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Choi et al.

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(54) **MOBILE TERMINAL AND CONTROL METHOD FOR ALIGNING AND RE-ALIGNING A PLURALITY OF APPLICATION LAYOUT ICONS**

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See application file for complete search history.

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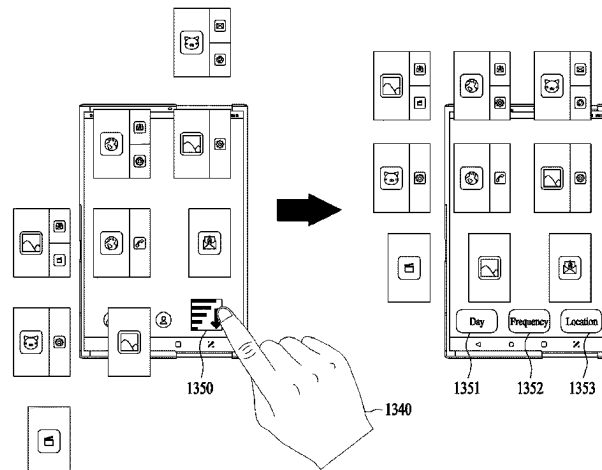
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(57) **ABSTRACT**

The present invention relates to a mobile terminal and a control method therefor and, more specifically, to a mobile terminal and a control method therefor, the mobile terminal comprising: a body; an input unit for receiving a user input; a display coupled to the body so that a display area viewed from the front of the body can vary according to switching between an expanded display mode and a reduced display mode; and a control unit, wherein the control unit outputs a plurality of application layout icons onto the display, aligns the plurality of application layout icons on the basis of a preset standard, and outputs an application onto the display on the basis of a first application layout icon from among the

(Continued)



plurality of application layout icons in response to receiving a first signal for selecting the first application layout icon.

