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ROLLABLE ELECTRONIC DEVICE COMPRISING SHIELDING MEMBER

Abstract

An electronic device includes: a housing including a first housing and a second housing configured to move relative to the first housing; a display configured to be unrolled based on a sliding of the second housing; an electronic component in the housing and configured to detect a magnetic field; a magnet in the housing, the magnet having an arc shape and including a first end and a second end facing the first end; and a shielding member including at least a portion positioned between the first end and the second end, and at least a portion positioned on an extension line between a center point of the magnet and the electronic component.

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATIONS [0001] This application is a continuation application of International Application No. PCT/KR2023/014374, filed on Sep. 21, 2023, which claims priority to Korean Patent Application No. 10-2022-0127211, filed on Oct. 5, 2022, in the Korean Intellectual Property Office, and Korean Patent Application No. 10-2022-0145845, filed on Nov. 4, 2022, the disclosures of which are incorporated by reference herein in their entireties.

BACKGROUND

1. Field

[0002] The disclosure relates to a rollable electronic device including a shielding member.

2. Description of Related Art

[0003] Due to advancements in information and communication technology and semiconductor technology, various functions are being integrated into a single portable electronic device. For example, an electronic device may implement not only communication functions, but also entertainment functions such as gaming, multimedia functions such as music/video playback, communication and security functions for mobile banking and the like, and functions for schedule management and an electronic wallet function. These electronic devices are being miniaturized to be conveniently carried by users.

[0004] As mobile communication services extend into the multimedia service domain, it is necessary to increase the display sizes of electronic devices in order to allow users to fully utilize multimedia services, in addition to voice calls and short message services. However, the display sizes of electronic devices may be in a trade-off relationship with the miniaturization of electronic devices.

SUMMARY

[0005] According to an aspect of the disclosure, an electronic device includes: a housing including a first housing and a second housing configured to move relative to the first housing; a display configured to be unrolled based on a sliding of the second housing; an electronic component in the housing and configured to detect a magnetic field; a magnet in the housing, the magnet having an arc shape and including a first end and a second end facing the first end; and a shielding member including at least a portion positioned between the first end and the second end, and at least a portion positioned on an extension line between a center point of the magnet and the electronic component.

[0006] The electronic device may further include a position determination magnet in the housing, the electronic component includes a magnetic field detection sensor configured to slide relative to the position determination magnet, and to detect the magnetic field generated from the position determination magnet.

[0007] The electronic device may further include a processor configured to identify a slide distance of the electronic device based on a signal detected by the magnetic field detection sensor.

[0008] The magnetic field detection sensor may include a plurality of hall sensors arranged along a first direction in which the electronic device slides, and the extension line may extend from the

center point of the magnet to a first hall sensor closest to the magnet among the plurality of hall sensors.

[0009] The shielding member may have relative permeability of 3,000 to 10,000, and saturation magnetic flux density of 1.7 T to 2.3 T.

[0010] The magnet may include: a first magnet including the first end; and a second magnet spaced apart from the first magnet and including the second end.

[0011] The shielding member may include: a central area between the first magnet and the second magnet; a first wing structure extending from the central area along an edge of the first magnet; and a second wing structure extending from the central area along an edge of the second magnet.

[0012] The electronic device may further include a power receiving circuit in the housing and including at least a portion facing the magnet.

[0013] The first housing may include a first cover member and a frame surrounded by the first cover member, the second housing may include a second cover member at least partially accommodated within the first cover member, and the magnet and the power receiving circuit may be on the first cover member.

[0014] A first width of the magnet may be smaller than a second width of the shielding member.

[0015] The electronic component may include a camera on the housing, and the shielding member may be between the center point of the magnet and the camera.

[0016] The electronic component may further include an antenna module in the housing, and the shielding member may be between the center point of the magnet and the antenna module.

[0017] The electronic device may further include a driving structure configured to slide the second housing relative to the first housing, and the driving structure may include: a motor in the first housing and configured to generate a driving force for moving the second housing relative to the first housing; a gear connected to the motor; and a rack connected to the second housing and configured to be engaged with the gear.

[0018] The electronic device may further include a multi-bar structure configured to support at least a portion of the display; and a guide rail connected to the first housing and including a slit configured to guide movement of the multi-bar structure.

[0019] The display may include: a first display area connected to the second housing; and a second display area extending from the first display area and configured to be rolled or unrolled based on the sliding of the second housing.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] The above and other aspects and/or features of embodiments of the present disclosure will be more apparent from the following description taken in conjunction with the accompanying drawings, in which:

[0021] FIG. 1 is a block diagram of an electronic device according to an embodiment of the disclosure in a network environment;

[0022] FIG. 2 is a view illustrating the state in which a second display area of a display according to an embodiment of the disclosure is accommodated in a housing;

[0023] FIG. 3 is a view illustrating the state in which the second display area of the display according to an embodiment of the disclosure is exposed to the exterior of the housing;

[0024] FIG. 4 is an exploded perspective view of an electronic device according to an embodiment of the disclosure;

[0025] FIG. 5A is a cross-sectional view of an embodiment of the disclosure, taken along line A-A' in FIG. 2;

[0026] FIG. 5B is a cross-sectional view of an embodiment of the disclosure, taken along line B-B'

in FIG. 3;

[0027] FIG. 6 is a perspective view of a driving structure according to an embodiment of the disclosure;

[0028] FIG. 7 is a rear view of an electronic device according to an embodiment of the disclosure;

[0029] FIG. 8 is an exploded perspective view of an accessory and an electronic device including a magnet according to an embodiment of the disclosure;

[0030] FIG. 9 is a rear perspective view of an electronic device according to an embodiment of the disclosure;

[0031] FIG. 10 is a front view of an electronic device including a magnet, a shielding member, and a magnetic field detection sensor according to an embodiment of the disclosure;

[0032] FIG. 11 is a view illustrating a positional relationship of a magnet according to an embodiment of the disclosure;

[0033] FIGS. 12A and 12B are views illustrating a positional relationship between a magnet and a hall sensor according to an embodiment of the present disclosure;

[0034] FIGS. 13A and 13B are views illustrating a structure for designing the shape of a magnet according to an embodiment of the disclosure;

[0035] FIG. 14A is a view illustrating the structure of an electronic device facing an external accessory;

[0036] FIG. 14B is a cross-sectional view taken along line C-C' of FIG. 15;

[0037] FIG. 15 is a front view of an electronic device including a magnet and a shielding member with an external magnet attached thereto according to an embodiment of the disclosure;

[0038] FIG. 16 is a view of a shielding member according to an embodiment of the disclosure; and

[0039] FIGS. 17A and 17B are views illustrating a positional relationship between the shielding member and the hall sensor according to an embodiment of the disclosure.

DETAILED DESCRIPTION

[0040] FIG. 1 is a block diagram illustrating an electronic device in a network environment according to an embodiment of the disclosure.

[0041] Referring to FIG. 1, the electronic device **101** in the network environment **100** may communicate with an electronic device **102** via a first network **198** (e.g., a short-range wireless communication network), or at least one of an electronic device **104** or a server **108** via a second network **199** (e.g., a long-range wireless communication network). According to an embodiment, the electronic device **101** may communicate with the electronic device **104** via the server **108**.

According to an embodiment, the electronic device **101** may include a processor **120**, memory **130**, an input module **150**, a sound output module **155**, a display module **160**, an audio module **170**, a sensor module **176**, an interface **177**, a connecting terminal **178**, a haptic module **179**, a camera module **180**, a power management module **188**, a battery **189**, a communication module **190**, a subscriber identification module (SIM) **196**, or an antenna module **197**. In some embodiments, at least one of the components (e.g., the connecting terminal **178**) may be omitted from the electronic device **101**, or one or more other components may be added in the electronic device **101**. In some embodiments, some of the components (e.g., the sensor module **176**, the camera module **180**, or the antenna module **197**) may be implemented as a single component (e.g., the display module **160**).

[0042] The processor **120** may execute, for example, software (e.g., a program **140**) to control at least one other component (e.g., a hardware or software component) of the electronic device **101** coupled with the processor **120**, and may perform various data processing or computation.

According to one embodiment, as at least part of the data processing or computation, the processor **120** may store a command or data received from another component (e.g., the sensor module **176** or the communication module **190**) in volatile memory **132**, process the command or the data stored in the volatile memory **132**, and store resulting data in non-volatile memory **134**. According to an embodiment, the processor **120** may include a main processor **121** (e.g., a central processing unit (CPU) or an application processor (AP)), or an auxiliary processor **123** (e.g., a graphics

processing unit (GPU), a neural processing unit (NPU), an image signal processor (ISP), a sensor hub processor, or a communication processor (CP)) that is operable independently from, or in conjunction with, the main processor **121**. For example, when the electronic device **101** includes the main processor **121** and the auxiliary processor **123**, the auxiliary processor **123** may be adapted to consume less power than the main processor **121**, or to be specific to a specified function. The auxiliary processor **123** may be implemented as separate from, or as part of the main processor **121**.

[0043] The auxiliary processor **123** may control at least some of functions or states related to at least one component (e.g., the display module **160**, the sensor module **176**, or the communication module **190**) among the components of the electronic device **101**, instead of the main processor **121** while the main processor **121** is in an inactive (e.g., sleep) state, or together with the main processor **121** while the main processor **121** is in an active state (e.g., executing an application). According to an embodiment, the auxiliary processor **123** (e.g., an image signal processor or a communication processor) may be implemented as part of another component (e.g., the camera module **180** or the communication module **190**) functionally related to the auxiliary processor **123**. According to an embodiment, the auxiliary processor **123** (e.g., the neural processing unit) may include a hardware structure specified for artificial intelligence model processing. An artificial intelligence model may be generated by machine learning. Such learning may be performed, e.g., by the electronic device **101** where the artificial intelligence is performed or via a separate server (e.g., the server **108**). Learning algorithms may include, but are not limited to, e.g., supervised learning, unsupervised learning, semi-supervised learning, or reinforcement learning. The artificial intelligence model may include a plurality of artificial neural network layers. The artificial neural network may be a deep neural network (DNN), a convolutional neural network (CNN), a recurrent neural network (RNN), a restricted Boltzmann machine (RBM), a deep belief network (DBN), a bidirectional recurrent deep neural network (BRDNN), deep Q-network or a combination of two or more thereof but is not limited thereto. The artificial intelligence model may, additionally or alternatively, include a software structure other than the hardware structure.

[0044] 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**.

[0045] 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**.

[0046] The input module **150** may receive a command or data to be used by another component (e.g., the processor **120**) of the electronic device **101**, from the outside (e.g., a user) of the electronic device **101**. The input module **150** may include, for example, a microphone, a mouse, a keyboard, a key (e.g., a button), or a digital pen (e.g., a stylus pen).

[0047] 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.

[0048] The display module **160** may visually provide information to the outside (e.g., a user) of the electronic device **101**. The display module **160** may include, for example, a display, a hologram device, or a projector and control circuitry to control a corresponding one of the display, hologram device, and projector. According to an embodiment, the display module **160** may include a touch sensor adapted to detect a touch, or a pressure sensor adapted to measure the intensity of force incurred by the touch.

