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(71) Applicant: **LG ELECTRONICS INC.** [KR/KR]; 128, Yeoui-daero, Yeongdeungpo-gu, Seoul 150-721 (KR).

(72) Inventors: **PARK, Daemyeong**; 19, Yangjae-daero 11-gil, Seocho-gu, Seoul 137-893 (KR). **JEONG, Woong**; 19, Yangjae-daero 11-gil, Seocho-gu, Seoul 137-893 (KR). **CHO, Jinho**; 19, Yangjae-daero 11-gil, Seocho-gu, Seoul 137-893 (KR).

(74) Agent: **PARK, Jang-Won**; 2nd-3rd Fl., 566, Gangnam-daero, Gangnam-gu, Seoul 135-814 (KR).

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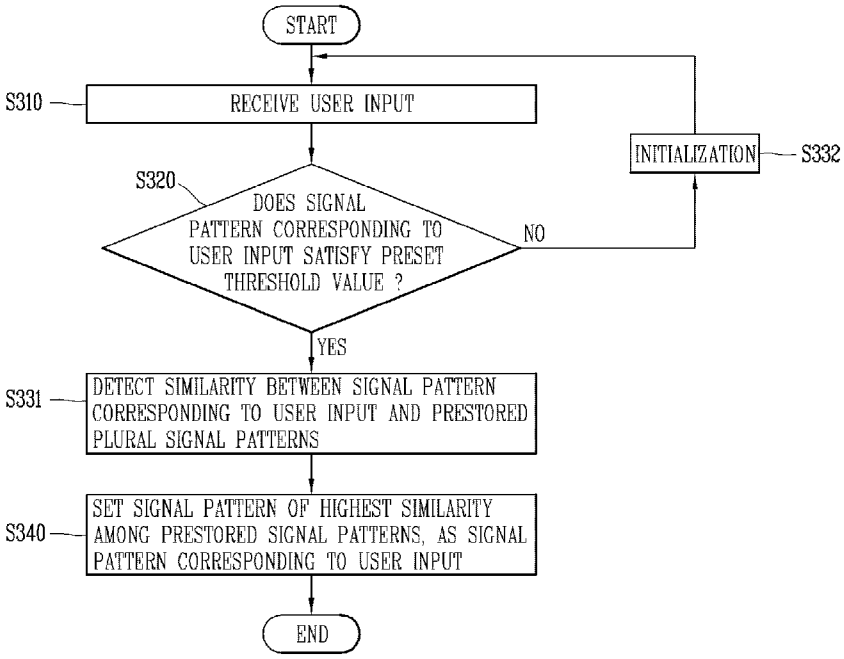
(54) **Title**: MOBILE TERMINAL AND METHOD FOR CONTROLLING THE SAME



(57) **Abstract**: Disclosed are a mobile terminal having a side display and a control method thereof. The mobile terminal includes a terminal body having a front surface and side surfaces, a display unit including a first region disposed on the front surface and a second region connected to the first region and disposed on the side surfaces, a sensing unit for sensing a touch input or a tap input, and a controller for displaying an execution screen of a function related to the touch or tap input on at least part of the first region corresponding to a region where the touch or tap input is sensed, in response to the touch or tap input applied to the second region.

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Description

Title of Invention: MOBILE TERMINAL AND METHOD FOR CONTROLLING THE SAME

Technical Field

[1] The present invention relates to a mobile terminal having side display parts, and a method for controlling the same.

Background Art

[2] 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.

[3] Mobile terminals have become increasingly more functional. Examples of such functions may include data and voice communications, capturing images and video through a camera, recording audio, playing music files through a speaker system, and displaying images and video on a display unit. Some mobile terminals additionally provide functions such as playing an electronic game, or executing a function of multimedia players. Especially, recent mobile terminals may receive multicast signal for providing visual content such as broadcasts, videos, or television programs.

[4] As it becomes multifunctional, a mobile terminal can be allowed to capture still images or moving images, play music or video files, play games, receive broadcast and the like, so as to be implemented as an integrated multimedia player.

[5] 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.

[6] As one of such structural changes and improvements in the mobile terminal, the mobile terminal may include a bendable display unit. The bendable display unit may be called various names such as a curved display and a flexible display.

[7] The mobile terminal may have display units at a front surface and side surfaces of a terminal body. Thus, developing various user interfaces is required with respect to such a mobile terminal having display units at front and side surfaces of a terminal body.

Disclosure of Invention

Technical Problem

[8] It is an object of the present invention to provide a mobile terminal and a method for controlling the same, which is capable of enhancing an accuracy of sensing a user input applied to side display parts.

[9] It is another object of the present invention to provide a mobile terminal and a

method for controlling the same, which is capable of providing different functions according to a user input applied to side display parts.

Solution to Problem

[10] To achieve these and other advantages and objects of the present invention, there is provided a mobile terminal including: a terminal body including a front surface and side surfaces; a display unit including a first region disposed on the front surface and a second region connected to the first region and disposed on the side surfaces, a sensing unit disposed at a lower end of the first and second regions and configured to sense a touch input or a tap input, and a controller configured to display an execution screen of a function related to the touch or tap input on at least part of the first region corresponding to a region where the touch or tap input is sensed, in response to the touch or tap input applied to the second region.

[11] In one embodiment, the sensing unit may include a touch sensor disposed at a lower end of at least part of the first and second regions and configured to sense a touch input and a tap sensor disposed at a lower end of the second region and configured to sense a tap input.

[12] In one embodiment, the controller may be configured to receive a signal corresponding to the touch or tap input applied to the second region, from at least one of the touch sensing portion and the tap sensing portion, and sense a position where the signal corresponding to the touch or tap input is received.

[13] In one embodiment, the controller may be configured to execute a different function according to a position where a signal corresponding to the touch or tap input is received.

[14] In one embodiment, the controller may be configured to display an execution screen of an executed function according to a position where a signal corresponding to the touch or tap input is received.

[15] In one embodiment, the controller may be configured to output an execution screen of the executed function to a region on the first region, the region adjacent to a position where a signal corresponding to the touch or tap input is received.

[16] In one embodiment, the second region may include a first sensing region configured to receive a user input through the touch sensor, a second sensing region configured to receive a user input through the touch sensor and the tap sensor, and a third sensing region configured to receive a user input through the tap sensor.

[17] In one embodiment, the controller may be configured to compare a signal pattern corresponding to the user input with pre-stored plural signal patterns when the user input is received on the second region, and detect one signal pattern among the plural signal patterns according to the comparison result.

[18] In one embodiment, the controller may be configured to determine a signal pattern which has a highest similarity to a signal pattern corresponding to the user input among the plural signal patterns, as a signal pattern corresponding to the user input.

[19] In one embodiment, the second region may include a first sub-region disposed at a left side and a second sub-region disposed at a right side based on the front surface, and wherein the controller may be configured to determine whether the signal pattern corresponding to the touch or tap input is received on which region between the first sub-region and the second sub-region.

[20] In one embodiment, when a touch or tap input is received at the first sub-region, the controller may be configured to output an execution screen of a first function related to the first sub-region, to a region on the first region adjacent to the first sub-region, and wherein when a touch or tap input is received on the second sub-region, the controller may be configured to output an execution screen of a second function related to the second sub-region, to a region on the second region adjacent to the second sub-region.

[21] In one embodiment, the controller may be configured to determine whether a touch or tap received through the sensing unit is applied by a first finger or a second finger, and execute a different function according to the determination result.

[22] In one embodiment, the controller may be configured to execute a first function related to the first finger when it is determined that the input is applied by the first finger, and execute a second function related to the second finger when it is determined that the input is applied by the second finger.

[23] In one embodiment, the signal pattern corresponding to the touch or tap may include a plurality of touches or taps applied within a preset time.

[24] There is also provided with a method for controlling a mobile terminal having a display unit on a front surface and side surfaces, including : sensing a user input to the display unit including a first region disposed at a front surface and a second region disposed at a rear surface, detecting a region where a user input is applied, among an entire part of the second region, executing a function related to the detected region; and displaying an execution screen of the executed function on at least part of the first region corresponding to the detected region.

[25] In one embodiment, detecting a region where a user input is applied may include: determining whether the user input satisfies a preset threshold value; comparing a signal pattern corresponding to the user input with pre-stored plural signal patterns when the user input satisfies the threshold value; and setting one of the pre-stored plural signal patterns as a user input.

[26] In one embodiment, comparing a signal pattern with pre-stored plural signal patterns may include: calculating a similarity between the plural signal patterns and the signal pattern corresponding to the user input.

[27] In one embodiment, the second region may include a first sub-region disposed at a left side and a second sub-region disposed at a right side based on the front surface, and wherein detecting a region where a user input is applied may include determining whether the signal pattern corresponding to the touch or tap input is received on which region between the first sub-region and the second sub-region.

[28] In one embodiment, in the step for displaying an execution screen of the executed function at least part of the first region corresponding to the detected region, the execution screen of the executed function may be displayed on a region adjacent to a position where a user input is applied between the first and second sub-regions.

[29] In one embodiment, when a user input is sensed on one of the first and second sub-regions in a state that the execution screen of the executed function is displayed, the execution screen of the executed function may disappear from the first region.

[30]

Advantageous Effects of Invention

[31] According to the present invention, it is possible to receive a user input applied to side display parts by an additional sensor in order to compensate for degraded touch sensitivity due to bending of the side display parts. As a result, it is possible to determine a position of a user input applied to the side display parts and a kind of object applying the user input.

[32] Further, according to the present invention, it is possible to provide different functions according to a position of a user input applied to the side display parts and a kind of object applying the user input. Through this, it is possible to provide various functions through inputs to the side display parts without additional motions, while a user grasps the mobile terminal with one hand.

Brief Description of Drawings

[33] FIG. 1A is a block diagram illustrating a mobile terminal according to the present invention;

[34] FIGS. 1B and 1C are schematic views illustrating an example of a mobile terminal, viewed from different directions according to the present invention;

[35] FIG. 1D is a schematic view illustrating another example of a transformable mobile terminal according to the present invention;

[36] FIG. 1E is a perspective view illustrating another example of a mobile terminal, viewed from the front side according to the present invention;

[37] FIG. 1F is a perspective view illustrating another example of a mobile terminal, viewed from the rear side according to the present invention;

[38] FIG. 2 is a sectional view illustrating a structure of a side display part according to the present invention;

[39] FIG. 3 is a flowchart illustrating processes to recognize a user input applied to a side display part, according to the present invention;

[40] FIGS. 4A through 4C and FIG. 5 are graphs indicating signal patterns when a user input is applied to a side display part, according to the present invention;

[41] FIGS. 6A through 6C are schematic views illustrating types of a user input which may be applied to a side display part, according to the present invention;

[42] FIGS. 7A through 7C and FIGS. 8A and 8B are schematic views illustrating a method in which different functions are executed based on a position of a user input applied to a side display part, according to the present invention;

[43] FIGS. 9A and 9B are schematic views illustrating a method to control a front display part based on a position of a user input applied to a side display part, according to the present invention;

[44] FIGS. 10A and 10B are schematic views illustrating that different functions are executed based on a position of a user input applied to a side display part, according to the present invention;

[45] FIGS. 11A and 11B are schematic views illustrating a method to execute different functions by different fingers applying a user input to a side display part, according to the present invention; and

[46] FIGS. 12A through 12C are schematic views illustrating a control of a mobile terminal when user inputs are simultaneously applied to side display parts, according to the present invention.

Mode for the Invention

[47] Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings. It will also be apparent to those skilled in the art that various modifications and variations can be made in the present invention without departing from the spirit or scope of the invention. Thus, it is intended that the present invention cover modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents.

[48] Description will now be given in detail of the exemplary embodiments, with reference to the accompanying drawings. For the sake of brief description with reference to the drawings, the same or equivalent components will be provided with the same reference numbers, and description thereof will not be repeated. A suffix "module" or "unit" used for constituent elements disclosed in the following description is merely intended for easy description of the specification, and the suffix itself does not give any special meaning or function. In describing the present invention, if a detailed explanation for a related known function or construction is considered to un-

necessarily divert the gist of the present disclosure, such explanation has been omitted but would be understood by those skilled in the art. The accompanying drawings are used to help easily understood the technical idea of the present invention and it should be understood that the idea of the present disclosure is not limited by the accompanying drawings. In the following description, explanations will be made in order in the clockwise direction based on the drawing in a right upper side.

[49] 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.

[50] It will be understood that when an element is referred to as being "connected with" another element, the element can be 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.

[51] 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.

[52] Mobile terminals presented herein may be implemented using a variety of different types of terminals. Examples of such terminals include cellular phones, smart phones, user equipment, laptop computers, digital broadcast terminals, personal digital assistants (PDAs), portable multimedia players (PMPs), navigators, portable computers (PCs), slate PCs, tablet PCs, ultra books, wearable devices (for example, smart watches, smart glasses, head mounted displays (HMDs)), and the like.

[53] By way of non-limiting example only, further description will be made with reference to particular types of mobile terminals. However, such teachings apply equally to other types of terminals, such as those types noted above. In addition, these teachings may also be applied to stationary terminals such as digital TV, desktop computers, and the like.

[54] Reference is now made to FIGS. 1A-1C, where FIG. 1A is a block diagram of a mobile terminal in accordance with the present disclosure, and FIGS. 1B and 1C are conceptual views of one example of the mobile terminal, viewed from different directions.

[55] 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. It is understood that implementing all of the illustrated components is not a requirement, and that greater or fewer components may alternatively be implemented.

[56] Referring now to FIG. 1A, the mobile terminal 100 is shown having wireless communication unit 110 configured with several commonly implemented components. For instance, the wireless communication unit 110 typically includes one or more components which permit wireless communication between the mobile terminal 100 and a wireless communication system or network within which the mobile terminal is located.

[57] 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.

[58] 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.

[59] 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, in FIG. 1A, the sensing unit 140 is shown having a proximity sensor 141 and an illumination sensor 142.

[60] If desired, the sensing unit 140 may alternatively or additionally include other types of sensors or devices, such as 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.

[61] 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.

[62] 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.

[63] 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.

[64] 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.

[65] 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 by the various components depicted in Fig. 1A, or activating application programs stored in the memory 170. As one example, the controller 180 controls some or all of the components illustrated in FIGS. 1A-1C according to the execution of an application program that have been stored in the memory 170.

[66] 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.

[67] Referring still to FIG. 1A, various components depicted in this figure will now be described in more detail. 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.

[68] 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.

[69] 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.

[70] 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.

[71] 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.

[72] The short-range communication module 114 is configured to facilitate short-range communications. Suitable technologies for implementing such short-range communications include BLUETOOTHTM, 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.

[73] In some embodiments, another mobile terminal (which may be configured similarly to mobile terminal 100) may be a wearable device, for example, a smart watch, a smart glass or a head mounted display (HMD), which is able to exchange data with the mobile terminal 100 (or otherwise cooperate with the mobile terminal 100). The short-range communication module 114 may sense or recognize the wearable device, and permit communication between the wearable device and the mobile terminal 100. In addition, when the sensed wearable device is a device which is authenticated to communicate with the mobile terminal 100, the controller 180, for example, may cause transmission of data processed in the mobile terminal 100 to the wearable device via the short-range communication module 114. Hence, a user of the wearable device may use the data processed in the mobile terminal 100 on the wearable device. For example, when a call is received in the mobile terminal 100, the user may answer the call using the wearable device. Also, when a message is received in the mobile terminal 100, the user can check the received message using the wearable device.

[74] 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.

[75] 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.

[76] The input unit 120 may be configured to permit various types of input to the mobile terminal 120. Examples of such input include audio, image, video, data, and user input. Image and video input is often obtained using one or more cameras 121. 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.

[77] 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.

[78] 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.

[79] The sensing unit 140 is generally configured to sense one or more of internal information of the mobile terminal, surrounding environment information of the mobile terminal, user information, or the like. The controller 180 generally cooperates with the sending unit 140 to control operation of the mobile terminal 100 or execute data processing, a function or an operation associated with an application program installed in the mobile terminal based on the sensing provided by the sensing unit 140. The sensing unit 140 may be implemented using any of a variety of sensors, some of which will now be described in more detail.

[80] The proximity sensor 141 may include a sensor to sense presence or absence of an object approaching a surface, or an object located near a surface, by using an electro-

magnetic field, infrared rays, or the like without a mechanical contact. The proximity sensor 141 may be arranged at an inner region of the mobile terminal covered by the touch screen, or near the touch screen.

[81] The proximity sensor 141, for example, may include any of a transmissive type photoelectric sensor, a direct reflective type photoelectric sensor, a mirror reflective type photoelectric sensor, a high-frequency oscillation proximity sensor, a capacitance type proximity sensor, a magnetic type proximity sensor, an infrared rays proximity sensor, and the like. When the touch screen is implemented as a capacitance type, the proximity sensor 141 can sense proximity of a pointer relative to the touch screen by changes of an electromagnetic field, which is responsive to an approach of an object with conductivity. In this case, the touch screen (touch sensor) may also be categorized as a proximity sensor.

[82] The term "proximity touch" will often be referred to herein to denote the scenario in which a pointer is positioned to be proximate to the touch screen without contacting the touch screen. The term "contact touch" will often be referred to herein to denote the scenario in which a pointer makes physical contact with the touch screen. For the position corresponding to the proximity touch of the pointer relative to the touch screen, such position will correspond to a position where the pointer is perpendicular to the touch screen. The proximity sensor 141 may sense proximity touch, and proximity touch patterns (for example, distance, direction, speed, time, position, moving status, and the like).

[83] In general, controller 180 processes data corresponding to proximity touches and proximity touch patterns sensed by the proximity sensor 141, and cause output of visual information on the touch screen. In addition, the controller 180 can control the mobile terminal 100 to execute different operations or process different data according to whether a touch with respect to a point on the touch screen is either a proximity touch or a contact touch.

[84] A touch sensor can sense a touch applied to the touch screen, such as display unit 151, using any of a variety of touch methods. Examples of such touch methods include a resistive type, a capacitive type, an infrared type, and a magnetic field type, among others.

[85] As one example, the touch sensor may be configured to convert changes of pressure applied to a specific part of the display unit 151, or convert capacitance occurring at a specific part of the display unit 151, into electric input signals. The touch sensor may also be configured to sense not only a touched position and a touched area, but also touch pressure and/or touch capacitance. A touch object is generally used to apply a touch input to the touch sensor. Examples of typical touch objects include a finger, a touch pen, a stylus pen, a pointer, or the like.

[86] When a touch input is sensed by a touch sensor, corresponding signals may be transmitted to a touch controller. The touch controller may process the received signals, and then transmit corresponding data to the controller 180. Accordingly, the controller 180 may sense which region of the display unit 151 has been touched. Here, the touch controller may be a component separate from the controller 180, the controller 180, and combinations thereof.