11 Claims, 17 Drawing Sheets

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FIG. 1

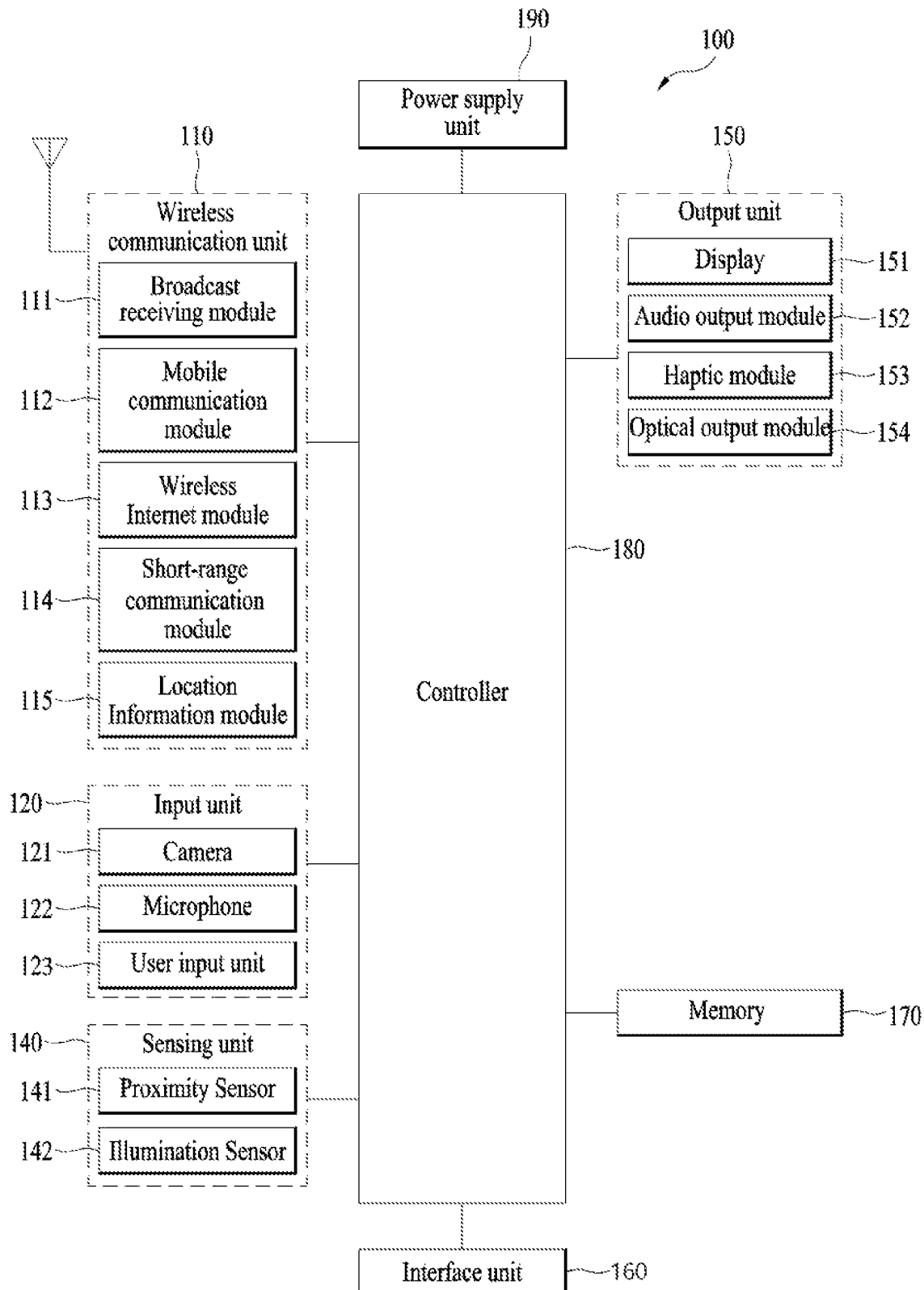


FIG. 2

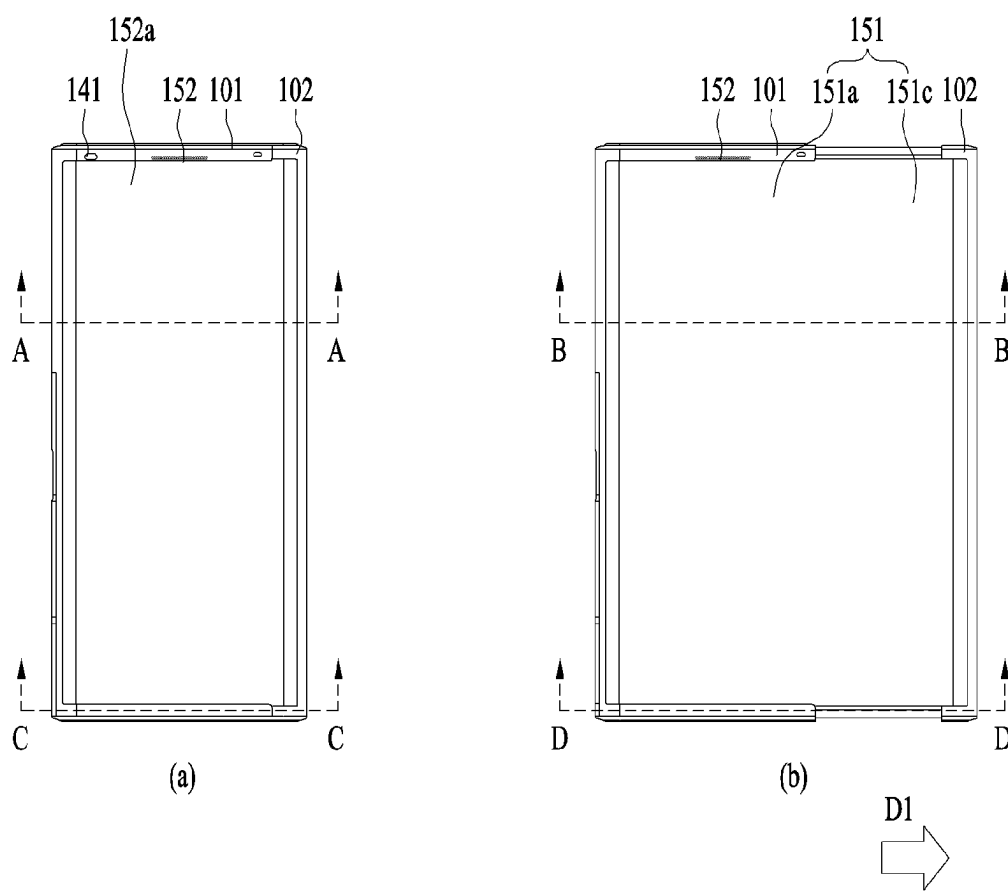


FIG. 3

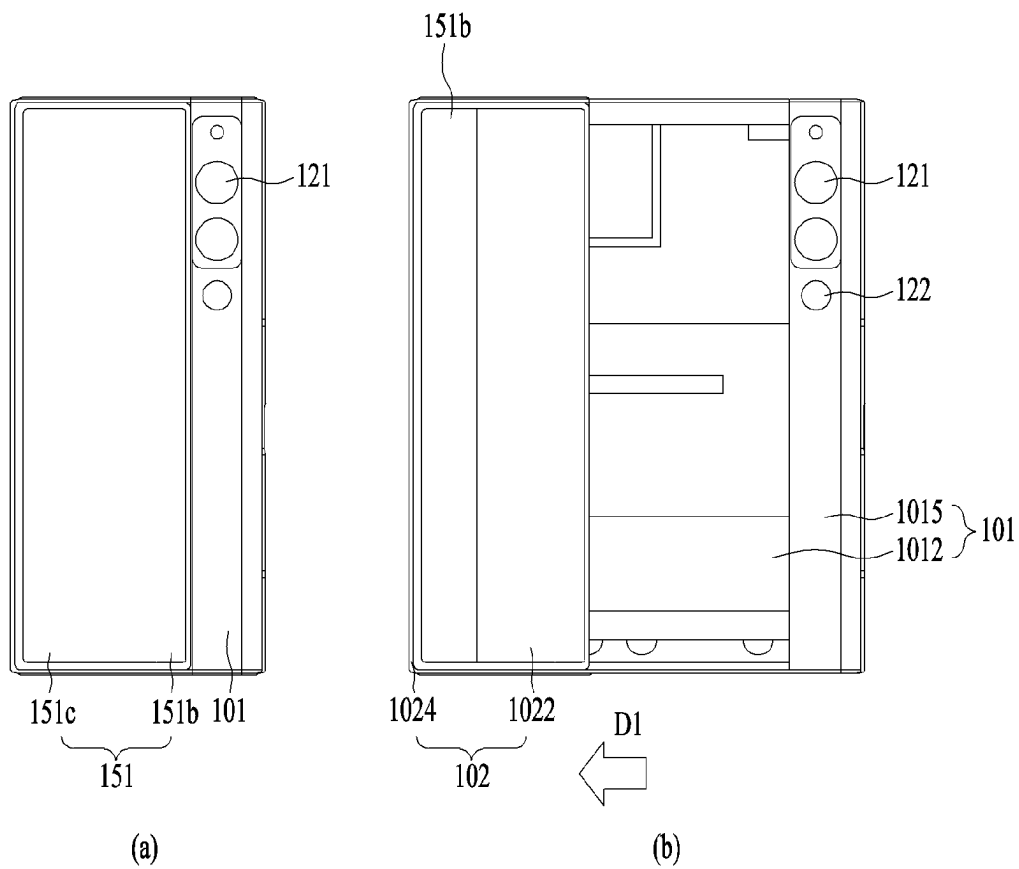


FIG. 4

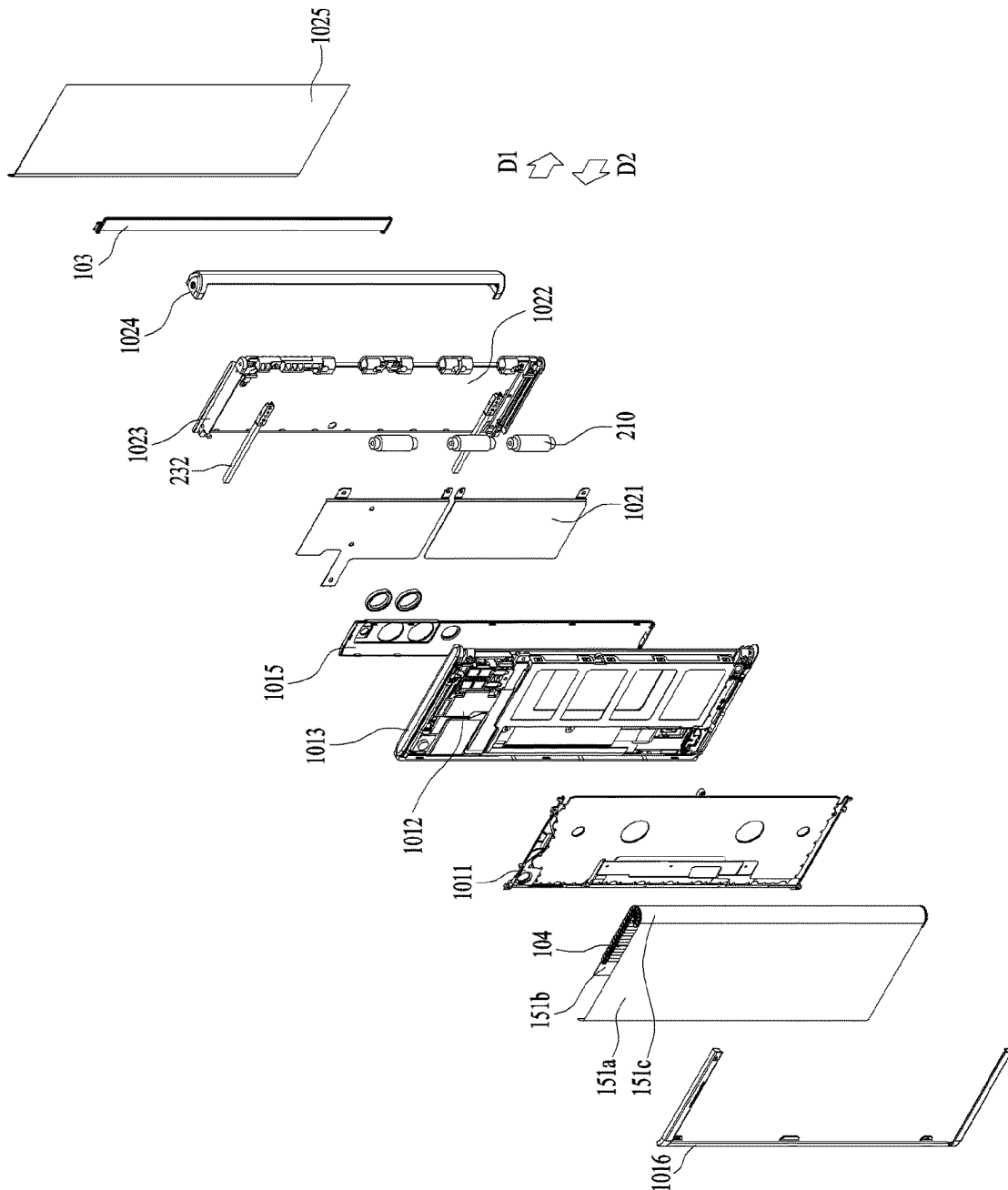


FIG. 5

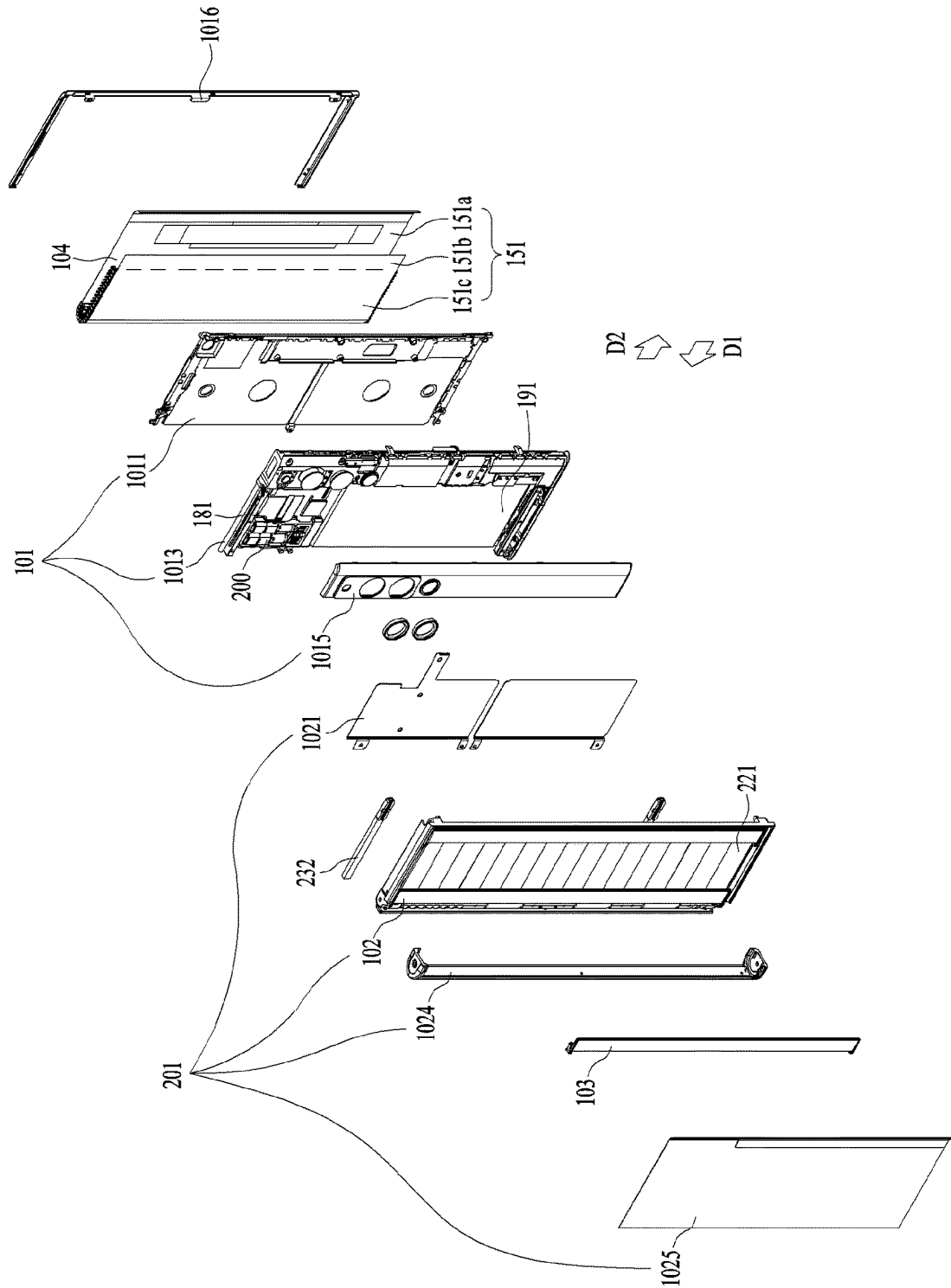


FIG. 6

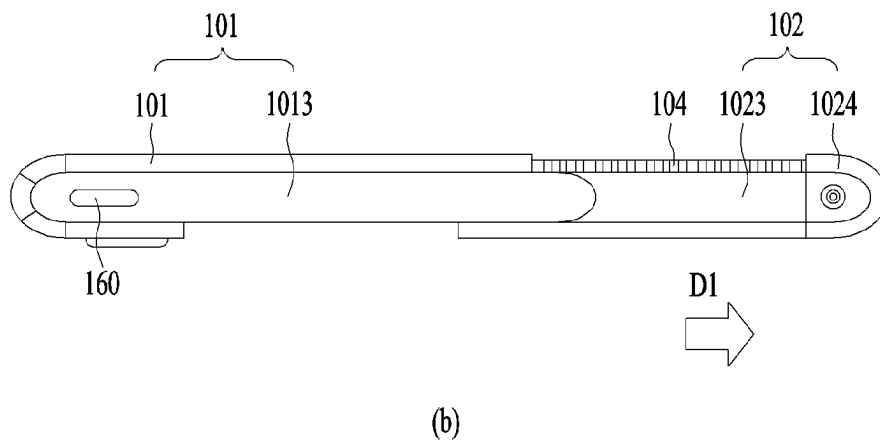
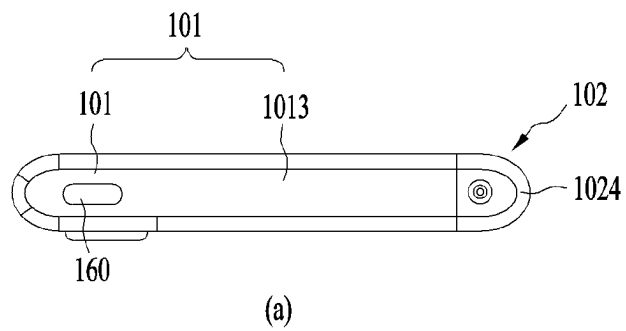


FIG. 7

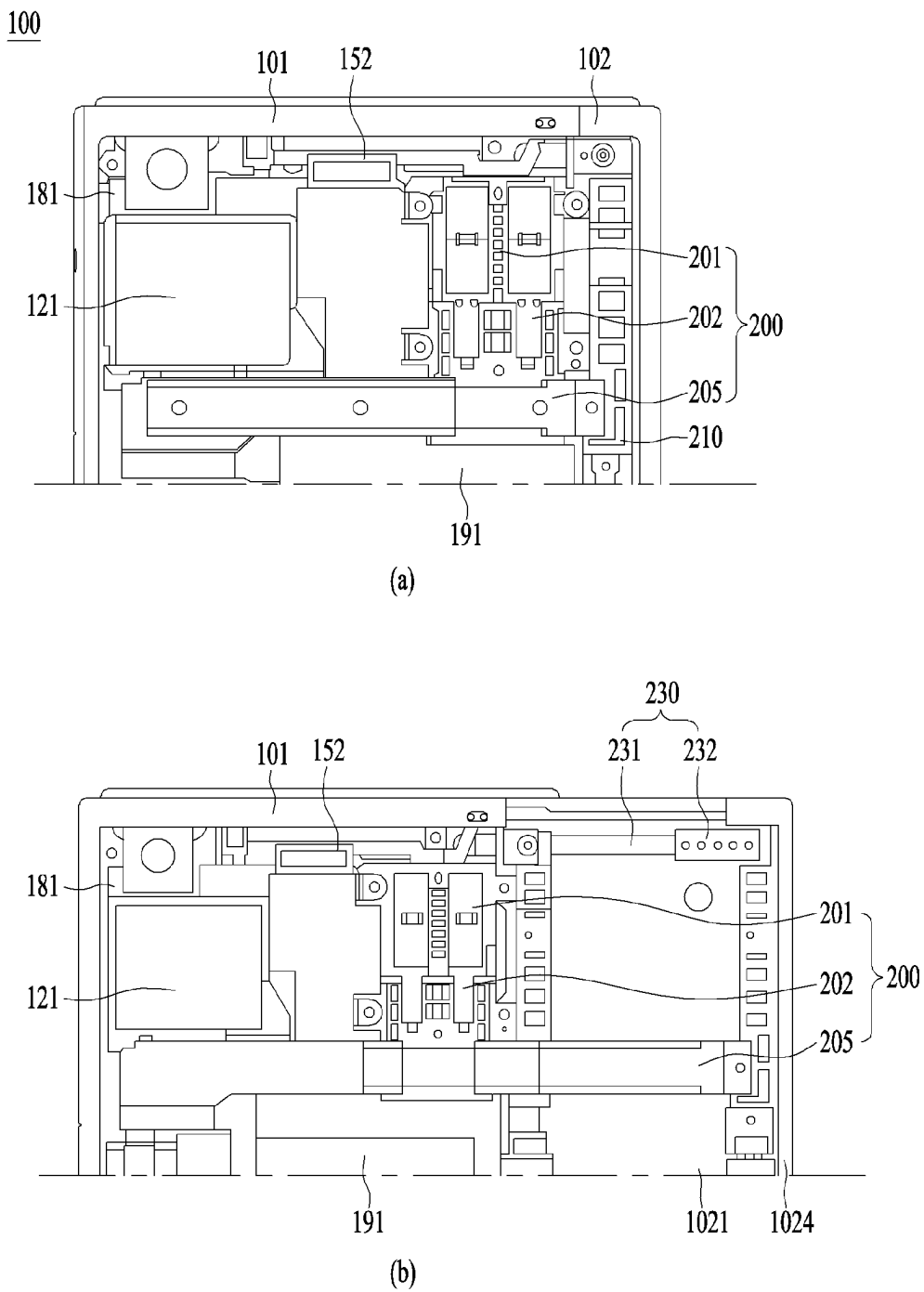


FIG. 8

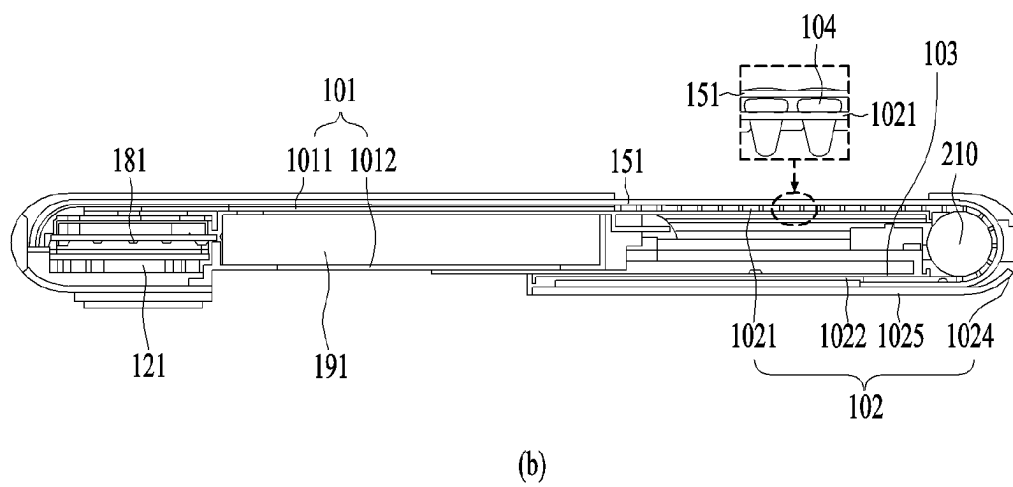
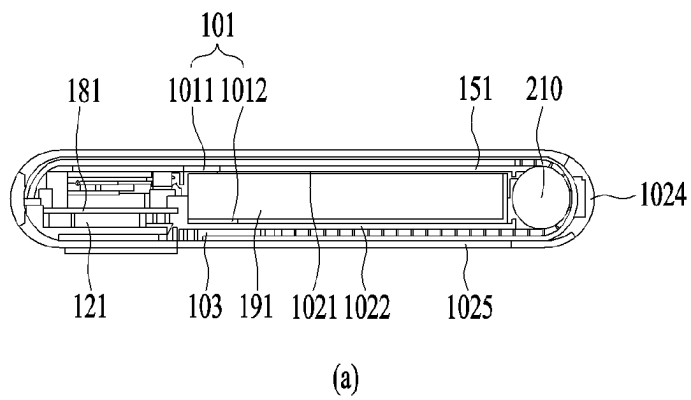


