 25C, the processor (e.g., the processor **120** of FIG. 1) of the electronic device **101** may be configured to identify whether the difference in acceleration sensor values is equal to or less than a specific value at the operation **1031**. The difference in acceleration sensor values may be the difference between a first value measured from the acceleration sensor of the electronic device **101** and a second value measured from the acceleration sensor of the digital pen **300**. The processor **120** of the electronic device **101** may be electrically connected to the communication module (e.g., the communication module **190** of FIG. 1) and may receive information about the second value measured from the acceleration sensor of the digital pen **300** from the communication circuit (e.g., the communication circuit **490** of FIG. 6) of the digital pen **300**.

[0360] According to an embodiment, the acceleration sensor of the electronic device **101** and the acceleration sensor of the digital pen **300** may each be a 3-axis acceleration sensor configured to measure acceleration values in three-axis directions.

[0361] According to an embodiment, the processor **120** of the electronic device **101** may receive information about the first value measured from the acceleration sensor of the electronic device **101** and information about the second value measured from the acceleration sensor of the digital pen **300**.

[0362] The processor **120** of the electronic device **101** may identify whether the difference between the first value and the second value is equal to or less than a specific value predesignated in the memory **130**. For example, the specific

value may be defined and/or interpreted as a threshold stored in the memory. For example, the processor **120** of the electronic device **101** may be configured to compare the first value and the second value for any one axis among the acceleration values in three-axis directions, but the processor **120** of the disclosure is not limited thereto and may be configured to compare the first value and the second value for each of two axes, or may be configured to compare the first value and the second value for each of three axes. Hereinafter, the case where the processor **120** of the electronic device **101** is configured to compare the difference between the first value and the second value for any one axis among the acceleration values in three-axis directions is described as an example, but the disclosure is not limited thereto. For example, the difference between the first value and the second value may be defined as an angle formed between the electronic device **101** and the digital pen **300**. For example, when the difference between the first value and the second value exceeds a specific value (e.g., FIG. 25B), the digital pen **300** may be in a state of being held by a user or may be disposed at a predetermined angle with respect to the electronic device **101**. For example, when the difference between the first value and the second value is equal to or less than a specific value (e.g., FIG. 25C), the digital pen **300** may be in a state of not being held by a user or may be disposed on at least a portion of the electronic device **101**.

[0363] The processor **120** of the electronic device **101** may control the first battery **271** to apply current to at least one electromagnet **290** when the difference in acceleration sensor values is equal to or less than a specific value (e.g., FIG. 25C) at the operation **1033**. For example, when the angle formed between the electronic device **101** and the digital pen **300** is equal to or less than a specific angle, it may be a state in which a user is not using the digital pen **300** of the electronic device **101**. When the difference in acceleration sensor values is equal to or less than a specific value, the processor **120** of the electronic device **101** may be configured to determine that a non-use event of the digital pen **300** occurs. When a non-use event of the digital pen **300** occurs, the processor **120** of the electronic device **101** may control the first battery **271** so that current is applied to at least one electromagnet **290**. At least one electromagnet **290** may generate magnetic force to form an attractive force with at least one magnetic member **340** of the digital pen **300** when current is applied.

[0364] The processor **120** of the electronic device **101** may control the first battery **271** to cut off current to at least one electromagnet **290** when the difference in acceleration sensor values exceeds a specific value (e.g., FIG. 25B) at the operation **1035**. For example, when the angle formed between the electronic device **101** and the digital pen **300** exceeds a specific angle, it may be a state in which a user is using or intending to use the digital pen **300** of the electronic device **101**. When the difference in acceleration sensor values exceeds a specific value, the processor **120** of the electronic device **101** may be configured to determine that a use event of the digital pen **300** occurs. When a use event of the digital pen **300** occurs, the processor **120** of the electronic device **101** may control the first battery **271** so

that current is not applied to at least one electromagnet **290**. At least one electromagnet **290** may not generate magnetic force when current is not applied.

[0365] According to an embodiment, the processor **120** of the electronic device **101** may be configured to control the first battery **271** or the power management module (e.g., the power management module **188** of FIG. 1) to apply current to at least one electromagnet **290** or to cut off current to at least one electromagnet **290**.