[0049] The audio module **170** may convert a sound into an electrical signal and vice versa.

According to an embodiment, the audio module **170** may obtain the sound via the input module

150, or output the sound via the sound output module **155** or a headphone of an external electronic device (e.g., an electronic device **102**) directly (e.g., wiredly) or wirelessly coupled with the electronic device **101**.

[0050] The sensor module **176** may detect an operational state (e.g., power or temperature) of the electronic device **101** or an environmental state (e.g., a state of a user) external to the electronic device **101**, and then generate an electrical signal or data value corresponding to the detected state. According to an embodiment, the sensor module **176** may include, for example, a gesture sensor, a gyro sensor, an atmospheric pressure sensor, a magnetic sensor, an acceleration sensor, a grip sensor, a proximity sensor, a color sensor, an infrared (IR) sensor, a biometric sensor, a temperature sensor, a humidity sensor, or an illuminance sensor.

[0051] 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.

[0052] A connecting terminal **178** may include a connector via which the electronic device **101** may be physically connected with the external electronic device (e.g., the electronic device **102**). According to an embodiment, the connecting terminal **178** may include, for example, a HDMI connector, a USB connector, a SD card connector, or an audio connector (e.g., a headphone connector).

[0053] The haptic module **179** may convert an electrical signal into a mechanical stimulus (e.g., a vibration or a movement) or electrical stimulus which may be recognized by a user via his tactile sensation or kinesthetic sensation. According to an embodiment, the haptic module **179** may include, for example, a motor, a piezoelectric element, or an electric stimulator.

[0054] 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.

[0055] The power management module **188** may manage power supplied to the electronic device **101**. According to one embodiment, the power management module **188** may be implemented as at least part of, for example, a power management integrated circuit (PMIC).

[0056] 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.

[0057] The communication module **190** may support establishing a direct (e.g., wired) communication channel or a wireless communication channel between the electronic device **101** and the external electronic device (e.g., the electronic device **102**, the electronic device **104**, or the server **108**) and performing communication via the established communication channel. The communication module **190** may include one or more communication processors that are operable independently from the processor **120** (e.g., the application processor (AP)) and supports a direct (e.g., wired) communication or a wireless communication. According to an embodiment, the communication module **190** may include a wireless communication module **192** (e.g., a cellular 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 via the first network **198** (e.g., a short-range communication network, such as Bluetooth™, wireless-fidelity (Wi-Fi) direct, or infrared data association (IrDA)) or the second network **199** (e.g., a long-range communication network, such as a legacy cellular network, a 5G network, a next-generation communication network, the Internet, or a computer network (e.g., LAN or wide area network (WAN))). These various types of communication modules may be

implemented as a single component (e.g., a single chip), or may be implemented as multi components (e.g., multi chips) separate from each other. The wireless communication module **192** may identify and authenticate the electronic device **101** in a communication network, such as the first network **198** or the second network **199**, using subscriber information (e.g., international mobile subscriber identity (IMSI)) stored in the subscriber identification module **196**.

[0058] The wireless communication module **192** may support a 5G network, after a 4G network, and next-generation communication technology, e.g., new radio (NR) access technology. The NR access technology may support enhanced mobile broadband (eMBB), massive machine type communications (mMTC), or ultra-reliable and low-latency communications (URLLC). The wireless communication module **192** may support a high-frequency band (e.g., the mmWave band) to achieve, e.g., a high data transmission rate. The wireless communication module **192** may support various technologies for securing performance on a high-frequency band, such as, e.g., beamforming, massive multiple-input and multiple-output (massive MIMO), full dimensional MIMO (FD-MIMO), array antenna, analog beam-forming, or large scale antenna. The wireless communication module **192** may support various requirements specified in the electronic device **101**, an external electronic device (e.g., the electronic device **104**), or a network system (e.g., the second network **199**). According to an embodiment, the wireless communication module **192** may support a peak data rate (e.g., 20 Gbps or more) for implementing eMBB, loss coverage (e.g., 164 dB or less) for implementing mMTC, or U-plane latency (e.g., 0.5 ms or less for each of downlink (DL) and uplink (UL), or a round trip of 1 ms or less) for implementing URLLC.

[0059] The antenna module **197** may transmit or receive a signal or power to or from the outside (e.g., the external electronic device) of the electronic device **101**. According to an embodiment, the antenna module **197** may include an antenna including a radiating element composed of a conductive material or a conductive pattern formed in or on a substrate (e.g., a printed circuit board (PCB)). According to an embodiment, the antenna module **197** may include a plurality of antennas (e.g., array antennas). In such a case, at least one antenna appropriate for a communication scheme used in the communication network, such as the first network **198** or the second network **199**, may be selected, for example, by the communication module **190** (e.g., the wireless communication module **192**) from the plurality of antennas. The signal or the power may then be transmitted or received between the communication module **190** and the external electronic device via the selected at least one antenna. According to an embodiment, another component (e.g., a radio frequency integrated circuit (RFIC)) other than the radiating element may be additionally formed as part of the antenna module **197**.

[0060] 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.

[0061] 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)).

[0062] According to an embodiment, commands or data may be transmitted or received between the electronic device **101** and the external electronic device **104** via the server **108** coupled with the second network **199**. Each of the electronic devices **102** or **104** may be a device of a same type as, or a different type, from the electronic device **101**. According to an embodiment, all or some of operations to be executed at the electronic device **101** may be executed at one or more of the external electronic devices **102**, **104**, or **108**. For example, if the electronic device **101** should

perform a function or a service automatically, or in response to a request from a user or another device, the electronic device **101**, instead of, or in addition to, executing the function or the service, may request the one or more external electronic devices to perform at least part of the function or the service. The one or more external electronic devices receiving the request may perform the at least part of the function or the service requested, or an additional function or an additional service related to the request, and transfer an outcome of the performing to the electronic device **101**. The electronic device **101** may provide the outcome, with or without further processing of the outcome, as at least part of a reply to the request. To that end, a cloud computing, distributed computing, mobile edge computing (MEC), or client-server computing technology may be used, for example. The electronic device **101** may provide ultra low-latency services using, e.g., distributed computing or mobile edge computing. In 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.

[0063] The electronic device according to various embodiments may be one of various types of electronic devices. The electronic devices may include, for example, a portable communication device (e.g., a smartphone), a computer device, a portable multimedia device, a portable medical device, a camera, a wearable device, or a home appliance. According to an embodiment of the disclosure, the electronic devices are not limited to those described above.

[0064] It should be appreciated that various embodiments of the present disclosure and the terms used therein are not intended to limit the technological features set forth herein to particular embodiments and include various changes, equivalents, or replacements for a corresponding embodiment. With regard to the description of the drawings, similar reference numerals may be used to refer to similar or related elements. It is to be understood that a singular form of a noun corresponding to an item may include one or more of the things, unless the relevant context clearly indicates otherwise. As used herein, each of such phrases as “A or B,” “at least one of A and B,” “at least one of A or B,” “A, B, or C,” “at least one of A, B, and C,” and “at least one of A, B, or C,” may include any one of, or all possible combinations of the items enumerated together in a corresponding one of the phrases. As used herein, such terms as “1st” and “2nd,” or “first” and “second” may be used to simply distinguish a corresponding component from another, and does not limit the components in other aspect (e.g., importance or order). It is to be understood that if an element (e.g., a first element) is referred to, with or without the term “operatively” or “communicatively”, as “coupled with,” “coupled to,” “connected with,” or “connected to” another element (e.g., a second element), it means that the element may be coupled with the other element directly (e.g., wiredly), wirelessly, or via a third element.

[0065] As used in connection with various embodiments of the disclosure, 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).

[0066] According to various embodiments, each component (e.g., a module or a program) of the above-described components may include a single entity or multiple entities, and some of the multiple entities may be separately disposed in different components. According to various embodiments, one or more of the above-described components may be omitted, or one or more other components may be added. Alternatively or additionally, a plurality of components (e.g., modules or programs) may be integrated into a single component. In such a case, according to various embodiments, the integrated component may still perform one or more functions of each of

the plurality of components in the same or similar manner as they are performed by a corresponding one of the plurality of components before the integration. According to various embodiments, operations performed by the module, the program, or another component may be carried out sequentially, in parallel, repeatedly, or heuristically, or one or more of the operations may be executed in a different order or omitted, or one or more other operations may be added. [0067] FIG. 2 is a view illustrating the state in which a second display area of a display according to an embodiment of the disclosure is accommodated in a housing. FIG. 3 is a view illustrating the state in which the second display area of the display according to an embodiment of the disclosure is exposed to the exterior of the housing.

[0068] FIGS. 2 and 3 illustrate a structure in which a display **203** (e.g., a flexible display or rollable display) is expanded in the longitudinal direction (e.g., the +Y direction) when viewed from the front of the electronic device **101**. However, the expansion direction of the display **203** is not limited to one direction (e.g., the +Y direction). For example, a design change may be made such that the display **203** may be expanded upward (e.g., in the +Y direction), rightward (e.g., in the +X direction), leftward (e.g., in the -X direction), and/or downward (e.g., in the -Y direction).

[0069] The state illustrated in FIG. 2 may be referred to as a slid-in state of the electronic device **101** or a state in which the second display area A2 of the display **203** is closed.

[0070] The state illustrated in FIG. 3 may be referred to as a slid-out state of the electronic device **101** or a state in which the second display area A2 of the display **203** is opened.

[0071] Referring to FIGS. 2 and 3, the electronic device **101** may include a housing **210**. The housing **210** may include a first housing **201** and a second housing **202** disposed to be movable relative to the first housing **201**. In an embodiment, the electronic device **101** may be interpreted as having a structure in which the first housing **201** is disposed to be slidable relative to the second housing **202**. According to an embodiment, the second housing **202** may be disposed to be able to reciprocate by a predetermined distance in the illustrated direction (e.g., the direction indicated by arrow {circle around (1)}) relative to the first housing **201**.

[0072] According to an embodiment, the second housing **202** may be referred to as a slide portion or a slide housing and may be movable relative to the first housing **201**. According to an embodiment, the second housing **202** may accommodate various electrical and electronic components such as a circuit board and a battery.

[0073] According to an embodiment, the first housing **201** may accommodate a motor, a speaker, a SIM socket, and/or a sub-circuit board (e.g., the second circuit board **249** in FIG. 4) electrically connected to the main circuit board. The second housing **202** may accommodate a main circuit board (e.g., the first circuit board **248** in FIG. 4) on which electrical components such as an application processor (AP) and a communication processor (CP) are mounted.

[0074] According to an embodiment, the first housing **201** may include a first cover member **211**. The first cover member **211** may include a (1-1).sup.th side wall **211a**, a (1-2).sup.th side wall **211b** extending from the (1-1).sup.th side wall **211a**, and a (1-3).sup.th side wall **211c** extending from the (1-1).sup.th side wall **211c** substantially parallel to the (1-2).sup.th side wall **211b**. According to an embodiment, the (1-2).sup.th side wall **211b** and the (1-3).sup.th side wall **211c** may be substantially perpendicular to the (1-1).sup.th side wall **211a**. According to an embodiment, the first cover member **211** may be referred to as a main case or a cover member.