FIG. 9

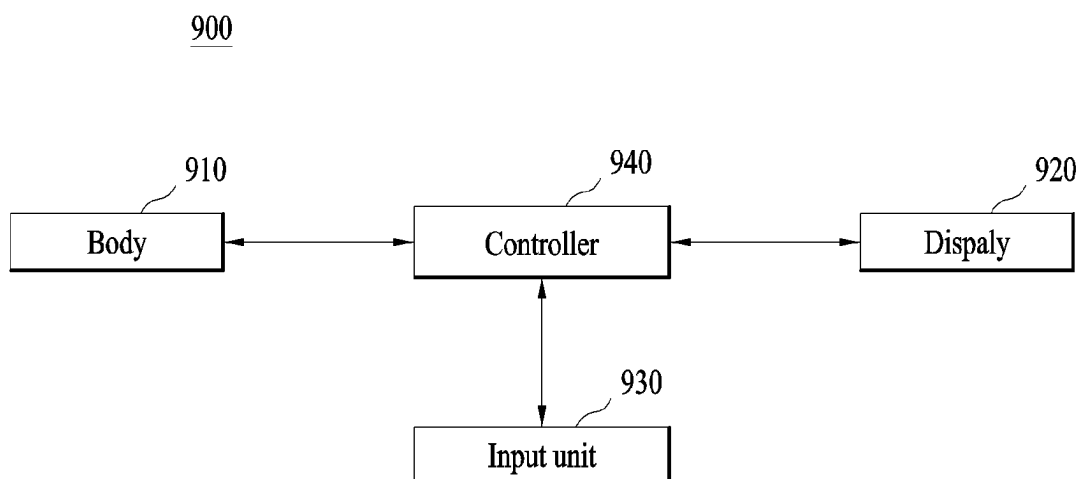


FIG. 10

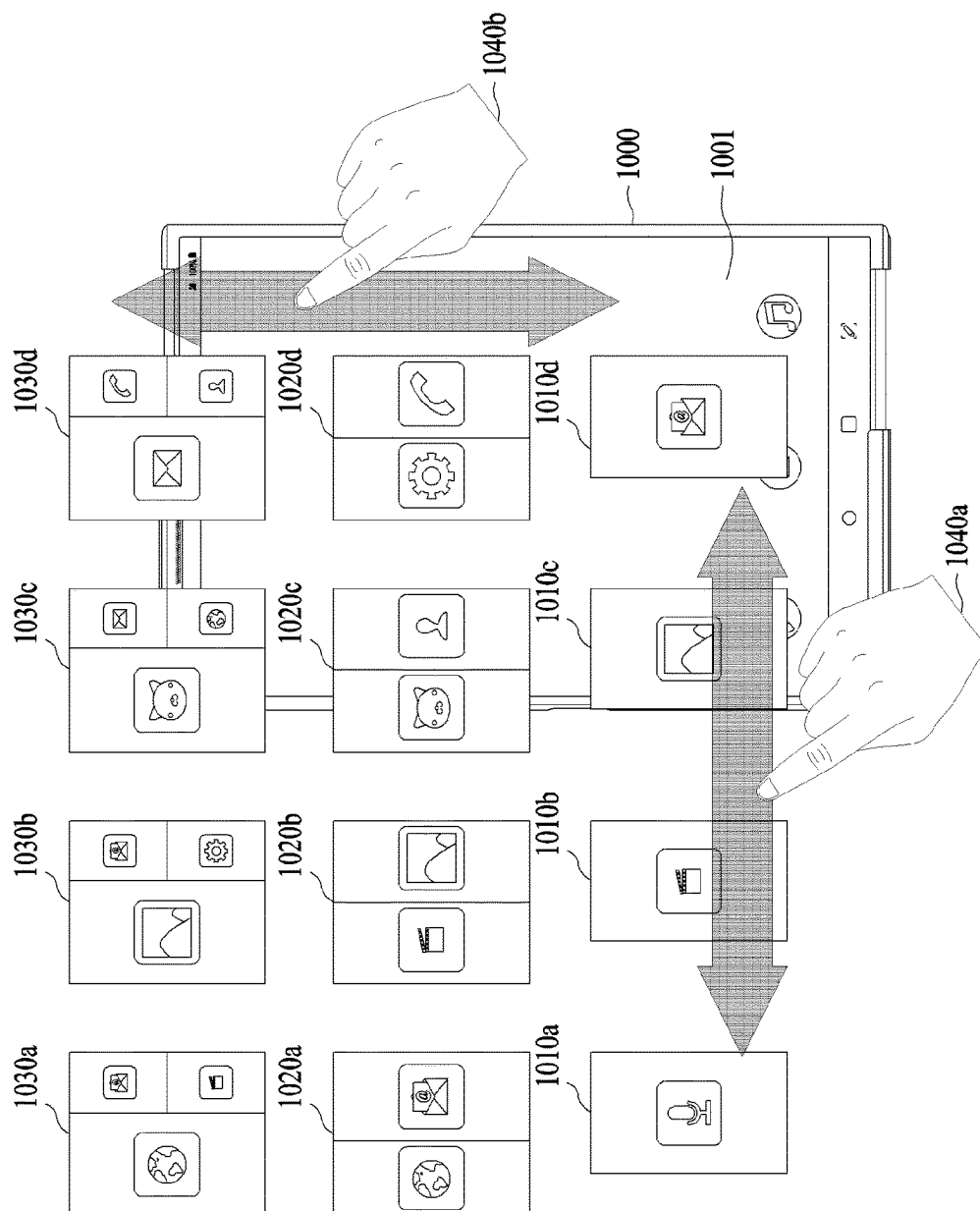


FIG. 11

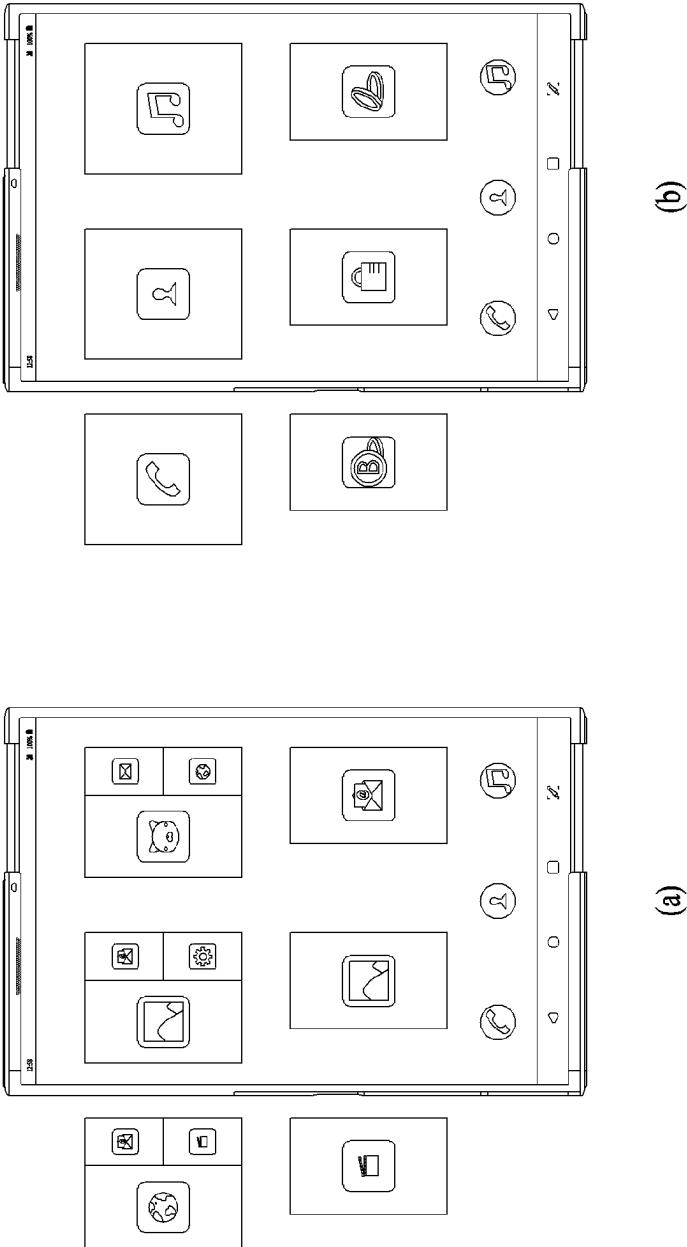


FIG. 12

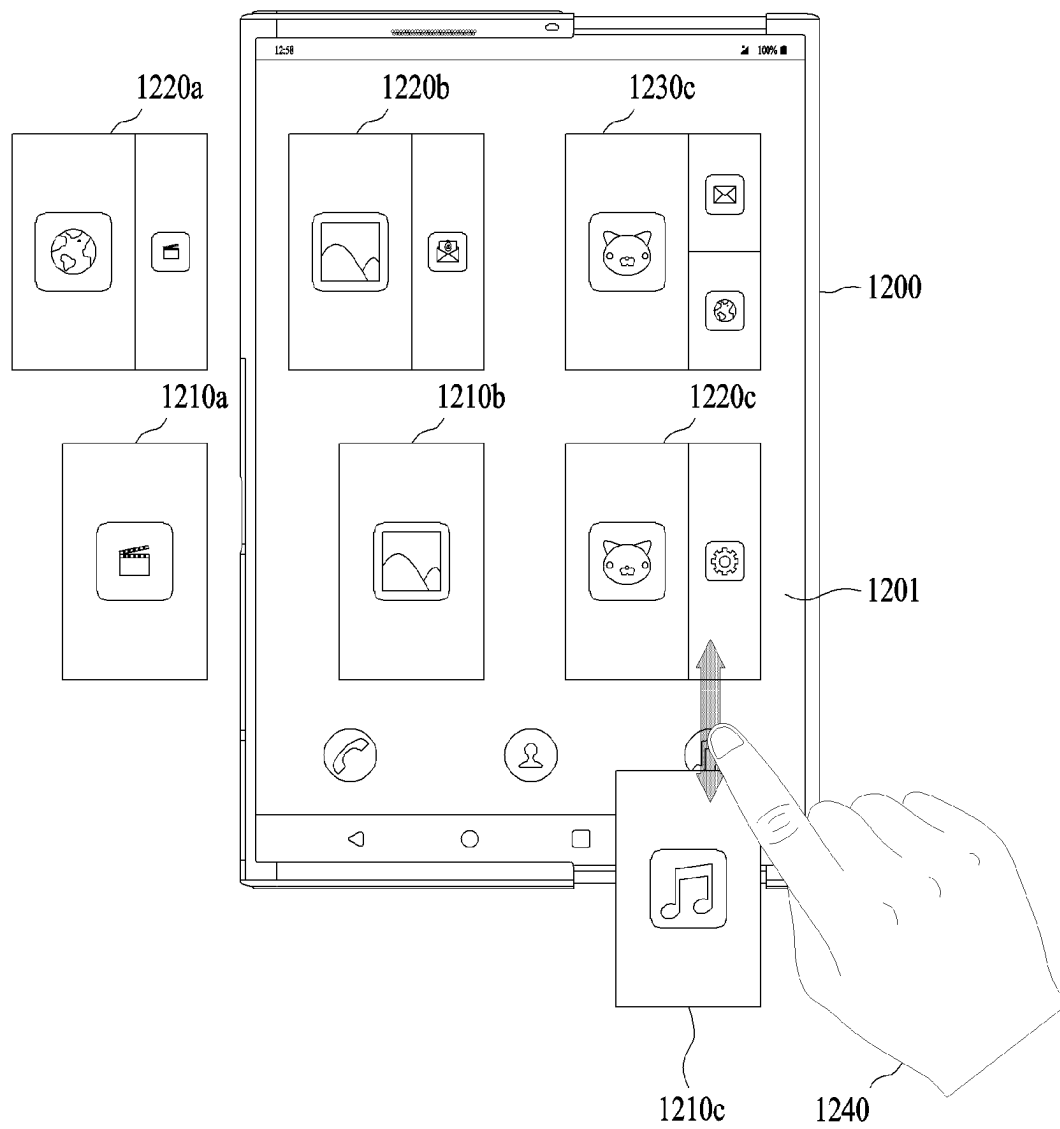


FIG. 13

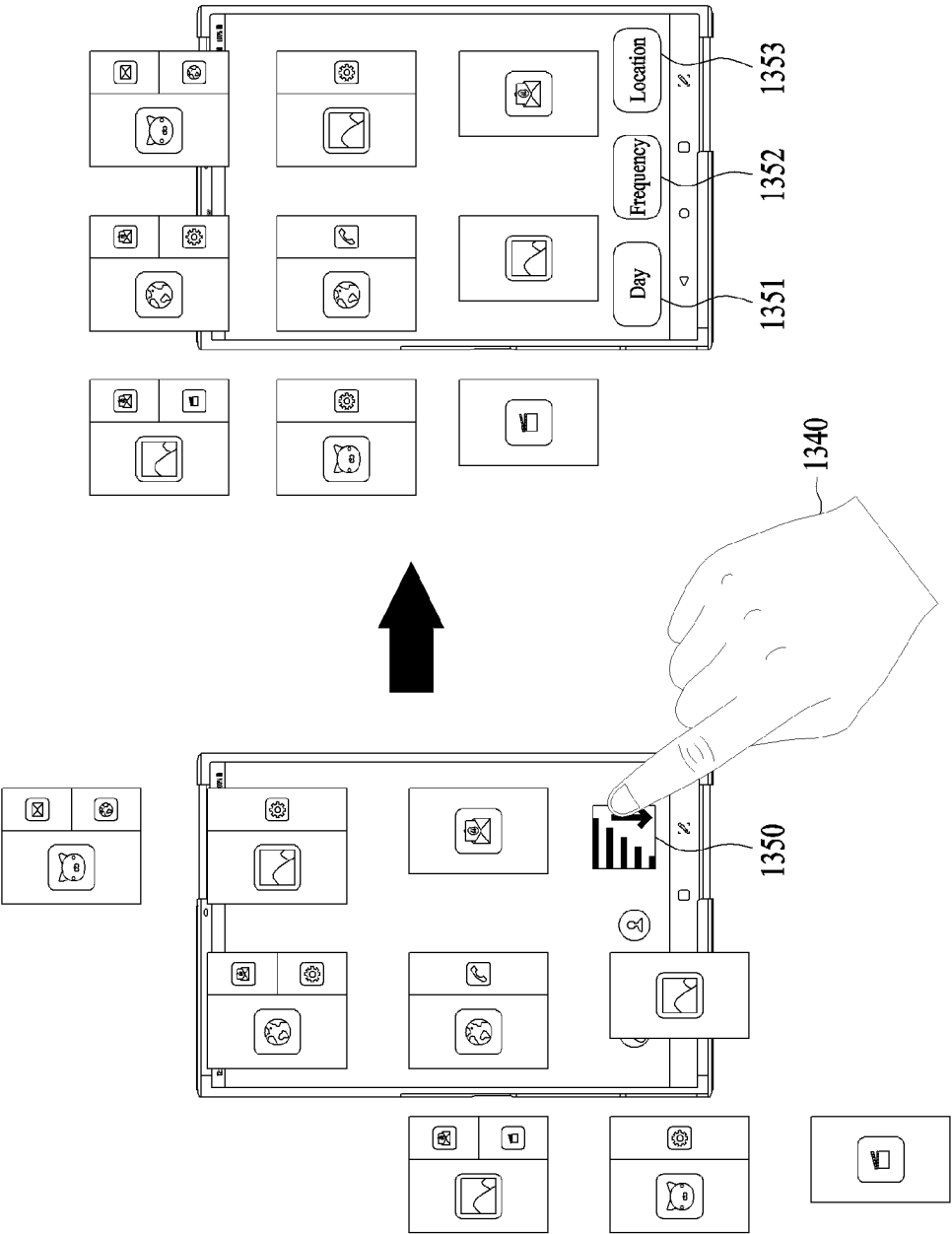


FIG. 14

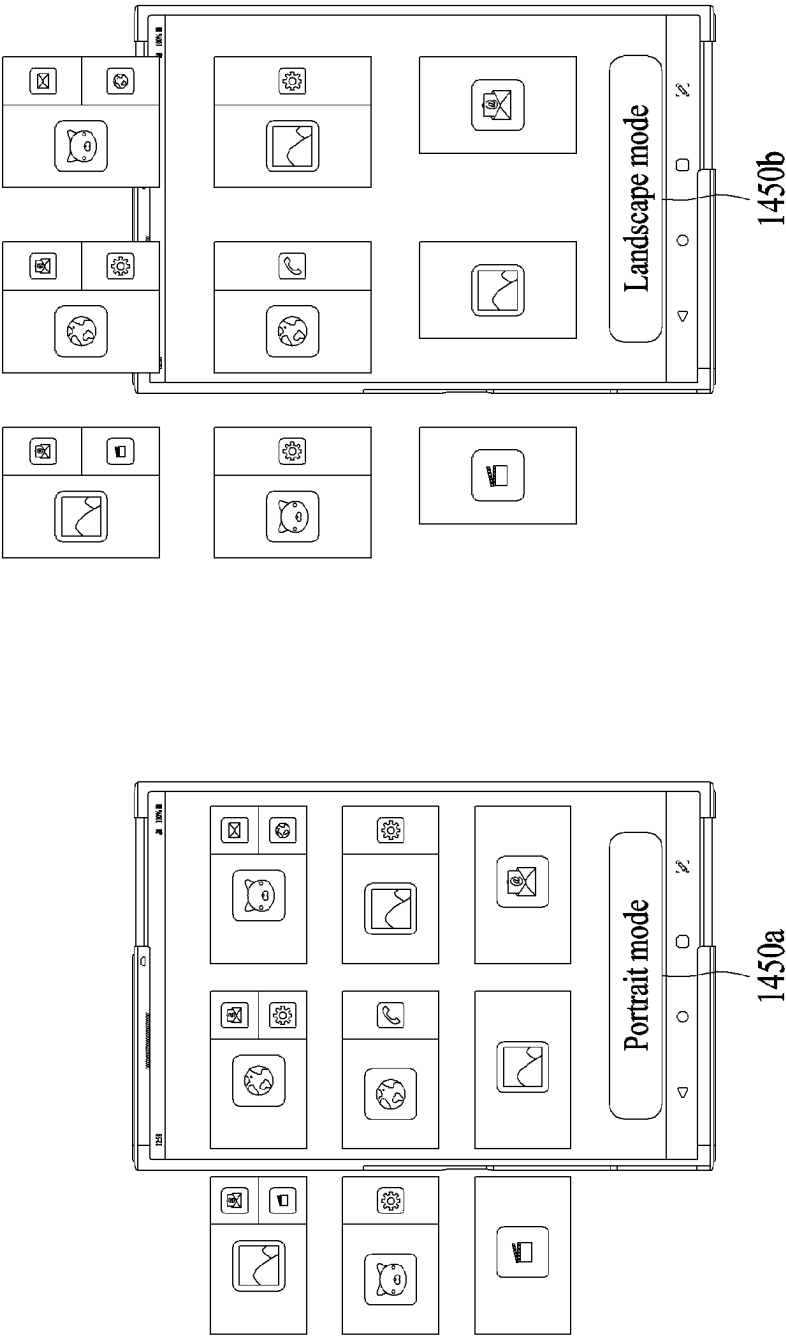


FIG. 15

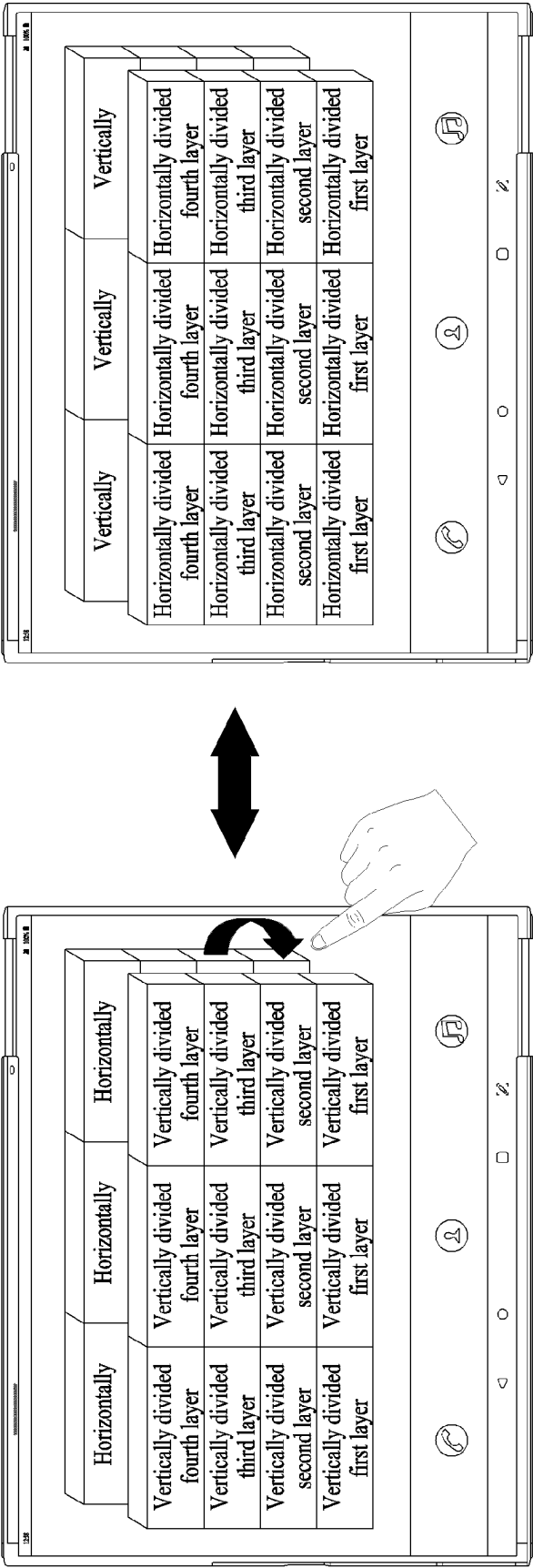


FIG. 16

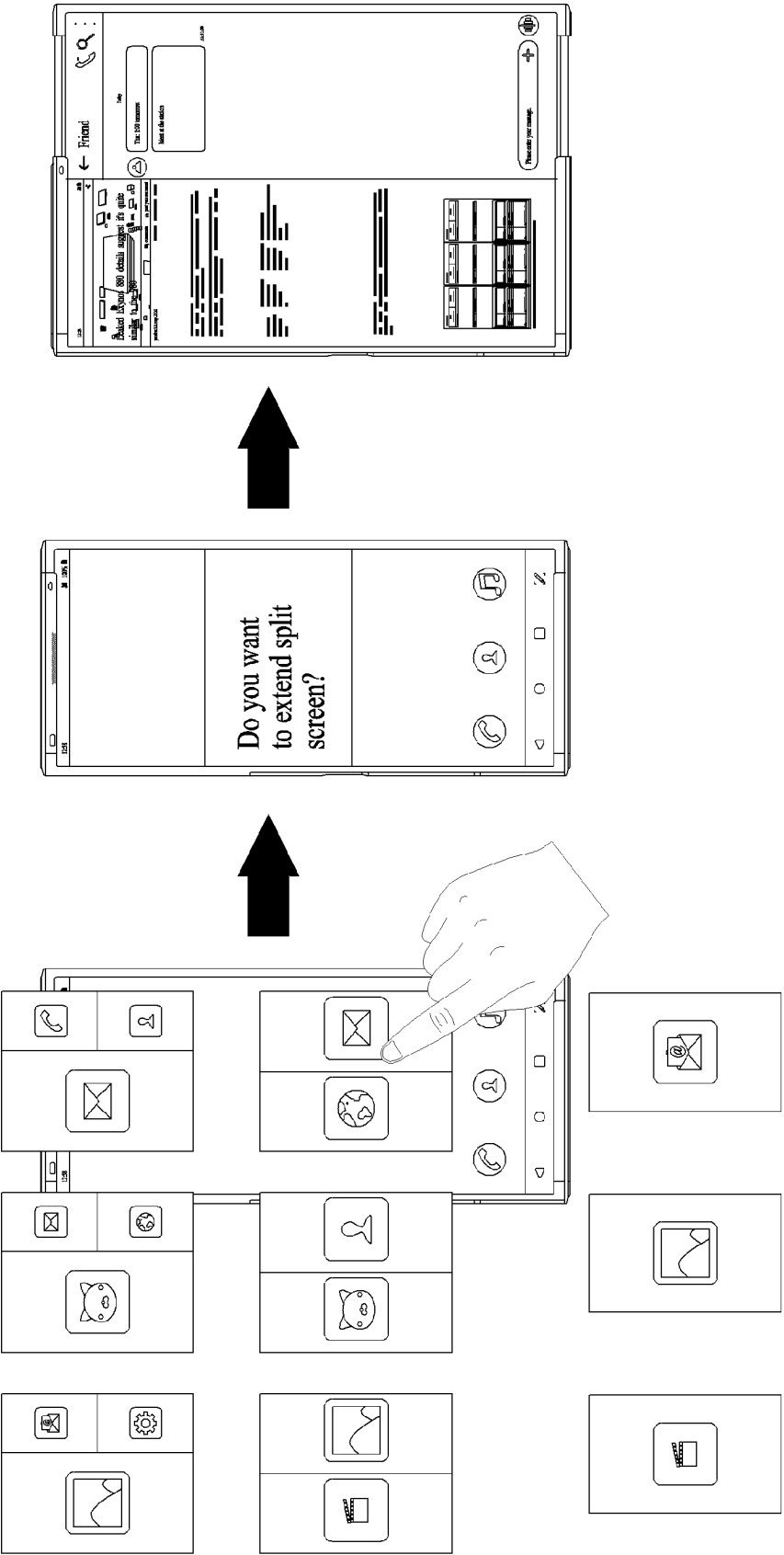
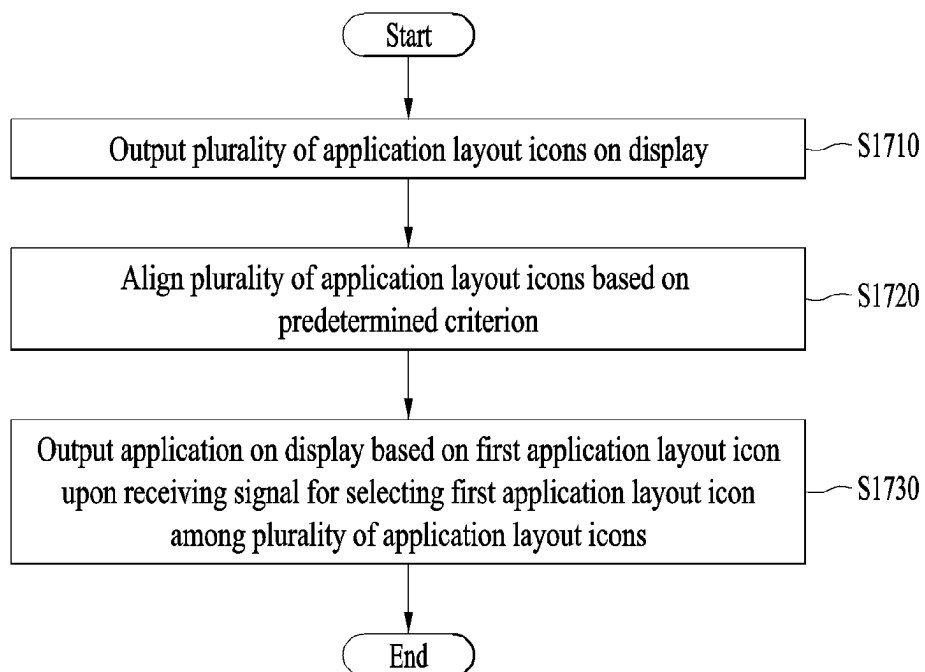


FIG. 17



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MOBILE TERMINAL AND CONTROL METHOD FOR ALIGNING AND RE-ALIGNING A PLURALITY OF APPLICATION LAYOUT ICONS

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is the National Stage filing under 35 U.S.C. 371 of International Application No. PCT/KR2020/012776, filed on Sep. 22, 2020, the contents of which are incorporated by reference herein in its entirety.

TECHNICAL FIELD

The present disclosure relates to a mobile terminal and a method for controlling the same. More specifically, the present disclosure relates to a mobile terminal that divides a screen based on an application layout icon and a method for controlling the same.

BACKGROUND

Terminals may be generally classified as mobile/portable terminals or stationary terminals according to their mobility. Mobile terminals may also be classified as handheld terminals or vehicle mounted terminals according to whether or not a user can directly carry the terminal.

Mobile terminals have become increasingly more functional. Examples of such functions include data and voice communications, capturing images and video via a camera, recording audio, playing music files via a speaker system, and displaying images and video on a display. Some mobile terminals include additional functionality which supports game playing, while other terminals are configured as multimedia players. More recently, mobile terminals have been configured to receive broadcast and multicast signals which permit viewing of content such as videos and television programs.

Mobile terminals may be configured to perform various functions. Examples of such functions include data and voice communications, capturing images and video via a camera, recording audio, playing music files and outputting music via a speaker system, and displaying images and video on a display. Some terminals include additional functionality which supports game playing, while other terminals are also configured as multimedia players.

Efforts are ongoing to support and increase the functionality of mobile terminals. Such efforts include software and hardware improvements, as well as changes and improvements in the structural components.

A terminal having an extended display may output several applications in divided display regions. In this regard, there is an inconvenience that a user has to individually execute the applications in the divided display regions.

Summary

Technical Problem

The present disclosure is to solve the above and other problems.

The present disclosure is to provide a mobile terminal that outputs an application on a display based on a first application layout icon upon receiving a first signal for selecting a first application layout icon among a plurality of application layout icons, and a method for controlling the same.

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Technical Solutions

According to an aspect of the present disclosure, provided is a mobile terminal including a body, an input unit for receiving an input of a user, a display coupled to the body such that a display region visible from a front surface of the body is variable as a mode of the display is switched between an enlarged display mode and a reduced display mode, and a controller, wherein the controller outputs a plurality of application layout icons on the display, aligns the plurality of application layout icons based on a predetermined criterion, and outputs an application on the display based on a first application layout icon as a first signal for selecting the first application layout icon among the plurality of application layout icons is received.

In one implementation, the predetermined criterion may include at least one of the number of split screens, a day of use, a frequency of use, a location, and a theme.

In one implementation, the controller may align the plurality of application layout icons in a manner of being classified into a first layer, a second layer, and a third layer when the plurality of application layout icons are aligned based on the number of split screens.

In one implementation, the controller may output at least one full-screen application layout icon in the first layer, output at least one 2-split-screen application layout icon in the second layer, and output at least one 3-split-screen application layout icon in the third layer.

In one implementation, the controller may move the output full-screen application layout icon in response to a second signal for selecting the first layer and dragging the first layer in left and right directions.

In one implementation, the controller may move the first layer, the second layer, and the third layer together in response to a third signal for vertical dragging.

In one implementation, the controller may individually move a second application layout icon contained in the first layer in response to a fourth signal for vertical dragging.

In one implementation, the controller may output an alignment icon, which is based on the predetermined criterion, and re-align the plurality of application layout icons in response to a fifth signal for selecting the alignment icon.

In one implementation, the controller may align the plurality of application layout icons based on a portrait mode or a landscape mode.

In one implementation, the controller may output the plurality of application layout icons in 3D layers.

In one implementation, the controller may switch the mode of the display to the enlarged display mode as a fourth signal for selecting a second application layout icon among the plurality of application layout icons is received in a state where the display is in the reduced display mode, and output the application based on the second application layout icon.

In one implementation, the controller may output a pop-up window informing of the switching to the enlarged display mode as the fourth signal is received.

According to another aspect of the present disclosure, provided is a method for controlling a mobile terminal including a display coupled to a body such that a display region visible from a front surface of the body is variable as a mode of the display is switched between an enlarged display mode and a reduced display mode including outputting a plurality of application layout icons on the display, aligning the plurality of application layout icons based on a predetermined criterion, and outputting an application on the display based on a first application layout icon as a signal for selecting the first application layout icon among the plurality of application layout icons is received.

Advantageous Effects

Effects of the mobile terminal and the method for controlling the same according to the present disclosure will be described as follows.

According to at least one of the embodiments of the present disclosure, there is an advantage in that the several applications may be output at once in the divided display regions based on the application layout icon.

According to at least one of the embodiments of the present disclosure, there is an advantage in that the application icons may be aligned based on the predetermined criterion.

A further scope of applicability of the present disclosure will become apparent from the detailed description below.

However, because various changes and modifications within the spirit and scope of the present disclosure may be clearly understood by those skilled in the art, it should be understood that the detailed description and specific embodiments such as the preferred embodiment of the present disclosure are only given as examples.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a block diagram for describing a mobile terminal.

FIG. 2 is a front view of a first state and a second state of the mobile terminal in accordance with an embodiment.

FIG. 3 is a rear view of the first state and the second state of the mobile terminal in accordance with an embodiment.