[87] In some embodiments, the controller 180 may execute the same or different controls according to a type of touch object that touches the touch screen or a touch key provided in addition to the touch screen. Whether to execute the same or different control according to the object which provides a touch input may be decided based on a current operating state of the mobile terminal 100 or a currently executed application program, for example.

[88] The touch sensor and the proximity sensor may be implemented individually, or in combination, to sense various types of touches. Such touches includes a short (or tap) touch, a long touch, a multi-touch, a drag touch, a flick touch, a pinch-in touch, a pinch-out touch, a swipe touch, a hovering touch, and the like.

[89] If desired, an ultrasonic sensor may be implemented to recognize position information relating to a touch object using ultrasonic waves. The controller 180, for example, may calculate a position of a wave generation source based on information sensed by an illumination sensor and a plurality of ultrasonic sensors. Since light is much faster than ultrasonic waves, the time for which the light reaches the optical sensor is much shorter than the time for which the ultrasonic wave reaches the ultrasonic sensor. The position of the wave generation source may be calculated using this fact. For instance, the position of the wave generation source may be calculated using the time difference from the time that the ultrasonic wave reaches the sensor based on the light as a reference signal.

[90] The camera 121 typically includes at least one a camera sensor (CCD, CMOS etc.), a photo sensor (or image sensors), and a laser sensor.

[91] Implementing the camera 121 with a laser sensor may allow detection of a touch of a physical object with respect to a 3D stereoscopic image. The photo sensor may be laminated on, or overlapped with, the display device. The photo sensor may be configured to scan movement of the physical object in proximity to the touch screen. In more detail, the photo sensor may include photo diodes and transistors at rows and columns to scan content received at the photo sensor using an electrical signal which changes according to the quantity of applied light. Namely, the photo sensor may calculate the coordinates of the physical object according to variation of light to thus obtain position information of the physical object.

[92] The display unit 151 is generally configured to output information processed in the

mobile terminal 100. For example, the display unit 151 may display execution screen information of an application program executing at the mobile terminal 100 or user interface (UI) and graphic user interface (GUI) information in response to the execution screen information.

[93] In some embodiments, the display unit 151 may be implemented as a stereoscopic display unit for displaying stereoscopic images. A typical stereoscopic display unit may employ a stereoscopic display scheme such as a stereoscopic scheme (a glass scheme), an auto-stereoscopic scheme (glassless scheme), a projection scheme (holographic scheme), or the like.

[94] 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.

[95] 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.

[96] Besides vibration, the haptic module 153 can generate various other tactile effects, including an effect by stimulation such as a pin arrangement vertically moving to contact skin, a spray force or suction force of air through a jet orifice or a suction opening, a touch to the skin, a contact of an electrode, electrostatic force, an effect by reproducing the sense of cold and warmth using an element that can absorb or generate heat, and the like.

[97] The haptic module 153 can also be implemented to allow the user to feel a tactile effect through a muscle sensation such as the user's fingers or arm, as well as transferring the tactile effect through direct contact. Two or more haptic modules 153 may be provided according to the particular configuration of the mobile terminal 100.

[98] 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.

[99] A signal output by the optical output module 154 may be implemented in such a manner that the mobile terminal emits monochromatic light or light with a plurality of colors. The signal output may be terminated as the mobile terminal senses that a user has checked the generated event, for example.

[100] The interface unit 160 serves as an interface for external devices to be connected with the mobile terminal 100. For example, the interface unit 160 can receive data transmitted from an external device, receive power to transfer to elements and components within the mobile terminal 100, or transmit internal data of the mobile terminal 100 to such external device. The interface unit 160 may include wired or wireless headset 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, or the like.

[101] The identification module may be a chip that stores various information for authenticating authority of using the mobile terminal 100 and may include a user identity module (UIM), a subscriber identity module (SIM), a universal subscriber identity module (USIM), and the like. In addition, the device having the identification module (also referred to herein as an "identifying device") may take the form of a smart card. Accordingly, the identifying device can be connected with the terminal 100 via the interface unit 160.

[102] When the mobile terminal 100 is connected with an external cradle, the interface unit 160 can serve as a passage to allow power from the cradle to be supplied to the mobile terminal 100 or may serve as a passage to allow various command signals input by the user from the cradle to be transferred to the mobile terminal there through. Various command signals or power input from the cradle may operate as signals for recognizing that the mobile terminal is properly mounted on the cradle.

[103] The memory 170 can store programs to support operations of the controller 180 and store input/output data (for example, phonebook, messages, still images, videos, etc.). The memory 170 may store data related to various patterns of vibrations and audio which are output in response to touch inputs on the touch screen.

[104] The memory 170 may include one or more types of storage mediums including a Flash memory, a hard disk, a solid state disk, a silicon disk, a multimedia card micro type, a card-type memory (e.g., SD or DX memory, etc), a Random Access Memory (RAM), a Static Random Access Memory (SRAM), a Read-Only Memory (ROM), an Electrically Erasable Programmable Read-Only Memory (EEPROM), a Programmable Read-Only memory (PROM), a magnetic memory, a magnetic disk, an optical disk, and the like. The mobile terminal 100 may also be operated in relation to a network

storage device that performs the storage function of the memory 170 over a network, such as the Internet.

[105] The controller 180 may typically control the general operations of the mobile terminal 100. For example, the controller 180 may set or release a lock state for restricting a user from inputting a control command with respect to applications when a status of the mobile terminal meets a preset condition.

[106] The controller 180 can also perform the controlling and processing associated with voice calls, data communications, video calls, and the like, or perform pattern recognition processing to recognize a handwriting input or a picture drawing input performed on the touch screen as characters or images, respectively. In addition, the controller 180 can control one or a combination of those components in order to implement various exemplary embodiments disclosed herein.

[107] The power supply unit 190 receives external power or provides internal power and supply the appropriate power required for operating respective elements and components included in the mobile terminal 100. The power supply unit 190 may include a battery, which is typically rechargeable or be detachably coupled to the terminal body for charging.

[108] The power supply unit 190 may include a connection port. The connection port may be configured as one example of the interface unit 160 to which an external charger for supplying power to recharge the battery is electrically connected.

[109] As another example, the power supply unit 190 may be configured to recharge the battery in a wireless manner without use of the connection port. In this example, the power supply unit 190 can receive power, transferred from an external wireless power transmitter, using at least one of an inductive coupling method which is based on magnetic induction or a magnetic resonance coupling method which is based on electromagnetic resonance.

[110] Various embodiments described herein may be implemented in a computer-readable medium, a machine-readable medium, or similar medium using, for example, software, hardware, or any combination thereof.

[111] Referring now to FIGS. 1B and 1C, the mobile terminal 100 is described with reference to a bar-type terminal body. However, the mobile terminal 100 may alternatively be implemented in any of a variety of different configurations. Examples of such configurations include watch-type, clip-type, glasses-type, or as a folder-type, flip-type, slide-type, swing-type, and swivel-type in which two and more bodies are combined with each other in a relatively movable manner, and combinations thereof. Discussion herein will often relate to a particular type of mobile terminal (for example, bar-type, watch-type, glasses-type, and the like). However, such teachings with regard to a particular type of mobile terminal will generally apply to other types of mobile

terminals as well.

[112] The mobile terminal 100 will generally include a case (for example, frame, housing, cover, and the like) forming the appearance of the terminal. In this embodiment, the case is formed using a front case 101 and a rear case 102. Various electronic components are incorporated into a space formed between the front case 101 and the rear case 102. At least one middle case may be additionally positioned between the front case 101 and the rear case 102.

[113] The display unit 151 is shown located on the front side of the terminal body to output information. As illustrated, a window 151a of the display unit 151 may be mounted to the front case 101 to form the front surface of the terminal body together with the front case 101.

[114] In some embodiments, electronic components may also be mounted to the rear case 102. Examples of such electronic components include a detachable battery 191, an identification module, a memory card, and the like. Rear cover 103 is shown covering the electronic components, and this cover may be detachably coupled to the rear case 102. Therefore, when the rear cover 103 is detached from the rear case 102, the electronic components mounted to the rear case 102 are externally exposed.

[115] As illustrated, when the rear cover 103 is coupled to the rear case 102, a side surface of the rear case 102 is partially exposed. In some cases, upon the coupling, the rear case 102 may also be completely shielded by the rear cover 103. In some embodiments, the rear cover 103 may include an opening for externally exposing a camera 121b or an audio output module 152b.

[116] The cases 101, 102, 103 may be formed by injection-molding synthetic resin or may be formed of a metal, for example, stainless steel (STS), aluminum (Al), titanium (Ti), or the like.

[117] As an alternative to the example in which the plurality of cases form an inner space for accommodating components, the mobile terminal 100 may be configured such that one case forms the inner space. In this example, a mobile terminal 100 having a unibody is formed in such a manner that synthetic resin or metal extends from a side surface to a rear surface.

[118] If desired, the mobile terminal 100 may include a waterproofing unit (not shown) for preventing introduction of water into the terminal body. For example, the waterproofing unit may include a waterproofing member which is located between the window 151a and the front case 101, between the front case 101 and the rear case 102, or between the rear case 102 and the rear cover 103, to hermetically seal an inner space when those cases are coupled.

[119] FIGS. 1B and 1C depict certain components as arranged on the mobile terminal. However, it is to be understood that alternative arrangements are possible and within

the teachings of the instant disclosure. Some components may be omitted or re-arranged. For example, the first manipulation unit 123a may be located on another surface of the terminal body, and the second audio output module 152b may be located on the side surface of the terminal body.

[120] The display unit 151 outputs information processed in the mobile terminal 100. The display unit 151 may be implemented using one or more suitable display devices. Examples of such suitable display devices include a liquid crystal display (LCD), a thin film transistor-liquid crystal display (TFT-LCD), an organic light emitting diode (OLED), a flexible display, a 3-dimensional (3D) display, an e-ink display, and combinations thereof.

[121] The display unit 151 may be implemented using two display devices, which can implement the same or different display technology. For instance, a plurality of the display units 151 may be arranged on one side, either spaced apart from each other, or these devices may be integrated, or these devices may be arranged on different surfaces.

[122] The display unit 151 may also include a touch sensor which senses a touch input received at the display unit. When a touch is input to the display unit 151, the touch sensor may be configured to sense this touch and the controller 180, for example, may generate a control command or other signal corresponding to the touch. The content which is input in the touching manner may be a text or numerical value, or a menu item which can be indicated or designated in various modes.

[123] The touch sensor may be configured in a form of a film having a touch pattern, disposed between the window 151a and a display on a rear surface of the window 151a, or a metal wire which is patterned directly on the rear surface of the window 151a. Alternatively, the touch sensor may be integrally formed with the display. For example, the touch sensor may be disposed on a substrate of the display or within the display.

[124] The display unit 151 may also form a touch screen together with the touch sensor. Here, the touch screen may serve as the user input unit 123 (see FIG. 1A). Therefore, the touch screen may replace at least some of the functions of the first manipulation unit 123a.

[125] The first audio output module 152a may be implemented in the form of a speaker to output voice audio, alarm sounds, multimedia audio reproduction, and the like.

[126] The window 151a of the display unit 151 will typically include an aperture to permit audio generated by the first audio output module 152a to pass. One alternative is to allow audio to be released along an assembly gap between the structural bodies (for example, a gap between the window 151a and the front case 101). In this case, a hole independently formed to output audio sounds may not be seen or is otherwise hidden in

terms of appearance, thereby further simplifying the appearance and manufacturing of the mobile terminal 100.

[127] The optical output module 154 can be configured to output light for indicating an event generation. Examples of such events include a message reception, a call signal reception, a missed call, an alarm, a schedule notice, an email reception, information reception through an application, and the like. When a user has checked a generated event, the controller can control the optical output unit 154 to stop the light output.

[128] The first camera 121a can process image frames such as still or moving images obtained by the image sensor in a capture mode or a video call mode. The processed image frames can then be displayed on the display unit 151 or stored in the memory 170.

[129] The first and second manipulation units 123a and 123b are examples of the user input unit 123, which may be manipulated by a user to provide input to the mobile terminal 100. The first and second manipulation units 123a and 123b may also be commonly referred to as a manipulating portion, and may employ any tactile method that allows the user to perform manipulation such as touch, push, scroll, or the like. The first and second manipulation units 123a and 123b may also employ any non-tactile method that allows the user to perform manipulation such as proximity touch, hovering, or the like.

[130] FIG. 1B illustrates the first manipulation unit 123a as a touch key, but possible alternatives include a mechanical key, a push key, a touch key, and combinations thereof.

[131] Input received at the first and second manipulation units 123a and 123b may be used in various ways. For example, the first manipulation unit 123a may be used by the user to provide an input to a menu, home key, cancel, search, or the like, and the second manipulation unit 123b may be used by the user to provide an input to control a volume level being output from the first or second audio output modules 152a or 152b, to switch to a touch recognition mode of the display unit 151, or the like.

[132] As another example of the user input unit 123, a rear input unit (not shown) may be located on the rear surface of the terminal body. The rear input unit can be manipulated by a user to provide input to the mobile terminal 100. The input may be used in a variety of different ways. For example, the rear input unit may be used by the user to provide an input for power on/off, start, end, scroll, control volume level being output from the first or second audio output modules 152a or 152b, switch to a touch recognition mode of the display unit 151, and the like. The rear input unit may be configured to permit touch input, a push input, or combinations thereof.

[133] The rear input unit may be located to overlap the display unit 151 of the front side in a thickness direction of the terminal body. As one example, the rear input unit may be located on an upper end portion of the rear side of the terminal body such that a user

can easily manipulate it using a forefinger when the user grabs the terminal body with one hand. Alternatively, the rear input unit can be positioned at most any location of the rear side of the terminal body.

[134] Embodiments that include the rear input unit may implement some or all of the functionality of the first manipulation unit 123a in the rear input unit. As such, in situations where the first manipulation unit 123a is omitted from the front side, the display unit 151 can have a larger screen.

[135] As a further alternative, the mobile terminal 100 may include a finger scan sensor which scans a user's fingerprint. The controller 180 can then use fingerprint information sensed by the finger scan sensor as part of an authentication procedure. The finger scan sensor may also be installed in the display unit 151 or implemented in the user input unit 123.

[136] The microphone 122 is shown located at an end of the mobile terminal 100, but other locations are possible. If desired, multiple microphones may be implemented, with such an arrangement permitting the receiving of stereo sounds.

[137] The interface unit 160 may serve as a path allowing the mobile terminal 100 to interface with external devices. For example, the interface unit 160 may include one or more of a connection terminal for connecting to another device (for example, an earphone, an external speaker, or the like), a port for near field communication (for example, an Infrared Data Association (IrDA) port, a Bluetooth port, a wireless LAN port, and the like), or a power supply terminal for supplying power to the mobile terminal 100. The interface unit 160 may be implemented in the form of a socket for accommodating an external card, such as Subscriber Identification Module (SIM), User Identity Module (UIM), or a memory card for information storage.

[138] The second camera 121b is shown located at the rear side of the terminal body and includes an image capturing direction that is substantially opposite to the image capturing direction of the first camera unit 121a. If desired, second camera 121a may alternatively be located at other locations, or made to be moveable, in order to have a different image capturing direction from that which is shown.

[139] The second camera 121b can include a plurality of lenses arranged along at least one line. The plurality of lenses may also be arranged in a matrix configuration. The cameras may be referred to as an "array camera." When the second camera 121b is implemented as an array camera, images may be captured in various manners using the plurality of lenses and images with better qualities.

[140] As shown in FIG. 1C, a flash 124 is shown adjacent to the second camera 121b. When an image of a subject is captured with the camera 121b, the flash 124 may illuminate the subject.

[141] As shown in FIG. 1B, the second audio output module 152b can be located on the

terminal body. The second audio output module 152b may implement stereophonic sound functions in conjunction with the first audio output module 152a, and may be also used for implementing a speaker phone mode for call communication.

[142] At least one antenna for wireless communication may be located on the terminal body. The antenna may be installed in the terminal body or formed by the case. For example, an antenna which configures a part of the broadcast receiving module 111 may be retractable into the terminal body. Alternatively, an antenna may be formed using a film attached to an inner surface of the rear cover 103, or a case that includes a conductive material.

[143] A power supply unit 190 for supplying power to the mobile terminal 100 may include a battery 191, which is mounted in the terminal body or detachably coupled to an outside of the terminal body. The battery 191 may receive power via a power source cable connected to the interface unit 160. Also, the battery 191 can be recharged in a wireless manner using a wireless charger. Wireless charging may be implemented by magnetic induction or electromagnetic resonance.

[144] The rear cover 103 is shown coupled to the rear case 102 for shielding the battery 191, to prevent separation of the battery 191, and to protect the battery 191 from an external impact or from foreign material. When the battery 191 is detachable from the terminal body, the rear case 103 may be detachably coupled to the rear case 102.

[145] An accessory for protecting an appearance or assisting or extending the functions of the mobile terminal 100 can also be provided on the mobile terminal 100. As one example of an accessory, a cover or pouch for covering or accommodating at least one surface of the mobile terminal 100 may be provided. The cover or pouch may cooperate with the display unit 151 to extend the function of the mobile terminal 100. Another example of the accessory is a touch pen for assisting or extending a touch input to a touch screen.

[146] In the present invention, information processed in the mobile terminal may be displayed on a flexible display unit, which will be explained in more detail.

[147] FIG. 1D is a conceptual view of a deformable mobile terminal according to an alternative embodiment of the present invention.

[148] In this figure, mobile terminal 200 is shown having display unit 251, which is a type of display that is deformable by an external force. This deformation, which includes display unit 251 and other components of mobile terminal 200, may include any of curving, bending, folding, twisting, rolling, and combinations thereof. The deformable display unit 251 may also be referred to as a "flexible display unit." In some implementations, the flexible display unit 251 may include a general flexible display, electronic paper (also known as e-paper), and combinations thereof. In general, mobile terminal 200 may be configured to include features that are the same or similar to that

of mobile terminal 100 of FIGS. 1A-1C.

[149] The flexible display of mobile terminal 200 is generally formed as a lightweight, non-fragile display, which still exhibits characteristics of a conventional flat panel display, but is instead fabricated on a flexible substrate which can be deformed as noted previously.

[150] The term e-paper may be used to refer to a display technology employing the characteristic of a general ink, and is different from the conventional flat panel display in view of using reflected light. E-paper is generally understood as changing displayed information using a twist ball or via electrophoresis using a capsule.

[151] When in a state that the flexible display unit 251 is not deformed (for example, in a state with an infinite radius of curvature and referred to as a first state), a display region of the flexible display unit 251 includes a generally flat surface. When in a state that the flexible display unit 251 is deformed from the first state by an external force (for example, a state with a finite radius of curvature and referred to as a second state), the display region may become a curved surface or a bent surface. As illustrated, information displayed in the second state may be visual information output on the curved surface. The visual information may be realized in such a manner that a light emission of each unit pixel (sub-pixel) arranged in a matrix configuration is controlled independently. The unit pixel denotes an elementary unit for representing one color.