[0366] FIG. 26 is a flowchart **1040** for describing a current application process for an electromagnet of an electronic device according to an embodiment of the disclosure.

[0367] The embodiment of FIG. 26 may be combined with the embodiments of FIGS. 1 to 25.

[0368] Referring to FIGS. 4, 7, 10, and 26, the processor (e.g., the processor **120** of FIG. 1) of the electronic device **101** may be configured to identify whether the flexible display **250** of the electronic device **101** is in an off state at the operation **1041**. For example, the off state of the flexible display **250** may be defined and/or referred to as a state in which visual images are not implemented through the flexible display **250** or a state in which the flexible display **250** is turned off, and the on state of the flexible display **250** may be defined and/or referred to as a state in which visual images are implemented through the flexible display **250** or a state in which the flexible display **250** is turned on.

[0369] The processor **120** of the electronic device **101** may control the first battery **271** to apply current to at least one electromagnet **290** when the flexible display **250** of the electronic device **101** is in an off state at the operation **1043**. For example, when the flexible display **250** of the electronic device **101** is in an off state, it may be a state in which a user is not using the digital pen **300** of the electronic device **101**. When the flexible display **250** of the electronic device **101** is in an off state, the processor **120** of the electronic device **101** may control the first battery **271** so that current is applied to at least one electromagnet **290**. At least one electromagnet **290** may generate magnetic force to form an attractive force with at least one magnetic member **340** of the digital pen **300** when current is applied.

[0370] The processor **120** of the electronic device **101** may control the first battery **271** to cut off current to at least one electromagnet **290** when the flexible display **250** of the electronic device **101** is in an on state at the operation **1045**. For example, when the flexible display **250** of the electronic device **101** is in an on state, it may be a state in which a user is using or intending to use the digital pen **300** of the electronic device **101**. When the flexible display **250** of the electronic device **101** is in an on state, the processor **120** of the electronic device **101** may be configured to determine that a use event of the digital pen **300** occurs. When a use event of the digital pen **300** occurs, the processor **120** of the electronic device **101** may control the first battery **271** so that current is not applied to at least one electromagnet **290**. At least one electromagnet **290** may not generate magnetic force when current is not applied.

[0371] According to an embodiment, the processor **120** of the electronic device **101** may be configured to control the first battery **271** or the power management module (e.g., the power management module **188** of FIG. 1) to apply cur-

rent to at least one electromagnet **290** or to cut off current to at least one electromagnet **290**.

[**0372**] A foldable electronic device may have a flexible display that may be folded disposed over the entire area of the housing structure and may include a plurality of housing structures to support this. Therefore, the foldable electronic device may have various components disposed and/or mounted in each of the plurality of housing structures. As the functions of foldable electronic devices become more diverse, the number of components disposed and/or mounted inside foldable electronic devices is increasing. Since the overall size or inner space of a foldable electronic device is limited, it may be difficult to secure sufficient space for various components to be disposed and/or mounted.

[**0373**] Further, a foldable electronic device may be provided with a stylus pen for implementing a user's handwriting input. However, since the inner space of a foldable electronic device is limited, it may be difficult to secure space for the stylus pen to be stored inside the housing structure.

[**0374**] According to an embodiment of the disclosure, a digital pen and an electronic device including the same may be provided that provide a structure for accommodating the digital pen when the foldable electronic device is in a folded state.

[**0375**] The disclosure is not limited to the foregoing embodiments but various modifications or changes may rather be made thereto without departing from the spirit and scope of the disclosure.

[**0376**] According to an embodiment of the disclosure, a digital pen that may be accommodated in an accommodation space defined by a flexible display and an electronic device including the same may be provided.

[**0377**] According to an embodiment of the disclosure, an electronic device may be provided that may apply or cut off current to an electromagnet by distinguishing between a use state and a non-use state of a digital pen.

[**0378**] The effects obtainable from the disclosure are not limited to the effects mentioned above, and other effects not mentioned is clearly understood by those skilled in the art to which the disclosure pertains from the following description.