FIGS. 4 and 5 are exploded perspective views of the mobile terminal in accordance with an embodiment.

FIG. 6 is a side view of the mobile terminal as viewed from a third direction.

FIG. 7 is a view showing a driving unit of the mobile terminal in accordance with an embodiment.

FIG. 8 is a cross-sectional view taken along lines A-A and B-B in FIG. 2.

FIG. 9 is a block diagram illustrating constituent modules of a mobile terminal according to an embodiment of the present disclosure.

FIG. 10 is a diagram illustrating an embodiment of outputting a plurality of application layout icons in a mobile terminal according to one embodiment of the present disclosure.

FIG. 11 is a diagram for illustrating an embodiment of aligning a plurality of application layout icons in a mobile terminal according to one embodiment of the present disclosure.

FIG. 12 is a diagram for illustrating another embodiment of aligning a plurality of application layout icons in a mobile terminal according to one embodiment of the present disclosure.

FIG. 13 is a diagram for illustrating another embodiment of aligning a plurality of application layout icons in a mobile terminal according to one embodiment of the present disclosure.

FIG. 14 is a diagram for illustrating another embodiment of aligning a plurality of application layout icons in a mobile terminal according to one embodiment of the present disclosure.

FIG. 15 is a diagram for illustrating an embodiment of outputting a plurality of application layout icons in a mobile terminal according to an embodiment of the present disclosure.

FIG. 16 is a diagram for illustrating an embodiment of extending a display based on an application layout icon in a mobile terminal according to an embodiment of the present disclosure.

FIG. 17 is a flowchart illustrating an embodiment of aligning a plurality of application layout icons in a mobile terminal according to an embodiment of the present disclosure.

DETAILED DESCRIPTION

Description will now be given in detail according to exemplary embodiments disclosed herein, with reference to the accompanying drawings. For the sake of brief description with reference to the drawings, the same or equivalent components may be provided with the same reference numbers, and description thereof will not be repeated. In general, a suffix such as “module” and “unit” may be used to refer to elements or components. Use of such a suffix herein is merely intended to facilitate description of the specification, and the suffix itself is not intended to give any special meaning or function. In the present disclosure, that which is well-known to one of ordinary skill in the relevant art has generally been omitted for the sake of brevity. The accompanying drawings are used to help easily understand various technical features and it should be understood that the embodiments presented herein are not limited by the accompanying drawings. As such, the present disclosure should be construed to extend to any alterations, equivalents and substitutes in addition to those which are particularly set out in the accompanying drawings.

It will be understood that although the terms first, second, etc. may be used herein to describe various elements, these elements should not be limited by these terms. These terms are generally only used to distinguish one element from another.

It will be understood that when an element is referred to as being “connected with” another element, the element can be directly connected with the other element or intervening elements may also be present. In contrast, when an element is referred to as being “directly connected with” another element, there are no intervening elements present.

A singular representation may include a plural representation unless it represents a definitely different meaning from the context.

Terms such as “include” or “has” are used herein and should be understood that they are intended to indicate an existence of several components, functions or steps, disclosed in the specification, and it is also understood that greater or fewer components, functions, or steps may likewise be utilized.

FIG. 1 is a block diagram for describing a mobile terminal.

The mobile terminal 100 is shown having components such as a wireless communication unit 110, an input unit 120, a sensing unit 140, an output unit 150, an interface unit 160, a memory 170, a controller 180, and a power supply unit 190. Referring now to FIG. 1, the mobile terminal 100 is shown having wireless communication unit 110 configured with several commonly implemented components. It is understood that implementing all of the illustrated components is not a requirement, and that greater or fewer components may alternatively be implemented.

More specifically, the wireless communication unit 110 typically includes one or more modules which permit communications such as wireless communications between the mobile terminal 100 and a wireless communication system,

communications between the mobile terminal **100** and another mobile terminal, communications between the mobile terminal **100** and an external server. Further, the wireless communication unit **110** typically includes one or more modules which connect the mobile terminal **100** to one or more networks.

To facilitate such communications, the wireless communication unit **110** includes one or more of a broadcast receiving module **111**, a mobile communication module **112**, a wireless Internet module **113**, a short-range communication module **114**, and a location information module **115**.

Regarding the wireless communication unit **110**, the broadcast receiving module **111** is typically configured to receive a broadcast signal and/or broadcast associated information from an external broadcast managing entity via a broadcast channel. The broadcast channel may include a satellite channel, a terrestrial channel, or both. In some embodiments, two or more broadcast receiving modules **111** may be utilized to facilitate simultaneously receiving of two or more broadcast channels, or to support switching among broadcast channels.

The mobile communication module **112** can transmit and/or receive wireless signals to and from one or more network entities. Typical examples of a network entity include a base station, an external mobile terminal, a server, and the like. Such network entities form part of a mobile communication network, which is constructed according to technical standards or communication methods for mobile communications (for example, Global System for Mobile Communication (GSM), Code Division Multi Access (CDMA), CDMA2000(Code Division Multi Access 2000), EV-DO(Enhanced Voice-Data Optimized or Enhanced Voice-Data Only), Wideband CDMA (WCDMA), High Speed Downlink Packet access (HSDPA), HSUPA(High Speed Uplink Packet Access), Long Term Evolution (LTE), LTE-A(Long Term Evolution-Advanced), and the like).

Examples of wireless signals transmitted and/or received via the mobile communication module **112** include audio call signals, video (telephony) call signals, or various formats of data to support communication of text and multimedia messages.

The wireless Internet module **113** is configured to facilitate wireless Internet access. This module may be internally or externally coupled to the mobile terminal **100**. The wireless Internet module **113** may transmit and/or receive wireless signals via communication networks according to wireless Internet technologies.

Examples of such wireless Internet access include Wireless LAN (WLAN), Wireless Fidelity (Wi-Fi), Wi-Fi Direct, Digital Living Network Alliance (DLNA), Wireless Broadband (WiBro), Worldwide Interoperability for Microwave Access (WiMAX), High Speed Downlink Packet Access (HSDPA), HSUPA(High Speed Uplink Packet Access), Long Term Evolution (LTE), LTE-A(Long Term Evolution-Advanced), and the like. The wireless Internet module **113** may transmit/receive data according to one or more of such wireless Internet technologies, and other Internet technologies as well.

In some embodiments, when the wireless Internet access is implemented according to, for example, WiBro, HSDPA, HSUPA, GSM, CDMA, WCDMA, LTE, LTE-A and the like, as part of a mobile communication network, the wireless Internet module **113** performs such wireless Internet access. As such, the Internet module **113** may cooperate with, or function as, the mobile communication module **112**.