[152] According to one alternative embodiment, the first state of the flexible display unit 251 may be a curved state (for example, a state of being curved from up to down or from right to left), instead of being in flat state. In this embodiment, when an external force is applied to the flexible display unit 251, the flexible display unit 251 may transition to the second state such that the flexible display unit is deformed into the flat state (or a less curved state) or into a more curved state.

[153] If desired, the flexible display unit 251 may implement a flexible touch screen using a touch sensor in combination with the display. When a touch is received at the flexible touch screen, the controller 180 can execute certain control corresponding to the touch input. In general, the flexible touch screen is configured to sense touch and other input while in both the first and second states.

[154] One option is to configure the mobile terminal 200 to include a deformation sensor which senses the deforming of the flexible display unit 251. The deformation sensor may be included in the sensing unit 140.

[155] The deformation sensor may be located in the flexible display unit 251 or the case 201 to sense information related to the deforming of the flexible display unit 251. Examples of such information related to the deforming of the flexible display unit 251 may be a deformed direction, a deformed degree, a deformed position, a deformed amount of time, an acceleration that the deformed flexible display unit 251 is restored,

and the like. Other possibilities include most any type of information which can be sensed in response to the curving of the flexible display unit or sensed while the flexible display unit 251 is transitioning into, or existing in, the first and second states.

[156] In some embodiments, controller 180 or other component can change information displayed on the flexible display unit 251, or generate a control signal for controlling a function of the mobile terminal 200, based on the information related to the deforming of the flexible display unit 251. Such information is typically sensed by the deformation sensor.

[157] The mobile terminal 200 is shown having a case 201 for accommodating the flexible display unit 251. The case 201 can be deformable together with the flexible display unit 251, taking into account the characteristics of the flexible display unit 251.

[158] A battery (not shown in this figure) located in the mobile terminal 200 may also be deformable in cooperation with the flexible display unit 261, taking into account the characteristic of the flexible display unit 251. One technique to implement such a battery is to use a stack and folding method of stacking battery cells.

[159] The deformation of the flexible display unit 251 not limited to perform by an external force. For example, the flexible display unit 251 can be deformed into the second state from the first state by a user command, application command, or the like.

[160] Hereinafter, explanations will be made clockwise based on the left upper drawing.

[161] Meanwhile, according to the present invention, a mobile terminal may have various shapes in the aspect of design. Hereinafter, as one of structural changes and improvements, a mobile terminal having a side display part and a user interface using the same will be described.

[162] FIG. 1E is a perspective view illustrating a mobile terminal according to another embodiment of the present invention viewed from the front side, and FIG. 1F is a perspective view illustrating the mobile terminal of FIG. 1E viewed from the rear side.

[163] The improved mobile terminal 200 includes a bar type terminal body. However, the present invention is not limited to this type of a mobile terminal, and may be applicable to various types such as a slide type in which more than two bodies are coupled to be relatively rotated, a folder type, a swing type, and a swivel type.

[164] The terminal body includes a case (for instance, a casing, a housing, a cover, and the like) constituting an external appearance. In the present embodiment of the present invention, the case may be divided into a front case 201 and a rear case 202. In a space formed between the front case 201 and the rear case 202, various electronic components may be mounted. At least one intermediate case may be disposed between the front case 201 and the rear case 202.

[165] Further, the cases may be formed by a synthetic resin mold, or formed of a metal, for instance, stainless steel (STS) or titanium (Ti).

[166] In the terminal body, mainly, the front case 201, a display unit 251, a sound output unit 252, a camera module 221, and the like may be disposed. And an interface 270 and the like may be disposed on side surfaces of the front case 201 and rear case 202.

[167] The display unit 251 may occupy most parts of an outer circumferential surface of the front case 201. That is, the display unit may be disposed on the front surface of the terminal and formed so as to display visual information. The display unit 251 of the present invention is configured to extend not only to a front surface of the mobile terminal, but also to other surface of the mobile terminal in an extended form. More specifically, the display unit 251 includes a first region 261 disposed on a front surface and second regions 262 and 263 extended from the first region 261 and disposed on side surfaces of the terminal body. Here, the side surfaces may be surfaces that are viewed from a user when a user sees the mobile terminal at side surfaces (or sideways).

[168] Meanwhile, at least part of the second regions 262 and 263 may be disposed on the front surface. For instance, the second regions 262 and 263 may be formed on the side surfaces and front surface of the mobile terminal. Here, whether or not the second regions 262 and 263 are seen on the front surface may be determined by a structure that the first region 261 and the second regions 262 and 263 are disposed on the display unit 251.

[169] For instance, a window disposed at an upper surface of the display unit 251 may be formed in a shape in which both side surfaces thereof are bent, as a result, an external appearance of the front and side surfaces of the terminal body may be formed by the window. Thus, the first region 261 and the second regions 262 and 263 may be connected to each other without a physical interface therebetween. In this case, the display unit 251 is formed in a bending type to have a display device which is correspondingly mounted within the window.

[170] As another example, the display unit 251 may be a flexible display. The flexible display may include a display which may be bendable, curved, twisted, and rolled by an external force. Here, the flexible display may include both a general flexible display and an electronic paper.

[171] Here, the general flexible display means a light, unbreakable and strong

[172] display which is manufactured on a substrate which may be bendable, curved, twisted, and rolled like paper, while maintaining display features of an existing flat display device.

[173] Further, the electronic paper may be different from a general flat display device in that it uses reflective light as a display technique adopting the features of general ink. The electronic paper may change pictures or characters using twist balls or electrophoresis using capsules.

[174] Owing to such flexible features of the material, a terminal body, having a display unit

of which two sides are bent, can be implemented.

[175] A flexible display unit which is extended across the front and side surfaces has been explained. However, the mobile terminal according to the present invention may be configured as a type that three independent displays are disposed at the front and both side surfaces. For instance, the front display part 261 and the side display parts 262 and 263 are independent display units, respectively, and may be disposed so as to be adjacent to each other.

[176] A sound output unit 252 and a camera module 221 may be disposed at a region adjacent to one end between both ends of the display unit 251, and a front input unit (not shown) and a microphone 222 may be disposed at a region adjacent to another end of the display unit 251.

[177] The front input unit is an example of the user input 230 (refer to FIG. 1A) and may include a plurality of manipulation units. The manipulation units may be referred to as a manipulation portion, and any tactile method that allows a user to perform manipulation with a sense of touch may be employed.

[178] Further, the display unit 251 may form a touch screen together with a touch sensor, and in this case, the touch screen may be a user input. By such an arrangement, it is possible to implement a mobile terminal which does not have an input unit on the front surface. In this case, it is possible to implement a mobile terminal in which an input operation to the terminal body may be possible only through the display unit 251 and a rear input unit 232 which will be described later.

[179] Referring to FIG. 1F, at a rear surface of the terminal body, that is, at a rear case 202, a camera module 221' may be additionally mounted. The camera module 221' may be a camera which has a substantially opposite capturing direction to the camera 221 (refer to FIG. 1E), and different pixels from the camera 221.

[180] For instance, the camera module 221 may have low pixels so as to capture and send a user's face to other part in a video call mode without any difficulty, while the newly mounted camera module 221' may preferably have high pixels because it captures common subjects and then normally does not send the captured images to others. Such camera modules 221 and 221' may be mounted in the terminal body in a rotatable manner or to be able to popup.

[181] Adjacent to the camera module 221', a flash and a mirror may be additionally disposed. The flash is configured to direct project light to a subject when capturing the subject by the camera module 221'. The mirror is configured to reflect a user's face when taking a photo of the user him/herself using the camera module 221'.

[182] A sound output unit (not shown) may be additionally disposed at a rear surface of the terminal body. The rear sound output unit may implement a stereo function together with the front sound output unit 252 (refer to FIG. 1E), and may be used for im-

plementing a speaker phone mode in calling.

[183] That is, together with the front sound output unit 251 (a first sound output unit) of the mobile terminal, a second sound output unit disposed at a rear surface and including a speaker may be provided. The present invention is not limited to this type of arrangement, and the second sound output unit may be disposed at a side surface of the mobile terminal.

[184] A power supply 290 for supplying a power to the mobile terminal may be mounted to a terminal body. The power supply 290 may be mounted within the terminal body, or provided to the terminal body so as to be directly detachable from an external portion of the terminal body.

[185] As shown in the drawings, a rear input unit 232 may be disposed at a rear surface of the terminal body. The rear input unit 232 may be disposed at, for instance, a lower portion of a camera module 221'.

[186] The rear input unit 232 is configured to be manipulated to receive an input of a command for controlling an operation of the mobile terminal 200, and the input content may be set in various types. For instance, the rear input unit 232 may receive an input of a command such as an on/off of a power, a start, an end, a scroll, a control of a magnitude of sound output from a sound output unit 252, or conversion of the display module 251 into a touch recognition mode. However, the present invention is not limited to this type of arrangement, and the mobile terminal may include one of the front input unit and the rear input unit 232, or both of them.

[187] Meanwhile, as described above, the controller 180 may control an operation of a mobile terminal using the display init 251 disposed at a side surface of the mobile terminal.

[188] Hereinafter, a method for controlling an operation of the mobile terminal using display units disposed at both side surfaces will be described in detail with reference to the attached drawings.

[189] For convenience, the first region 263 means a display region which is disposed at a left side surface between both side surfaces based on a front surface, and the second region 262 means a display region which is disposed at a right side surface between both side surfaces based on the front surface. Further, the third region 261 means a display region (front display region) disposed at the front.

[190] The display unit 251 according to the present invention is shown in the drawings so as to have display regions at both sides, that is, at the left and right sides. However, unlike this, the display unit 251 may further include a single display unit at one side between the left and right side surfaces based on the third region 261, i.e., the front surface of the display unit 251. For convenience, in the description, a display unit 251 including display regions (display units) at the front, left and right side surfaces, re-

spectively, will be explained, as an example.

[191] Furthermore, in the specification, the front display part (or the third region) will be described with reference numeral "261", and the side display parts (or first and second regions) will be described with reference numerals "263" or "262". Further, when the front and side display regions are not required to be distinguished from each other, simply " the display unit 251" will be referred to in the description, instead of the reference numerals indicative of the front and side display regions.

[192] FIG. 2 is a sectional view illustrating the structure of a side display part according to the present invention, FIG. 3 is a flowchart illustrating processes to recognize a user input applied to a side display part according to the present invention, FIGS. 4A through 4C and FIG. 5 are graphs indicating signal patterns when a user input is applied to a side display part according to the present invention, and FIGS. 6A through 6C are schematic views illustrating types of a user input which may be applied to a side display part according to the present invention.

[193] The mobile terminal according to the present invention may sense a user input applied to the side display parts 262 and 263. Here, the user input may be a touch input or a tap input to tap an object.

[194] Further, the user input may be a plurality of touch inputs, or a plurality of tap inputs to tap an object which are applied within a preset time. That is, the controller 180 may form a signal pattern using a plurality of touch and tap inputs applied within a preset time.

[195] In the present invention, when the user input applied to the side display parts 262 and 263 is received within a preset time regardless of its type, i.e., a touch input or a tap input, it is recognized as an input generating a single signal pattern.

[196] The side display parts 262 and 263 may include a sensing unit which senses the touch and tap inputs.

[197] The sensing unit may be integrally formed with the side display parts 262 and 263, or disposed at a lower end of the side display parts 262 and 263 in a layered structure.

[198] Further, the sensing unit may integrally or separately include a touch sensing portion 291 and a tap sensing portion 292. The touch sensing portion 291 may sense a touch input and the tap sensing portion 292 may sense a tap input.

[199] The tap sensing portion 292 may sense a tap motion that taps on an object. The tap motion to tap on an object may be a tap motion that taps on the mobile terminal. For instance, the motion to tap on an object may be a motion to tap on the terminal body of the mobile terminal. In this case, the motion to tap on an object may be performed by a user's finger, a touch pen, or other external object.

[200] The sensing unit will be described in detail with reference to FIG. 2. The side display part 263 may include a first sensing region 283 configured to sense a user input

through the touch sensing portion 292, a second sensing region 282 configured to sense a user input through the touch sensing portion 292 and the tap sensing portion 291, and a third sensing region 281 configured to sense a user input through the tap sensing portion 291.

[201] The first sensing region 283 is connected to the display part 261 disposed at the front and may sense a user input through the touch sensing portion 292. In this case, the controller 180 may distinguish the first sensing region 283 from a region where the user input is applied among the entire regions of the display part 261 disposed at the front surface, based on a pixel value of the display part 261 where the user input is applied. For instance, the controller 180 may determine whether a region where the user input is applied is the front display part 261 or the first sensing region 283 of the side display part based on a pixel value (71x) of the front display part 261. In this case, the first sensing region 283 has a large curvature, and thus a user input may be detected in the first sensing region 283, through the touch sensing portion 292.

[202] Further, the second sensing region 282, a central region of the side display part 262, is connected to the first sensing region 283 and may be a region that has a smaller curvature. In the second sensing region 282, a user input may be sensed through the touch sensing portion 292 and the tap sensing portion 291.

[203] That is, in order to compensate for decrease in sensitivity of a touch due to bending of the display unit, the second sensing region 282 may include the tap sensor 291 to recognize a user input.

[204] Further, the third sensing region 281 is connected to the second sensing region 282 and may sense a user input through the tap sensing portion 292. Since the third sensing region 281 is a region that contacts a hardware frame for fixing the display unit, a touch is not sensed thereon. In this case, according to the present invention, the tap sensing portion 291 is further provided on the hardware frame so that a user input applied to the third sensing region 281 can be sensed.

[205] That is, in the present invention, in order to compensate for decrease in a sensitivity of the touch sensing portion 292 due to bending of the display unit 251, the tap sensor 291 may be further provided on at least part of the side display part 263.

[206] Further, according to the present invention, it is possible to more precisely sense a position of a user input applied to the side display parts 262 and 263 by further providing the touch sensing portion 291.

[207] More specifically, referring to FIG. 3, the controller 180 may receive a user input applied to the side display parts 262 and 263 (S310). When the user input is received, the controller 180 may determine whether a signal pattern corresponding to the user input satisfies a preset threshold value (S320).

[208] More specifically, the controller 180 detects components of X-axis, Y-axis and Z-

axis of a signal pattern corresponding to the user input, and determines whether a variation of each component satisfies the preset threshold value.

[209] For instance, referring to FIG. 4A, when a user input is received, the controller 180 may create a signal pattern in the x-axis, y-axis and z-axis based on the user input. In this case, referring to FIG. 4B, the controller 180 may determine whether the signal pattern of each axis satisfies a preset threshold value.

[210] In a case where the signal pattern of each axis does not satisfy the preset threshold value, the controller 180 may initialize the signal pattern corresponding to the user input. In this case, the controller 180 determines that the user input is improperly input and ignores the user input.

[211] On the contrary, in a case where the signal pattern of each axis satisfies the preset threshold value, the controller 180 may compare the signal pattern corresponding to the user input with a plurality of pre-stored signal patterns (S330).

[212] The plurality of pre-stored signal patterns may be signal patterns which include position information of a user input applied to the side display parts 262 and 263 and finger information on fingers used to apply the user input.

[213] In this case, the controller 180 may detect a similarity between the signal pattern corresponding to the user input and the plurality of pre-stored signal patterns. For instance, the controller 180 may detect a similarity between the signal pattern corresponding to the user input and the plurality of pre-stored signal patterns by a cross correlation method. The cross correlation method is used to measure a similarity of one of two signal patterns by applying a time difference to the one.

[214] Meanwhile, as a method to detect a similarity, various conventional methods may be applied.

[215] When the similarity is detected, the controller 180 may set, as a signal pattern corresponding to the user input, a signal pattern of the highest similarity among the plurality of pre-stored signal patterns (S340).

[216] In a case where a signal pattern of the highest similarity among the plurality of pre-stored signal patterns is set as a signal pattern corresponding to the user input, the controller 180 may detect attribute information of the user input through the signal pattern of the highest similarity. The attribute of the user input may be a position where the user input is applied, a type of an object applying the user input, or the like.

[217] For instance, referring to FIGS. 4A and 4B, the controller 180 may determine a position where the user input is applied using the signal pattern of the highest similarity.

[218] If it is determined that a signal pattern corresponding to the user input has the highest similarity with a pre-stored signal pattern in an x-axis direction, the controller 180 may determine whether the user input is applied to which one between the right and left

display units 263 and 263 based on the front display part 261. For instance, referring to FIGS. 6A and 6B, a user may apply a user input to one of the left side display part 263 and the right side display part 262. In this case, the controller 180 may determine a side display part where the user input is applied using a form of the pre-stored signal pattern in the x-axis direction.

[219] Further, the controller 180 may determine a region of the side display part to which a user input is applied through the touch sensing portion as well.

[220] In case of a mobile terminal having only an existing tap sensor, it is not possible to determine whether the user input is applied to which one of the right and left side display parts 263 and 262 when a signal in the x-axis direction is sensed.

[221] However, according to the present invention providing a touch sensor, even in a case where a signal in the x-axis direction is sensed, it is possible to determine whether the user input is applied to which one of the right and left display units 263 and 262 through the touch sensor.

[222] In another example, the controller 180 may determine a finger that applies a user input using a similarity value of a signal pattern corresponding to the user input at each axis.

[223] More specifically, the controller 180 may distinguish a signal pattern in case of applying a user input by a first finger, from a signal pattern in case of applying a user input by a second finger. For instance, referring to FIG. 6C, the controller 180 may distinguish a signal pattern in case of applying a user input by the thumb, from a signal pattern in case of applying a user input by the index finger.

[224] For instance, referring to FIG. 5, the controller 180 may detect similarity values of x-axis and z-axis of the signal pattern corresponding to the user input. In this case, the controller 180 may determine that the user input is applied by the index finger when the similarity values are higher than preset threshold values.

[225] Though the above explanation has been given based on the left side display part 263, the same description may be applicable to the right side display part 262.

[226] Hereinbefore, a method to sense a user input has been described in the present invention.

[227] Hereinafter, a method to execute different functions according to a position of a user input applied to the side display parts will be described.

[228] FIGS. 7A through 7C and FIGS. 8A and 8B are schematic views illustrating a method to execute different functions according to a position of a user input applied to the side display parts.

[229] The mobile terminal according to the present invention may sense a user input applied when the display unit 251 is in an activated state or in an inactivated state. The inactivated state of the display unit 251 may mean a state that a background lighting of

the display unit 251 is turned off. Further, the activated state of the display unit 251 may mean a state that a background lighting of the display unit 251 is turned on and screen information is displayed on the display unit 251.

[230] Further, in the present invention, it is possible to control an activated state and an inactivated state of the front display part 261 and side display parts 262 and 263, respectively. For instance, the controller 180 may control the front display part 261 to be activated and the side display parts 262 and 263 to be inactivated.