[0075] According to an embodiment, the (1-1).sup.th side wall **211a**, the (1-2).sup.th side wall **211b**, and the (1-3).sup.th side wall **211c** of the first cover member **211** may have a shape that is open on one side (e.g., the front surface) to accommodate (or surround) at least a portion of the second housing **202**. For example, at least a portion of the second housing **202** may be surrounded by the first housing **201** and may be slid in a direction parallel to a first surface (e.g., the first surface F1 in FIG. 4) (e.g., the direction indicated by arrow {circle around (1)}) while being guided by the first housing **201**. According to an embodiment, the (1-1).sup.th side wall **211a**, the (1-2).sup.th side wall **211b**, and/or the (1-3).sup.th side wall **211c** of the first cover member **211** may

be integrally configured. According to an embodiment, the (1-1).sup.th side wall **211a**, the (1-2).sup.th side wall **211b**, and/or the (1-3).sup.th side wall **211c** of the first cover member **211** may be provided as separate structures and coupled or assembled to each other.

[0076] According to an embodiment, the first cover member **211** may be configured to surround at least a portion of a display **203**. For example, the display **203** may be provided to be at least partially surrounded by the (1-1).sup.th side wall **211a**, the (1-2).sup.th side wall **211b**, and/or the (1-3).sup.th side wall **211c** of the first cover member **211**.

[0077] According to an embodiment, the second housing **202** may include a second cover member **221** (e.g., a slide plate). The second cover member **221** may have a plate shape and include a first surface (e.g., the first surface **F1** in FIG. 4) supporting internal components. For example, the second cover member **221** may support at least a portion of the display **203** (e.g., the first display area **A1**). According to an embodiment, the second cover member **221** may be referred to as a front cover.

[0078] According to an embodiment, the second cover member **221** may include a (2-1).sup.th side wall **221a**, a (2-2).sup.th side wall **221b** extending from the (2-1).sup.th side wall **221a**, and a (2-3).sup.th side wall **221c** extending from the (2-1).sup.th side wall **221a** substantially parallel to the (2-2).sup.th side wall **221b**. According to an embodiment, the (2-2).sup.th side wall **221b** and the (2-3).sup.th side wall **221c** may be substantially perpendicular to the (2-1).sup.th side wall **221a**. According to an embodiment, the second cover member **221** may be referred to as an auxiliary cover member.

[0079] According to an embodiment, as the second housing **202** moves in the first direction (e.g., direction {circle around (1)}) parallel to the (2-2).sup.th side wall **211b** or the (2-3).sup.th side wall **211c**, the electronic device **101** may be in the slid-in state and the slid-out state. In the slid-in state of the electronic device **101**, the second housing **202** is positioned at a first distance from the (1-1).sup.th side wall **211a** of the first housing **201**, and in the slid-out state of the electronic device **101**, the second housing **202** may be moved to be positioned at a second distance greater than the first distance from the (1-1).sup.th side wall **211a** of the first housing **201**. In an embodiment, in the slid-in state of the electronic device **101**, the first housing **201** may be configured to partially surround the (2-1).sup.th side wall **221a**.

[0080] According to an embodiment, the electronic device **101** may be in an intermediate state between the slid-in state of FIG. 2 (e.g., the fully opened state) and the slid-out state of FIG. 3 (e.g., the fully closed state). The distance between the (1-1).sup.th side wall **211a** and the (2-1).sup.th side wall **221a** in the intermediate state of the electronic device **101** may be smaller than the distance between the (1-1).sup.th side wall **211a** and the (2-1).sup.th side wall **211a** of the electronic device **101** in the fully opened state and may be greater than the distance between the (1-1).sup.th side wall **211a** and the (2-1).sup.th side wall **221a** of the electronic device **101** in the fully closed state. According to an embodiment, as at least a portion of the display **203** slides in the intermediate state of the electronic device **101**, the area of the display exposed to the outside may be variable. For example, in the intermediate state of the electronic device **101**, the ratio of the width (the length in the X direction) and the height (the length in the Y direction) of the display **203** and/or the distance between the (1-1).sup.th side wall **211a** and the (2-1).sup.th side wall **221a** may be changed based on the slide movement of the electronic device **101**.

[0081] According to an embodiment, the electronic device **101** may include a display **203**, key input devices **245**, a connector hole **243**, audio modules **247a** and **247b**, or camera modules **249a** and **249b**. According to an embodiment, the electronic device **101** may further include an indicator (e.g., an LED device) or various sensor modules.

[0082] According to an embodiment, the display **203** may include a first display area **A1** and a second display area **A2** configured to be exposed to the exterior of the electronic device **101** based on the slide movement of the second housing **202**. According to an embodiment, the first display area **A1** may be disposed on the second housing **202**. For example, the first display area **A1** may be

disposed on the second cover member **221** of the second housing **202**. According to an embodiment, the second display area **A2** extends from the first display area **A1**, and as the second housing **202** slides relative to the first housing **201**, the second display area **A2** may be accommodated inside the first housing **201** or visually exposed to the exterior of the electronic device **101**. According to an embodiment, as the electronic device **101** is changed from the slid-out state to the slid-in state, the display **203** may be expanded in the downward direction of the electronic device **101** (e.g., the $-Y$ direction). For example, when the electronic device **101** is in the slid-out state, the second display area **A2** may be visually exposed below the display **203** (e.g., in the $-Y$ direction). According to an embodiment, as the electronic device **101** is changed from the slid-out state to the slid-in state, the display **203** may be expanded in the upward direction of the electronic device **101** (e.g., in the $+Y$ direction). For example, when the electronic device **101** is in the slid-out state, the second display area **A2** may be visually exposed above the display **203** (e.g., in the $+Y$ direction).

[0083] According to an embodiment, the second display area **A2** may move substantially while being guided by an area of the first housing **201** (e.g., the curved surface **e** in FIG. **4**), and may be accommodated in a space positioned inside the first housing **201** or exposed to the exterior of the electronic device **101**. According to an embodiment, the second display area **A2** may be moved based on the sliding of the second housing **202** in the first direction (e.g., the direction indicated by arrow {circle around (1)}). For example, while the second housing **202** slides, a portion of the second display area **A2** may be deformed into a curved shape at a position corresponding to the curved surface **213a** of the first housing **201**.

[0084] According to an embodiment, when viewed from above the second cover member **221** (e.g., the front cover), when the electronic device **101** is changed from the slid-in state to the slid-out state (for example, when the second housing **202** slides to be expanded with respect to the first housing **201**), the second display area **A2** may form a substantially flat surface together with the first display area **A1** while being gradually exposed to the exterior of the first housing **201**. According to an embodiment, the display **203** may be coupled to or arranged adjacent to a touch-sensing circuit, a pressure sensor that is capable of measuring touch intensity (pressure), and/or a digitizer that detects a magnetic field-type stylus pen. According to an embodiment, regardless whether the electronic device **101** is in the slid-in or slid-out state, a portion of the exposed second display area **A2** may be positioned on a portion of the first housing (e.g., the curved surface **213a** in FIG. **4**), and a portion of the second display area **A2** may maintain the curved shape at a position corresponding to the curved surface **213a**.

[0085] According to an embodiment, the key input devices **245** may be positioned in one area of the housing **210** (e.g., the first housing **201** and/or the second housing **202**). Depending on the external appearance and use state, the electronic device **101** may be designed such that the illustrated key input devices **245** are omitted or one or more additional key input devices are included. According to an embodiment, the electronic device **101** may include key input devices, such as a home key button or touch pads arranged around the home key button. According to an embodiment, at least some of the key input devices **245** may be disposed on the (1-1).sup.th side wall **211a**, the (1-2).sup.th side wall **211b**, and/or the (1-3).sup.th side wall **211c** of the first housing **201**. According to an embodiment, at least some of the key input devices **245** may be disposed on the (2-1).sup.th side wall **221a**, the (2-2).sup.th side wall **221b**, and/or the (2-3).sup.th side wall **221c** of the second housing **202**.

[0086] According to an embodiment, the connector hole **243** may be omitted in some embodiments and may accommodate a connector (e.g., a USB connector) for transmitting/receiving power and/or data to/from an external electronic device. According to an embodiment, the electronic device **101** may include a plurality of connector holes **243**, and some of the connector holes **243** may function as connector holes for transmitting/receiving audio signals to/from an external electronic device. In the illustrated embodiment, the connector hole **243** is positioned in the second housing **202**, but is

not limited to thereto. The connector hole **243** or a connector hole may be positioned in the first housing **201**.

[0087] According to an embodiment, the audio modules **247a** and **247b** may include one or more speaker holes **247a** or one or more microphone holes **247b**. One of the speaker holes **247a** may be provided as a receiver hole for a voice call, and another one may be provided as an external speaker hole. The electronic device **101** may include a microphone configured to acquire sound, and the microphone may acquire sound outside the electronic device **101** through the microphone holes **247b**. According to an embodiment, the electronic device **101** may include a plurality of microphones in order to detect the direction of sound. According to an embodiment, the electronic device **101** may include an audio module in which the speaker holes **247a** and the microphone holes **247b** are implemented as a single hole, or a speaker in which the speaker holes **247a** are excluded (e.g., a piezo speaker). According to an embodiment, the speaker hole **247a** and the microphone hole **247b** may be positioned in the first housing **201** and/or the second housing **202**.

[0088] According to an embodiment, the camera modules **249a** and **249b** may include a first camera module **249a** (e.g., a front camera) and a second camera module **249b** (e.g., a rear camera) (e.g., the second camera module **249b** in FIGS. 5A and 5B). According to an embodiment, the electronic device **101** may include at least one of a wide-angle camera, a telephoto camera, or a close-up camera. In some embodiments, the electronic device **101** may include an infrared projector and/or an infrared receiver to measure the distance to a subject. The camera modules **249a** and **249b** may include one or more lenses, an image sensor, and/or an image signal processor. The first camera module **249a** may be arranged to be oriented in the same direction as the display **203**. For example, the first camera module **249a** may be arranged around the first display area **A1** or in an area overlapping the display **203**, and may capture a subject through the display **203** when arranged in the area overlapping the display **203**. According to an embodiment, the first camera module **249a** may include an under-display camera (UDC) which may be hidden without being visually exposed to a screen display area (e.g., the first display area **A1**). According to an embodiment, the second camera module **249b** may capture a subject in a direction opposite to the first display area **A1**. According to an embodiment, the first camera module **249a** and/or the second camera module **249b** may be disposed on the second housing **202**. According to an embodiment, a plurality of second camera module **249b** may be provided to provide various arrangements. For example, the plurality of second camera modules **249b** may be arranged along the width direction (the X-axis direction), which is a direction substantially perpendicular to the slide movement direction (e.g., the Y-axis direction) of the electronic device **101**. As another example, the plurality of second camera modules **249b** may be arranged along the slide movement direction (e.g., the Y-axis direction) of the electronic device **101**. As another example, the plurality of second camera modules **249b** may be arranged along N*M rows and columns like a matrix.