The short-range communication module **114** is configured to facilitate short-range communications. Suitable technologies

for implementing such short-range communications include BLUETOOTH™, Radio Frequency IDentification (RFID), Infrared Data Association (IrDA), Ultra-WideBand (UWB), ZigBee, Near Field Communication (NFC), Wireless-Fidelity (Wi-Fi), Wi-Fi Direct, Wireless USB(Wireless Universal Serial Bus), and the like. The short-range communication module **114** in general supports wireless communications between the mobile terminal **100** and a wireless communication system, communications between the mobile terminal **100** and another mobile terminal **100**, or communications between the mobile terminal and a network where another mobile terminal **100** (or an external server) is located, via wireless area networks. One example of the wireless area networks is a wireless personal area networks.

The location information module **115** is generally configured to detect, calculate, derive or otherwise identify a position of the mobile terminal. As an example, the location information module **115** includes a Global Position System (GPS) module, a Wi-Fi module, or both. If desired, the location information module **115** may alternatively or additionally function with any of the other modules of the wireless communication unit **110** to obtain data related to the position of the mobile terminal. As one example, when the mobile terminal uses a GPS module, a position of the mobile terminal may be acquired using a signal sent from a GPS satellite. As another example, when the mobile terminal uses the Wi-Fi module, a position of the mobile terminal can be acquired based on information related to a wireless access point (AP) which transmits or receives a wireless signal to or from the Wi-Fi module.

The input unit **120** includes a camera **121** for obtaining images or video, a microphone **122**, which is one type of audio input device for inputting an audio signal, and a user input unit **123** (for example, a touch key, a push key, a mechanical key, a soft key, and the like) for allowing a user to input information. Data (for example, audio, video, image, and the like) is obtained by the input unit **120** and may be analyzed and processed by controller **180** according to device parameters, user commands, and combinations thereof.

Such cameras **121** may process image frames of still pictures or video obtained by image sensors in a video or image capture mode. The processed image frames can be displayed on the display unit **151** or stored in memory **170**. In some cases, the cameras **121** may be arranged in a matrix configuration to permit a plurality of images having various angles or focal points to be input to the mobile terminal **100**. As another example, the cameras **121** may be located in a stereoscopic arrangement to acquire left and right images for implementing a stereoscopic image.

The microphone **122** is generally implemented to permit audio input to the mobile terminal **100**. The audio input can be processed in various manners according to a function being executed in the mobile terminal **100**. If desired, the microphone **122** may include assorted noise removing algorithms to remove unwanted noise generated in the course of receiving the external audio.

The user input unit **123** is a component that permits input by a user. Such user input may enable the controller **180** to control operation of the mobile terminal **100**. The user input unit **123** may include one or more of a mechanical input element (for example, a key, a button located on a front and/or rear surface or a side surface of the mobile terminal **100**, a dome switch, a jog wheel, a jog switch, and the like), or a touch-sensitive input, among others. As one example, the touch-sensitive input may be a virtual key or a soft key, which is displayed on a touch screen through software

processing, or a touch key which is located on the mobile terminal at a location that is other than the touch screen. On the other hand, the virtual key or the visual key may be displayed on the touch screen in various shapes, for example, graphic, text, icon, video, or a combination thereof.

The sensing unit **140** is typically implemented using one or more sensors configured to sense internal information of the mobile terminal, the surrounding environment of the mobile terminal, user information, and the like. For example, the sensing unit **140** may alternatively or additionally include other types of sensors or devices, such as a proximity sensor **141** and an illumination sensor **142**, a touch sensor, an acceleration sensor, a magnetic sensor, a G-sensor, a gyroscope sensor, a motion sensor, an RGB sensor, an infrared (IR) sensor, a finger scan sensor, a ultrasonic sensor, an optical sensor (for example, camera **121**), a microphone **122**, a battery gauge, an environment sensor (for example, a barometer, a hygrometer, a thermometer, a radiation detection sensor, a thermal sensor, and a gas sensor, among others), and a chemical sensor (for example, an electronic nose, a health care sensor, a biometric sensor, and the like), to name a few. The mobile terminal **100** may be configured to utilize information obtained from sensing unit **140**, and in particular, information obtained from one or more sensors of the sensing unit **140**, and combinations thereof.

The output unit **150** is typically configured to output various types of information, such as audio, video, tactile output, and the like. The output unit **150** is shown having a display unit **151**, an audio output module **152**, a haptic module **153**, and an optical output module **154**. The display unit **151** may have an inter-layered structure or an integrated structure with a touch sensor in order to facilitate a touch screen. The touch screen may provide an output interface between the mobile terminal **100** and a user, as well as function as the user input unit **123** which provides an input interface between the mobile terminal **100** and the user.

The audio output module **152** is generally configured to output audio data. Such audio data may be obtained from any of a number of different sources, such that the audio data may be received from the wireless communication unit **110** or may have been stored in the memory **170**. The audio data may be output during modes such as a signal reception mode, a call mode, a record mode, a voice recognition mode, a broadcast reception mode, and the like. The audio output module **152** can provide audible output related to a particular function (e.g., a call signal reception sound, a message reception sound, etc.) performed by the mobile terminal **100**. The audio output module **152** may also be implemented as a receiver, a speaker, a buzzer, or the like.

A haptic module **153** can be configured to generate various tactile effects that a user feels, perceive, or otherwise experience. A typical example of a tactile effect generated by the haptic module **153** is vibration. The strength, pattern and the like of the vibration generated by the haptic module **153** can be controlled by user selection or setting by the controller. For example, the haptic module **153** may output different vibrations in a combining manner or a sequential manner.

An optical output module **154** can output a signal for indicating an event generation using light of a light source. Examples of events generated in the mobile terminal **100** may include message reception, call signal reception, a missed call, an alarm, a schedule notice, an email reception, information reception through an application, and the like.

The interface unit **160** serves as an interface with various types of external devices that can be coupled to the mobile terminal **100**. The interface unit **160**, for example, may include any of wired or wireless ports, external power supply ports, wired or wireless data ports, memory card ports, ports for connecting a device having an identification module, audio input/output (I/O) ports, video I/O ports, earphone ports, and the like. In some cases, the mobile terminal **100** may perform assorted control functions associated with a connected external device, in response to the external device being connected to the interface unit **160**.

The memory **170** is typically implemented to store data to support various functions or features of the mobile terminal **100**. For instance, the memory **170** may be configured to store application programs executed in the mobile terminal **100**, data or instructions for operations of the mobile terminal **100**, and the like. Some of these application programs may be downloaded from an external server via wireless communication. Other application programs may be installed within the mobile terminal **100** at time of manufacturing or shipping, which is typically the case for basic functions of the mobile terminal **100** (for example, receiving a call, placing a call, receiving a message, sending a message, and the like). It is common for application programs to be stored in the memory **170**, installed in the mobile terminal **100**, and executed by the controller **180** to perform an operation (or function) for the mobile terminal **100**.

The controller **180** typically functions to control overall operation of the mobile terminal **100**, in addition to the operations associated with the application programs. The controller **180** may provide or process information or functions appropriate for a user by processing signals, data, information and the like, which are input or output, or activating application programs stored in the memory **170**.

To drive the application programs stored in the memory **170**, the controller **180** may be implemented to control a predetermined number of the components mentioned above in reference with FIG. 1A. Moreover, the controller **180** may be implemented to combinedly operate two or more of the components provided in the mobile terminal **100** to drive the application programs.

The power supply unit **190** can be configured to receive external power or provide internal power in order to supply appropriate power required for operating elements and components included in the mobile terminal **100**. The power supply unit **190** may include a battery, and the battery may be configured to be embedded in the terminal body, or configured to be detachable from the terminal body.

Some or more of the components may be operated cooperatively to embody an operation, control or a control method of the mobile terminal in accordance with embodiments of the present disclosure. Also, the operation, control or control method of the mobile terminal may be realized on the mobile terminal by driving of one or more application programs stored in the memory **170**.

FIG. 2 is a front view of a first state and a second state of the mobile terminal in accordance with an embodiment, and FIG. 3 is a rear view of the first state and the second state of the mobile terminal in accordance with an embodiment. FIGS. 2(a) and 3(a) are views showing the first state in which the mobile terminal is contracted, and FIGS. 2(b) and 3(b) are views showing the second state in which the mobile terminal is extended.

As shown in the figures, the mobile terminal **100** in the first state is in a contracted position, and has a smaller size than the mobile terminal **100** in the second state. In addition, the size of the display unit **151** positioned on the front of the

mobile terminal **100** is also smaller than in the second state. The mobile terminal **100** in the first state may be extended in a first direction **D1** to switch to the second state. In the second state, as shown in FIG. 2(b), the size of the mobile terminal **100** and the size of the display unit **151** positioned on the front of the mobile terminal **100** are larger than in the first state, while the size of the display unit **151** positioned on the rear of the mobile terminal **100** is reduced as shown in FIG. 3(b). That is, a part of the display units **151** positioned on the rear of the mobile terminal **151** in the first state moves to the front of the mobile terminal **100** in the second state.

In the following description, the direction in which the mobile terminal **100** and the display unit **151** thereof are extended or enlarged is defined as a first direction **D1**, and the direction in which the mobile terminal contracts or retracts or is reduced to switch from the second state to the first state is defined as a second direction **D2**. A direction perpendicular to the first and second directions **D1** and **D2** is defined as a third direction. Description will be made on the assumption that the first and second directions are horizontal directions and the third direction is a vertical direction. However, depending on the arrangement of the mobile terminal **100**, the first and second directions may be vertical directions and the third direction may be a horizontal direction.

As such, a flexible display unit **151** which is bendable may be used as the display unit such that the position of the display unit may be varied. The flexible display unit **151** may be a display unit capable of maintaining a flat state like a conventional flat panel display and capable of warping, bending, folding, twisting, or rolling like paper. The flexible display unit **151** refers to a display which is manufactured on a thin and flexible substrate and is thus lightweight and robust as not to be easily broken. The flexible display unit according to the present disclosure may be bent in a specific direction, and may be arranged such that the curvature thereof may change in the first direction.

In addition, an electronic paper is a display technology to which properties of general ink are applied. The electronic paper may be different from the conventional flat panel display in using reflected light. The electronic paper may change information using a twisted ball or electrophoresis using a capsule.

In a state in which the flexible display unit **151** is not deformed (e.g., a state of having an infinite curvature radius, hereinafter referred to as a basic state), a display region of the flexible display unit **151** becomes flat. In a state in which the flexible display unit **151** is deformed by an external force from the basic state (e.g., a state of having a finite radius of curvature, hereinafter referred to as a deformed state), the display region may become a curved face. As shown, information displayed in the deformation state may be visual information output on the curved face. Such visual information is implemented by independently controlling light emission of sub-pixels arranged in a matrix. The sub-pixel refers to a minimum unit for implementing one color. When external force is applied to the flexible display unit **151**, the flexible display unit **151** may be deformed to switch from the default state, which is the flat state, to a bent state, which is not the flat state.

The flexible display unit **151** may be combined with a touch sensor to implement a flexible touch screen. When a touch is made on the flexible touch screen, the controller **180** (see FIG. 1) may perform control corresponding to such

touch input. The flexible touch screen may be configured to detect the touch input in the deformed state as well as in the basic state.

The touch sensor detects the touch (or touch input) applied on the touch screen using at least one of various touch schemes such as a resistive film scheme, a capacitance scheme, an infrared scheme, an ultrasonic wave scheme, a magnetic field scheme, and the like.

As an example, the touch sensor may be configured to convert a change in pressure applied on a specific portion of the touch screen, capacitance generated at the specific portion, or the like into an electrical input signal. The touch sensor may be configured such that a touch object applying a touch on the touch screen may detect touched position and area on the touch sensor, a pressure during the touch, a capacitance during the touch, and the like.

Further, the mobile terminal **100** may have a deformation detection means for detecting the deformation of the flexible display unit **151**. Such deformation detection means may be included in the sensing unit **140** (see FIG. 1).

The deformation detection means may be disposed in the flexible display unit **151** or a case (first to second frames **101** to **102** to be described later) to detect information related to the deformation of the flexible display unit **151**. In this connection, the information related to the deformation may include a direction in which the flexible display unit **151** is deformed, a degree of the deformation, a deformed position, a deformed time, an acceleration at which the deformed flexible display unit **151** is restored, and the like. In addition, the information related to the deformation may include various kinds of information that may be detected due to the bending of the flexible display unit **151**.

In addition, the controller **180** may change information displayed on the flexible display unit **151** or generate a control signal for controlling a function of the mobile terminal **100** based on the information related to the deformation of the flexible display unit **151** detected by the deformation detection means.

The deformation of the flexible display unit **151** may vary depending on the positions of the first frame **101** and the second frame **102**. As shown in FIG. 2, since the bending position on the flexible display unit **151** is determined according to the positions of the first frame and the second frame, the bending deformation position of the flexible display unit **151** and the area thereof positioned on the front may be calculated based on the positions of the first frame **101** and the second frame **102** in place of the deformation detection means of the flexible display unit **151**.

The state conversion (first or second state) of the flexible display unit **151**, i.e., the size change at the front and rear faces of the mobile terminal **100** of the display unit **151** based on the size change of the mobile terminal **100** may be performed manually by a force applied by the user, but may be not limited to such manual scheme. For example, when the mobile terminal **100** or the flexible display unit **151** is in the first state, the mobile terminal **100** or the flexible display unit **151** may be converted into the second state by the user or an application command without the external force applied by the user. As such, in order for the flexible display unit **151** to be automatically deformed without the external force, the mobile terminal **100** may include a driving unit **200**, which will be described later.

The flexible display unit **151** of the present disclosure is bent 180 degrees by rolling around a side portion of the mobile terminal **100** facing in the first direction. Accordingly, based on the side portion of the mobile terminal **100**, a part of the flexible display unit **151** is disposed on the front

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of the mobile terminal **100**, and the other part of the flexible display unit **151** is disposed on the rear of the mobile terminal **100**. For simplicity, the part of the flexible display unit **151** positioned on the front is called a front face, and the other part of the flexible display unit **151** positioned on the rear is called a rear face. As illustrated in FIG. 2, the mobile terminal may extend in the first direction or contract in the second direction opposite to the first direction. In this case, the area of the flexible display unit **151** positioned on the front changes. That is, the sizes of the front face and the rear face may be changed according to a change in the state of the mobile terminal.

The part of the flexible display unit **151** positioned on the front of the mobile terminal **100** may be immovably fixed to the front surface of the first frame **101**, and the other part thereof positioned on the rear of the mobile terminal **100** may be movably arranged on the rear of the mobile terminal **100**.

In addition, the flexible display unit **151** may be rolled on or released at the side portion in the first direction of mobile terminal. Accordingly, the rear face of the display unit **151** moves, so that the size of the front face of the display unit **151** may be adjusted. Since the size of the flexible display unit **151** is determined and the flexible display unit **151** is formed of one continuous body, an area of rear face of the display unit **151** decreases as an area of the front face of the display unit **151** increases. Such a display unit **151** may be rolled in a second frame **102**, which is movable relative to a first frame **101** to be described later, more correctly, on one of sides of the second frame **102**. The display unit **151** may be withdrawn or pulled out from or inserted or pushed into the second frame **102** while being rolled in the second frame **102** along a moving direction of the second frame **102** to adjust the area of the display unit **151** on the front face of the mobile terminal **100**. Such operation will be described in more detail below along with other relevant components of the mobile terminal **100**.

Typically, an antenna is disposed in the case or the housing of the mobile terminal **100**, but a portion where the antenna is installed in the case or the housing may be limited because of the flexible display unit **151** that covers not only the front face of the mobile terminal **100** but also the rear face thereof. For this reason, the antenna may be implemented on the flexible display unit **151**. An antenna on display (AOD) is an antenna in which a transparent film is formed by stacking an electrode layer and a dielectric layer that have patterns engraved thereon, respectively. The antenna on display may be implemented thinner than an antenna implemented using a laser direct structuring (LDS) technology using a conventional copper nickel plating scheme, so that the antenna on display may not be exposed to the outside without affecting a thickness. In addition, the antenna on display may transmit and receive a signal directly to or from the display unit **151**. Accordingly, the antenna on display may be used in the mobile terminal **100** in which the display unit **151** is located on the both faces of the mobile terminal **100** as in the present disclosure.

FIGS. 4 and 5 are exploded perspective views of the mobile terminal in accordance with an embodiment. FIG. 4 is an exploded perspective view of the mobile terminal as viewed from the front side, and FIG. 5 is an exploded perspective view of the mobile terminal as viewed from the rear side.

The mobile terminal **100** of the present disclosure includes frames **101** and **102** in which components are mounted, and the frames **101** and **102** of the present disclosure may vary in size in the first direction as shown in FIG.