[231] In this case, the mobile terminal according to the present invention may have a doze mode in order to sense a user input applied in an inactivated state of the display unit 251. The doze mode is a mode to activate the sensing parts 291 and 292 so as to sense a user input applied to the display unit at every preset period. In this case, the mobile terminal may reduce power consumption more than in an operation mode where the sensing parts 291 and 292 are always in an activated state.

[232] When a user input is sensed in a doze mode, the controller 180 may be converted into an operation mode. The operation mode may mean a state that the sensing parts 291 and 292 are always in an activated state in order to sense a user input applied to the display unit 251. Thereafter, the controller 180 may enter a doze mode when a user input is not applied for a preset time.

[233] When a user input is sensed in a state that the display unit 251 is inactivated, the controller 180 may activate at least part of the display unit 251 and execute a function related to the user input on at least part of the display unit 251.

[234] For instance, referring to FIG. 7A, the controller 180 may sense a user input applied to the left side display part 263 in a state that the display unit 251 is inactivated.

[235] When a user input is sensed at the left side display part 263, the controller 180 may sense a position where the user input is applied. And the controller 180 may activate a region corresponding to a position where the user input is applied among the entire region of the front display part 261. In this case, the remaining region of the front display part 261 may be maintained in an inactivated state.

[236] The region corresponding to a position where the user input is applied may be a region that is nearest to the region where the user input is applied among the entire region of the front display part 261. Further, a size of the region corresponding to a position where the user input is applied may be preset by a user or at a manufacturing stage of a factory. In this case, the controller 180 may display an execution screen of a function to be executed based on the user input, on the activated region.

[237] That is, according to the present invention, it is possible to provide screen information to the front display part through an input to the side display parts. Further, according to the present invention, it is possible for a user to recognize that a function is executed through his or her input by providing screen information to a position of

the front display part adjacent to a position where the input is applied to the side display parts.

[238] Meanwhile, the controller 180 may execute a different function according to whether the input is applied to which of the right and left side display parts 263 and 262.

[239] In this case, the different function may be preset by a user. That is, a user may preset a function by a user input applied in a state that the display unit 251 is inactivated.

[240] For instance, referring to FIG. 7A, the controller 180 may execute a predetermined function when a user input is applied to the left side display part 263. An execution screen of the predetermined function may be displayed on a region activated by the user input among the entire region of the front display part 261.

[241] In another example, referring to FIG. 7B, the controller 180 may execute a message function when a user input is applied to the right side display part 262. In this case, the controller 180 may display an execution screen of the message function on a region activated by the user input among the entire region of the front display part 261.

[242] Meanwhile, the controller 180 may sense that a user input is applied to both the right and left side display parts 263 and 262. In this case, the user input may be sequentially or simultaneously applied.

[243] In this case, referring to FIG. 7C, the controller 180 may sense a plurality of user inputs applied to the right and left display units 263 and 262, respectively. In this case, the controller 180 may activate regions adjacent to positions where the plurality of user inputs are respectively sensed among the entire region of the front display part 261, and output execution screens of functions executed by the user inputs. That is, according to the present invention, when a plurality of user inputs are sensed, it is possible to provide functions corresponding to the user inputs on the front display part 261.

[244] Further, the controller 180 may sense a user input applied to the side display parts 262 and 263 in a state that the display unit 251 is activated. In this case, the controller 180 may control the front display part 261 based on the user input applied to the side display parts 262 and 263.

[245] For instance, when a user input applied to the side display part 262 is sensed in a state that first screen information is displayed on the front display part 261, the controller 180 may output second screen information related to the first screen information. In this case, the second screen information may be displayed on the front display part 261, or the side display part 262 where the user input is applied.

[246] Meanwhile, in a case where the second screen information is output to the front display part 261, the controller 180 may output the second screen information to different positions according to positions on the side display parts 262 and 263 where user inputs are applied.

[247] For instance, referring to FIG. 8A, the controller 180 may sense a user input applied to the left display unit 263 in a case where an image is output to the front display part 261. In this case, the controller 180 may output screen information related to the image on a region adjacent to the left side display part 263 among the entire region of the front display part 261. The screen information related to the image may be a list of images stored in the memory unit 170, and a graphic object indicating an editing function of an image.

[248] In a further example, referring to FIG. 8B, the controller 180 may sense a user input applied to the right side display part 262 in a state that an image is output to the front display part 261. In this case, the controller 180 may output screen information related to the image on a region adjacent to the right side display part 262 among the entire region of the front display part 261.

[249] In the foregoing description, a method to output screen information to the front display part 261 by a user input applied to the side display parts 262 and 263 has been explained.

[250] In this case, the screen information may disappear from the front display part 261 in response to a user input being applied to one side display part 262 between the side display parts 262 and 263, in a state that the screen information is output to the front display part 261.

[251] Here, the user input may be an input applied to the side display parts 262 and 263 adjacent to a region where the screen information is output.

[252] Further, the user input may be an input which is implemented in the same manner as a user input for outputting the screen information.

[253] Hereinbefore, a method to control the front display part through a user input applied to different side display parts has been explained. That is, a user may execute different functions using fingers contacting the side display parts, while grasping the mobile terminal with one hand without an additional motion.

[254] Hereinafter, a method to control a front display part according to a position of a user input applied to side display parts will be described.

[255] FIGS. 9A and 9B are schematic views illustrating a method to control a front display part according to a position of a user input applied to side display parts, according to the present invention.

[256] According to the present invention, it is possible to control the front display part 261 based on a user input applied to the side display parts 262 and 263.

[257] More specifically, when a specific function is executed by a user input applied to the side display parts 262 and 263, the controller 180 may determine a region of screen information of the specific function among the entire region of the front display part 261 based on a position where the user input is applied.

[258] For instance, referring to the first drawing of FIG. 9A, the controller 180 may sense a user input on a lower region of the left side display part 263. In this case, the controller 180 may execute a predetermined function based on the user input applied to the left side display part 263.

[259] In this case, the controller 180 may display an execution screen indicating the predetermined function on a region corresponding to a position where the user input is applied among the entire region of the front display part 261. For instance, referring to the second drawing of FIG. 9A, the execution screen indicating the predetermined function may be displayed on a left lower region among the entire region of the front display part 261.

[260] As a further example, referring to the first drawing of FIG. 9B, the controller 180 may sense a user input on an upper region of the left side display part 263. In this case, the controller 180 may execute a predetermined function based on the user input applied to the left side display part 263.

[261] In this case, the controller 180 may display an execution screen indicating the predetermined function on a region corresponding to a position where the user input is applied among the entire region of the front display part 261. For instance, referring to the second drawing of FIG. 9B, the execution screen indicating the predetermined function may be displayed on a left upper region among the entire region of the front display part 261.

[262] Meanwhile, the screen information may disappear from the front display part 261 in response to a user input being applied to the side display part 263, in a state that the screen information is output to the front display part 261.

[263] That is, according to the present invention, it is possible to control a position of an execution screen executed by a user input, according to a position of the user input applied to the side display part, even though the user input is applied to the same side display part. Through this, a user may recognize that screen information has been provided on the front display part, through his or her input applied to the side display part.

[264] Hereinafter, in the mobile terminal according to an embodiment of the present invention, different functions are executed according to a position of a user input applied to the side display part will be described.

[265] FIGS. 10A and 10B are schematic views illustrating that different functions are executed according to a position of a user input applied to a side display part according to the present invention.

[266] Unlike the aforementioned description, according to the present invention, it is possible to execute different functions according to a position where a user input is applied, even though the user input is applied to the same side display part 262.

[267] More specifically, referring to the first drawing of FIG. 10A, the controller 180 may sense a user input on a lower region of the side display part 263. In this case, the controller 180 may execute a function related to a position where the user input is applied.

[268] For instance, referring to the second drawing of FIG. 10A, the controller 180 may execute a predetermined function related to a lower region of the side display part 263. In this case, an execution screen of the predetermined function may be displayed on the side display part 263, or on at least part of the front display part 261.

[269] As a further example, referring to the first drawing of FIG. 10B, the controller 180 may sense a user input on an upper region of the side display part 263. In this case, the controller 180 may execute a function related to the upper region of the left side display part 263. For instance, referring to the second drawing of FIG. 10B, the controller 180 may execute a message function related to the left side display part 263. In this case, an execution screen of the message function may be displayed on the side display part 263, or on at least part of the front display part 261.

[270] Further, the screen information may disappear from the front display part 261 in response to a user input being applied to the side display part 263, in a state that the screen information is output to the front display part 261.

[271] Meanwhile, according to the present invention, it is possible to select, by a user, whether to execute different functions according to a position of a user input applied to the same side display part 263, or to execute the same function regardless of the position where the user input is applied.

[272] In the foregoing description, a method to execute different functions according to a position of a user input applied to the same side display part has been explained.

[273] Hereinafter, a method to execute different functions by different fingers applying a user input to the side display part will be described.

[274] FIGS. 11A and 11B are schematic views illustrating a method to execute different functions by different fingers applying a user input to side display parts according to the present invention.

[275] The controller 180 may distinguish a type of fingers that apply a user input to the side display part 263. That is, the controller 180 may distinguish a user input applied by a thumb from a user input applied by a forefinger.

[276] The controller 180 may execute different functions according to a type of finger applying a user input. For instance, the controller 180 may execute a first function when it is determined that a user input is applied by a first finger, and execute a second function when it is determined that a user input is applied by a second finger.

[277] Here, the functions related to the fingers may be set by a user. That is, a user may associate one finger with one of plural functions installed in the mobile terminal.

[278] For instance, referring to FIG. 10A, the controller 180 may execute a predetermined function associated with the thumb when it is determined that a user input by the thumb is applied to the side display part 263.

[279] As a further example, referring to FIG. 10B, the controller 180 may execute a message function associated with the forefinger when it is determined that a user input by the forefinger is applied to the side display part 263.

[280] In this case, the controller 180 may execute a function associated with the thumb irrespective of whether the user input is applied to either the left or the right side display part 263 or 262.

[281] Further, the controller 180 may execute different functions associated with the thumb according to whether a user input is applied to which one of the right and left side display parts 263 and 262. Such a setting may be performed by a user. That is, the controller 180 may execute different functions according to whether a user input is applied to the left or the right side display part 263 or 262, even though the user input is applied by the same thumb.

[282] According to the present invention, it is possible for a user to execute different functions using different fingers while grasping the mobile terminal including side display parts.

[283] Hereinafter, a control method in a case where a user input is simultaneously sensed on both of the side display parts will be described.

[284] FIGS. 12A through 12C are schematic views illustrating a control of a mobile terminal when a user input is simultaneously applied to side display parts according to the present invention.

[285] The controller 180 may sense that a user input is applied, within a preset time, to at least two spots on the side display parts 262 and 263 disposed at both sides of the front display part 261.

[286] In this case, the controller 180 may execute a function related to the user input simultaneously applied to the right and left side display parts 263 and 262. The function related to the user input simultaneously applied to the right and left side display parts 263 and 262 may be set by a user.

[287] Meanwhile, the controller 180 may distinguish a type of fingers applying a user input to the right and left side display parts 263 and 262, respectively. In this case, the controller 180 may execute different functions according to the type of the fingers.

[288] The user input simultaneously applied to the right and left side display parts 263 and 262 may be applied by different fingers of two hands (for instance, the thumb of right hand and the forefinger of left hand), or same type of fingers of two hands (for instance, the thumbs of left and right hands).

[289] Further, the user input simultaneously applied to the right and left side display parts

263 and 262 may be applied by different fingers of a single hand (for instance, the thumb and the forefinger).

[290] For instance, referring to FIG 12A, the controller 180 may sense that a user input is applied to the right and left side display parts 263 and 262 by two forefingers in a state that an image is displayed on the front display part 261.

[291] In this case, the controller 180 may execute a capture function to store the image displayed on the front display part 261 in the memory unit.

[292] As a further example, referring to FIG. 12B, the controller 180 may sense that a user input by two thumbs is applied to the right and left side display parts 263 and 262. In this case, the controller 180 may terminate functions executed in the mobile terminal based on the user input by the thumbs.

[293] As a further example, referring to FIG. 12C, the controller 180 may sense that a user input by different fingers is applied to the right and left side display parts 263 and 262. In this case, the controller 180 may inactivate the activated display unit 251 based on the user input by the different fingers.

[294] Hereinbefore, a control method in a case where a user input is simultaneously applied to both of the side display parts has been described.

[295] According to the present invention, it is possible to receive a user input applied to side display parts by an additional sensor in order to compensate for degraded touch sensitivity due to bending of the side display parts. As a result, it is possible to determine a position of a user input applied to the side display parts and a kind of object applying the user input.

[296] Further, according to the present invention, it is possible to provide different functions according to a position of a user input applied to the side display parts and a kind of object applying the user input. Through this, it is possible to provide various functions through inputs to the side display parts without additional motions, while a user grasps the mobile terminal with one hand.

[297] As described above, the present invention is capable of implementing a computer readable code in a media in which programs are recorded. The computer readable media include all kinds of recording devices in which data readable by a computer system are stored. Examples of the computer readable media are a Hard Disk Drive (HDD), a Solid State Disk (SSD), a Silicon Disk Drive (SSD), a ROM, a RAM, a CD-ROM, a magnetic tape, a floppy disk, an optical data storage device, and include a type in the form of a carrier wave (for instance, transmission via internet). Further, the controller 180 of the computer terminal may be included.

[298]

[299]

Claims

[Claim 1] A mobile terminal, comprising:
a terminal body including a front surface and side surfaces;
a display unit including a first region disposed on the front surface and a second region connected to the first region and disposed on the side surfaces;
a sensing unit disposed at a lower end of the first and second regions and configured to sense a touch input or a tap input; and
a controller configured to display an execution screen of a function related to the touch or tap input on at least part of the first region corresponding to a region where the touch or tap input is sensed, in response to the touch or tap input applied to the second region.

[Claim 2] The mobile terminal of claim 1, wherein the sensing unit includes:
a touch sensing portion disposed at a lower end of at least part of the first and second regions and configured to sense a touch input; and
a tap sensing portion disposed at a lower end of the second region and configured to sense a tap input.

[Claim 3] The mobile terminal of claim 2, wherein the controller is configured to receive a signal corresponding to the touch or tap input applied to the second region, from at least one of the touch sensing portion and the tap sensing portion, and sense a position where the signal corresponding to the touch or tap input is received.

[Claim 4] The mobile terminal of claim 3, wherein the controller is configured to execute a different function according to a position where a signal corresponding to the touch or tap input is received.

[Claim 5] The mobile terminal of claim 4, wherein the controller is configured to display an execution screen of an executed function according to a position where a signal corresponding to the touch or tap input is received.

[Claim 6] The mobile terminal of claim 5, wherein the controller is configured to output the execution screen of the executed function to a region on the first region, the region adjacent to a position where a signal corresponding to the touch or tap input is received.

[Claim 7] The mobile terminal of claim 2, wherein the second region includes:
a first sensing region configured to receive a user input through the touch sensing portion;
a second sensing region configured to receive a user input through the

touch sensing unit and the tap sensing portion; and
a third sensing region configured to receive a user input through the tap sensing portion.

[Claim 8] The mobile terminal of claim 7, wherein the controller is configured to compare a signal pattern corresponding to the user input with preset plural signal patterns, when the user input is received on the second region, and
wherein the controller is configured to detect one signal pattern among the plural signal patterns according to the comparison result.

[Claim 9] The mobile terminal of claim 8, wherein the controller is configured to determine a signal pattern which has a highest similarity to a signal pattern corresponding to the user input among the plural signal patterns, as a signal pattern corresponding to the user input.

[Claim 10] The mobile terminal of claim 1, wherein the second region includes a first sub-region disposed at a left side and a second sub-region disposed at a right side based on the front surface, and
wherein the controller is configured to determine whether the signal pattern corresponding to the touch or tap input is received on which region between the first sub-region and the second sub-region.

[Claim 11] The mobile terminal of claim 10, wherein when a touch or tap input is received at the first sub-region, the controller is configured to output an execution screen of a first function related to the first sub-region, to a region on the first region adjacent to the first sub-region, and
wherein when a touch or tap input is received at the second sub-region, the controller is configured to output an execution screen of a second function related to the second sub-region, to a region on the second region adjacent to the second sub-region.

[Claim 12] The mobile terminal of claim 1, wherein the controller is configured to determine whether a touch or tap received through the sensing unit is applied by a first finger or a second finger, and execute a different function according to the determination result.

[Claim 13] The mobile terminal of claim 12, wherein the controller is configured to execute a first function related to the first finger when it is determined that the input is applied by the first finger, and execute a second function related to the second finger when it is determined that the input is applied by the second finger.

[Claim 14] The mobile terminal of claim 1, wherein a signal pattern corresponding to the touch or tap includes a plurality of touches or taps applied within

a preset time.

[Claim 15] A method for controlling a mobile terminal including a display unit on front surface and side surfaces, comprising:
sensing a user input to the display unit including a first region disposed at a front surface and a second region disposed at a rear surface;
detecting a region where a user input is applied, among an entire part of the second region;
executing a function related to the detected region; and
displaying an execution screen of the executed function on at least part of the first region corresponding to the detected region.

[Claim 16] The method of claim 15, wherein the detecting a region where a user input is applied includes:
determining whether the user input satisfies a preset threshold value;
comparing a signal pattern corresponding to the user input with pre-stored plural signal patterns when the user input satisfies the threshold value; and
setting one of the pre-stored plural signal patterns as a user input.