[0089] According to an embodiment, when the electronic device **101** is in the slid-in state, the second camera module **249b** may not be visually exposed to the outside of the electronic device **101**, and when the electronic device **101** is in the slid-out state, the second camera module **249b** may capture a scene outside the electronic device **101**. According to an embodiment, the second camera module **249b** may capture a scene outside the electronic device **101** when the electronic device **101** is in the slid-in state and the slid-out state. For example, at least a portion of the housing **210** (e.g., the first rear surface plate **215** and/or the second rear surface plate **225** in FIG. 4) may be substantially transparent, and the second camera module **249b** may capture a scene outside the electronic device **101** through the first rear surface plate **215** and/or the second rear surface plate **225**.

[0090] According to an embodiment, an indicator of the electronic device **101** may be disposed on the first housing **201** or the second housing **202**, and may include a light-emitting diode to provide state information of the electronic device **101** as a visual signal. A sensor module of the electronic device **101** may generate an electrical signal or a data value corresponding to an internal operating

status of the electronic device **101** or an external environmental status. The sensor module may include, for example, a proximity sensor, a fingerprint sensor, or a biometric sensor (e.g., an iris/face recognition sensor or an HRM sensor). In another embodiment, the sensor modules may further include at least one of, for example, a gesture sensor, a gyro sensor, an atmospheric pressure sensor, a magnetic sensor, an acceleration sensor, a grip sensor, a color sensor, an infrared (IR) sensor, a temperature sensor, a humidity sensor, or an illuminance sensor. According to an embodiment, the sensor modules may be disposed in the first housing **201** and the second housing **202**. For example, at least some of the sensor modules may be positioned in the first housing **201**, while some others may be positioned in the second housing **202**.

[0091] FIG. **4** is an exploded perspective view of an electronic device according to an embodiment of the disclosure. For example, FIG. **4A** is a rear exploded perspective view of an electronic device **101** according to an embodiment.

[0092] FIG. **5A** is a cross-sectional view of an embodiment of the disclosure, taken along line A-A' in FIG. **2**. FIG. **5B** is a cross-sectional view of an embodiment of the disclosure, taken along line B-B' in FIG. **3**. FIG. **6** is a perspective view of a driving structure according to an embodiment of the disclosure.

[0093] Referring to FIG. **4**, FIG. **5A**, FIG. **5B**, and/or FIG. **6**, the electronic device **101** may include a first housing **201**, a second housing **202**, a display assembly **230**, and a driving structure **240**. The components of the first housing **201**, the second housing **202**, and the display assembly **230** of FIG. **4**, FIG. **5A** and/or FIG. **5B** may be wholly or partially the same as those of the first housing **201**, the second housing **202**, and the display **203** of FIG. **2** and/or FIG. **3**. An embodiment illustrated in FIG. **2** and/or FIG. **3** may be partially combined with embodiments illustrated in FIG. **4**, FIG. **5A**, FIG. **5B**, and/or FIG. **6**. According to an embodiment, the first housing **201** may include a first cover member **211** (e.g., the first cover member **211** in FIGS. **2** and **3**), a frame **213**, and a first rear surface plate **215**.

[0094] According to an embodiment, the first cover member **211** may accommodate at least a portion of the frame **213** and a component (e.g., the battery **289**) positioned on the frame **213**. According to an embodiment, the first cover member **211** may be configured to surround at least a portion of a second housing **202**. According to an embodiment, the first cover member **211** may protect components (e.g., the second circuit board **249** and the frame **213**) positioned in the first housing **201** from external impact. According to an embodiment, the second circuit board **249**, which accommodates electronic components, may be connected to the first cover member **211**.

[0095] According to an embodiment, the frame **213** may be connected to the first cover member **211**. For example, the frame **213** may be connected to the first cover member **211**, and the second housing **202** may be moved relative to the first cover member **211** and/or the frame **213**. According to an embodiment, the frame **213** may accommodate the battery **289**. For example, the frame **213** may include a groove to accommodate the battery **289**. The frame **213** may be connected to a battery cover **289a** and may surround at least a portion of the battery **289** together with the battery cover **289a**. According to an embodiment, the frame **213** may include a curved portion **213a** facing the display assembly **230**.

[0096] According to an embodiment, the first rear surface plate **215** may substantially define at least a portion of the exterior of the first housing **201** or the electronic device **101**. For example, the first rear surface plate **215** may be coupled to the outer surface of the first cover member **211**. According to an embodiment, the first rear surface plate **215** may provide a decorative effect on the exterior of the electronic device **101**. The first rear surface plate **215** may be made of at least one of metal, glass, synthetic resin, or ceramic.

[0097] According to an embodiment, the second housing **202** may include a second cover member **221** (e.g., the second cover member **221** in FIGS. **2** and **3**), a rear cover **223**, and a second rear surface plate **225**.

[0098] According to an embodiment, the second cover member **221** may be connected to the first

housing **201** via a guide rail **250**, and may linearly reciprocate in in one direction (e.g., the direction indicated by arrow {circle around (1)} in FIG. 3) while being guided by the guide rail **250**.

[0099] According to an embodiment, the second cover member **221** may be configured to support at least a portion of the display **203**. For example, the second cover member **221** may include a first surface **F1**, and the first display area **A1** of the display **203** may be substantially positioned on the first surface **F1** and maintained in a flat plate shape. According to an embodiment, the second cover member **221** may be made of a metal material and/or a non-metal (e.g., polymer) material.

According to an embodiment, the first circuit board **248**, which accommodates electronic components (e.g., the processor **120** and/or the memory **130** in FIG. 1), may be connected to the second cover member **221**. According to an embodiment, the second cover member **221** may protect components (e.g., the first circuit board **248** and the rear cover **223**) positioned in the second housing **202** from external impact.

[0100] According to an embodiment, the rear cover **223** may protect components (e.g., the first circuit board **248**) positioned on the second cover member **221**. For example, the rear cover **223** may be connected to the second cover member **221** and surround at least a portion of the first circuit board **248**. According to an embodiment, the rear cover **223** may include an antenna pattern for communication with an external electronic device. For example, the rear cover **223** may include a laser direct structuring (LDS) antenna.

[0101] According to an embodiment, the second rear surface plate **225** may substantially define at least a portion of the exterior of the second housing **202** or the electronic device **101**. For example, the second rear surface plate **225** may be coupled to the outer surface of the second cover member **221**. According to an embodiment, the second rear surface plate **225** may provide a decorative effect on the exterior of the electronic device **101**. The second rear surface plate **225** may be made of at least one of metal, glass, synthetic resin, or ceramic.

[0102] According to an embodiment, the display assembly **230** may include a display **231** (e.g., the display **203** in FIGS. 2 and/or 3) and a multi-bar structure **232** supporting the display **203**. According to an embodiment, the display **231** may be referred to as a flexible display, a foldable display, and/or a rollable display. According to an embodiment, the first display area **A1** of the display **231** may be supported by a rigid body, and the second display area **A2** may be supported by a bendable structure. For example, the first display area **A1** may be supported by the first surface **F1** of the second cover member **221** or a plate. The second display area **A2** may be supported by the multi-bar structure **232**.

[0103] According to an embodiment, the multi-bar structure **232** may be connected or attached to at least a portion of the display **231** (e.g., the second display area **A2**). According to an embodiment, as the second housing **202** slides, the multi-bar structure **232** may move relative to the first housing **201**. When the electronic device **101** is in the slid-in state (e.g., FIG. 2), the multi-bar structure **232** may be mostly accommodated inside the first housing **201**, and may be positioned between the first cover member **211** and the second cover member **221**. According to an embodiment, at least a portion of the multi-bar structure **232** may move to correspond to the curved surface **213a** positioned at an edge of the frame **213**. According to an embodiment, the multi-bar structure **232** may be referred to as a display support member or support structure, and may be in the form of an elastic plate.

[0104] According to an embodiment, the driving structure **240** may relatively move the second housing **202** relative to the first housing **201**. For example, the driving structure **240** may include a motor **241** configured to generate a driving force for sliding the second housing **202** relative to the first housing **201**. The driving structure **240** may include a gear **244** (e.g., a pinion) connected to the motor **241** and a rack **242** configured to be engaged with the gear.

[0105] According to an embodiment, the housing in which the rack **242** is positioned and the housing in which the motor **241** is positioned may be different. According to an embodiment, the motor **241** may be connected to the second housing **202**, and the rack **242** may be connected to the

first housing **201**. According to an embodiment, the motor **241** may be connected to the first housing **201**, and the rack **242** may be connected to the second housing **202** (e.g., the second cover member **221**). For example, the motor **241** may be mounted on the frame **213**.

[0106] According to an embodiment, the motor **241** may be controlled by a processor (e.g., the processor **120** in FIG. **1**). For example, the processor **120** may include a motor driver driving circuit and deliver a pulse width modulation (PWM) signal to the motor **241** to control the speed of the motor **241** and/or the torque of the motor **241**. According to an embodiment, the motor **241** may be electrically connected to a processor (e.g., the processor **120** in FIG. **1**) located on a circuit board (e.g., the circuit board **204** in FIG. **4**) via a flexible printed circuit board.

[0107] According to an embodiment, the second housing **202** may accommodate the first circuit board **248** (e.g., a main board). According to an embodiment, a processor, memory, and/or an interface may be mounted on the first circuit board **248**. The processor may include, for example, one or more of a central processing unit, an application processor, a graphics processing unit, an image signal processor, a sensor hub processor, or a communication processor. According to various embodiments, the first circuit board **248** may include a flexible printed circuit board-type radio frequency cable (FRC). The first circuit board **248** may be disposed in at least a portion of the second cover member **221** and may be electrically connected to an antenna module and a communication module.

[0108] According to an embodiment, the memory may include, for example, volatile memory or nonvolatile memory.

[0109] According to an embodiment, the interface may include, for example, a high-definition multimedia interface (HDMI), a universal serial bus (USB) interface, an SD card interface, and/or an audio interface. For example, the interface may electrically or physically connect the electronic device **101** to an external electronic device, and include a USB connector, an SD card/MMC connector, or an audio connector.

[0110] According to an embodiment, the electronic device **101** may include a second circuit board **249** (e.g., a sub-circuit board) spaced apart from the first circuit board **248** (e.g., a main circuit board) within the first housing **201**. The second circuit board **249** may be electrically connected to the first circuit board **248** via a connection flexible board. The second circuit board **249** may be electrically connected to the battery **289** or electrical components disposed in an end area of the electronic device **101**, such as a speaker and/or a SIM socket, to transmit signals and power. According to an embodiment, the second circuit board **249** may accommodate or be connected to a wireless charging antenna (e.g., a coil). For example, the battery **289** may receive power from an external electronic device using the wireless charging antenna. As another example, the battery **289** may transmit power to an external electronic device using the wireless charging antenna.

[0111] According to an embodiment, the battery **289** is a device that supplies power to at least one component of the electronic device **101**, and may include a non-rechargeable primary battery, a rechargeable secondary battery, or a fuel cell. The battery **289** may be integrally disposed inside the electronic device **101** or may be detachably disposed on the electronic device **101**. According to an embodiment, the battery **289** may be configured as a single integrated battery or may include a plurality of separable batteries. According to an embodiment, the battery **289** may be positioned on the frame **213**. For example, the battery **289** may be surrounded by the frame **213** and the battery cover **289a**. According to another embodiment, the battery may be positioned within the second housing **202** to be slidable with the second housing **202**.