[**0379**] According to an embodiment of the disclosure, an electronic device **101** may include a housing **201**, a display **250**, or at least one electromagnet **290**. The housing **201** may include a first housing **210**, a second housing **220**, or a hinge structure **231**. The hinge structure may rotatably connect the first housing and the second housing relative to each other. The display may be disposed on the housing. The display may include a first display area **251**, a second display area **252**, or a folding area **253**. The first display area may be disposed on the first housing. The second display area may be disposed on the second housing. The folding area may be configured to be at least partially foldable. The at least one electromagnet may be disposed between the hinge structure and the folding area. When the housing is in a folded state, the folding area may be configured to form an accommodation space capable of accommodating a

digital pen **300** including at least one magnetic member **340** when the housing is in a folded state.

[**0380**] According to an embodiment, the at least one electromagnet may be configured to generate magnetic force by having current applied thereto when the housing is in a folded state. The at least one electromagnet may be configured not to generate magnetic force by having current cut off when the housing is in an unfolded state.

[**0381**] According to an embodiment, the display may include an electromagnetic induction panel. At least a portion of the electromagnetic induction panel may be configured to be located between the at least one electromagnet and the at least one magnetic member when the digital pen is accommodated in the accommodation space.

[**0382**] According to an embodiment, the electronic device may further include a first printed circuit board **241**, a second printed circuit board **242**, or a flexible printed circuit board **243**. The first printed circuit board may be disposed inside the first housing. The second printed circuit board may be disposed inside the second housing. The flexible printed circuit board may be electrically connected to the first printed circuit board **241** and the second printed circuit board **242**.

[**0383**] According to an embodiment, at least a portion of the flexible printed circuit board may be disposed on the hinge structure. The at least one electromagnet may be disposed on at least a partial area of the flexible printed circuit board disposed on the hinge structure.

[**0384**] According to an embodiment, the electronic device may further include a first battery **271**. The first battery may be disposed in the first housing. The at least one electromagnet may be configured to have current applied thereto from the first battery.

[**0385**] According to an embodiment, the electronic device may further include a reinforcing member **281**. The reinforcing member may be configured to limit the movement of the flexible printed circuit board. The reinforcing member may be fixed to the hinge structure.

[**0386**] According to an embodiment, the at least one electromagnet may be disposed on the reinforcing member.

[**0387**] According to an embodiment, the reinforcing member may include a first reinforcing member **281a** or a second reinforcing member **281b**. The second reinforcing member may be spaced apart from the first reinforcing member. The at least one electromagnet may include a first electromagnet **290a** or a second electromagnet **290b**. The first electromagnet may be disposed on the first reinforcing member. The second electromagnet may be disposed on the second reinforcing member.

[**0388**] According to an embodiment, the electronic device may include a first battery **271** or a second battery **272**. The first battery may be disposed in the first housing. The second battery may be disposed in the second housing. The first electromagnet may be configured to have current applied thereto from the first battery. The second electromagnet may be configured to have current applied thereto from the second battery.

[**0389**] According to an embodiment, the at least one electromagnet may be configured not to generate magnetic force by having current cut off when a distance between the

display and a coil of the digital pen is equal to or less than a designated specific value. The at least one electromagnet may be configured to generate magnetic force by having current applied thereto when the distance between the display and the coil of the digital pen is greater than the designated specific value.

[0390] According to an embodiment, the at least one electromagnet may be configured to generate magnetic force by having current applied thereto when the display is in a turned-on state. The at least one electromagnet may be configured not to generate magnetic force by having current cut off when the display is in a turned-off state.

[0391] According to an embodiment of the disclosure, an electronic device 101 may include a housing, a display 550, or at least one electromagnet 590. The housing may include a first housing 501, a second housing 502, a third housing 503, a first hinge structure 504, or a second hinge structure 505. The first hinge structure may rotatably connect the first housing and the second housing relative to each other. The second hinge structure may rotatably connect the second housing and the third housing relative to each other. The display may be disposed on the housing. The display may include a first display area 551, a second display area 552, a third display area 553, or a folding area 554, 555. The first display area may be disposed on the first housing. The second display area may be disposed on the second housing. The third display area may be disposed on the third housing. The folding area may be configured to be at least partially foldable. The at least one electromagnet may be disposed on the first hinge structure or the second hinge structure. The folding area may be configured to form an accommodation space capable of accommodating a digital pen 300 including at least one magnetic member 340 when the housing is in a folded state.