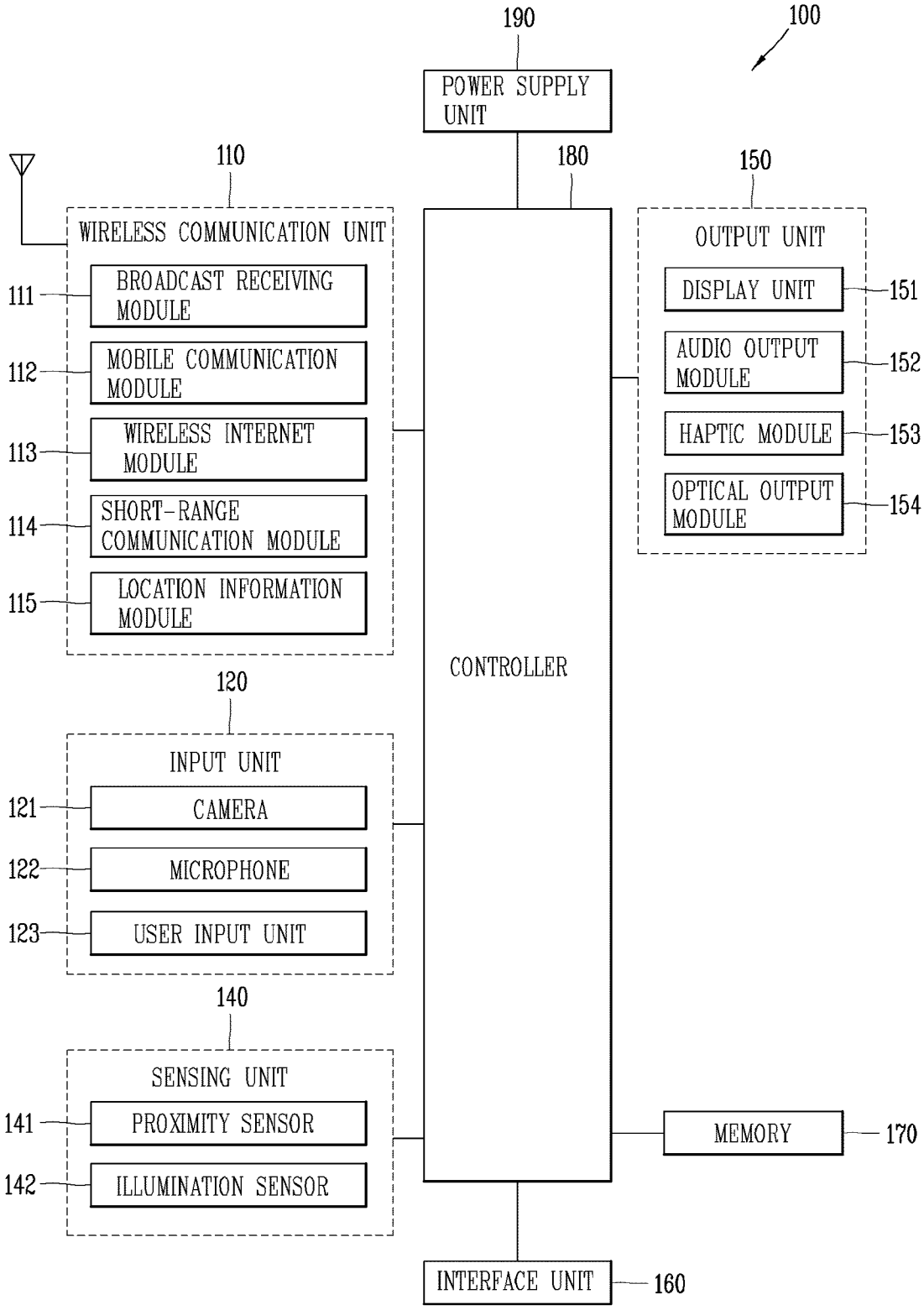
[Claim 17] The method of claim 16, wherein the comparing a signal pattern with pre-stored plural signal patterns includes calculating a similarity between the pre-stored plural signal patterns and the signal pattern corresponding to the user input.

[Claim 18] The method of claim 15, wherein the second region includes a first sub-region disposed at a left side and a second sub-region disposed at a right side based on the front surface, and
wherein detecting a region where a user input is applied includes determining whether the signal pattern corresponding to the touch or tap input is received on which region between the first sub-region and the second sub-region.

[Claim 19] The method of claim 18, wherein in the step for displaying an execution screen of the executed function on at least part of the first region corresponding to the detected region, the execution screen of the executed function is displayed on a region adjacent to a position where a user input is applied between the first and second sub-regions.

[Claim 20] The method of claim 19, wherein when a user input is sensed on one of the first and second sub-regions in a state that the execution screen of the executed function is displayed, the execution screen of the executed function disappears from the first region.

[Fig. 1a]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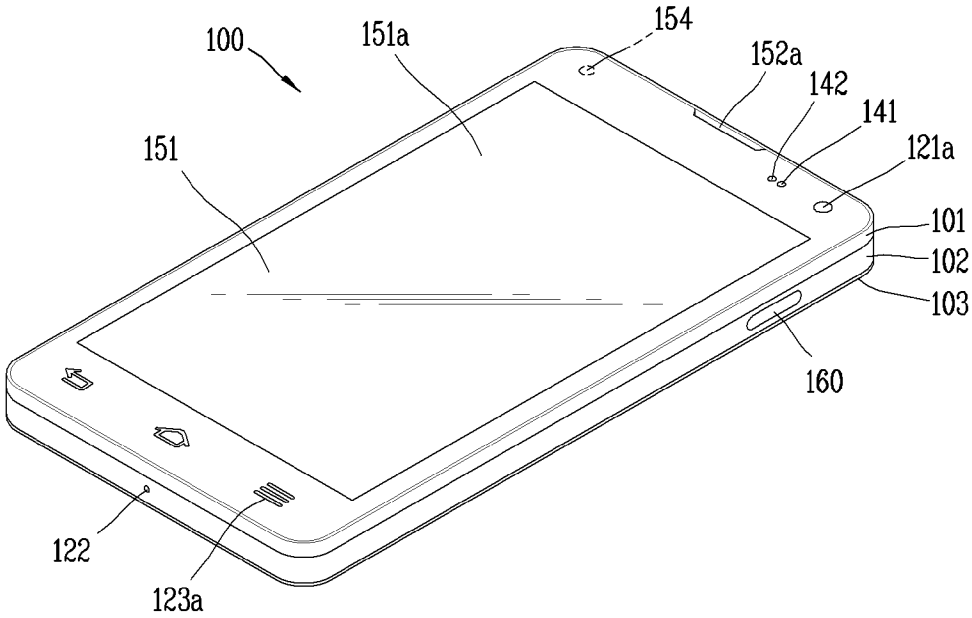
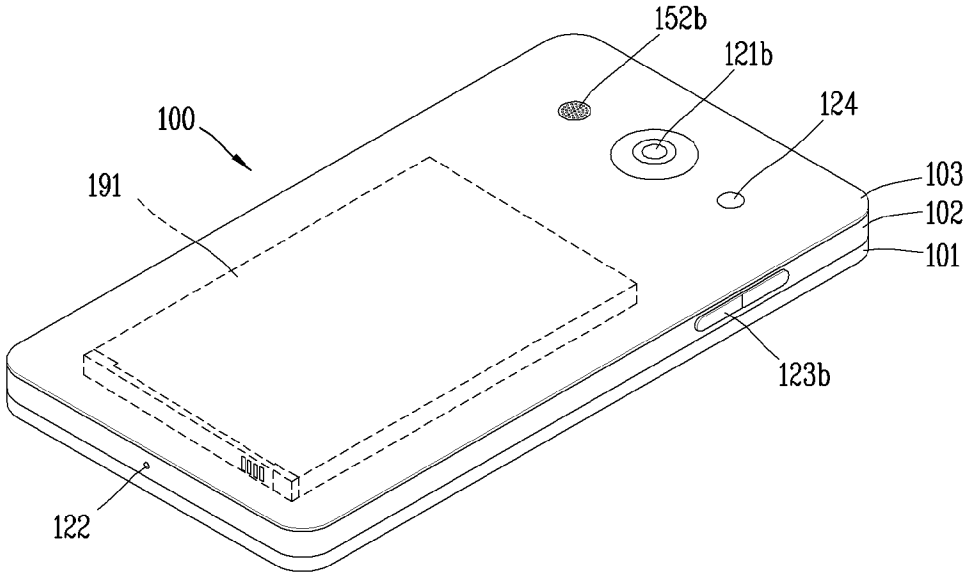
100
POWER SUPPLY UNIT
110
180
150
WIRELESS COMMUNICATION UNIT
OUTPUT UNIT
111
BROADCAST RECEIVING MODULE
DISPLAY UNIT
151
112
MOBILE COMMUNICATION MODULE
AUDIO OUTPUT MODULE
152
113
WIRELESS INTERNET MODULE
HAPTIC MODULE
153
114
SHORT-RANGE COMMUNICATION MODULE
OPTICAL OUTPUT MODULE
154
115
LOCATION INFORMATION MODULE
CONTROLLER
120
INPUT UNIT
121
CAMERA
122
MICROPHONE
123
USER INPUT UNIT
140
SENSING UNIT
141
PROXIMITY SENSOR
MEMORY
170
142
ILLUMINATION SENSOR
INTERFACE UNIT
160

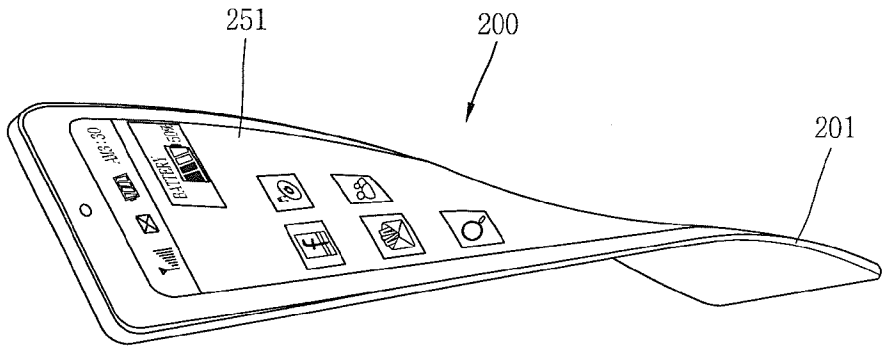
[Fig. 1b]



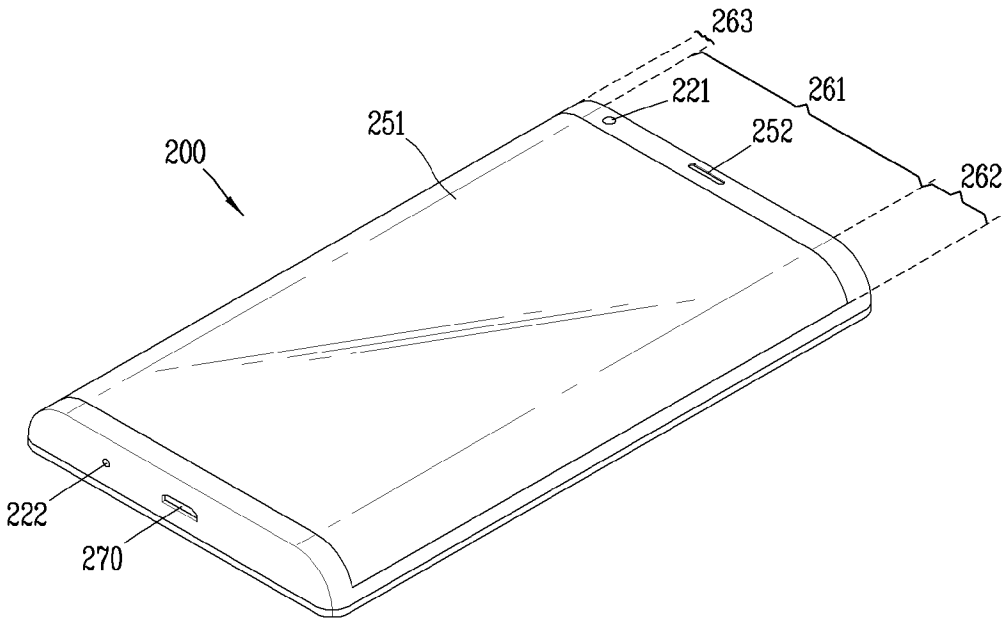
[Fig. 1c]



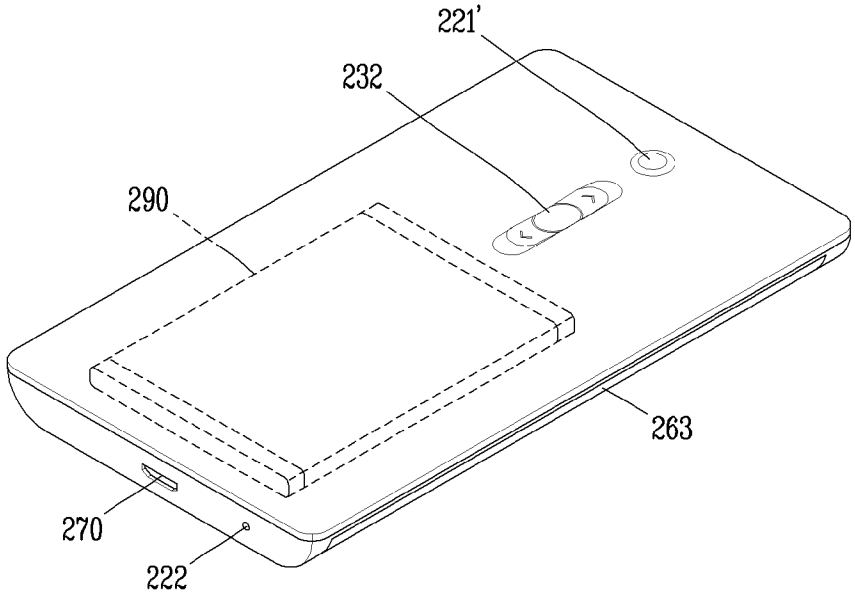
[Fig. 1d]



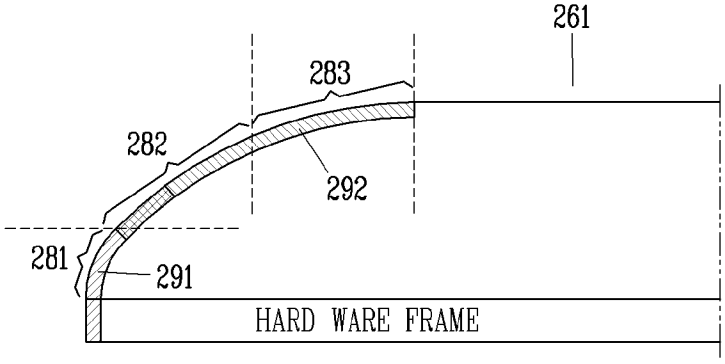
[Fig. 1e]



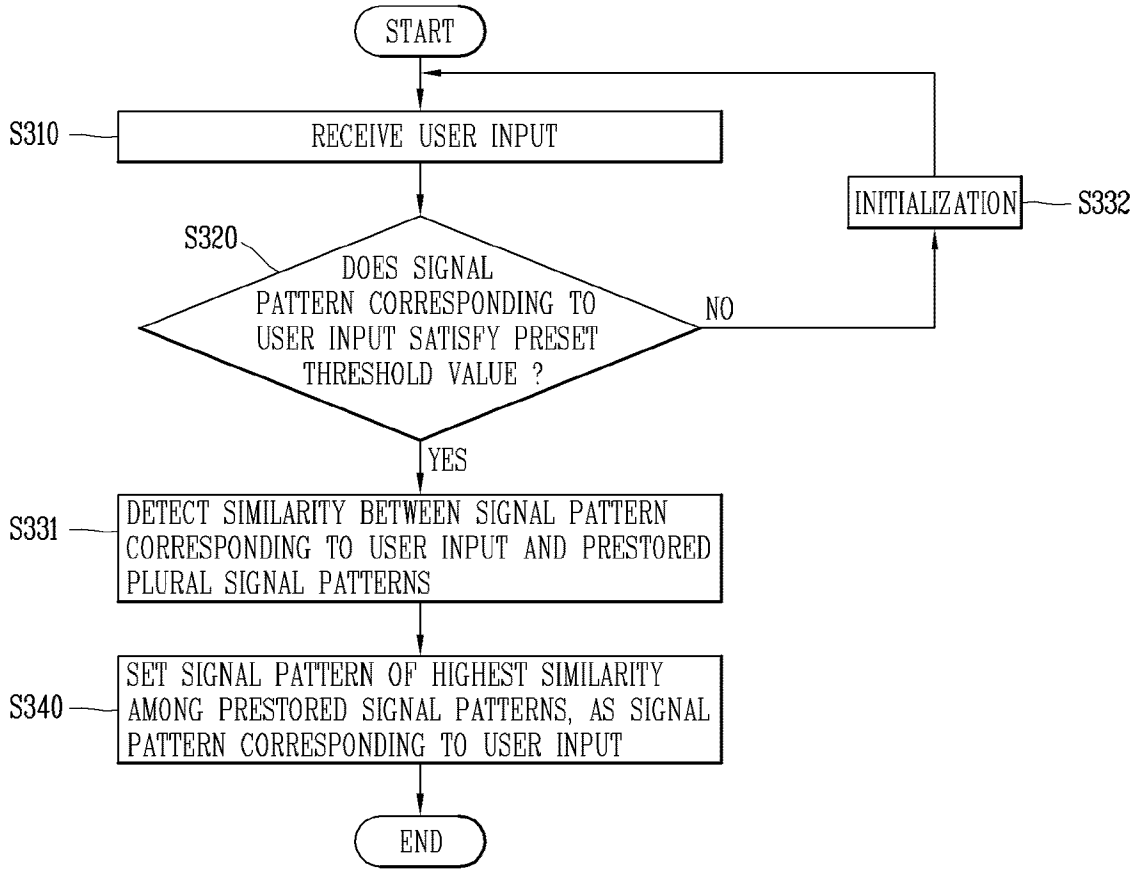
[Fig. 1f]



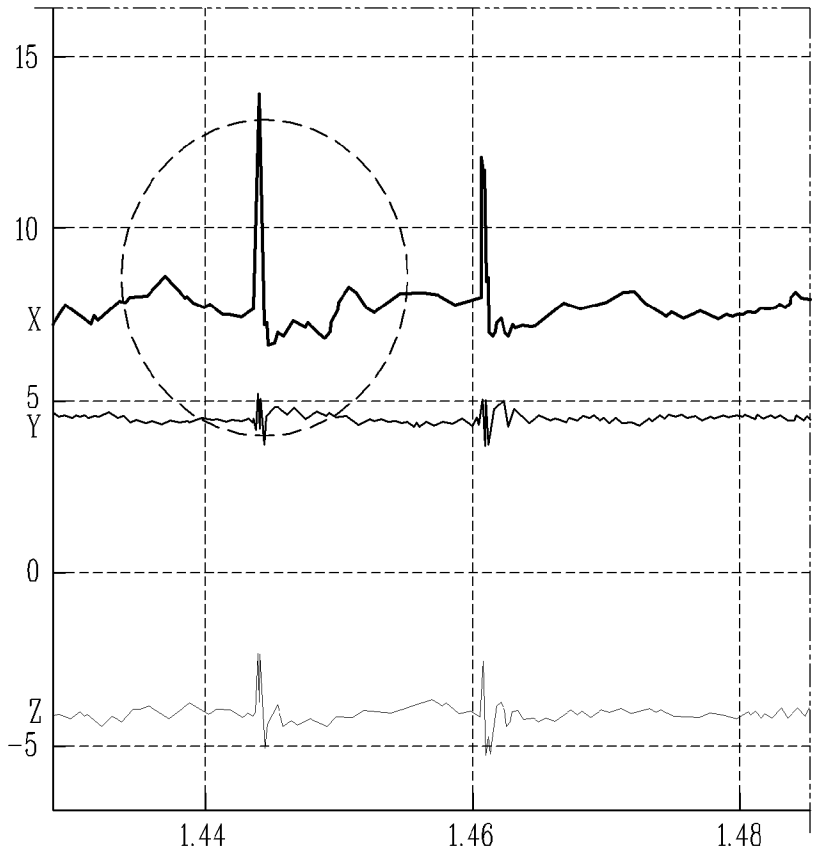
[Fig. 2]