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2. One or more frames **101** and **102** move relative to each other, and sizes thereof may vary in the first direction. Electronic components are mounted in the frames **101** and **102**, and the flexible display unit **151** is located out of the frames **101** and **102**.

Since the mobile terminal **100** of the present disclosure includes the flexible display unit **151**, the flexible display unit **151** may be combined in a form surrounding front faces and rear faces of the frames **101** and **102**. The frame may include the first frame **101** and the second frame **102** moving in the first direction with respect to the first frame **101**. The first frame **101** and the second frame **102** include front portions, a rear portions, and side portions, respectively, and are coupled to each other.

First, the first frame **101** corresponds to a main body of the mobile terminal **100**, and may have a space between the first front portion **1011** and the first rear portion **1012** therein for accommodating various components. In addition, the first frame **101** may accommodate the second frame **102** movably coupled to the first frame **101** in such a space. More specifically, as shown in FIGS. 2 and 5, the first frame **101** may include a first front portion **1011** disposed at a front portion of the mobile terminal **100** and supporting the front face of the display unit **151** and a first rear portion **1012** disposed at a rear portion of the mobile terminal and on which various components are mounted.

The first front portion **1011** and the first rear portion **1012** may be spaced apart from each other at a predetermined spacing to define a predetermined space therebetween, and may be connected to each other by a first side portion **1013**. The first side portion **1013** may be integrally formed with the first rear portion **1012** or the first front portion **1011**. The camera **121**, the audio output module **152**, and the input/output terminal **161**, the controller **180**, and the power supply unit **190** may be accommodated as components of the mobile terminal **100** in the space in the first frame **101**. For example, the controller **180** may be a circuit board **181** including a processor and an electronic circuit for controlling the operation of the mobile terminal, and the power supply unit **190** may be a battery **191** and related components. In addition, the driving unit **200** that controls the slide movement of the second frame **102**, which will be described later, may also be accommodated in the first frame **101**.

As described above, the display unit **151** has the continuous body, and thus, may be disposed on both the front face and the rear face of the mobile terminal **100** while being rolled in the mobile terminal **100**. The display unit **151** may include the front face positioned at the front face of the mobile terminal **100**, the rear face positioned at the rear face of the mobile terminal **100**, and the side face positioned between the front face and the rear face thereof and surrounding the side face of the mobile terminal. The front face and the rear face of the display unit **151** are flat, and the side face of the display unit **151** may form a curved face. The flexible display unit **151** may be damaged when being bent at an angle. Thus, the flexible display unit **151** may be formed to be bent with a predetermined curvature at the side face.

The display unit **151** may be divided into a fixed portion **151a** and **151b** and a variable portion **151c**. The fixed portion **151a** and **151b** means a portion fixed to the frame. Because of being fixed to the frame, the fixed portion **151a** and **151b** maintains a constant shape without changing a bending degree. On the other hand, the variable portion **151c** means a portion in which a bending angle or a position of the bent portion changes. The variable portion **151c** in which the position or bending angle of the bent portion changes

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requires a structure for supporting a rear face of the variable portion **151c** in response to the change.

The fixed portion **151a**, **151b** is coupled to the first frame of the display unit and is always positioned on the front face of the display unit to form a portion of the front face of the display unit. The variable portion **151c** includes a side face located at a side portion of the mobile terminal, and a position of the side face varies depending on the position of the second frame. Based on a side face, an area of a portion disposed on the front face of the display unit and an area of a portion disposed on the rear face of the display unit vary. That is, a portion of the variable portion **151c** may be the front face and another portion of the variable portion **151c** may be the rear face based on the first and second states. The variable portion **151c** is positioned in the first direction with respect to the fixed portion **151a**, **151b** relative to the mobile terminal, and an end of the variable portion **151c** is bent toward the rear face of the mobile terminal and slides on the rear face of the second frame.

The end of the variable portion of the display unit is coupled with a slide frame that guides the variable portion to slide move on the rear face of the second frame, and the slide frame moves in the first direction at the same time as the second frame moves in the first direction. As a result, a moving distance of the slide frame with respect to the first frame is twice as a moving distance of the second frame with respect to the first frame. Further, as shown in FIG. 3, the first rear portion **1012** of the mobile terminal **100** includes an exposed rear portion **1015** that is exposed to the outside without being covered by the display unit **151** even in the first state. The physical input unit **120** for the manipulation of the mobile terminal **100** such as various buttons, switches, the camera **121**, and a flash, and the sensing unit **140** such as the proximity sensor **141** or a fingerprint sensor may be arranged on the exposed rear portion **1015**. The first rear portion **1012** except for the exposed rear portion **1015** may be covered by the display unit **151** in the first state as shown in FIG. 3(a), and may be exposed rearward in the second state as shown in FIG. 3(b).

In a conventional bar-shaped terminal, a display unit is provided only on a front face of the terminal. Therefore, a main camera is placed on a rear face of the terminal in order for the user to capture an object at an opposite side while looking through the display unit. On the other hand, an additional auxiliary camera is required to be disposed on the front face of the terminal in order for the user to capture himself or herself while viewing himself or herself through the display unit.

In the mobile terminal **100** of the present disclosure, on the other hand, the display unit **151** is arranged on both the front and rear of the mobile terminal **100**. Accordingly, when a user photographs himself, a portion of the display unit **151** positioned on the same surface as the camera **121**, that is, the rear face of the display unit **151** may be used. When the user takes a photograph of an object around the user, a portion of the display unit **151** on the side facing away from the camera **121**, that is, the front face of the display unit **151** may be used. For this reason, the mobile terminal **100** may take a photograph of the user or an object located around the user using one camera **121**. The camera may include a plurality of cameras having different angles of view, such as wide angle, ultra wide angle, and telephoto angle. Not only the camera but also a proximity sensor and an audio output unit may be disposed on the exposed rear portion **1015**, and an antenna **116** may be installed on the rear portion **1015**. An exposed decor **1015** may be used to protect the camera, the sensor, or the like on the exposed rear portion **1015** and not

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to deteriorate the exterior design. A portion of the exposed decor **1015** corresponding to the camera **121** or the sensor **140** may be configured to be transparent, and the other portion thereof may have a predetermined pattern or color in consideration of design aspects without exposing internal parts.

The first side portion **1013** may extend along the edges of the first front portion **1011** and the first rear portion **1012** to surround the circumference of the first frame **101** and may define the appearance of the mobile terminal **100**. However, as mentioned above, the second frame **102** is accommodated in and movably coupled to the first frame **101**, and therefore a portion of the first frame **101** needs to be open to allow movement of the second frame **102** relative to the first frame **101**. As an example, as best shown in FIG. 2, the second frame **102** may be movably coupled to a side of the first frame **101** facing in the first direction, and accordingly the first side portion **1013** may not be formed on the lateral surface facing in the first direction such that the lateral surface is open. Since the first side portion **1013** is exposed to the outside of the mobile terminal **100**, the interface unit **160** for connecting a power port or an ear jack or the user input unit **120**, such as a volume control button, may be disposed on the first side portion **1013**. When the first side portion **1013** contains a metal material, the first side portion **1013** may serve as an antenna.

The second frame **102** may include a second front portion **1021** disposed at the front portion of the mobile terminal **100** and a second rear portion **1022** disposed at the rear portion of the mobile terminal **100**. Like the first front portion **1011** and the first rear portion **1012** of the first frame **101**, the second front portion **1021** and the second rear portion **1022** may be formed of plate-shaped members that are generally flat. In addition, the second frame **102** also accommodates various components, and must not interfere with the components accommodated in the first frame **101** during the movement. Accordingly, the second front portion **1021** and the second rear portion **1022** may be coupled to each other in a state of being spaced apart from each other to define a predetermined space therebetween, and may have shapes that do not interfere with the components in the first frame **101**.

FIG. 6 is a side view of the mobile terminal as viewed from a third direction. FIG. 6 shows the first side portion **1013** of the first frame **101** and a second side portion **1023** of the second frame **102**. Since the flexible display unit **151** is positioned at an end of the second frame **102** facing in the first direction, the end of the second frame **102** facing in the first direction should not be exposed to the outside. An end of the second frame **102** facing in the second direction should be open so as not to interfere with the first frame **101**. In the first state, the second side portion **1023** of the second frame **102**, which is positioned on the side facing in the third direction (which refers to the upward or downward direction in the drawing or may include both the upward and downward directions), may not be exposed to the outside because it overlaps the first side portion **1013** of the first frame. However, in the second state, it may be exposed to the outside because the second frame **102** is drawn out.

In addition, the display unit **151** may be bent 180 degrees while being rolled in the second frame **102** to be disposed on both the front face and the rear face of the mobile terminal **100**. For such an arrangement of the display unit **151**, the second frame **102** may include a roller **210** rotatably disposed therein. The roller **210** may be disposed at any position inside the second frame **102**. However, the display unit **151** should be spread flat on the front face and the rear

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face of the mobile terminal **100** to provide a good quality screen to the user. Further, for such spread, a proper tension must be provided on the display unit **151**. In order to provide the proper tension, the roller **210** may be disposed at a first directional end of the second frame **102**. The roller **210** may extend in the third direction, and may be rotatably coupled to the second frame **102**.

The display unit **151** may be rolled around the roller **210** while being gently bent with a predetermined curvature. The flexible display unit **151** may include a first face on which a video is output and exposed to the outside and an inner face facing the frame at the opposite side. The roller **210** may be installed to rotate freely in the second frame **102** while being in contact with the inner face of the display unit **151**. Accordingly, the roller **210** may actually move the display unit **151** in a lateral direction of the mobile terminal **100**, that is, in a direction perpendicular to a longitudinal direction. As will be described later, when the second frame **102** slides, because of the tension applied by the second frame **102**, the display unit **151** moves to the front face or the rear face of the mobile terminal **100** in different directions (i.e., the first direction **D1** or the second direction **D2**) relative to the second frame **102**. The roller **210** may guide such movement while rotating.

The roller **210** may be disposed adjacent to the end of the second frame **102** that faces in the first direction. A side frame **1024** may be disposed at the end of the second frame **102** facing in the first direction to prevent damage to the display unit **151** rolled around the roller **210**.

The side frame **1024** may extend in the longitudinal direction (the third direction) of the second frame **102** to cover the side portion facing in the first direction, thereby protecting the roller **210** and the display unit **151** rolled therearound.

Location may be varied according to the state of the mobile terminal. Since a side face is rolled around the roller, the side face is bent with a predetermined curvature and the inner face of a side frame may include a curved face corresponding to the curvature of the side face.

The side frame **1024** may substantially define the appearance of the mobile terminal **100** in cooperation with the first side portion **1013** of the first frame **101**. In addition, the side portion of the second frame **102** that faces in the second direction may be omitted to minimize interference with the components arranged in the first frame **101** during movement.

During the expansion and the contraction in such first and second directions **D1** and **D2**, the second frame **102** may overlap the first frame **101**, more precisely, the first front portion **1011** and the first rear portion **1012** thereof so as not to interfere with the first frame **101**. More specifically, the display unit **151** may be coupled to and supported by the first front portion **1011** of the first frame **101**, as described above. Accordingly, the display unit **151** does not need to be additionally supported by the second front portion **1021** of the second frame **102**. Rather, when the second front portion **1021** is interposed between the first front portion **1011** and the display unit **151**, the display unit **151** may be deformed or damaged because of friction with the second front portion **1021**, which is repeatedly moved. Thus, the second front portion **1021** may be disposed below the first front portion **1011**, or may be interposed between two first front portions **1011**. The second rear portion **1022** of the second frame **102** may be disposed rearward of the first rear portion **1012** of the first frame **101**. That is, the front face of the second rear portion **1022** may face the rear face of the first rear portion **1012**. In addition, the rear face of the first rear portion **1012**

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may be in contact with the front face of the second rear portion **1022** to stably support the movement of the second frame **102**. Because of such arrangement, the second rear portion **1022** may be exposed to the outside of the first frame, more precisely, of the first rear portion **1012**, and may be coupled to the display unit **151**.

In addition, the second frame **102** may extend and contract in the first and second directions **D1** and **D2** to change the size of the mobile terminal **100**, particularly, to extend or contract the front face of the mobile terminal **100**. Thus, the display unit **151** must move by such extended or reduced front face size to obtain the intended first and second states. However, when being fixed to the second frame **102**, the display unit **151** may not be moved smoothly to be adapted for the front face of the mobile terminal **100** that is extended or contracted. For this reason, the display unit **151** may be movably coupled to the second frame **102**.

More specifically, the display unit **151** may include a first region **151a** disposed on the front of the mobile terminal **100**, a second region **151b** coupled to a slide frame **103** positioned on the rear of the mobile terminal **100**, and a third region **151c** located between the first region **151a** and the second region **151b** and bent around the roller **210**. The third region **151c** may move to the front or the rear according to change in the state of the mobile terminal **100**. The slide frame **103** may be formed of a plate-shaped member extending in the longitudinal direction (the third direction) of the mobile terminal **100**, and may be coupled to the second rear portion **1022** so as to be movable in the first and second directions **D1** and **D2**.

The first to third regions **151a**, **151b**, and **151c** may be connected to each other, and may form a continuous body of the display unit **151**. In addition, as described above, for the movement of the third region **151c** toward the front face or the rear face of the mobile terminal **100** depending on the moving direction of the second frame **102**, the first region **151a** may be fixed so as not to move to the front face of the mobile terminal **100**, and the second region **151b** may be provided to be movable on the rear face of the mobile terminal. Such configuration of the display unit **151** will be described in more detail below.

The first region **151a** may be disposed on the front face of the mobile terminal **100**, more specifically, the first frame **101**, that is, on the front face of the first front portion **1011**. The first region **151a** is fixed to the first frame **101**, that is, the front face of the first front portion **1011** so as not to be moved during the movement of the second frame **102**, and thus, the first region **151a** may always be exposed to the front face of the mobile terminal **100**.

The third region **151c** may be adjacent to the first region **151a** in a direction of the second side edge **151e**, and may extend into the second frame **102** and rolled on the roller **210**. The third region **151c** may consecutively extend out of the second frame **102** again and partially cover the second frame **102**, that is, the rear face of the second rear portion **1022**. Further, the second frame **102**, that is, the second rear portion **1022**, is adjacent to the first frame **101**, that is, the first rear portion **1012** and together forms the rear case of the mobile terminal **100**, so that it may be described that the third region **151c** is also disposed on the rear face of the first frame **101**.

The second region **151b** may be adjacent to the third region **151c** and may be disposed on the rear face of the mobile terminal **100**, more specifically, on the second frame **102**, that is, the rear face of the second rear portion **1022**

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thereof. The second region **151b** may be coupled to the slide frame **103** without being directly coupled to the second frame **102**.

As a result, the first region **151a** may be disposed on the front face of the mobile terminal **100** and may be always exposed to the front face regardless of the movement of the second frame **102**, and the second region **151b** may be disposed on the rear face of the mobile terminal **100** and may be always exposed to the rear face regardless of the movement of the second frame **102**. In addition, the third region **151c** may be disposed between the first and second regions **151a** and **151b**, and may be selectively placed on the front face or the rear face of the mobile terminal **100** depending on the moving directions **D1** and **D2** of the second frame **102**.

Because of such selective placement of the third region **151c**, as shown in FIG. 4B, the first rear portion **1012** of the first frame **101** may be exposed to the outside of the mobile terminal **100** because the first rear portion **1012** is covered by the second and third regions **151b** and **151c** and the second rear portion **1022** of the display unit **151** in the first state, but, in the second state, the third region **151c** moves to the front face of the mobile terminal **100** and the second rear portion **1022** also moves in the first direction **D1**. In addition, the second front portion **1021** of the second frame **102** is hidden by the first front portion **1011** of the first frame **101** in the first state, but, in the second state, moves out of the first frame **101** to support the third region **151c** of the display unit **151** disposed on the front face of the mobile terminal **100**.

In order to prevent the second front portion **1021** from affecting the internal components during the slide movement, a separating plate **1017** may be further disposed rearward of the second front portion **1021** and fastened with the first front portion **1011**. The second front portion **1021** may move between the first front portion **1011** and the separating plate **1017** based on the slide movement of the second frame.

However, the third region **151c** may be rolled on the roller **210** and bent in the second frame **102**. When converting from the first state to the second state, the third region **151c** may extend from the second frame **102** to the front face of the mobile terminal **100** while being rolled on the roller **210** in one direction. On the other hand, when converting from the second state to the first state, the third region **151c** may be retracted from the front face of the mobile terminal **100** to the second frame **102** while being rolled on the roller **210** in the opposite direction, and at the same time, may return to the rear face of the mobile terminal **100** from the second frame **102**.