[0112] According to an embodiment, the guide rail **250** may guide the movement of the multi-bar structure **232**. For example, the multi-bar structure **232** may slide along the slit **251** provided in the guide rail **250**. According to an embodiment, the guide rail **250** may be connected to the first housing **201**. For example, the guide rail **250** may be connected to the first cover member **211** and/or the frame **213**. According to an embodiment, the slit **251** may be referred to as a groove or recess provided on the inner surface of the guide rail **250**.

[0113] According to an embodiment, the guide rail **250** may provide a force to the multi-bar structure **232** based on the driving of the motor **241**.

[0114] According to an embodiment, when the electronic device **101** is changed from the slid-in state to the slid-out state, the inner portion **252** of the guide rail **250** may provide a force to the multi-bar structure **232**. The multi-bar structure **232**, which has received the force, may move along the slit **251** of the guide rail **250**, and the second housing **202** may slide to be expanded with respect to the first housing **201**. At least a portion of the display assembly **230** accommodated between the first cover member **211** and the frame **213** may be expanded to the front surface.

[0115] According to an embodiment, when the electronic device **101** is changed from the slid-out state to the slid-in state, the outer portion **253** of the guide rail **250** may provide a force to the bent multi-bar structure **232**. The multi-bar structure **232**, which has received the force, may move along the slit **251** of the guide rail **250**, and the second housing **202** may slide to be at least partially accommodated in the first housing **201**. At least a portion of the display assembly **230** may be accommodated between the first cover member **211** and the frame **213**.

[0116] Referring to FIG. 5A, when the electronic device **101** is in the slid-in state, at least a portion of the second housing **202** may be disposed to be accommodated in the first housing **201**. As the second housing **202** is disposed to be accommodated in the first housing **201**, the overall volume of the electronic device **101** may be reduced. According to an embodiment, when the second housing **202** is accommodated in the first housing **201**, the visually exposed size of the display **231** may be minimized. For example, when the second housing **202** is fully accommodated in the first housing **201**, the first display area A1 of the display **231** is visually exposed, and at least a portion of the second display area A2 (e.g., the portion oriented in the -Z axis direction) may be disposed between the battery **289** and the first rear surface plate **215**.

[0117] Referring to FIG. 5B, when the electronic device **101** is in the slid-out state, at least a portion of the second housing **202** may protrude from the first housing **201**. As the second housing **202** protrudes from the first housing **201**, the overall volume of the electronic device **101** may increase. According to an embodiment, when the second housing **202** protrudes from the first housing **201**, at least a portion of the second display area A2 of the display **231** may be visually exposed to the exterior of the electronic device **101** together with the first display area A1.

[0118] FIG. 7 is a rear view of an electronic device according to an embodiment of the disclosure. FIG. 8 is an exploded perspective view of an accessory and an electronic device including a magnet according to an embodiment of the disclosure.

[0119] Referring to FIG. 7 and/or FIG. 8, the electronic device **101** may include a first cover member **211**, a power receiving circuit **310**, and a magnet **320**. The electronic device **101** may be attached to an external accessory **400** using the magnet **320**. The configuration of the first cover member **211** of FIG. 7 and/or FIG. 8 may be wholly or partially the same as the configuration of the first cover member **211** of FIG. 4, and the configuration of the power receiving circuit **310** of FIG. 7 may be wholly or partially the same as the configuration of the second circuit board **249** of FIG. 4.

[0120] According to an embodiment, the electronic device **101** may receive power from the accessory **400**. For example, the electronic device **101** may include a power receiving circuit **310** configured to receive power from the external accessory **400** that includes a power transmitting circuit. The power receiving circuit **310** may include a matching circuit, a rectifying circuit, an adjusting circuit, a switching circuit, and/or a coil. For example, the power receiving circuit **310** may receive wireless power in the form of an electromagnetic wave generated in response to a current and/or voltage applied to a coil of a power transmitting circuit through the coil. For example, the power receiving circuit **310** may receive power by using an electromotive force formed in the coil of the power transmitting circuit and the coil of the power receiving circuit **310**.

[0121] According to an embodiment, the power receiving circuit **310** and the magnet **320** may be disposed on the housing **201**. For example, the power receiving circuit **310** and the magnet **320**

may be disposed on the first cover member **211**. According to an embodiment, the power receiving circuit **310** and the magnet **320** may be positioned in an opposite direction of the magnetic field detection sensor **350** with respect to the first cover member **211**. For example, the power receiving circuit **310** and the magnet **320** may be attached to the outer surface of the first cover member **211**. The magnetic field detection sensor **350** may be attached to the inner surface of the first cover member **211**.

[0122] According to an embodiment, the magnet **320** may align or adjust the position of the accessory **400**. The magnet **320** may generate a magnetic field to guide the attachment of the accessory **400** (e.g., a wireless power transmitting device). For example, the accessory **400** may be attached to the electronic device **101** based on the magnetic force between the external magnet **410** and the magnet **320**. When the accessory **400** is attached to the electronic device **101**, the magnet **320** may overlap at least a portion of the external magnet **410** of the accessory **400**. According to an embodiment, the external magnet **410** of the accessory **400** and the magnet **320** of the electronic device **101** may be positioned relative to substantially the same center point (e.g., the center point O in FIG. 11).

[0123] According to an embodiment, the magnet **320** may be disposed on a housing (e.g., the housing **201** in FIG. 3). For example, the magnet **320** may be disposed on the first cover member **211**. The magnet **320** may be positioned between the first cover member **211** and the first rear surface plate (e.g., the rear surface plate **215** in FIG. 4).

[0124] According to an embodiment, the accessory **400** may be a wireless charging device or a wireless power transmitting device. For example, the external accessory **400** may include a transmitting coil for wireless power transmission.

[0125] According to an embodiment, the accessory **400** may include an external magnet **410**. The external magnet **410** may be referred to as an accessory fixing magnet. The accessory **400** may be attached to an electronic device **101** including a magnet **320** using the external magnet **410**.

[0126] FIG. 9 is a rear perspective view of an electronic device according to an embodiment of the disclosure.

[0127] Referring to FIG. 9, the electronic device **101** may include a first cover member **211** and a power receiving circuit **310**. The configurations of the first cover member **211** and the power receiving circuit **310** of FIG. 9 may be wholly or partially the same as the configurations of the first cover member **211** and the power receiving circuit **310** of FIG. 7 and/or FIG. 8.

[0128] According to an embodiment, the electronic device **101** may determine a slide distance of the electronic device **101**. The slide distance may be referred to as the distance that the second housing (e.g., the second housing **202** in FIG. 4) moves relative to the first housing (e.g., the first housing **201** in FIG. 4).

[0129] According to an embodiment, the electronic device **101** may include at least one position determination magnet **340** and a magnetic field detection sensor **350** configured to detect the position determination magnet **340**.

[0130] According to an embodiment, the magnetic field detection sensor **350** may include a plurality of hall sensors **351**. The magnetic field detection sensor **350** may detect a magnetic force generated by the position determination magnet **340**. A processor (e.g., the processor **120** in FIG. 1) may determine the slide distance of the electronic device **101** based on a signal detected by the magnetic field detection sensor. For example, the processor **120** may determine the distance by which the second housing (e.g., the second housing **202** in FIG. 3) slides relative to the first housing (e.g., the first housing **201** in FIG. 3). The slide distance may be referred to as an extension distance of the electronic device **101**.

[0131] According to an embodiment, the position determination magnet **340** may include a first position determination magnet **341** and a second position determination magnet **342** spaced apart from the first position determination magnet **341**. The magnetic field detection sensor **350** may detect a magnetic field generated from the first position determination magnet **341** in the slid-in

state of the electronic device **101** (e.g., FIG. 2). The magnetic field detection sensor **350** may detect a magnetic field generated from the second position determination magnet **342** in the slid-out state of the electronic device **101** (e.g., FIG. 3).

[0132] According to an embodiment, the plurality of hall sensors **351** may include a first sensor **351a**, a second sensor **351b**, a third sensor **351c**, and a fourth sensor **351d** spaced apart from each other. The first sensor **351a**, the second sensor **351b**, the third sensor **351c**, and the fourth sensor **351d** may be arranged along a slide direction of the electronic device **101** (e.g., the Y-axis direction). The processor **120** may determine the slide distance of the electronic device **101** based on the number or type of hall sensors **351** that detect a magnetic field.

[0133] According to an embodiment, the number of hall sensors **351** included in the magnetic field detection sensor **350** may be selectively designed. For example, in FIG. 9, the magnetic field detection sensor **350** is illustrated as having a structure including four hall sensors **351**, but the number of hall sensors **351** is not limited thereto.

[0134] According to an embodiment, the magnetic field detection sensor **350** may include a flexible circuit board **352**. The plurality of hall sensors **351** may be arranged on the flexible circuit board **352**. The plurality of hall sensors **351** may be electrically connected to the processor (e.g., the processor **120** in FIG. 1) via the flexible circuit board **352**.

[0135] According to an embodiment, the magnetic field detection sensor **350** and the position determination magnet **340** may be connected to different housings (e.g., the first housing **201** or the second housing **202** in FIG. 3). For example, when the electronic device **101** slides, the magnetic field detection sensor **350** may move relative to the position determination magnet **340**. In an embodiment, the position determination magnet **340** may be connected to the first housing **201**, and the magnetic field detection sensor **350** may be connected to the second housing **202**. In an embodiment, the position determination magnet **340** may be connected to the second housing **202**, and the magnetic field detection sensor **350** may be connected to the first housing **201**.

[0136] FIG. 10 is a front view of an electronic device including a magnet, a shielding member, and a magnetic field detection sensor according to an embodiment of the disclosure. FIG. 11 is a view illustrating a positional relationship of a magnet according to an embodiment of the disclosure.

[0137] Referring to FIG. 10 and/or FIG. 11, an electronic device **101** may include a magnet **320**, a shielding member **330**, and a magnetic field detection sensor **350**. The configurations of the magnet **320**, the shielding member **330**, and the magnetic field detection sensor **350** of FIG. 10 may be wholly or partially the same as the configurations of the magnet **320**, the shielding member **330**, and the magnetic field detection sensor **350** of FIG. 9.

[0138] According to an embodiment, the magnet **320** may have an arc shape. For example, the magnet **320** may be spaced apart from a center point O by a predetermined distance. According to an embodiment, the magnet **320** may have a “C” shape.

[0139] According to an embodiment, the magnet **320** may have a “C” shape or a shape with a portion removed from a ring structure. For example, the magnet **320** may include a first magnet **320a** and a second magnet **320b** spaced apart from the first magnet **320a**. Empty spaces **320c** and **320d** may be positioned between the first magnet **320a** and the second magnet **320b**.