[Fig. 3]


START
S310
RECEIVE USER INPUT
S320
DOES SIGNAL PATTERN CORRESPONDING TO USER INPUT SATISFY PRESET THRESHOLD VALUE ?
NO
INITIALIZATION
S332
YES
S331
DETECT SIMILARITY BETWEEN SIGNAL PATTERN CORRESPONDING TO USER INPUT AND PRESTORED PLURAL SIGNAL PATTERNS
S340
SET SIGNAL PATTERN OF HIGHEST SIMILARITY AMONG PRESTORED SIGNAL PATTERNS, AS SIGNAL PATTERN CORRESPONDING TO USER INPUT
END

[Fig. 4a]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Y
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Z
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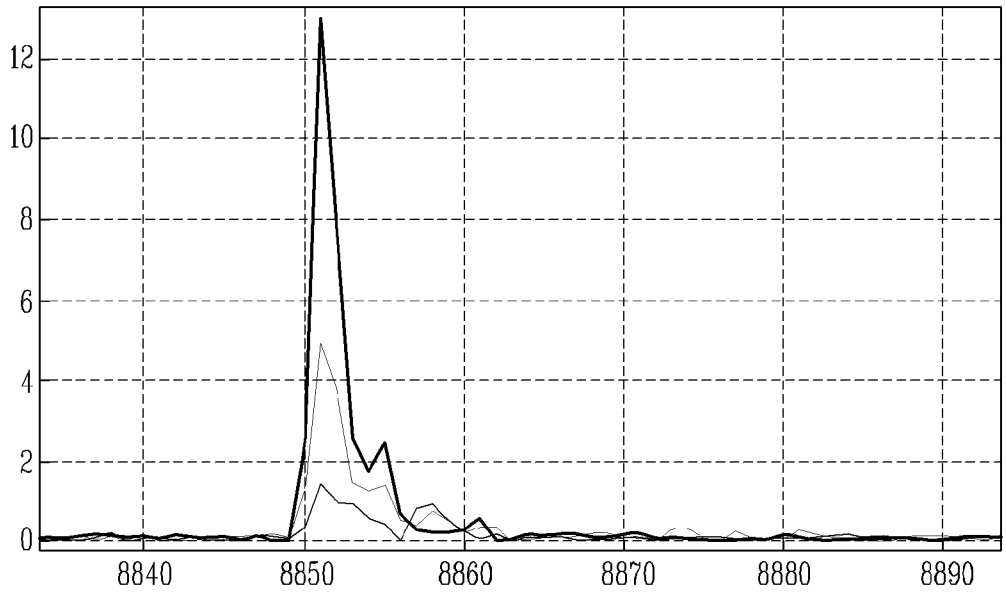
1.46
1.48

[Fig. 4b]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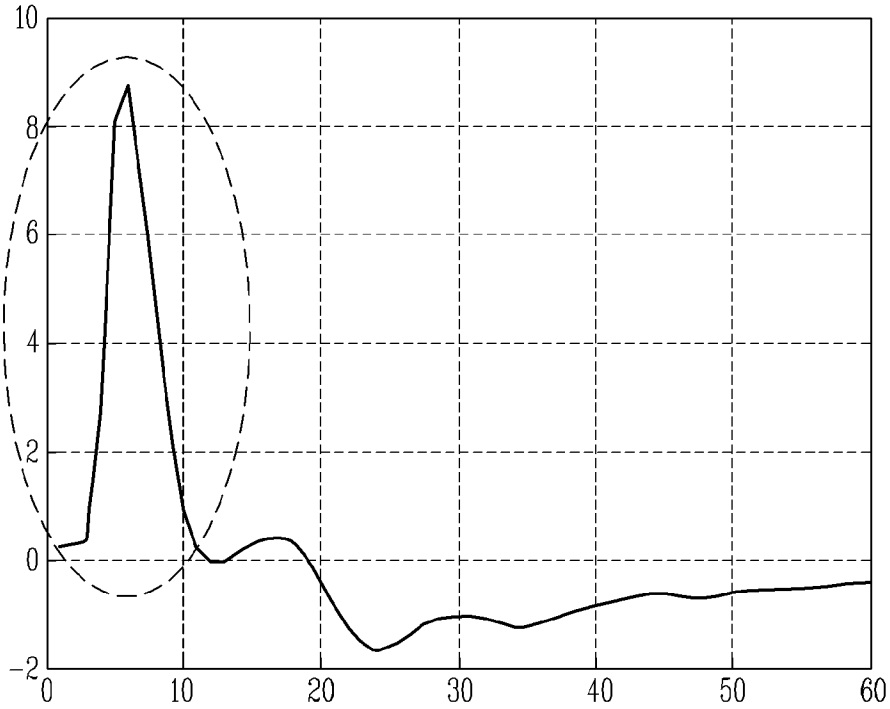
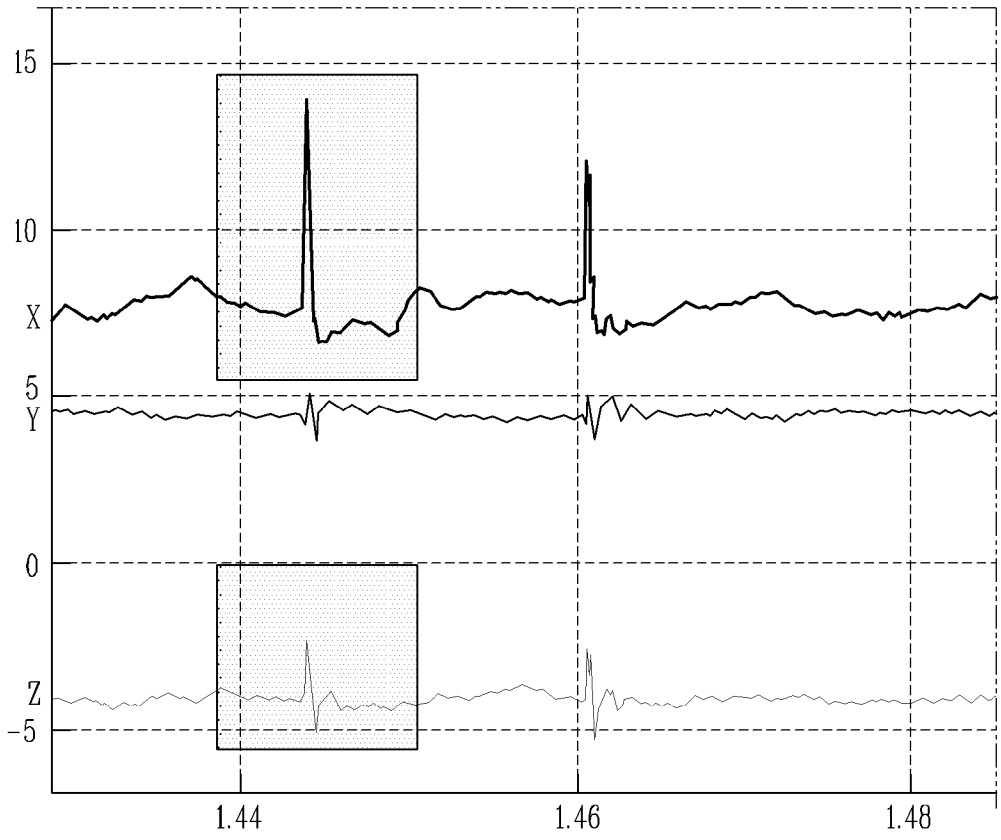
8850
8860
8870
8880
8890

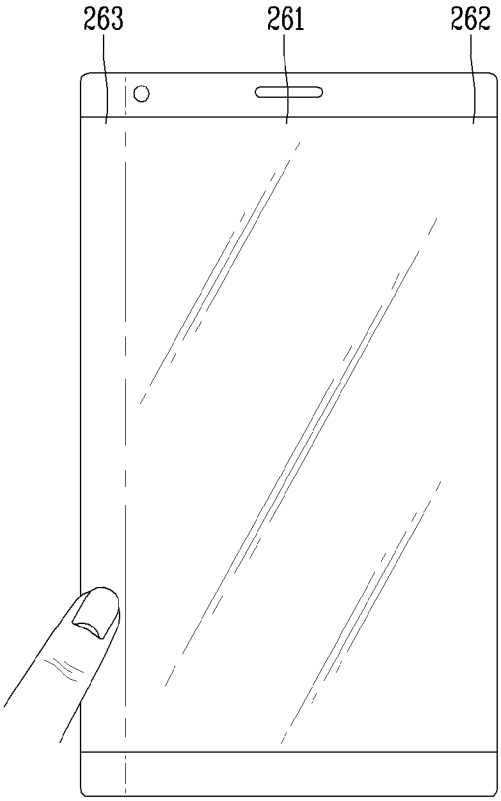
[Fig. 4c]



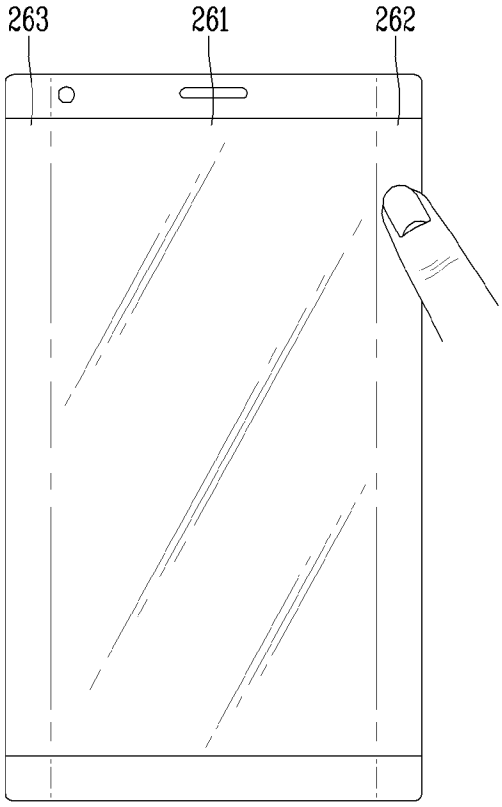
[Fig. 5]



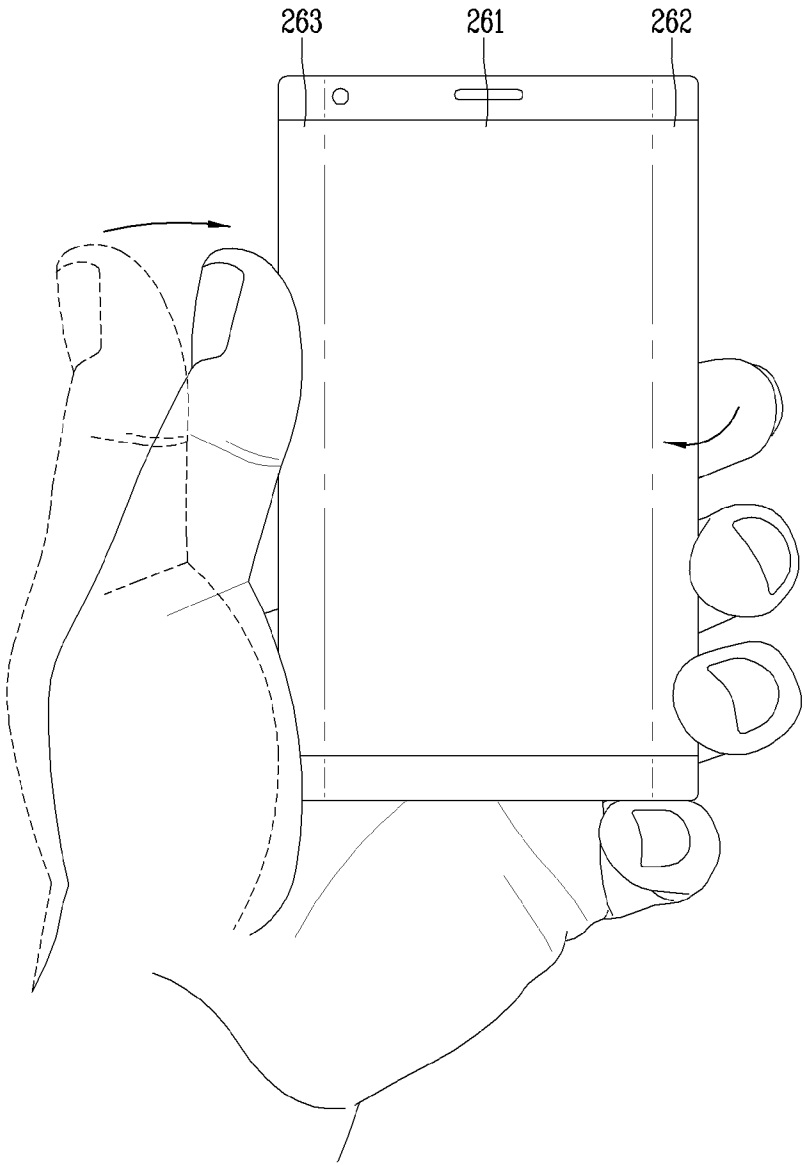
[Fig. 6a]



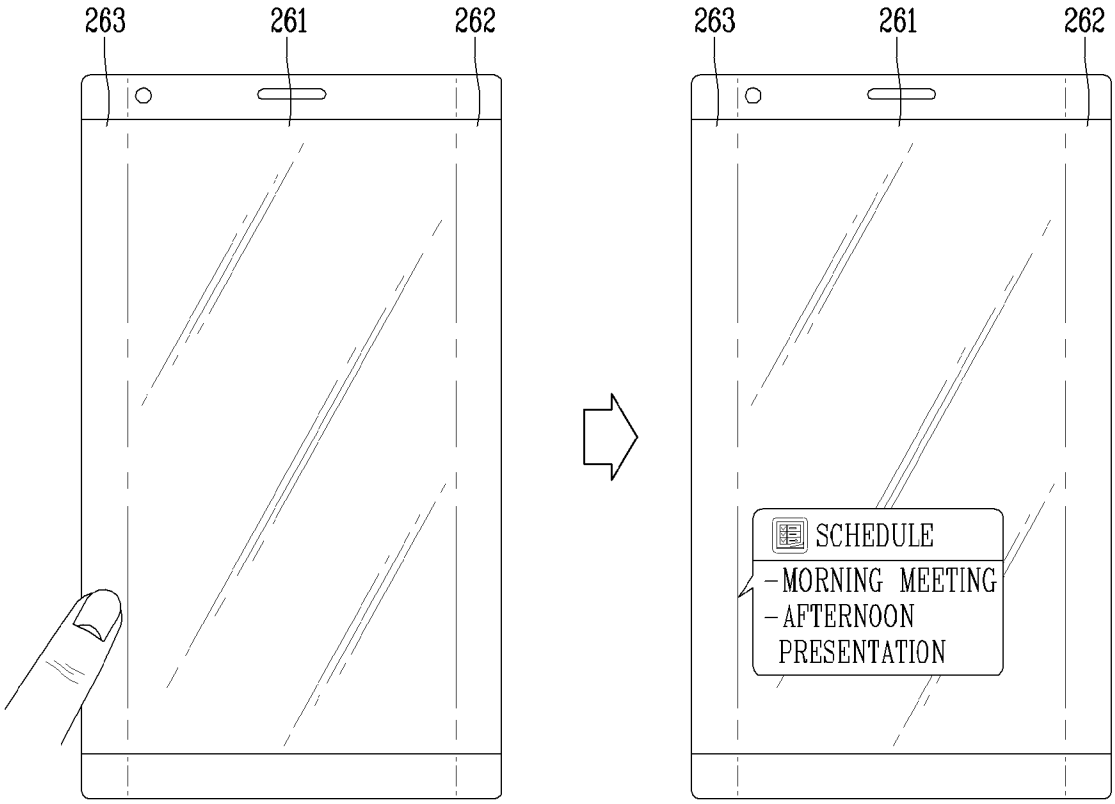
[Fig. 6b]



[Fig. 6c]



[Fig. 7a]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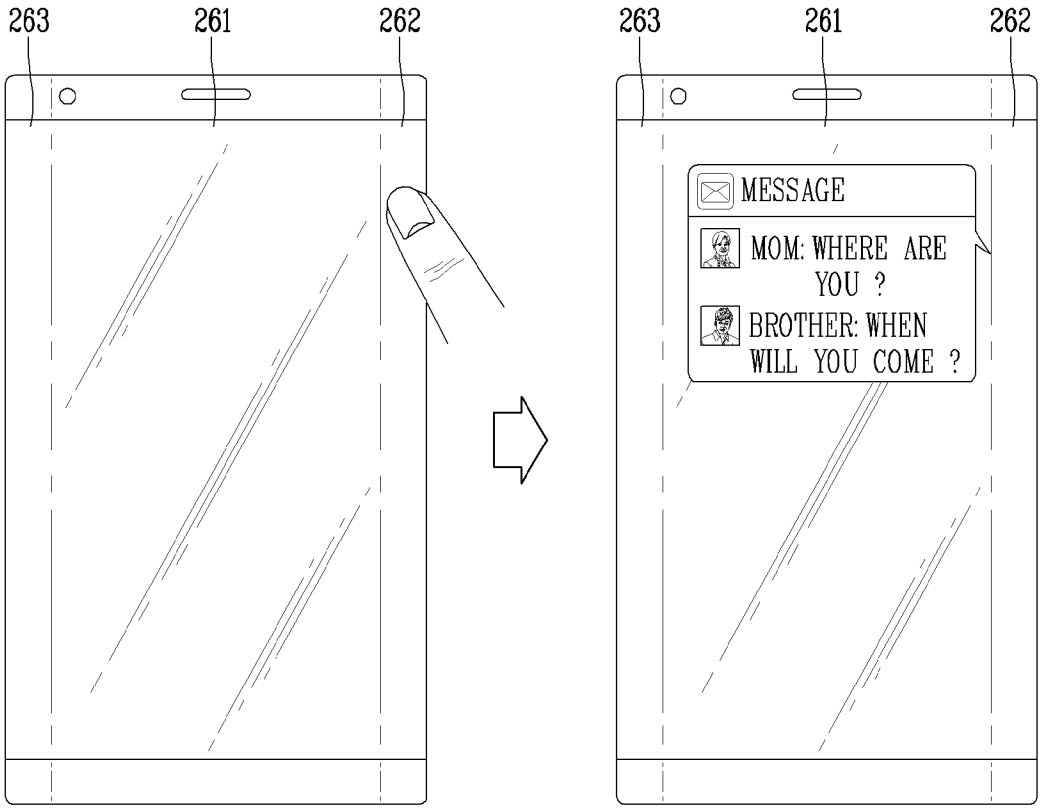
SCHEDULE
-MORNING MEETING
-AFTERNOON PRESENTATION