[0392] According to an embodiment, the folding area may include a first folding area 554 or a second folding area 555. The first folding area may connect the first display area and the second display area. The second folding area may connect the second display area and the third display area.

[0393] According to an embodiment, the at least one electromagnet may be disposed between the first hinge structure and the first folding area.

[0394] According to an embodiment, the at least one electromagnet may be disposed between the second hinge structure and the second folding area.

[0395] According to an embodiment of the disclosure, an electronic device 101 may include a housing 201, a display 250, at least one electromagnet 290, a battery 271, at least one processor 120, or memory 130. The housing may include a first housing 210, a second housing 220, or a hinge structure 231. The hinge structure may include a hinge structure 231 rotatably connecting the first housing and the second housing relative to each other. The display may be disposed on the housing. The display may include a first display area 251, a second display area 252, or a folding area 253. The first display area may be disposed on the first housing. The second display area may be disposed on the second housing. The folding area may be configured to be at least partially foldable. The at least one electromagnet

290 may be disposed between the hinge structure and the folding area. The battery may be configured to apply current to the at least one electromagnet. The at least one processor may be configured to control the battery to apply current to the at least one electromagnet when a non-use event of a digital pen 300 occurs. The at least one processor may be configured to control the battery to cut off current to the at least one electromagnet when a use event of the digital pen 300 occurs.

[0396] According to an embodiment, the at least one processor may be configured to determine that the non-use event of the digital pen occurs when a folding angle of the housing is equal to or less than a specific angle stored in the memory. The at least one processor may be configured to determine that the use event of the digital pen occurs when the folding angle of the housing exceeds the specific angle.

[0397] According to an embodiment, the at least one processor may be configured to determine that the use event of the digital pen occurs when a distance between the display and a coil of the digital pen is equal to or less than a specific distance. The at least one processor may be configured to determine that the non-use event of the digital pen occurs when the distance between the display and the coil of the digital pen exceeds the specific distance.

[0398] According to an embodiment, the at least one processor may be configured to determine that the non-use event of the digital pen occurs when a difference between a first value measured from an acceleration sensor of the electronic device and a second value measured from an acceleration sensor of the digital pen is equal to or less than a specific value. The at least one processor may be configured to determine that the use event of the digital pen occurs when the difference between the first value measured from the acceleration sensor of the electronic device and the second value measured from the acceleration sensor of the digital pen exceeds the specific value.

[0399] According to an embodiment, the at least one processor may be configured to determine that the non-use event of the digital pen occurs when the display is in an off state. The at least one processor may be configured to determine that the use event of the digital pen occurs when the display is in an on state.

[0400] While the disclosure has been shown and described with reference to various embodiments thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the disclosure as defined by the following claims.

What is claimed is:

1. An electronic device comprising:
 - a housing including a first housing, a second housing and a hinge structure rotatably connecting the first housing and the second housing relative to each other;
 - a display disposed on the housing, and including a first display area disposed on the first housing, a second display area disposed on the second housing, and a folding area configured to be at least partially foldable; and