[0140] According to an embodiment, the empty spaces **320c** and **320d** between the first magnet **320a** and the second magnet **320b** may be directed toward an electronic component of the electronic device **101**. For example, the empty spaces **320c** and **320d** may be at least partially positioned between the center point O of the magnet **320** and the electronic component. According to an embodiment, a first empty space **320c** may be positioned between the center point O and the magnetic field detection sensor **350**. A second empty space **320d** may be positioned between the center point O and another electronic component (e.g., the camera module **180** or the antenna module **197**). According to an embodiment, a portion of the magnet **320** may be spaced apart from the magnet to form an empty space, thereby reducing the intensity of the magnetic field transmitted to the electronic component. According to an embodiment, the shielding member **330** may be

provided in multiple pieces. For example, the shielding member **330** may include a first shielding member positioned within the first empty space **320c** and a second shielding member positioned within the second empty space **320d**. According to an embodiment, the sizes of the empty spaces **320c** and **320d** may be selectively designed based on the size or position of the electronic component (e.g., a magnetic field detection sensor **350**) affected by a magnetic field generated from the magnet **320**.

[0141] According to an embodiment, the electronic device **101** may include an electronic component configured to generate a magnetic field or detect a magnetic field. The electronic component may include a magnetic field detection sensor **350**, a camera module (e.g., the camera module **180** in FIG. 1), and/or an antenna module (e.g., the antenna module **197** in FIG. 1). The performance of the electronic component may be reduced by a magnetic field generated by the magnet **320** of the electronic device **101** and/or an external magnet (e.g., the external magnet **410** in FIG. 8) of an accessory (e.g., the accessory **400** in FIG. 8) configured to be attached to the electronic device **101**. For example, a hall sensor **351** of the magnetic field detection sensor **350**, a magnet for optical image stabilization (OIS) function for vibration compensation of the camera module **180**, and a sensor for detecting the magnet, a mm Wave antenna module, and/or a UWB patch antenna may have their performance reduced in response to the magnetic field transmitted from the magnet **320** and/or the external magnet **410**.

[0142] According to an embodiment, the description of the positional relationship between the hall sensor **351** of the magnetic field detection sensor **350** and the shielding member **330** may be applied to the positional relationship between the camera module **180** and the shielding member **330** or the positional relationship between the antenna module **197** and the shielding member **330**.

[0143] According to an embodiment, the shielding member **330** may reduce the influence of the magnetic field generated from the magnet **320** on the electronic component. For example, the sensor of the electronic component may receive the magnetic field generated from the magnet **320** of the electronic device **101** and/or the external magnet **410** of the accessory **400**. The shielding member **330** may absorb at least a portion of the magnetic field generated from the magnet **320** and/or the external magnet **410**. Since the shielding member **330** at least partially absorbs of the magnetic field, the intensity of the magnetic field transmitted to the electronic component may be reduced. According to an embodiment, the shielding member **330** may be referred to as a shield or a shielding structure.

[0144] According to an embodiment, at least a portion of the shielding member **330** may be positioned on an extension line L between the center point O of the magnet **320** and the electronic component (e.g., the magnetic field detection sensor **350**). The extension line L may be a virtual line connecting the center point O of the magnet **320** and a hall sensor **351** of the magnetic field detection sensor **350**. Since the shielding member **330** is positioned between the center point O of the magnet **320** and the magnetic field detection sensor **350**, the intensity of the magnetic field transmitted to the magnetic field detection sensor **350** (e.g., the magnetic field generated from the magnet **320**) may be reduced. According to an embodiment, the extension line L may be a virtual line connecting the center point O of the magnet **320** and a hall sensor (e.g., the first hall sensor **351a**) that is closest to the center point O among the plurality of hall sensors **351a**, **351b**, **351c**, and **351d**. According to an embodiment, the extension line L may pass through an empty space between the first magnet **320a** and the second magnet **320b** (e.g., the first void space **320c**). According to an embodiment, a cutout center **320e** of the magnet **320** may be positioned along the extension line L. The cutout center **320e** of the magnet **320** may be referred to as the center position of a portion (e.g., the first empty space **320c**) from which the magnet **320** is removed.

[0145] According to an embodiment, the magnet **320** may face at least a portion of the shielding member **330**. For example, the magnet **320** may include a second end **322** facing the first end **321**. According to an embodiment, the first end **321** may be one end of the first magnet **320a**, and the second end **322** may be one end of the second magnet **320b**. At least a portion of the shielding

member **330** may be positioned between the first end **321** and the second end **322**. According to an embodiment, the shielding member **330** may be positioned between the magnets **320**. For example, the shielding member **330** may be positioned between a portion of the first magnet **320a** (e.g., the first end **321**) and a portion of the second magnet **320** (e.g., the second end **322**).

[0146] According to an embodiment, the shielding member **330** may be made of a material for shielding a magnetic field transmitted to the electronic component. For example, the shielding member **330** may include steel plate cold commercial (SPCC). The maximum relative magnetic permeability of the shielding member **330** may be 3,000 to 10,000. The thickness of the shielding member **330** may be 0.2 mm to 5 mm. The saturation flux density of the shielding member **330** may be 1.7 T to 2.3 T. The coercive force of the shielding member **330** may be 380 A/m.

[0147] FIGS. **12A** and **12B** are views illustrating a positional relationship between a magnet and a hall sensor according to an embodiment of the present disclosure. FIGS. **13A** and **13B** are views illustrating a structure for designing the shape of a magnet according to an embodiment of the disclosure.

[0148] Referring to FIG. **12A**, FIG. **12B**, FIG. **13A**, and/or FIG. **13B**, the electronic device **101** may include a magnet **320** and a hall sensor **351**. The position of the extension line L may be changed based on the positions of the magnet **320** and the hall sensor **351**. The configurations of the magnet **320** and the hall sensors **351** of FIG. **12A**, FIG. **12A**, FIG. **13A**, and/or FIG. **13B** may be wholly or partially the same as the configurations of the magnet **320** and the hall sensor **351** (e.g., the first hall sensor **351a**) of FIG. **10** and/or FIG. **11**.

[0149] According to an embodiment, the portion from which the magnet **320** is removed may be designed asymmetrically (e.g., FIG. **12A** and/or FIG. **12B**). The extension line L may be positioned asymmetrically. For example, the distance between the extension line L and the first end **321** of the first magnet **320a** may be different from the distance between the extension line L and the second end **322** of the second magnet **320b**. According to an embodiment, the position of the extension line L may be selectively designed based on the arrangement relationship between the hall sensor **351** and the center point O.

[0150] According to an embodiment (e.g., FIGS. **12A** and **13A**), the extension line L may be defined based on the first end **3511** of the hall sensor **351**. For example, the extension line L may extend from the center point O of the magnet **320** to the first end **3511** of the hall sensor **351**. The distance between the extension line L and the first magnet **320a** may be smaller than the distance between the center **320e** of the first empty space **320c** and the first magnet **320a**.

[0151] According to an embodiment (e.g., FIGS. **12A** and **13A**), the shape of the magnet **320** may be designed with reference to the first end **3511** of the hall sensor **351**. For example, the first empty space **320c** of the magnet **320** may be referred to as an area where a portion of the ring-shaped magnet overlapping a first magnet cutout line ML1 is removed. By forming the first empty space **320c**, the magnet **320** may have a substantially circular arc shape.

[0152] According to an embodiment, the first empty space **320c** may be a space where a portion of a magnet positioned on a line extending from the first magnet deletion line ML1 and the center point O of the magnet **320** is removed. The first magnet cutout line ML1 may be an external common tangent of a first virtual circle d1 formed about a first point P1 and a second virtual circle d2 formed about a second point P2. The first point P1 may be a point of an electronic component (e.g., the hall sensor **351**) closest to the first end **321**. The second point P2 may be a point of an electronic component (e.g., the hall sensor **351**) closest to the second end **322**. The radius of the first virtual circle d1 may be the distance from the first point P1 to the first end **321** of the magnet **320**. The length of the radius of the second virtual circle d2 may be the same as the length of the radius of the first virtual circle d1.

[0153] According to an embodiment (e.g., FIGS. **12B** and **13B**), the extension line L may be defined based on the second end **3512** of the hall sensor **351**. For example, the extension line L may extend from the center point O of the magnet **320** to the second end **3512** of the hall sensor

351. The distance between the extension line L and the second magnet **320a** may be smaller than the distance between the center **320e** of the first empty space **320c** and the second magnet **320b**. [0154] According to an embodiment (e.g., FIGS. **12B** and **13B**), the shape of the magnet **320** may be designed with reference to the second end **3512** of the hall sensor **351**. For example, the first empty space **320c** of the magnet **320** may be referred to as an area where a portion of the ring-shaped magnet overlapping a second magnet cutout line ML2 is removed. By forming the first empty space **320c**, the magnet **320** may have a substantially circular arc shape.

[0155] According to an embodiment, the first empty space **320c** may be a space where a portion of a magnet positioned on a line extending from the second magnet deletion line ML2 and the center point O of the magnet **320** is removed. The second magnet cutout line ML2 may be an external common tangent of a second virtual circle d2 formed about a second point P2 and a first virtual circle d1 formed about a first point P1. The second point P2 may be a point of an electronic component (e.g., the hall sensor **351**) closest to the second end **322**. The first point P1 may be a point of an electronic component (e.g., the hall sensor **351**) closest to the first end **321**. The radius of the second virtual circle d2 may be the distance from the second point P2 to the second end **322** of the magnet **320**. The length of the radius of the first virtual circle d1 may be the same as the length of the radius of the second virtual circle d2.

[0156] The structure of the electronic device **101** of FIG. **12A**, FIG. **12B**, FIG. **13A**, or FIG. **13B** (e.g., the arrangement structure of the magnet **320** and the hall sensor **351**) may be applied to the previously described embodiments (e.g., the electronic device **101** of FIGS. **1** to **10**).

[0157] FIG. **14A** is a view illustrating the structure of an electronic device facing an external accessory. FIG. **14B** is a cross-sectional view taken along line C-C' of FIG. **15**.

[0158] Referring to FIGS. **14A** and **14B**, the electronic device **101** may include a power receiving circuit **310**, a magnet **320**, and a magnetic field detection sensor **350**. The magnet **320** may attach an accessory **400** to the electronic device **101**. For example, the accessory **400** may include an external magnet **410** and a power transmitting circuit assembly **420** at least partially surrounded by the external magnet **410**. The configurations of the power receiving circuit **310**, the magnet **320**, the accessory **400**, and the external magnet **410** of FIGS. **14A** and **14B** may be wholly or partially the same as the configurations of the power receiving circuit **310**, the magnet **320**, the accessory **400**, and the external magnet **410** of FIG. **8**. The configuration of the magnetic field detection sensor **350** of FIGS. **14A** and **14B** may be wholly or partially the same as the configuration of the magnetic field detection sensor **350** of FIG. **9**.

[0159] According to an embodiment, the power receiving circuit **310** may include a conductive sheet. The conductive sheet may reduce an eddy current or amplify a signal amplitude. For example, the conductive sheet may reduce magnetic resistance and increase power transmission efficiency. The conductive sheet may include at least one of a nanocrystal sheet or a ferrite. According to an embodiment, at least a portion of the power receiving circuit **310** may be surrounded by a magnet **320**.

[0160] According to an embodiment, the magnet **320** may generate a magnetic field to attract an external magnet **410** of the accessory **400**. By the attractive force between the magnet **320** and the external magnet **410**, the accessory **400** may be attached to the electronic device **101**. Based on the attractive force between the magnet **320** and the external magnet **410**, the power transmitting circuit assembly **420** may be aligned toward the power receiving circuit **310**. By making at least a portion of the power transmitting circuit assembly **420** face at least a portion of the power receiving circuit **310**, the wireless charging efficiency may be increased.