A specific location of the foldable mobile terminal in a form of being spread like a book is easily damaged because only the specific location is folded repeatedly. On the other hand, the deformed portion of the flexible display unit **151**, that is, a portion rolled on the roller **210**, may vary based on the first and second states of the mobile terminal **100**, that is, the movement of the second frame **102**. Accordingly, the mobile terminal **100** of the present disclosure may significantly reduce deformation and fatigue repeatedly applied to a specific portion of the display unit **151**, thereby preventing damage to the display unit **151**.

Based on the above-described configuration, overall operations of the mobile terminal **100** will be described as follows. As an example, the state conversion may be performed manually by the user, and an operation of the mobile terminal **100** during such manual state conversion will be described. However, operations of the first to third frames

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101 to **103** and the display unit **151**, which will be described below, may be performed in the same manner when a power source other than a user's force is used, for example, when the driving unit **200** to be described below is applied.

A rear face cover **1025** may be further disposed on a rear face of the second rear portion **1022** such that the rear face of the display unit positioned on the rear face of the mobile terminal **100** is not exposed to the outside. The rear face of the display unit may be used in the first state when the rear face cover **1025** uses a transparent material, and the rear face of the display unit may be covered such that the movement of the slide frame **103** is not exposed when the rear face cover **1025** uses an opaque material. That is, the second region and the third region of the slide frame **103** and the display unit **151** may move in the first direction and in the second direction in a space between the second rear portion **1022** and the rear face cover **1025**.

FIG. 7 is a view showing a driving unit **200** of the mobile terminal **100** in accordance with an embodiment. FIG. 7(a) shows the first state and FIG. 7(b) shows the second state. The mobile terminal **100** of the present disclosure may be switched between the states in a manner in which a user manually pulls the second frame **102** in the first direction **D1** or pushes the same in the second direction **D2** with respect to the first frame **101**. However, in the manual method, applying excessive force to the body of the mobile terminal **100** may damage the mobile terminal **100**. Accordingly, a driving unit **200** employing a motor **201** may be further provided to cause the second frame **102** to stably move without distortion.

As the motor **201**, a motor **201** configured to provide rotational force as shown in FIG. 7, or a linear motor **201** configured to make linear motion may be used. The motor **201** configured to provide the rotational force should have a large diameter to provide large force. Two motors **201** may be used as shown in FIG. 7 to provide driving force of a predetermined magnitude or more in the limited space of the mobile terminal **100** without increasing the thickness.

If the second frame **102** is moved excessively fast, damage or malfunction may occur. Accordingly, a planetary gear configured to decrease the speed of the motor **201** to ensure movement at a stable speed may be further provided. The planetary gear **202** serves to amplify or attenuate the number of revolutions of the motor **201** using a plurality of disc gears having different numbers of teeth. The motor **201** may be fixed to the first frame **101** as shown in FIG. 7(a). The position of the motor **201** is fixed even when the second frame **102** moves in the first direction to switch the mobile terminal **100** to the second state, as shown in FIG. 7(b).

Since the second frame **102** linearly moves with respect to the first frame **101** in the first direction or the second direction, rack and pinion gears configured to convert the rotational force of the motor **201** into linear motion may be used. A pinion gear to receive the rotational force of the motor **201** may be arranged to engage with a rack gear **205** composed of teeth continuously arranged in the first direction. The pinion gear may be fixed to the first frame **101** together with the motor **201** and the rack gear **205** may be positioned on the second frame **102**. Alternatively, the rack gear **205** may be positioned on the first frame **101**, and the motor **201** and the pinion gear may be arranged on the second frame **102**. Since the motor **201** holds the pinion gear such that the pinion gear does not rotate, the second frame **102** may maintain the first state and the second state. However, when large external force is applied, the second frame **102** may be displaced as the pinion gear rotates.

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A stopper (not shown) configured to fix the positions of the second frame **102** or the rack gear **205** and the first frame **101** may be further provided to fix the mobile terminal **100** in the first state or the second state. When electric current flows through the motor **201** to drive the motor **201**, the stopper may be released to allow the movement of the second frame **102**. When power is not applied to the motor **201** and thus the motor **201** does not rotate, the first frame **101** and the second frame **102** may be fastened such that the positions thereof are fixed.

When a pair of driving units **200** is symmetrically disposed in the vertical direction (the third direction), stable movement may be made. However, to arrange a battery or the like, the driving unit **200** should be arranged biased to one side in consideration of the limited mounting space of the mobile terminal **100** as shown in FIG. 7(a). According to such asymmetric arrangement of the driving unit **200**, the second frame **102** may be distorted during movement due to a difference in movement speed between the upper end portion and the lower end portion. To address this issue, a linear guide **230** may be further provided.

The linear guide **230** may be disposed at both ends of the mobile terminal **100** facing in the third direction, that is, on the upper and lower sides of the mobile terminal **100**, in order to supplement the function of one driving unit **200** biased to one side in the third direction. The linear guide **230** may include a guide rail **231** extending in the first direction and a guide block **232** configured to move along the guide rail **231**. The guide rail **231** may be disposed on the first frame **101** and the guide block **232** may be disposed on the second frame **102**, or vice versa. In this embodiment, the guide rail **231** may be disposed on the second frame **102** to cover the upper and lower sides of the extended portion of the second frame **102** in the second state.

After the guide block **232** is coupled to the first frame **101** and the guide rail **231** is coupled to the second frame **102**, the guide block **232** and the guide rail **231** may be slidably fastened to each other. However, for convenience of the fastening, the guide block **232** and the guide rail **231** fastened to each other. Then, the guide block **232** may be first fixed to the first frame **101**, and then the second frame **102** may be coupled to the guide rail **231**.

The guide block **232** may be provided with a guide groove into which the guide rail **231** is inserted. Alternatively, the guide rail **231** may be provided with a rail groove into which a portion of the guide block **232** is inserted. The fastening portions of the guide rail **231** and the guide block **232** may be formed to be bumpy. Accordingly, movement in the first direction or the second direction may be made without displacement in the thickness direction of the mobile terminal **100**. In order to reduce friction between the guide block **232** and the guide rail **231**, a self-lubricating member having high wear resistance and low friction resistance, such as a bearing or polyoxymethylene (POM), may be added to the inside of the guide groove.

FIG. 8 is a cross-sectional view taken along lines A-A and B-B in FIG. 2.

As illustrated in FIG. 2, when the second frame **102** switches to the second state by moving in the first direction, the third region **151c** positioned on the rear side moves to the front, and thus a structure to support the rear surface of the third region **151c** moved to the front is required. The second front portion **1021** positioned on the front surface of the second frame **102** may be positioned on the rear surface of the third region **151c** in the second state. However, in the first state, the second front portion **1021** is disposed to overlap the first front portion **1011** of the first frame **101**, and

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accordingly the first front portion **1011** and the second front portion **1021** form a step. A boundary is formed between the first region **151a** and the third region **151c** of the flexible display unit **151** by the step formed by the first front portion **1011** and the second front portion **1021**. A rolling plate **104** may be used as a support structure to fill the gap between the second front portion **1021** and the third region **151c** of the flexible display unit **151**.

The rolling plate **104** may be positioned on the rear surface of the flexible display unit **151**, and have a thickness corresponding to the gap between the second front portion **1021** and the flexible display unit **151** in the second state. As shown in FIG. 8(a), in the first state, the rolling plate **104** is rolled around the roller **210** and is positioned on the lateral side and rear side of the mobile terminal **100**. The flexible display unit **151** and the rolling plate **104** may be positioned between the second rear portion of the second frame **102** and a rear cover **1025** provided to cover the rear face of the display unit **151**. As shown in FIG. 8(b), when switch to the second state occurs, the rolling plate **104** may move to the front and the rolling plate **104** may be positioned on the front portion of the second frame **102**.

The third region **151c** of the display unit **151** in which the rolling plate **104** is positioned is a portion where bending deformation occurs when switch from the first state to the second state occurs. Accordingly, the rolling plate **104** may be deformed according to deformation of the third region **151c**. Here, the rolling plate **104** is required to have a predetermined stiffness to maintain the flat state when the flexible display unit **151** is positioned on the front or rear of the mobile terminal. That is, the rolling plate **104** needs a structure capable of maintaining the flat state in the third direction and performing bending deformation in the first direction.

Hereinafter, embodiments related with a control method that may be implemented in the mobile terminal configured as described above will be described with reference to the attached drawings. Those skilled in the art will appreciate that the present disclosure may be carried out in other specific ways than those set forth herein without departing from the spirit and essential characteristics of the present disclosure.

FIG. 9 is a block diagram illustrating constituent modules of a mobile terminal according to an embodiment of the present disclosure. The block diagram of FIG. 9 is for better explanation of an embodiment of the present disclosure, and the mobile terminal, which will be described below, may be implemented as the mobile terminal illustrated in FIGS. 1 to 8.

Referring to FIG. 9, a mobile terminal **900** according to an embodiment of the present disclosure may include a body **910**, a display **920**, an input unit **930**, and a controller **940**.

The body **910** is hardware constituting the mobile terminal **900** and may include a first frame and a second frame.

In an embodiment of the present disclosure, the second frame may be extendable or contractible from the first frame. Here, the first frame and the second frame may be implemented as the first frame and the second frame described with reference to FIGS. 1 to 8. That is, the second frame may be extended or contracted from the first frame manually or automatically by the above-described structure.

The mobile terminal **900** may further include a driving unit (not illustrated) for causing the second frame to be extended or contracted. Here, the driving unit may be implemented as the driving unit **200** of FIG. 7.

The mobile terminal **900** may operate in an enlarged display mode as the second frame is extended, and may

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operate in a reduced display mode as the second frame is contracted. The enlarged display mode and the reduced display mode may correspond to the first state and the second state, respectively, described in FIGS. 2 and 3.

The display 920 may be coupled to the body 910 so that a display region viewed from the front of the body 910 may vary as the display 920 switches between the enlarged display mode and the reduced display mode. That is, in an embodiment of the present disclosure, the display 920 may surround the front, side, and rear faces of the body 910. The display 920 may be implemented as the flexible display unit 151 of FIG. 1.

In an embodiment of the present disclosure, as the second frame is extended, a display portion positioned on the side of the body 910 may move to the front of the body 910, and a display portion positioned on the rear of the body 910 may move to the front of the body 910 via the side of the body 910.

As the second frame is contracted, the display portion positioned on the front of the body 910 may move to the side of the body 910 or to the rear of the body 910 via the side of the body 910.

In one embodiment of the present disclosure, the state in which the second frame is not extended, that is, the state in which the mobile terminal 900 is in the reduced display mode may be defined as the default state. In addition, the state in which the mobile terminal 900 is in the reduced display mode may be referred to as a first mode and the state in which the mobile terminal 900 is in the enlarged display mode may be referred to as a second mode.

The display 920 may display the visual information. In this regard, the visual information may include a text, an indicator, an icon, a content, an application, an image, and a video. In addition, the display 920 may output the visual information on the screen in response to a control command of the controller 940.

In particular, the display 920 may divide a region in the enlarged display mode. More specifically, the display 920 may output different visual information in the divided regions. For example, the display 920 may output a first application in a first region, a second application in a second region, and a third application in a third region.

In addition, the display 920 may output the visual effect. More specifically, the display 920 may give an effect to the output visual information rather than simply outputting the visual information. For example, the display 920 may display in black and white, blur, or dim the output application. In addition, the display 920 may output the visual effect only in a partial region.

In particular, the display 920 may be implemented as a touch screen by forming a mutual layer structure or integrally formed with the touch sensor as described above in FIG. 1, but an output function and a touch function may be controlled independently of each other. This will be described in detail in the drawings below.

The input unit 930 may receive various inputs from the user for the mobile terminal 900 and deliver input results such that the controller 940 may perform corresponding operations. For example, the input unit 930 may receive an input signal for touching the first region from the user, and may deliver the input result to the controller 940 such that the controller 940 may determine that the first region is selected.

In one embodiment of the present disclosure, the input unit 930 may be disposed in the display 920 and implemented as the touch screen. In this regard, the input unit 930 is disposed in the display 920, but is able to be controlled

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individually of the output function of the display 920. In addition, the input unit 930 may be implemented as the input unit 120 in FIG. 1.

The input unit 930 may sense the touch input from the user. In this regard, the input unit 930 may sense a point where the touch input is sensed, a touched area, a touch pressure, and the like together.

The input unit 930 may simply receive an input signal for touching the icon or the image from the user, and the input unit 930 may receive a touch drag input signal for touching the icon or the image and then dragging the icon or the image to another location. In addition, the input unit 930 may receive a touch drag input signal for touching and then dragging a button, and the controller 940 may obtain a drag distance and a drag direction of the received touch drag input signal.

The controller 940 may process data, control each unit of the mobile terminal 900 described above, and control data transmission/reception between the units. In the present disclosure, the controller 940 may be implemented as the controller 180 in FIG. 1.

Operations performed by the mobile terminal 900 may be controlled by the controller 940. However, for convenience, in the drawings and the following description, such operations are collectively referred to as being performed/controlled by the mobile terminal 900.

Hereinafter, embodiments of the present disclosure will be described with reference to FIGS. 10 to 17. In describing and understanding the embodiments of the present disclosure below, reference may be made to the contents described above with respect to FIGS. 1 to 9.

FIG. 10 is a diagram illustrating an embodiment of outputting a plurality of application layout icons in a mobile terminal according to one embodiment of the present disclosure.

A mobile terminal 1000 may output a plurality of application layout icons 1010a, 1010b, 1010c, 1010d, 1020a, 1020b, 1020c, 1020d, 1030a, 1030b, 1030c, and 1030d on the display. In one embodiment of the present disclosure, the mobile terminal 1000 may align the plurality of application layout icons 1010a to 1030d based on a predetermined criterion.

In addition, as a first signal (not shown) for selecting a fourth application layout icon 1010d among the plurality of application layout icons 1010a to 1030d is received, the mobile terminal 1000 may output the application based on a fourth application layout icon 1010d. In this regard, because the fourth application layout icon 1010d contains only one application, the mobile terminal 1000 may output one application in a full screen. On the other hand, when the mobile terminal 1000 receives a second signal (not shown) for selecting a twelfth application layout icon 1030d, the mobile terminal may divide the region of the display into three regions and output three applications in the respective three divided regions of the display.

Referring to FIG. 10, the mobile terminal 1000 may output the plurality of application layout icons 1010a to 1030d on a display 1001. In this regard, because the display region 1001 of the mobile terminal 1000 is limited, a current state may correspond to a state in which only some 1010c, 1010d, 1020c, and 1020d among the plurality of application layout icons 1010a to 1030d are output.

In addition, the mobile terminal 1000 may output the plurality of application layout icons 1010a to 1030d as a signal for outputting a list of recently used applications is received in a home screen or while executing another application. For example, the user may input a touch signal

of swiping from bottom to top on the home screen, and accordingly, the mobile terminal may output the recently used application list including the plurality of application layout icons **1010a** to **1030d**.

In particular, the plurality of application layout icons **1010a** to **1030d** may be aligned based on the predetermined criterion. In this regard, the predetermined criterion may include at least one of the number of split screens, a day of use, a frequency of use, a location, and a theme. This will be described in detail with reference to FIG. **11** below.

FIG. **10** shows an embodiment in which the plurality of application layout icons **1010a** to **1030d** are aligned based on the number of split screens.

More specifically, the mobile terminal **1000** may align the plurality of application layout icons **1010a** to **1030d** in a manner of being classified into a first layer, a second layer, and a third layer. In this regard, the first layer may contain full-screen application layout icons **1010a**, **1010b**, **1010c**, and **1010d**, the second layer may contain 2-split-screen application layout icons **1020a**, **1020b**, **1020c**, and **1020d**, and the third layer may contain 3-split-screen application layout icons **1030a**, **1030b**, **1030c**, and **1030d**.

In addition, the mobile terminal **1000** may move the full-screen application layout icons **1010a**, **1010b**, **1010c**, and **1010d** included in the first layer in response to a third signal **1040a** for selecting the first layer and touching and dragging the first layer in left and right directions. That is, because icons that the user can actually see in the screen are only the application layout icons **1010c**, **1010d**, **1020c**, and **1020d** output within the display region **1001**, the user may identify a first application layout icon **1010a** and a second application layout icon **1010b** based on the third signal **1040a**. In addition, although only the embodiment in which the first layer is selected has been described, this may also be applicable even when the second layer and the third layer are selected.

Similarly, the mobile terminal **1000** may move the first layer, the second layer, and the third layer in a vertical direction based on a fourth signal **1040b** for touch and drag in the vertical direction. In this regard, the first layer, the second layer, and the third layer may move in the vertical direction together. Accordingly, the user may select the application layout icons contained in the second layer and the third layer, not the application layout icons contained in the first layer and the second layer.

That is, the mobile terminal **1000** may output the application layout icons in the recently used application list based on the predetermined criterion, divide the display region with a single selection of the user, and output several applications.