- at least one electromagnet disposed between the hinge structure and the folding area,
 wherein, when the housing is in a folded state, the folding area is configured to form an accommodation space for accommodating a digital pen including at least one magnetic member.
- 2.** The electronic device of claim **1**,
 wherein, when the housing is in the folded state, the at least one electromagnet is configured to generate a magnetic force by having current applied thereto, and
 wherein, when the housing is in an unfolded state, the at least one electromagnet is configured not to generate the magnetic force by having current cut off.
- 3.** The electronic device of claim **1**,
 wherein the display further includes an electromagnetic induction panel, and
 wherein, when the digital pen is accommodated in the accommodation space, at least a portion of the electromagnetic induction panel is configured to be located between the at least one electromagnet and the at least one magnetic member.
- 4.** The electronic device of claim **1**, further comprising:
 a first battery disposed in the first housing,
 wherein the at least one electromagnet is configured to have current applied thereto from the first battery.
- 5.** The electronic device of claim **1**, further comprising:
 a first printed circuit board disposed inside the first housing;
 a second printed circuit board disposed inside the second housing; and
 a flexible printed circuit board electrically connected to the first printed circuit board and the second printed circuit board.
- 6.** The electronic device of claim **5**,
 wherein at least a portion of the flexible printed circuit board is disposed on the hinge structure, and
 wherein the at least one electromagnet is disposed on the at least a portion of the flexible printed circuit board disposed on the hinge structure.
- 7.** The electronic device of claim **5**, further comprising:
 a reinforcing member configured to limit a movement of the flexible printed circuit board and fixed to the hinge structure, and
 wherein the at least one electromagnet is disposed on the reinforcing member.
- 8.** The electronic device of claim **7**,
 wherein the reinforcing member includes a first reinforcing member and a second reinforcing member spaced apart from the first reinforcing member, and
 wherein the at least one electromagnet includes a first electromagnet disposed on the first reinforcing member and a second electromagnet disposed on the second reinforcing member.
- 9.** The electronic device of claim **8**, further comprising:
 a first battery disposed in the first housing; and
 a second battery disposed in the second housing,
 wherein the first electromagnet is configured to have current applied thereto from the first battery, and
 wherein the second electromagnet is configured to have current applied thereto from the second battery.
- 10.** The electronic device of claim **1**,
 wherein the at least one electromagnet is configured not to generate a magnetic force by having current cut off when a distance between the display and a coil of the digital pen is equal to or less than a designated specific value, and
 wherein the at least one electromagnet is configured to generate a magnetic force by having current applied thereto when the distance between the display and the coil of the digital pen is greater than the designated specific value.
- 11.** The electronic device of claim **1**,
 wherein, when the display is in a turned-on state, the at least one electromagnet is configured to generate a magnetic force by having current applied thereto, and
 wherein, when the display is in a turned-off state, the at least one electromagnet is configured not to generate a magnetic force by having current cut off.
- 12.** An electronic device comprising:
 a housing including a first housing, a second housing, a third housing, a first hinge structure rotatably connecting the first housing and the second housing relative to each other, and a second hinge structure rotatably connecting the second housing and the third housing relative to each other;
 a display disposed on the housing, and including a first display area disposed on the first housing, a second display area disposed on the second housing, a third display area disposed on the third housing, and a folding area configured to be at least partially foldable; and
 at least one electromagnet disposed on the first hinge structure or the second hinge structure,
 wherein, when the housing is in a folded state, the folding area is configured to form an accommodation space for accommodating a digital pen including at least one magnetic member.
- 13.** The electronic device of claim **12**, wherein the folding area includes:
 a first folding area connecting the first display area and the second display area; and
 a second folding area connecting the second display area and the third display area.
- 14.** The electronic device of claim **13**, wherein the at least one electromagnet is disposed between the first hinge structure and the first folding area.
- 15.** The electronic device of claim **13**, wherein the at least one electromagnet is disposed between the second hinge structure and the second folding area.
- 16.** The electronic device of claim **12**,
 wherein, when the housing is in the folded state, the at least one electromagnet is configured to generate a magnetic force by having current applied thereto, and
 wherein, when the housing is in an unfolded state, the at least one electromagnet is configured not to generate the magnetic force by having current cut off.
- 17.** The electronic device of claim **12**,

wherein the display further includes an electromagnetic induction panel, and

wherein, when the digital pen is accommodated in the accommodation space, at least a portion of the electromagnetic induction panel is configured to be located between the at least one electromagnet and the at least one magnetic member.

18. The electronic device of claim **12**, further comprising:

a first battery disposed in the first housing, wherein the at least one electromagnet is configured to have current applied thereto from the first battery.

19. The electronic device of claim **12**, further comprising:

a first printed circuit board disposed inside the first housing;
a second printed circuit board disposed inside the second housing; and
a flexible printed circuit board electrically connected to the first printed circuit board and the second printed circuit board.

20. The electronic device of claim **12**,

wherein the at least one electromagnet is configured not to generate a magnetic force by having current cut off when a distance between the display and a coil of the digital pen is equal to or less than a designated specific value, and

wherein the at least one electromagnet is configured to generate a magnetic force by having current applied thereto when the distance between the display and the coil of the digital pen is greater than the designated specific value.

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