[0161] According to an embodiment, the magnetization characteristic of the magnet **320** may be selectively designed. For example, the arrangement of the N and S poles of the magnet **320** may have a shape to reduce the magnetic field transmitted to the electronic component. According to an embodiment, at least a portion of the magnet **320** may include N and S poles facing in the thickness direction of the electronic device **101** (e.g., the Z-axis direction). At least a portion of the magnet

320 may include the N and S poles oriented in the width direction of the electronic device **101** (e.g., the X-axis direction).

[0162] According to an embodiment, the accessory **400** may include an external magnet **410** and a power transmitting circuit assembly **420** at least partially surrounded by the external magnet **410**. The power transmitting circuit assembly **420** may include a transmitting coil and a ferrite at least partially surrounded by the transmitting coil. The ferrite may reduce magnetic resistance and increase power transmitting efficiency.

[0163] According to an embodiment, when the accessory **400** is attached to the electronic device **101**, at least a portion of the magnetic field generated from the magnet **320** and at least a portion of the magnetic field generated from the external magnet **410** may be transmitted to the magnetic field detection sensor **350**.

[0164] FIG. **15** is a front view of an electronic device including a magnet and a shielding member with an external magnet attached thereto according to an embodiment of the disclosure. FIG. **16** is a view of a shielding member according to an embodiment of the disclosure.

[0165] Referring to FIGS. **15** and **16**, the electronic device **101** may include a magnet **320** and a shielding member **330**. The configurations of the magnet **320**, the shielding member **330**, and the external magnet **410** of FIG. **15** and/or FIG. **16** may be wholly or partially the same as the configurations of the magnet **320**, the shielding member **330**, and the external magnet **410** of FIG. **14B**.

[0166] According to an embodiment, the shielding member **330** may absorb at least a portion of the magnetic field generated from the magnet **320** and the external magnet **410**. For example, the shielding member **330** may reduce the intensity of the magnetic field transmitted to the electronic component (e.g., the hall sensor **351** of the magnetic field detection sensor **350** in FIG. **14B**).

[0167] According to an embodiment, the shielding member **330** may have a shape to reduce the transmission of the magnetic field generated from the magnet **320** and the magnetic field generated from the external magnet **410** to the electronic component. For example, the shielding member **330** may include a central area **331** and wing structures **332** and **333** protruding from the central area **331**. The central area **331** may face the magnet **320**. For example, the central area **331** may be positioned between the first end **321** of the first magnet **320a** and the second end **322** of the second magnet **320b**. At least a portion of the central area **331** may be positioned between the first wing structure **332** and the second wing structure **333**. The wing structure **332** may face the external magnet **410**. For example, the wing structure **332** may have a structure extending along the outer edge of the magnet **320**. According to an embodiment, the wing structures **332** and **333** may include a first wing structure **332** formed along the edge of the first magnet **320a** and the second wing structure **333** formed along the edge of the second magnet **320b**. For example, the first wing structure **332** may have an arc shape extending along a portion of the first magnet **320a**. The second wing structure **333** may have an arc shape extending along a portion of the second magnet **320b**. The central area **331** of the shielding member **330** may face at least a portion of the external magnet **410**. The wing structures **332** and **333** of the shielding member **330** may at least partially not face the external magnet **410**. For example, the wing structures **332** and **333** may at least partially protrude in the width direction of the electronic device **101** more than the external magnet **410**.

[0168] According to an embodiment, the shape of the shielding member **330** may be selectively designed based on the position of the electronic component, the sensitivity of the electronic component, and the separation distance between the magnet **320** and the electronic component. For example, at least one of the first wing structure **332** or the second wing structure **333** may be selectively removed. In an embodiment, the length of the first wing structure **332** may be different from that of the second wing structure **333**.

[0169] According to an embodiment, the size of the external magnet **410** may be larger than that of the magnet **320**. For example, the external magnet **410** may have a ring or arc shape formed about

the same point as the center point O of the magnet **320**. The external magnet **410** may have a third width **w3** greater than the first width **w1** of the magnet **320**. According to an embodiment, the inner diameter of the external magnet **410** may be substantially the same as the inner diameter of the magnet **320**, and the outer diameter of the external magnet **410** may be greater than the outer diameter of the magnet **320**.

[0170] According to an embodiment, the shielding member **330** may have a width greater than the magnet **320** and/or the external magnet **410**. For example, the second width **w2** of the central area **331** of the shielding member **330** may be greater than the third width **w3** of the magnet **320** or the first width **w1** of the external magnet **410**. By making the second width **w2** of the shielding member **330** greater than the first width **w1** of the magnet **320** and the third width **w3** of the external magnet **410**, the transmission of the magnetic field generated by the magnet **320** as well as the magnetic field generated by the external magnet **410** to the electronic components may be reduced. According to an embodiment, the second width **w2** may be selectively designed based on the sensitivity of the electronic component and the separation distance between the magnet **320** and the electronic component.

[0171] The structure of the shielding member **330** of FIG. **15** and/or FIG. **16** may be applied to the previously described embodiments (e.g., the electronic device **101** of FIGS. **1** to **14B**). For example, the electronic device **101** may include the shielding member **330** described with reference to FIG. **15** and/or FIG. **16**. However, the shape of the shielding member **330** is not limited thereto. For example, depending on the internal design of the electronic device **101**, at least one of the first wing structure **332** or the second wing structure **333** may be omitted.

[0172] FIGS. **17A** and **17B** are views illustrating a positional relationship between the shielding member and the hall sensor according to an embodiment of the disclosure.

[0173] Referring to FIGS. **17A** and **17B**, the electronic device **101** may include a magnet **320** and a hall sensor **351**. The position of the extension line L may be changed based on the positions of the magnet **320** and the hall sensor **351**.

[0174] The configurations of the magnet **320** and the hall sensor **351** of FIGS. **17A** and **17B** may be wholly or partially the same as the configurations of the magnet **320** and the hall sensor **351** (e.g., the first hall sensor **351a**) of FIG. **12A**, FIG. **12B**, FIG. **13A**, and/or FIG. **13B**, and the configuration of the shielding member **330** of FIGS. **17A** and **17B** may be wholly or partially the same as the configuration of the shielding member **330** of FIGS. **15** and **16**. For example, the description of the magnet **320** including the first magnet **320a** and the second magnet **320b** of FIG. **12A**, FIG. **12B**, FIG. **13A**, and/or FIG. **13B**, and the hall sensor **351** including the first end **3511** and the second end **3512** may be applied to FIGS. **17A** and **17B**.

[0175] According to an embodiment, the shielding member **330** may be positioned between the center point O of the magnet **320** and the electronic component (e.g., the hall sensor **3511**). For example, the shielding member **330** may be positioned on the extension line L connecting the center point O of the magnet **320** and the electronic component. At least a portion of the central area **331** of the shielding member **330** may be positioned on the extension line L.

[0176] According to an embodiment, the shape of the shielding member **330** may be designed asymmetrically. For example, the distance between the extension line L and the first wing structure **332** may be different from the distance between the extension line L and the second wing structure **333**. According to an embodiment (e.g., FIG. **17A**), the extension line L may extend from the center point O of the magnet **320** to the first end **3511** of the hall sensor **351**. The first wing structure **332** of the shielding member **330** may be disposed closer to the extension line L than the second wing structure **333**. According to an embodiment (e.g., FIG. **17B**), the extension line L may extend from the center point O of the magnet **320** to the second end **3512** of the hall sensor **351**. The second wing structure **333** of the shielding member **330** may be disposed closer to the extension line L than the first wing structure **332**. The position where the shielding member **330** is disposed may be selectively designed based on the intensity of the magnetic field of the magnet

320 and/or the position of the electronic component (e.g., the hall sensor **351**).

[0177] The structure of the electronic device **101** of FIG. **17A** and/or FIG. **17B** (e.g., the arrangement structure of the magnet **320**, the shielding member **330**, and the hall sensor **351**) may be applied to the previously described embodiments (e.g., the electronic device **101** of FIGS. **1** to **16**).

[0178] An electronic device (e.g., a portable terminal) may include a display having a flat surface or a flat surface and a curved surface. An electronic device including a display may have a limitation in implementing a screen larger than the size of the electronic device due to a fixed display structure. Accordingly, electronic devices including a rollable display are being researched.

[0179] An electronic device may include an accessory attachable to the electronic device or a magnet attachable to a wireless power transmitting device in order to maximize portability and convenience for a user. The accessory or the wireless power transmitting device may include an external magnet to be attached to the electronic device. The performance of an electronic component of the electronic device may be reduced by magnetic fields generated by a magnet inside the electronic device and an external magnet.

[0180] An embodiment of the disclosure may provide an electronic device that includes a shielding member capable of reducing the intensity of a magnetic field generated by a magnet positioned inside an external accessory or a wireless power transmitting device transmitted to the electronic component. By reducing the intensity of the magnetic field transmitted to the electronic component, malfunction of the electronic component may be reduced and the sensing accuracy of the electronic component may be increased. For example, the accuracy of a hall sensor for determining a slide distance in a rollable electronic device may be increased.

[0181] According to an embodiment of the disclosure, an electronic device (e.g., the electronic device **101** in FIG. **2**) may include a housing (e.g., the housing **210** in FIG. **3**) including a first housing (e.g., the first housing **201** in FIG. **3**) and a second housing (e.g., the second housing **202** in FIG. **3**) configured to move relative to the first housing, a display (e.g., the display **203** in FIG. **3**) configured to be unrolled based on the sliding of the second housing, an electronic component (e.g., the magnetic field detection sensor **350** in FIG. **9**, the camera module **249b** in FIG. **3**, and/or the antenna module **197** in FIG. **1**) disposed within the housing and configured to detect a magnetic field, a magnet (e.g., the magnet **320** in FIG. **7**) disposed within the housing, including a first end (e.g., the first end **321** in FIG. **10**) and a second end (e.g., the second end **322** in FIG. **10**) facing the first end, and having an arc shape, and a shielding member (e.g., the shielding member **330** in FIG. **10**) having at least a portion positioned between the first end and the second end, and at least a portion positioned on an extension line (e.g., the extension line **L** in FIG. **9**) between the center point of the magnet (e.g., the center point **O** in FIG. **9**) and the electronic component. Due to the shielding member, the intensity of the magnetic field transmitted to the electronic component may be reduced, thereby reducing malfunction of the electronic component. For example, the shielding member may reduce the intensity of the magnetic field generated by the magnet and/or the magnetic field included in an external accessory to be attached to the electronic device transmitted to the electronic component.

[0182] According to an embodiment of the disclosure, the electronic device may reduce the intensity of at least some of the magnetic field generated by the magnet and/or at least some of the magnetic field generated by the external magnet and transmitted to the electronic component (e.g., a magnetic field detection sensor, a camera module, and/or an antenna module) by using the shielding member positioned on the extension line connecting the center point of the magnet and the electronic component. In addition, various effects that are directly or indirectly identified through this document may be provided.