FIG. **11** is a diagram for illustrating an embodiment of aligning a plurality of application layout icons in a mobile terminal according to one embodiment of the present disclosure.

The mobile terminal may output a plurality of application layout icons, and may align the icons based on a predetermined criterion. In this regard, the predetermined criterion may consider at least one of the number of split screens, a day of use, a frequency of use, a position, and a theme.

(a) in FIG. **11** illustrates an embodiment in which the application layout icons are aligned based on the frequency of use, and (b) in FIG. **11** illustrates an embodiment in which the application layout icons are aligned based on the theme of the application.

Referring to (a) in FIG. **11**, the mobile terminal may align the application layout icons based on the frequency of use. More specifically, the mobile terminal may output an appli-

cation layout icon corresponding to an application that has been used the most during a predetermined period of time on the first layer. In addition, the mobile terminal may output an application layout icon corresponding to an application that has been used the most in a full screen during a predetermined period of time on the first layer. That is, the mobile terminal may consider the plurality of predetermined criteria together.

Referring to (b) in FIG. **11**, the mobile terminal may align the application layout icons based on the theme of the application. More specifically, the mobile terminal may output an application layout icon for a bank application in the first layer and output an application layout icon for a home screen layout in the second layer. In this regard, the home screen layout may correspond to a stored value of an application layout of the home screen manually set by the user. That is, the mobile terminal may align the application layout icons in the first layer, the second layer, and the third layer based on the theme of the application.

FIG. **12** is a diagram for illustrating another embodiment of aligning a plurality of application layout icons in a mobile terminal according to one embodiment of the present disclosure.

The mobile terminal may move a sixth application layout icon contained in the second layer in response to a vertically dragging signal.

The mobile terminal may align and output a plurality of application layout icons in the first layer, the second layer, and the third layer. However, unlike the embodiment described above, the mobile terminal may change the application layout icon contained in the layer based on a vertically dragging signal **1240**.

More specifically, the mobile terminal may output full-screen application layout icons **1210a**, **1210b**, and **1210c** in the first layer, output 2-split-screen application layout icons **1220a**, **1220b**, and **1220c** in the second layer, and output 3-split-screen application layout icons (not shown and **1230c**) in the third layer. In this regard, the mobile terminal may receive the signal **1240** of touching and downwardly dragging a sixth application layout icon **1220c** output in the second layer.

The mobile terminal may output a first application layout icon **1210a**, a second application layout icon **1210b**, and the sixth application layout icon **1220c** in the first layer based on the signal **1240**.

In other words, in order to place frequently used application layout icons in the first layer, the user may individually move the application layout icons aligned in the full screen, the 2 split screens, and the 3 split screens to create new first, second and third layers.

FIG. **13** is a diagram for illustrating another embodiment of aligning a plurality of application layout icons in a mobile terminal according to one embodiment of the present disclosure.

The mobile terminal may output an alignment icon **1350** in a state in which a plurality of application layout icons are output. In one embodiment of the present disclosure, the mobile terminal may align the plurality of application layout icons again based on a signal **1340** for selecting the alignment icon **1350**.

Referring to a left drawing in FIG. **13**, the mobile terminal may output the plurality of application layout icons. In this regard, the plurality of output application layout icons may be in a state of being aligned in various ways according to the above-described embodiment or by the manual manipulation of the user.

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In one embodiment of the present disclosure, the mobile terminal may receive the signal **1340** for selecting the alignment icon **1350**. In this regard, the alignment icon **1350** may correspond to an icon of aligning the application layout icons based on the above-described predetermined criterion. In the embodiment of FIG. **13**, the alignment icon **1350** may correspond to an icon of aligning the application layout icons based on the number of split screens.

Referring to a right diagram in FIG. **13**, the mobile terminal may align the plurality of application layout icons again in response to the signal **1340** based on the number of split screens such that the full-screen application layout icons are output in the first layer, the 2-split-screen application layout icons are output in the second layer, and the 3-split-screen application layout icons are output in the third layer.

In addition, the mobile terminal may further output an alignment icon **1351** based on the day of use, an alignment icon **1352** based on the frequency of use, an alignment icon **1353** based on the position, and an alignment icon (not shown) based on an order of recent use in addition to the alignment icon **1350** based on the number of split screens.

FIG. **14** is a diagram for illustrating another embodiment of aligning a plurality of application layout icons in a mobile terminal according to one embodiment of the present disclosure.

In one embodiment of the present disclosure, the mobile terminal may align a plurality of application layout icons based on a portrait mode or a landscape mode.

A mode that users mainly use is determined based on characteristics of the application, such as preferring the portrait mode or the landscape mode depending on the application. For example, a video playback application is commonly executed in the landscape mode.

In order to conveniently use such fact, the mobile terminal may align the application layout icons based on the portrait mode or the landscape mode.

Referring to a left diagram in FIG. **14**, when outputting the plurality of application layout icons based on the signal for executing the recently used application list, the mobile terminal may output application layout icons corresponding to applications mainly output in the landscape mode.

For example, when the user terminates the video playback application after executing the same, and when the video playback application is terminated in the landscape mode, the mobile terminal may output an application layout icon corresponding to the video playback application in the first layer of the left drawing in FIG. **14**.

In another example, when the user executes the video playback application and a web browser application in the 2 split screens and then terminates the same, and when the 2 split screens of the video playback application and the web browser application are terminated in the landscape mode, the mobile terminal may output a 2-split-screen application layout icon corresponding to the video playback application and the web browser application in the second layer of the left drawing in FIG. **14**.

In addition, in one embodiment of the present disclosure, when receiving a signal (not shown) for selecting a portrait mode alignment icon **1450a** in the state of outputting the application layout icons that were output in the landscape mode, the mobile terminal may change the application layout icons currently being output into application layout icons that were output in the portrait mode.

Referring to a right diagram in FIG. **14**, when outputting the plurality of application layout icons in response to the signal for executing the recently used application list, the

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mobile terminal may output application layout icons corresponding to applications that were mainly output in the portrait mode.

For example, when the user executes a messenger application and then terminates the same, and when the messenger application is terminated in the portrait mode, the mobile terminal may output an application layout icon corresponding to the messenger application in the first layer of the right drawing in FIG. **14**. In addition, the same embodiment may be applied to the 2 split screens or the 3 split screens.

In addition, when receiving a signal (not shown) for selecting a landscape mode alignment icon **1450b** in the state of outputting the application layout icons that were output in the portrait mode, the mobile terminal may change the application layout icons currently being output into the application layout icons that were output in the landscape mode.

FIG. **15** is a diagram for illustrating an embodiment of outputting a plurality of application layout icons in a mobile terminal according to an embodiment of the present disclosure.

The embodiment of FIG. **14** may be applied to the embodiment in FIG. **15**. That is, referring to a left drawing in FIG. **15**, the mobile terminal may output application layout icons that were output in the full screen in a vertical mode (corresponding to the portrait mode in FIG. **14**) in the first layer, output application layout icons that were output in the 2 split screens in the second layer, output application layout icons that were output in the 3 split screens in the third layer, and output application layout icons that were output in 4 split screens in a fourth layer.

In addition, in the embodiment of FIG. **15**, the mobile terminal may output the plurality of application layout icons in 3D layers. More specifically, the first to fourth layers may be output on a first surface and fifth to eighth layers may be output on a second surface.

In this regard, the fifth to eighth layers correspond to layers in which application layout icons output in the full screen, the 2 split screens, the 3 split screens, and the 4 split screens in a horizontal mode (corresponding to the landscape mode in FIG. **14**) are aligned.

In addition, when receiving a signal **1540** for moving the second surface to the first surface, the mobile terminal may change output positions of the second surface and the first surface as shown in a right drawing of FIG. **15**. For example, unlike the above-described embodiment, the output positions of the second surface and the first surface may be changed in response to a touch signal that intuitively pulls a surface located behind to the front, even when it is not a signal to select an alignment icon.

FIG. **16** is a diagram for illustrating an embodiment of extending a display based on an application layout icon in a mobile terminal according to an embodiment of the present disclosure.

A first drawing of FIG. **16** corresponds to an embodiment in which application layout icons are aligned according to the above-described embodiments. In particular, the mobile terminal may switch the mode of the display to the enlarged display mode as the display receives a signal **1640** for selecting a first application layout icon among a plurality of application layout icons in the reduced display mode.

Referring to a second drawing of FIG. **16**, the mobile terminal may output a pop-up window **1660** informing of the switching to the enlarged display mode upon receiving the signal **1640**. In this regard, the pop-up window **1660** may correspond to a pop-up window **1660** notifying an event of

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switching the display mode from the reduced display mode to the enlarged display mode.

In addition, in another embodiment, the mobile terminal may switch the display mode to the enlarged display mode when there is an additional signal from the user. That is, the mobile terminal may inform the user of switching to the enlarged display mode only when there is the additional signal from the user via the pop-up window 1660. In this case, the mobile terminal may extend the display as shown in a third drawing of FIG. 16 only when there is the additional signal from the user after the pop-up window 1660 is output.

Referring to the third drawing of FIG. 16, upon receiving the signal 1640, the mobile terminal may switch the mode of the display to the enlarged display mode and output an application based on the first application layout icon. More specifically, the first application layout icon may correspond to a 2-split-screen layout and may include a first application 1611 and a second application 1612. Accordingly, the mobile terminal may switch the mode of the display to the enlarged display mode based on the first application layout icon, output the first application 1611 in a left region, and output the second application 1612 in a right region.

FIG. 17 is a flowchart illustrating an embodiment of aligning a plurality of application layout icons in a mobile terminal according to an embodiment of the present disclosure. Each step of FIG. 17 to be described below may be controlled by the controller in FIG. 1. In particular, the mobile terminal performing the control method in FIG. 17 includes the display coupled to the body such that the display region visible from the front surface of the body may vary as the display mode is switched between the enlarged display mode and the reduced display mode.

In step S1710, the mobile terminal may output the plurality of application layout icons on the display.

In step S1720, the mobile terminal may align the plurality of output application layout icons based on the predetermined criterion. In this regard, the preset criterion may include at least one of the number of split screens, the day of use, the frequency of use, the location, and the theme. In particular, when the plurality of application layout icons are aligned based on the number of split screens, the mobile terminal may align the plurality of application layout icons in the manner of being classified into the first layer, the second layer, and the third layer. In this regard, the mobile terminal may output the full-screen application layout icon in the first layer, output the 2-split-screen application layout icon in the second layer, and the 3-split-screen application layout icon in the third layer. In addition, the mobile terminal may move the output application layout icon in response to the user signal. In this regard, the mobile terminal may move the application layout icon in units of layers or individually.

In step S1730, the mobile terminal may output the application on the display based on the first application layout icon upon receiving the first signal for selecting the first application layout icon among the plurality of application layout icons. In addition, as the mobile terminal receives the second signal for selecting the second application layout icon among the plurality of application layout icons in the state in which the display is in the reduced display mode, the mobile terminal may switch the mode of the display to the enlarged display mode and output the application based on the second application layout icon. In this regard, the second application layout icon may include the application frequently used in the enlarged display mode. In addition, the mobile terminal may output the pop-up window notifying the switching to the enlarged display mode upon receiving

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the second signal. In addition, the mobile terminal may switch the mode of the display to the enlarged display mode only when receiving the additional signal from the user after the pop-up window is output.

The embodiments described above with reference to FIGS. 10 to 16 may also be implemented with the control method of the mobile terminal as shown in FIG. 17.

Various embodiments may be implemented using a machine-readable medium having instructions stored thereon for execution by a processor to perform various methods presented herein. Examples of possible machine-readable mediums include HDD(Hard Disk Drive), SSD(Solid State Disk), SDD(Silicon Disk Drive), ROM, RAM, CD-ROM, a magnetic tape, a floppy disk, an optical data storage device, the other types of storage mediums presented herein, and combinations thereof. If desired, the machine-readable medium may be realized in the form of a carrier wave (for example, a transmission over the Internet). The processor may include the controller 180 of the mobile terminal. The foregoing embodiments are merely exemplary and are not to be considered as limiting the present disclosure. The present teachings can be readily applied to other types of methods and apparatuses. This description is intended to be illustrative, and not to limit the scope of the claims. Many alternatives, modifications, and variations will be apparent to those skilled in the art. The features, structures, methods, and other characteristics of the exemplary embodiments described herein may be combined in various ways to obtain additional and/or alternative exemplary embodiments.

INDUSTRIAL APPLICABILITY

The mobile terminal according to one embodiment of the present disclosure is able to be repeatedly implemented and has industrial applicability.

What is claimed is:

1. A mobile terminal comprising:

a body;

an input device for receiving an input of a user;

a display coupled to the body such that a display region, visible from a front surface of the body, varies the display is switched from a reduced display mode to an enlarged display mode; and

a controller comprising a processor,

wherein the controller is configured to:

based on the display being switched from the reduced display mode to the enlarged display mode, display a plurality of application layout icons amongst a full screen application layout icon and a plurality of split screen application layout icons on the display;

align the plurality of application layout icons amongst the full screen layout icon and the plurality of split screen application layout icons based on a first predetermined criterion of a plurality of predetermined criteria; and

in response to first user input for selecting a first application layout icon among the plurality of application layout icons, display an application on the display based on the selected first application layout icon,

wherein the controller is further configured to:

display a plurality of alignment icons, each of the plurality of alignment icons corresponding to one of the plurality of predetermined criteria other than the first predetermined criteria; and

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re-align the plurality of application layout icons amongst the full screen application layout icon and the plurality of split screen application layout icons in response to a user input to one of the display plurality of alignment icons, and

wherein the plurality of predetermined criteria includes at least three criteria of a set of criteria, the set of criteria comprising:

- a number of split screens of the plurality of split screen application layout icons,
- a day of use of the mobile terminal,
- a frequency of use of applications corresponding to the application layout icons,
- a location of the mobile terminal, and
- a theme of applications corresponding to the application layout icons.

2. The mobile terminal of claim 1, wherein the controller is configured to align or re-align the plurality of application layout icons in a first layer, a second layer, and a third layer when the plurality of application layout icons are aligned based on the number of split screens.

3. The mobile terminal of claim 2, wherein the controller is configured to display a full screen application layout icon in the first layer, at least one 2-split-screen application layout icon in the second layer, and at least one 3-split-screen application layout icon in the third layer.

4. The mobile terminal of claim 3, wherein the controller is configured to move the displayed full screen application layout icon in response to a second user input for selecting the first layer, the second user input comprising dragging the first layer in one or more directions.

5. The mobile terminal of claim 3, wherein the controller is configured to move the first layer, the second layer, or the third layer together in response to a third user input, the third user input comprising vertical dragging the first layer, the second layer, or the third layer in one or more directions.

6. The mobile terminal of claim 3, wherein the controller is configured to individually move a second application layout icon contained in the first layer in response to a fourth user input, the fourth user input comprising vertical dragging the second application layout icon in one or more directions.

7. The mobile terminal of claim 1, wherein the controller is configured to align or re-align the plurality of application layout icons based on the display being in a portrait mode or a landscape mode.

8. The mobile terminal of claim 1, wherein the controller is configured to display the plurality of application layout icons in 3D layers.

9. The mobile terminal of claim 1, wherein the controller is configured to: switch the display from the reduced display mode to the enlarged display mode in response to a fifth user input,

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received while in the reduced display mode, the fifth user input for selecting a second application layout icon among the plurality of application layout icons; and display the application based on the second application layout icon.

10. The mobile terminal of claim 9, wherein the controller is configured to display a pop-up window informing of the switching to the enlarged display mode based on receiving the fifth user input.

11. A method for controlling a mobile terminal including that includes a display coupled to a body such that a display region visible from a front surface of the body varies as the display is switched from a reduced display mode to an enlarged display mode, the method comprising:

based on the display being switched from the reduced display mode to the enlarged display mode, displaying a plurality of application layout icons amongst a full screen application layout icon and a plurality of split screen application layout icons on the display;

aligning the plurality of application layout icons amongst the full screen application layout icon and the plurality of split screen application layout icons based on a first predetermined criterion of a plurality of predetermined criteria; and

in response to a first user input for selecting a first application layout icon among the plurality of application layout icons, displaying an application on the display based on the selected first application layout icon,

wherein the method further comprises:

displaying a plurality of alignment icons, each of the plurality of alignment icons corresponding to one of the plurality of predetermined criteria other than the first predetermined criterion; and

re-aligning the plurality of application layout icons amongst the full screen application layout icon and the plurality of split screen application layout icons in response to a user input to one of the displayed plurality of alignment icons, and

wherein the plurality of predetermined criteria includes at least three criteria of a set of criteria, the set of criteria comprising:

- a number of split screens of the plurality of split screen application layout icons,
- a day of use of the mobile terminal,
- a frequency of use of the applications corresponding to the application layout icons,
- a location of the mobile terminal, and
- a theme of applications corresponding to the application layout icons.

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