[Fig. 7b]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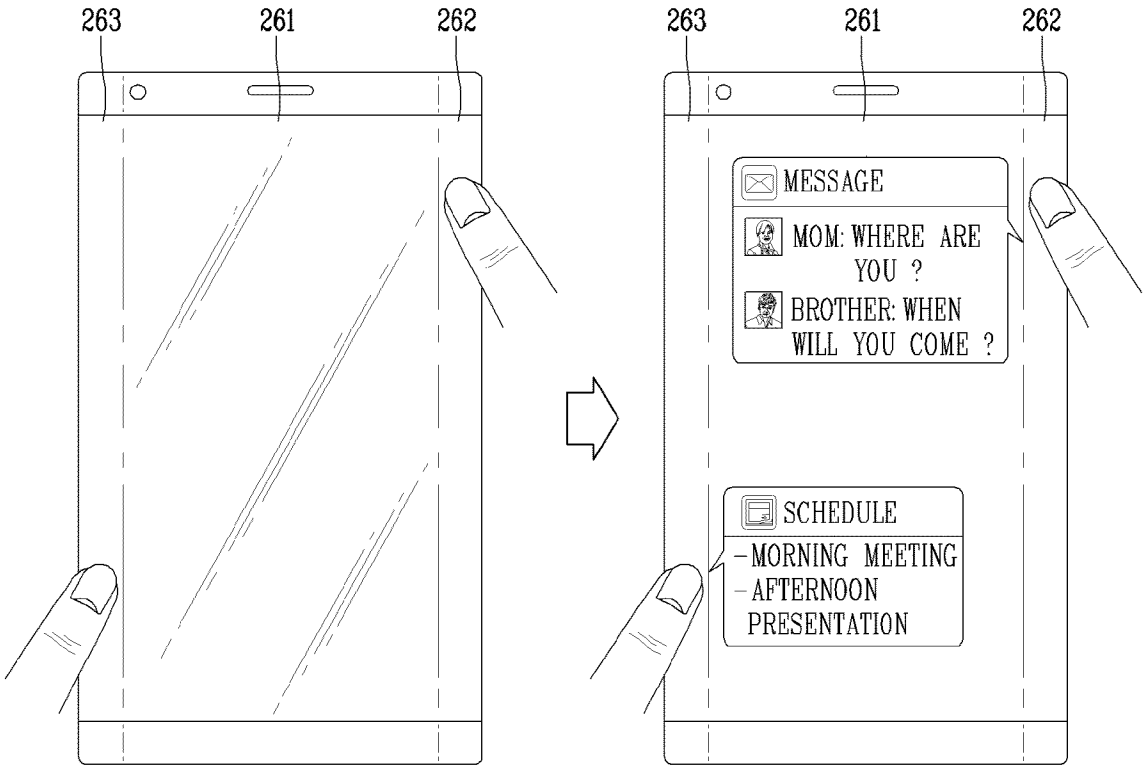
MESSAGE
MOM: WHERE ARE YOU ?
BROTHER: WHEN WILL YOU COME ?

[Fig. 7c]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261
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263
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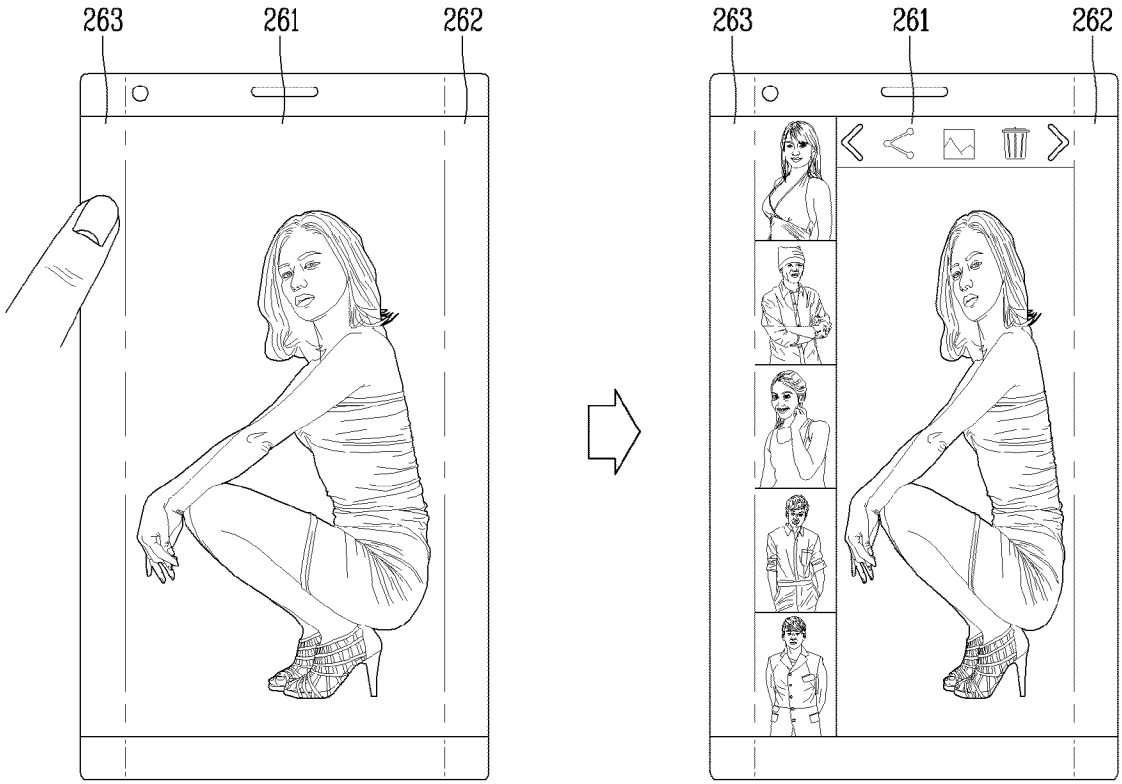
MESSAGE
MOM: WHERE ARE YOU ?
BROTHER: WHEN WILL YOU COME ?
SCHEDULE
- MORNING MEETING
- AFTERNOON PRESENTATION

[Fig. 8a]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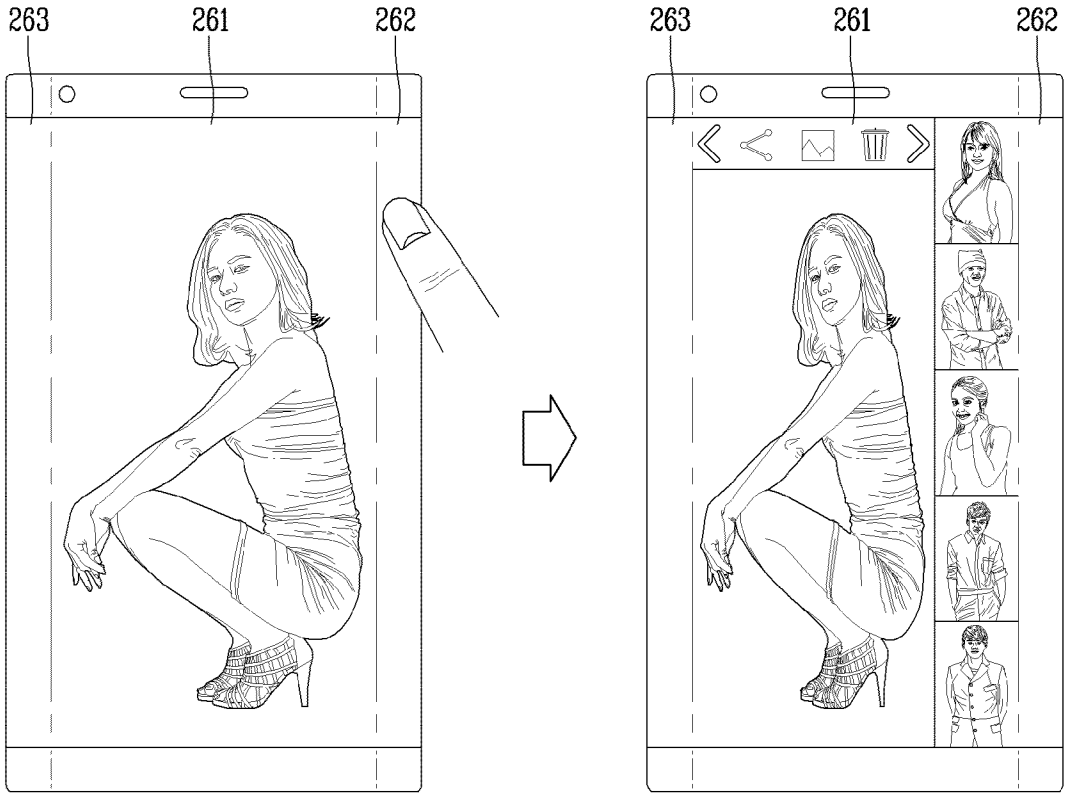
[Fig. 8b]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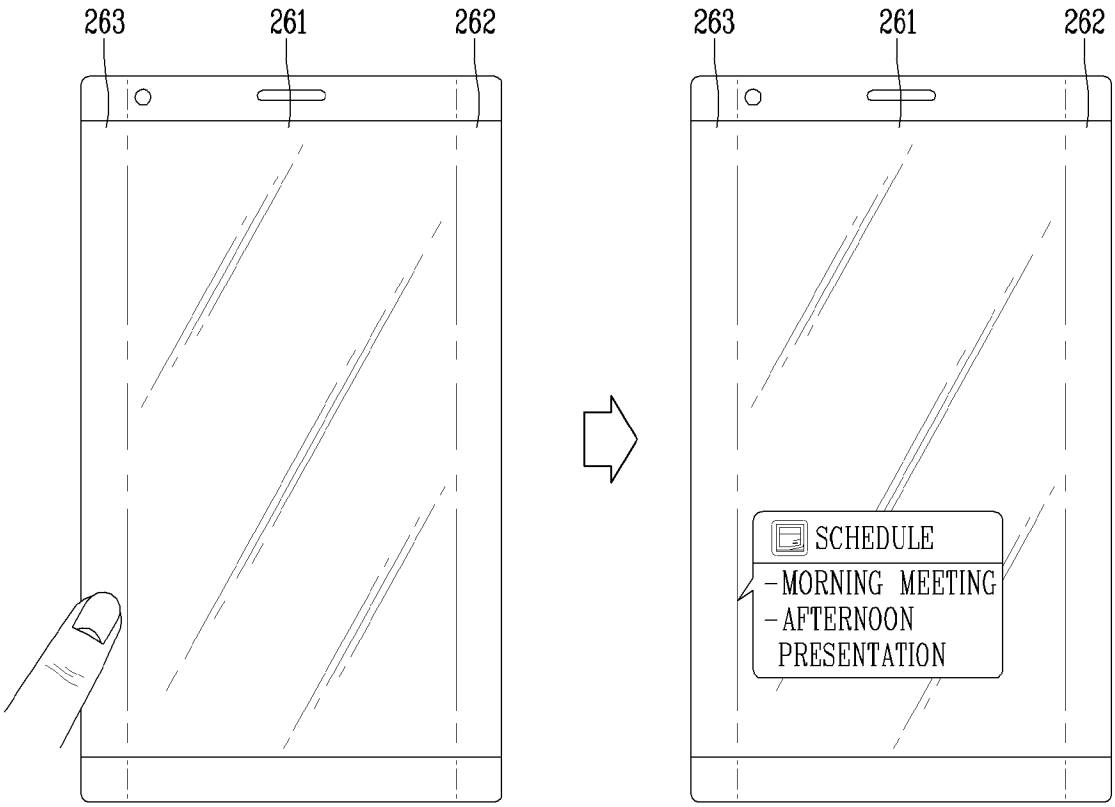
262

[Fig. 9a]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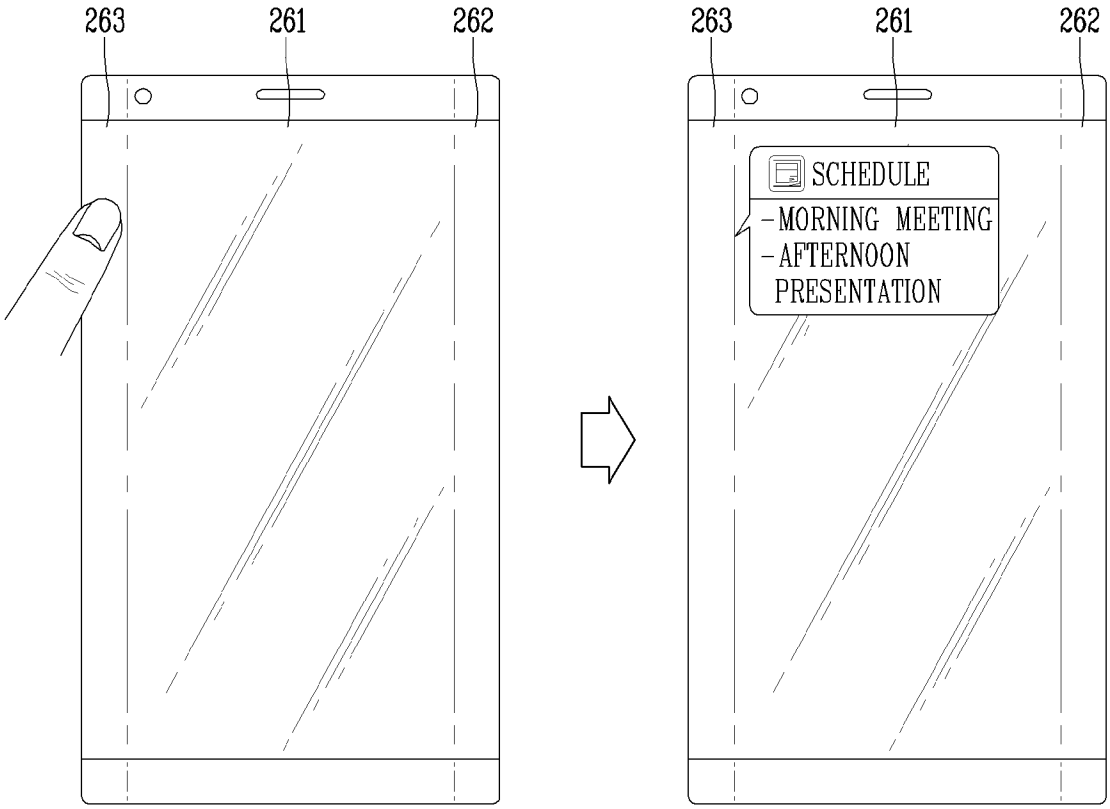
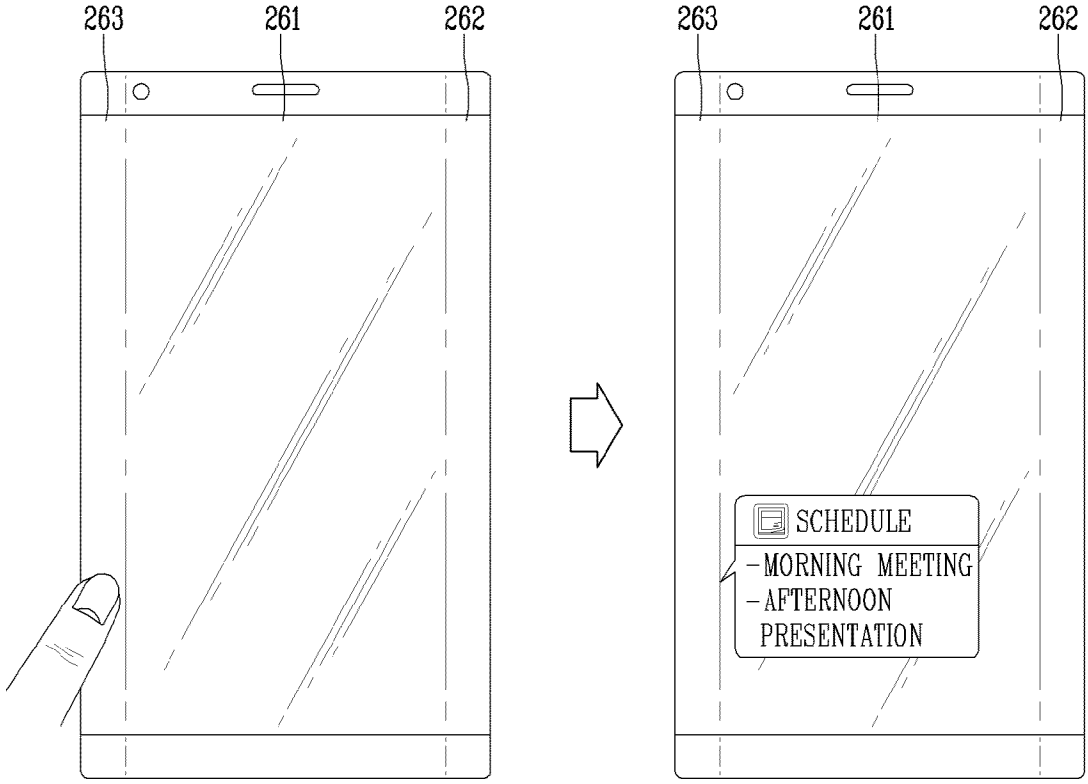
261
262
SCHEDULE
-MORNING MEETING
-AFTERNOON
PRESENTATION

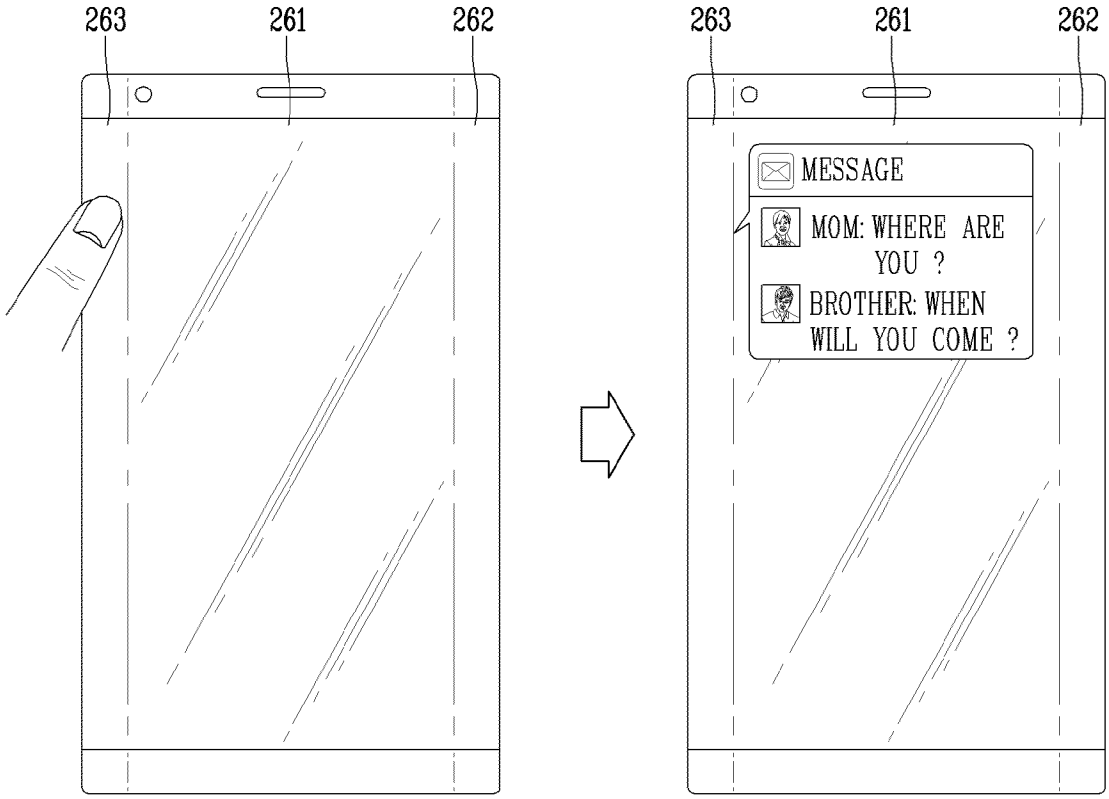
[Fig. 9b]