[0183] According to an embodiment, the electronic device may further include a position determination magnet (e.g., the position determination magnet **340** in FIG. **9**) disposed within the housing. The electronic component may include a magnetic field detection sensor (e.g., the

magnetic field detection sensor **350** in FIG. **9**) configured to slide relative to the position determination magnet, and to detect a magnetic field generated from the position determination magnet.

[0184] According to an embodiment, the electronic device may further include a processor (e.g., the processor **120** in FIG. **1**) configured to determine a slide distance of the electronic device based on a signal detected by the magnetic field detection sensor.

[0185] According to an embodiment, the magnetic field detection sensor may include a plurality of hall sensors (e.g., the hall sensors **351** in FIG. **10**) arranged along a first direction in which the electronic device slides (e.g., the Y-axis direction of FIG. **10**). The extension line in the electronic device is a line extending from the center point of the magnet to a first hall sensor (e.g., the first hall sensor **351** in FIG. **9**) closest to the magnet among the plurality of hall sensors.

[0186] According to an embodiment, the shielding member has relative magnetic permeability of 3,000 to 10,000, and saturation magnetic flux density of 1.7 T to 2.3 T. The magnetic field transmitted to the electronic component may be at least partially shielded by the shielding member.

[0187] According to an embodiment, the first magnet may include a first magnet (e.g., the first magnet **320a** in FIG. **10**) including the first end and a second magnet (e.g., the second magnet **320b** in FIG. **10**) spaced apart from the first magnet and including the second end.

[0188] According to an embodiment, the shielding member may include a central area (e.g., the central area **330** in FIG. **16**) positioned between the first magnet and the second magnet, a first wing structure (e.g., the first wing structure **332** in FIG. **16**) extending from the central area along an edge of the first magnet, and a second wing structure (e.g., the second wing structure **333** in FIG. **16**) extending from the central area along an edge of the second magnet.

[0189] According to an embodiment, the electronic device may further include a power receiving circuit (e.g., the power receiving circuit **310** in FIG. **7**) disposed within the housing and having at least a portion facing the magnet.

[0190] According to an embodiment, the first housing may include a first cover member (e.g., the first cover member **211** in FIG. **4**) and a frame (e.g., the frame **213** in FIG. **4**) surrounded by the first cover member. The second housing may include a second cover member (e.g., the second cover member **221** in FIG. **4**) at least partially accommodated within the first cover member. The magnet and the power receiving circuit may be disposed on the first cover member.

[0191] According to an embodiment, the magnet may have a first width (e.g., the first width **w1** in FIG. **14B**) smaller than a second width (e.g., the second width **w2** in FIG. **14B**) of the shielding member. Since the width of the shielding member is larger than the width of the magnet, the magnetic field generated from the magnet and the external magnet attached to the magnet may be effectively shielded by the shielding member.

[0192] According to an embodiment, the electronic component may include a camera module (e.g., the first camera module **180** in FIG. **1** and/or the camera modules **249a** and **249b** in FIG. **3**) disposed on the housing. The shielding member may be positioned between the center point of the magnet and the camera module. By shielding the magnetic field transmitted to the camera module by the shielding member, the camera performance (e.g., anti-shake function) may be improved.

[0193] According to an embodiment, the electronic component may further include an antenna module (e.g., antenna module **197** in FIG. **1**) disposed within the housing. The shielding member may be positioned between the center point of the magnet and the antenna module. By shielding the magnetic field transmitted to the antenna module by the shielding member, the antenna performance may be improved.

[0194] According to an embodiment, the electronic component may further include a driving structure (e.g., the driving structure **240** in FIG. **4**) configured to slide the second housing to slide relative to the first housing. The driving structure may include a motor (e.g., the motor **241** in FIG. **6**) disposed within the first housing and configured to generate a driving force for moving the second housing relative to the first housing, and a gear (e.g., the gear **244** in FIG. **6**) connected to

the motor and a rack (e.g., the rack **242** in FIG. **6**) connected to the second housing and configured to mesh with the gear.

[0195] According to an embodiment, the electronic device may further include a multi-bar structure (e.g., the multi-bar structure **232** of FIG. **4**) supporting at least a portion of the display, and a guide rail (e.g., the guide rail **250** in FIG. **4**) including a slit (e.g., the slit **251** in FIG. **4**) and configured to guide the movement of the multi-bar structure, and connected to the frame.

[0196] According to an embodiment, the display may include a first display area (e.g., the first display area **A1** in FIG. **4**) connected to the second housing, and a second display area (e.g., the second display area **A2** in FIG. **4**) extending from the first display area and configured to be rolled or unrolled based on the sliding of the second housing.

[0197] According to an embodiment of the disclosure, an electronic device (e.g., the electronic device **101** in FIG. **3**) may include a housing (e.g., the housing **210** in FIG. **3**) including a first housing (e.g., the first housing **201** in FIG. **3**) and a second housing (e.g., the second housing **202** in FIG. **3**) configured to move relative to the first housing, a display (e.g., the display **203** in FIG. **3**) configured to be unrolled based on the sliding of the second housing, a position determination magnet (e.g., the magnet **340** in FIG. **9**) disposed within in the housing, a magnetic field detection sensor (e.g., the magnetic field detection sensor **350** in FIG. **9**) configured to slide relative to the position determination magnet, and including a hall sensor (e.g., the hall sensor **351** in FIG. **9**) configured to detect a magnetic field generated from the position determination magnet, a magnet (e.g., the magnet **321** in FIG. **10**) disposed within the housing and including a first end (e.g., the first end **321** in FIG. **10**) and a second end (e.g., the second end **322** in FIG. **10**) facing the first end, and a shielding member (e.g., the shielding member **330** in FIG. **10**) at least partially positioned between the first end and the second end, and positioned on an extension line (e.g., the extension line **L** in FIG. **11**) between the center point of the magnet (e.g., the center point **O** in FIG. **11**) and the hall sensor.

[0198] According to an embodiment, the first magnet may include a first magnet (e.g., the first magnet **320a** in FIG. **11**) including the first end and a second magnet (e.g., the second magnet **320b** in FIG. **11**) spaced apart from the first magnet and including the second end.

[0199] According to an embodiment, the shielding member may include a central area (e.g., the central area **331** in FIG. **15**) positioned between the first magnet and the second magnet, a first wing structure (e.g., the first wing structure **332** in FIG. **15**) extending from the central area along an edge of the first magnet, and a second wing structure (e.g., the second wing structure **333** in FIG. **15**) extending from the central area along an edge of the second magnet.

[0200] According to an embodiment, the shielding member has relative magnetic permeability of 3,000 to 10,000, and saturation magnetic flux density of 1.7 T to 2.3 T.

[0201] According to an embodiment, the electronic device may further include a power receiving circuit (e.g., the power receiving circuit **310** in FIG. **7**) disposed within the housing and having at least a portion facing the magnet.

[0202] It may be apparent to a person ordinarily skilled in the art to which the disclosure belongs that the above-described electronic device including a shielding member according to the disclosure is not limited by the above-described embodiments and drawings, and may be variously substituted, modified, and changed within the technical scope of the disclosure.

Claims

1. An electronic device comprising: a housing comprising a first housing and a second housing configured to move relative to the first housing; a display configured to be unrolled based on a sliding of the second housing; an electronic component in the housing and configured to detect a magnetic field; a magnet in the housing, the magnet having an arc shape and comprising a first end and a second end facing the first end; and a shielding member comprising at least a portion

- positioned between the first end and the second end, and at least a portion positioned on an extension line between a center point of the magnet and the electronic component.
2. The electronic device of claim 1, further comprising: a position determination magnet in the housing, wherein the electronic component comprises a magnetic field detection sensor configured to slide relative to the position determination magnet, and to detect a magnetic field generated from the position determination magnet.
 3. The electronic device of claim 2, further comprising: a processor configured to determine a slide distance of the electronic device based on a signal detected by the magnetic field detection sensor.
 4. The electronic device of claim 2, wherein the magnetic field detection sensor comprises a plurality of hall sensors arranged along a first direction in which the electronic device slides, and wherein the extension line extends from the center point of the magnet to a first hall sensor closest to the magnet among the plurality of hall sensors.
 5. The electronic device of claim 1, wherein the shielding member has relative permeability of 3,000 to 10,000, and saturation magnetic flux density of 1.7 T to 2.3 T.
 6. The electronic device of claim 1, wherein the magnet comprises: a first magnet comprising the first end; and a second magnet spaced apart from the first magnet and comprising the second end.
 7. The electronic device of claim 6, wherein the shielding member comprises: a central area between the first magnet and the second magnet; a first wing structure extending from the central area along an edge of the first magnet; and a second wing structure extending from the central area along an edge of the second magnet.
 8. The electronic device of claim 1, further comprising: a power receiving circuit in the housing and comprising at least a portion facing the magnet.
 9. The electronic device of claim 8, wherein the first housing comprises a first cover member and a frame surrounded by the first cover member, wherein the second housing comprises a second cover member at least partially accommodated within the first cover member, and wherein the magnet and the power receiving circuit are on the first cover member.
 10. The electronic device of claim 1, wherein a first width of the magnet is smaller than a second width of the shielding member.
 11. The electronic device of claim 1, wherein the electronic component comprises a camera on the housing, and wherein the shielding member is between the center point of the magnet and the camera.
 12. The electronic device of claim 1, wherein the electronic component further comprises an antenna module in the housing, and wherein the shielding member is between the center point of the magnet and the antenna module.
 13. The electronic device of claim 1, further comprising: a driving structure configured to slide the second housing relative to the first housing, wherein the driving structure comprises: a motor in the first housing and configured to generate a driving force for moving the second housing relative to the first housing; a gear connected to the motor; and a rack connected to the second housing and configured to be engaged with the gear.
 14. The electronic device of claim 1, further comprising: a multi-bar structure configured to support at least a portion of the display; and a guide rail connected to the first housing and comprising a slit configured to guide movement of the multi-bar structure.
 15. The electronic device of claim 1, wherein the display comprises: a first display area connected to the second housing; and a second display area extending from the first display area and configured to be rolled or unrolled based on the sliding of the second housing.
 16. An electronic device comprising: a housing comprising a first housing and a second housing configured to move relative to the first housing; a display configured to be unrolled based on a sliding of the second housing; a position determination magnet in the housing; a magnetic field detection sensor configured to slide relative to the position determination magnet, the magnetic field detection sensor comprising a hall sensor configured to detect a magnetic field generated from

the position determination magnet; a magnet in the housing, the magnet comprising a first end and a second end facing the first end; and a shielding member comprising at least a portion positioned between the first end and the second end, and at least a portion positioned on an extension line between a center point of the magnet and the hall sensor.

17. The electronic device of claim 16, wherein the magnet comprises: a first magnet comprising the first end; and a second magnet spaced apart from the first magnet and comprising the second end.

18. The electronic device of claim 17, wherein the shielding member comprises: a central area between the first magnet and the second magnet; a first wing structure extending from the central area along an edge of the first magnet; and a second wing structure extending from the central area along an edge of the second magnet.

19. The electronic device of claim 16, wherein the shielding member has a relative permeability of 3,000 to 10,000, and a saturation magnetic flux density of 1.7 T to 2.3 T.

20. The electronic device of claim 16, further comprising a power receiving circuit in the housing and comprising at least a portion facing the magnet.