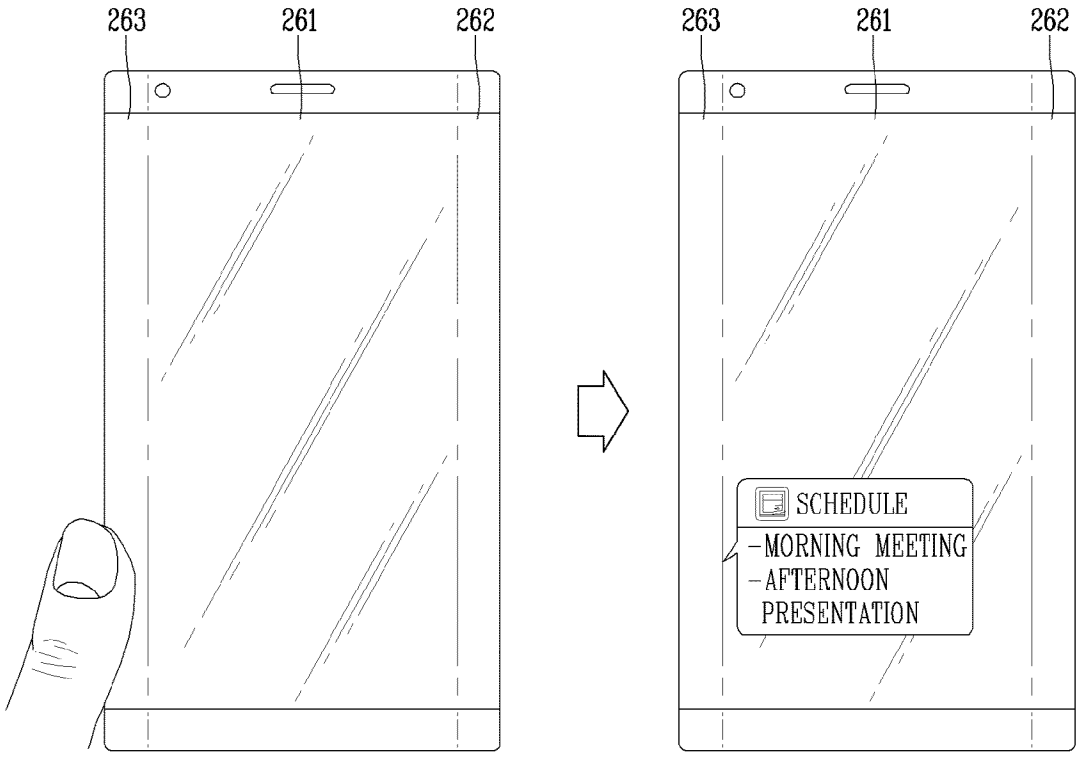
[Fig. 10a]



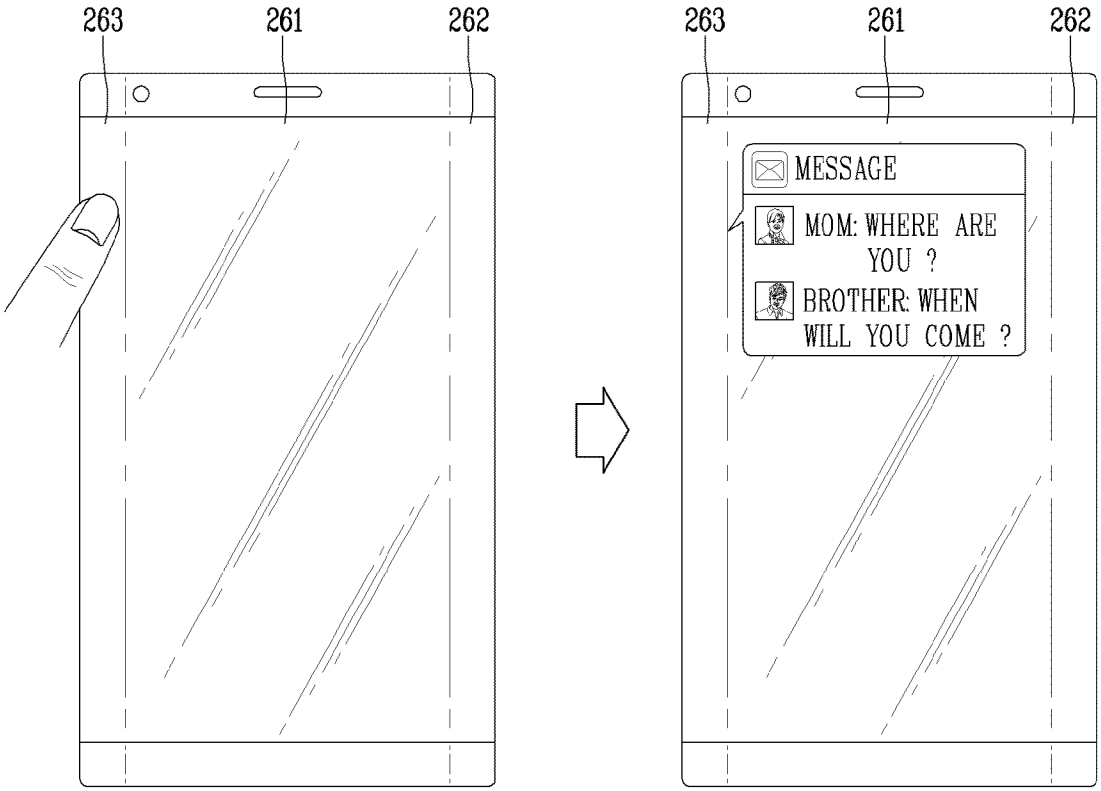
[Fig. 10b]



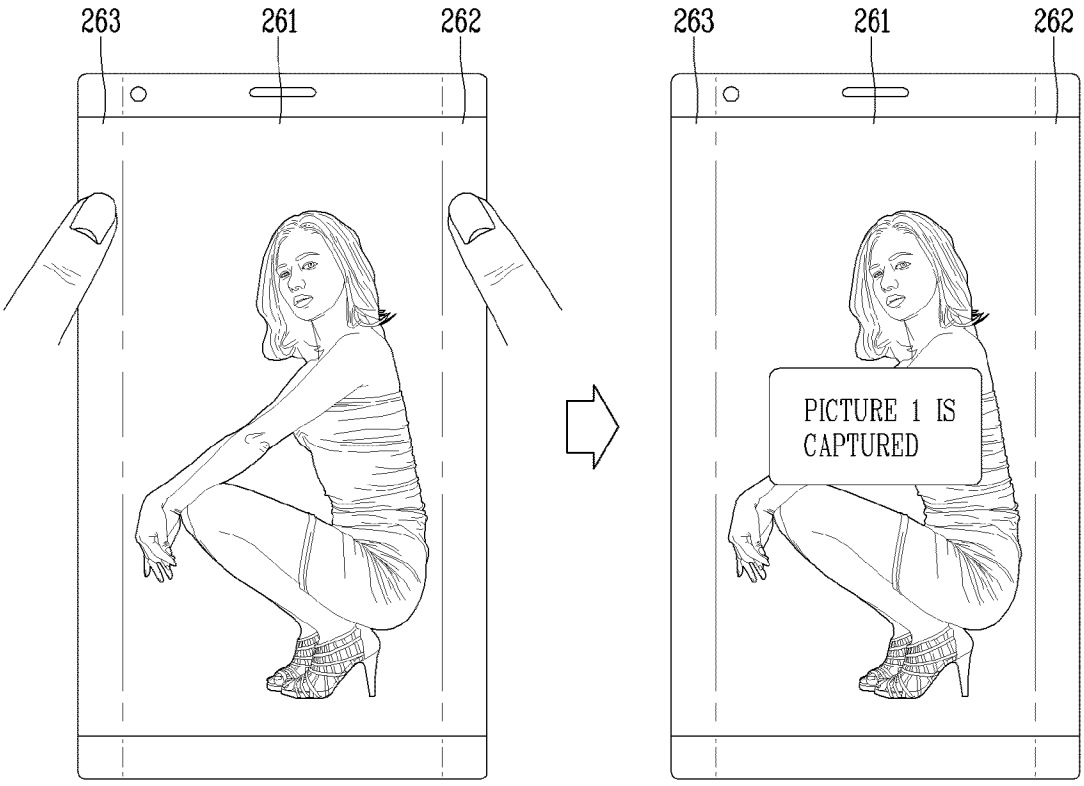
[Fig. 11a]



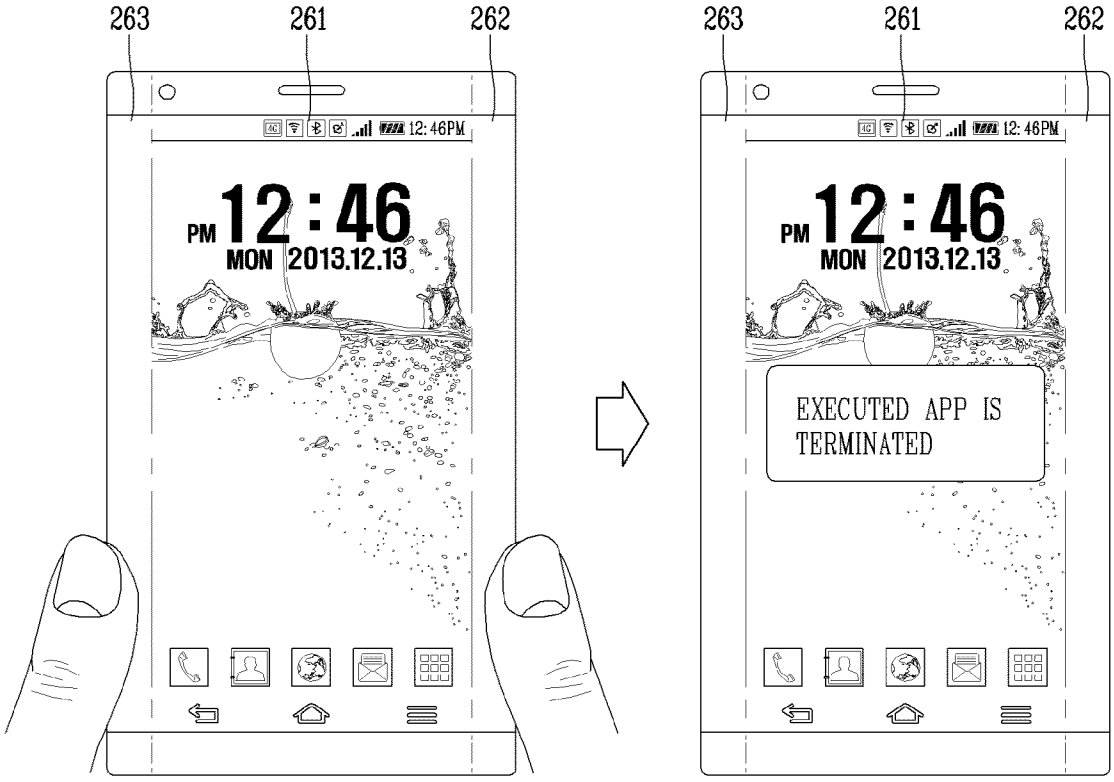
[Fig. 11b]



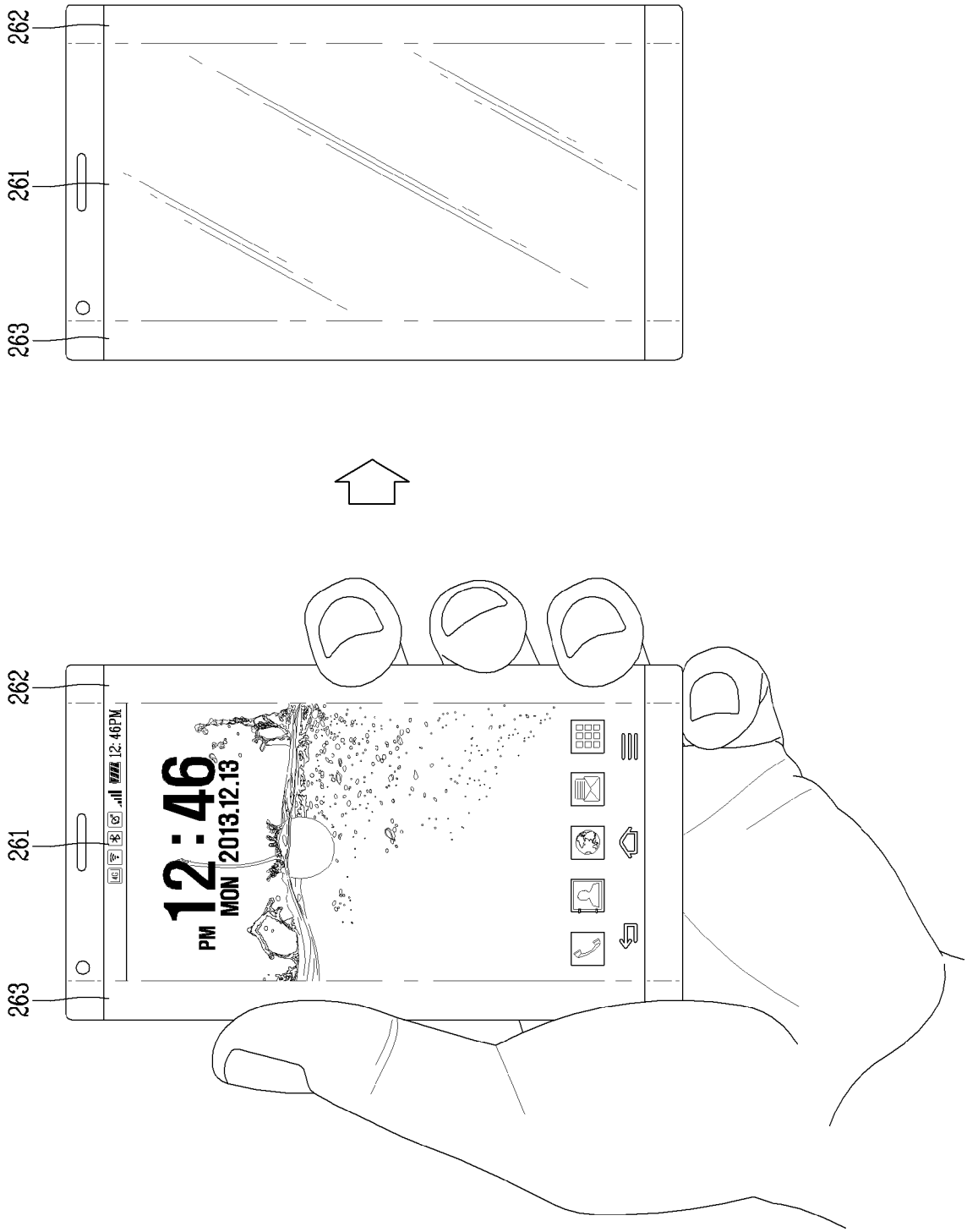
[Fig. 12a]



[Fig. 12b]


263
261
262
12:46PM
PM 12:46
MON 2013.12.13
263
261
262
12:46PM
PM 12:46
MON 2013.12.13
EXECUTED APP IS TERMINATED

[Fig. 12c]



INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2015/007661

A. CLASSIFICATION OF SUBJECT MATTER

G06F 3/048(2006.01)i, G06F 3/041(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
G06F 3/048; G09G 5/00; G06F 3/041

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean utility models and applications for utility models
Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKOMPASS(KIPO internal) & Keywords: bendable display, side, tap, touch, portion, signal, function, pattern

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2014-0118271 A1 (SAMSUNG DISPLAY CO., LTD.) 01 May 2014 See paragraphs [0008], [0032], [0049]; claim 1; and figure 1.	1-20
Y	US 2014-0218312 A1 (SAMSUNG DISPLAY CO., LTD.) 07 August 2014 See paragraphs [0008], [0036], [0051], [0066]; and figures 1, 3C.	1-20
Y	EP 2778866 A1 (LG ELECTRONICS, INC.) 17 September 2014 See paragraphs [0008]-[0009]; claim 4; and figure 5.	8-9,12-13,16-17
A	US 2013-0300697 A1 (SAMSUNG ELECTRONICS CO., LTD.) 14 November 2013 See paragraph [0043]; and figure 1.	1-20
A	US 2014-0028601 A1 (MOTOROLA MOBILITY LLC) 30 January 2014 See paragraph [0056]; and figure 6.	1-20

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents,such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
17 December 2015 (17.12.2015)	**18 December 2015 (18.12.2015)**

Name and mailing address of the ISA/KR
International Application Division
Korean Intellectual Property Office
189 Cheongsa-ro, Seo-gu, Daejeon Metropolitan City, 35208, Republic of Korea
Facsimile No. +82-42-472-7140

Authorized officer
LEE, Dong Yun
Telephone No. +82-42-481-8734

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/KR2015/007661

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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US 2014-0218312 A1	07/08/2014	CN 103973839 A	06/08/2014
		EP 2762996 A2	06/08/2014
		KR 10-2014-0099093 A	11/08/2014
EP 2778866 A1	17/09/2014	CN 104049728 A	17/09/2014
		KR 10-2014-0113119 A	24/09/2014
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US 2013-0300697 A1	14/11/2013	KR 10-1515623 B1	28/04/2015
		KR 10-2013-0127050 A	22/11/2013
		KR 10-2015-0044427 A	24/04/2015
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		KR 10-2014-0007949 A	20/01/2014
		US 2012-0306766 A1	06/12/2012
		US 8587542 B2	19/11/2013
		WO 2012-166279 A1	06/12/2012