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(54) **USER TERMINAL DEVICE AND DISPLAYING METHOD THEREOF**

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

(21) Appl. No.: **16/571,261**

(22) Filed: **Sep. 16, 2019**

Related U.S. Application Data

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(60) Provisional application No. 61/937,744, filed on Feb. 10, 2014.

(30) **Foreign Application Priority Data**

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Publication Classification

(51) **Int. Cl.**

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G06F 3/0484	(2006.01)
H04M 1/725	(2006.01)
G06F 3/0488	(2006.01)
G06F 9/451	(2006.01)

(52) **U.S. Cl.**

CPC ***G06F 3/04817*** (2013.01); ***G06F 3/0482*** (2013.01); ***G06F 9/451*** (2018.02); ***H04M 1/72583*** (2013.01); ***G06F 3/0488*** (2013.01); ***G06F 3/04842*** (2013.01)

(57) **ABSTRACT**

A user terminal device and a controlling method thereof are provided. The user terminal device includes a display configured to be divided into a first area and a second area which is larger than the first area with reference to a folding line, a detector configured to detect a user interaction, and a controller configured to, in response to a folding of the display with reference to the folding line being detected through the detector, control the display to display a predetermined UI on an exposure area which is exposed part of the second area.

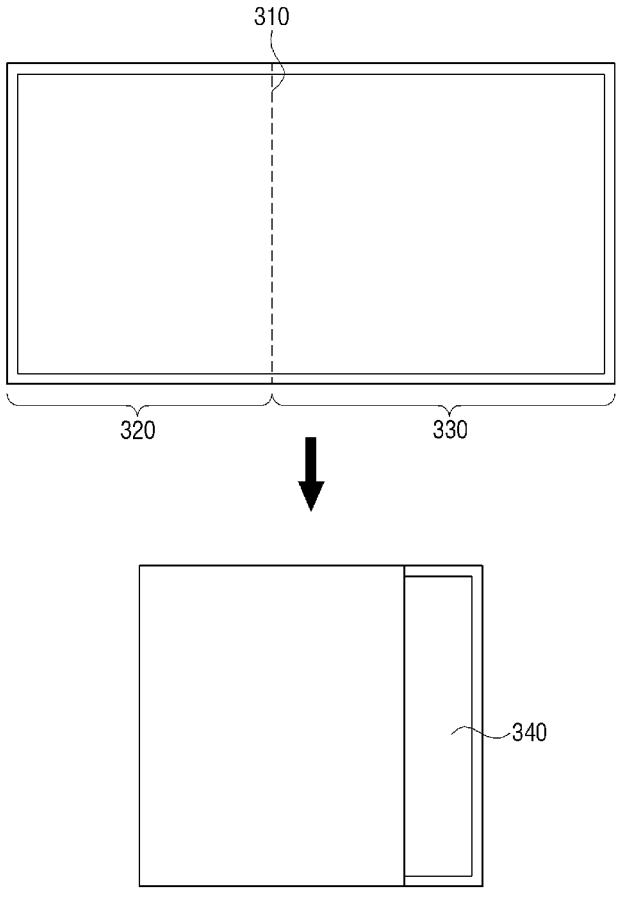


FIG. 1

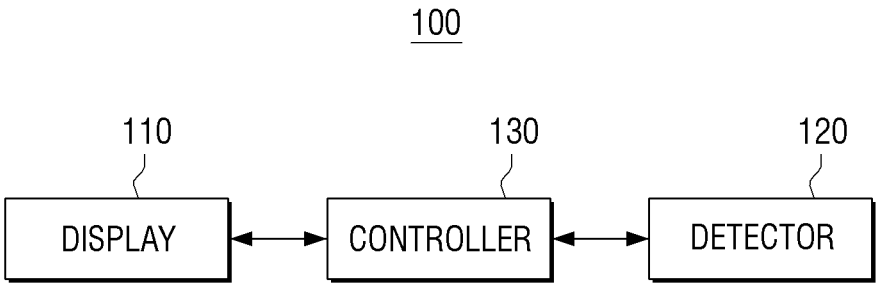


FIG. 2

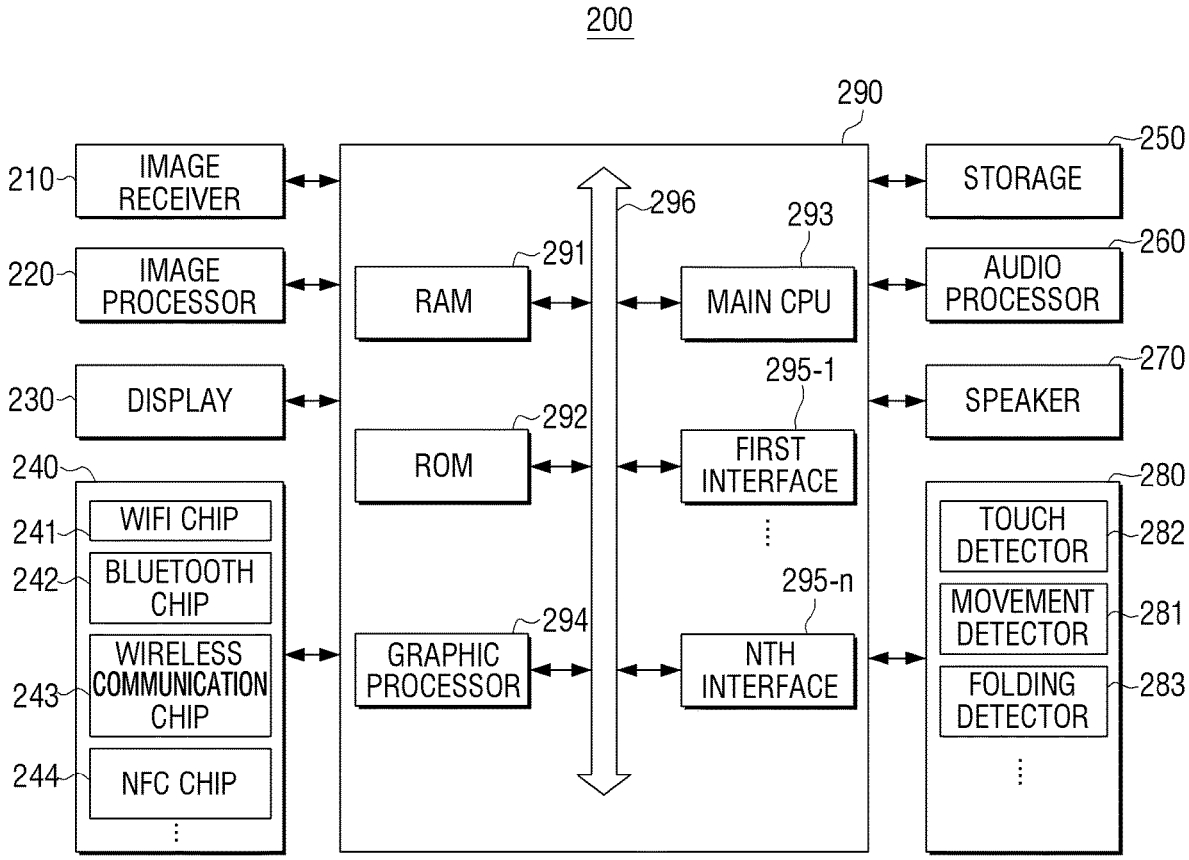

200
290
210
IMAGE RECEIVER
220
IMAGE PROCESSOR
230
DISPLAY
240
WIFI CHIP
241
BLUETOOTH CHIP
242
WIRELESS COMMUNICATION CHIP
243
NFC CHIP
244
RAM
291
ROM
292
GRAPHIC PROCESSOR
294
296
MAIN CPU
293
FIRST INTERFACE
295-1
NTH INTERFACE
295-n
STORAGE
250
AUDIO PROCESSOR
260
SPEAKER
270
280
TOUCH DETECTOR
282
MOVEMENT DETECTOR
281
FOLDING DETECTOR
283

FIG. 3A

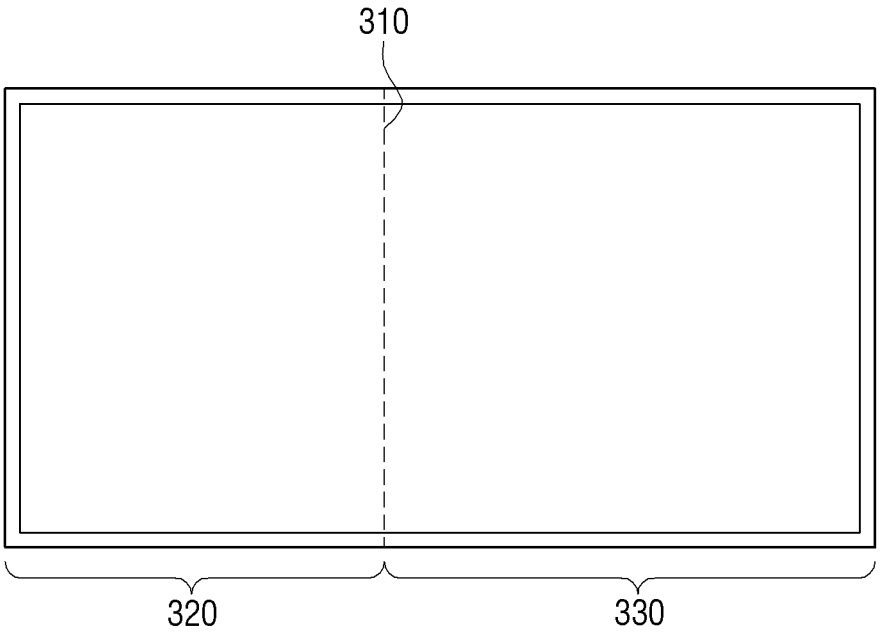


FIG. 3B

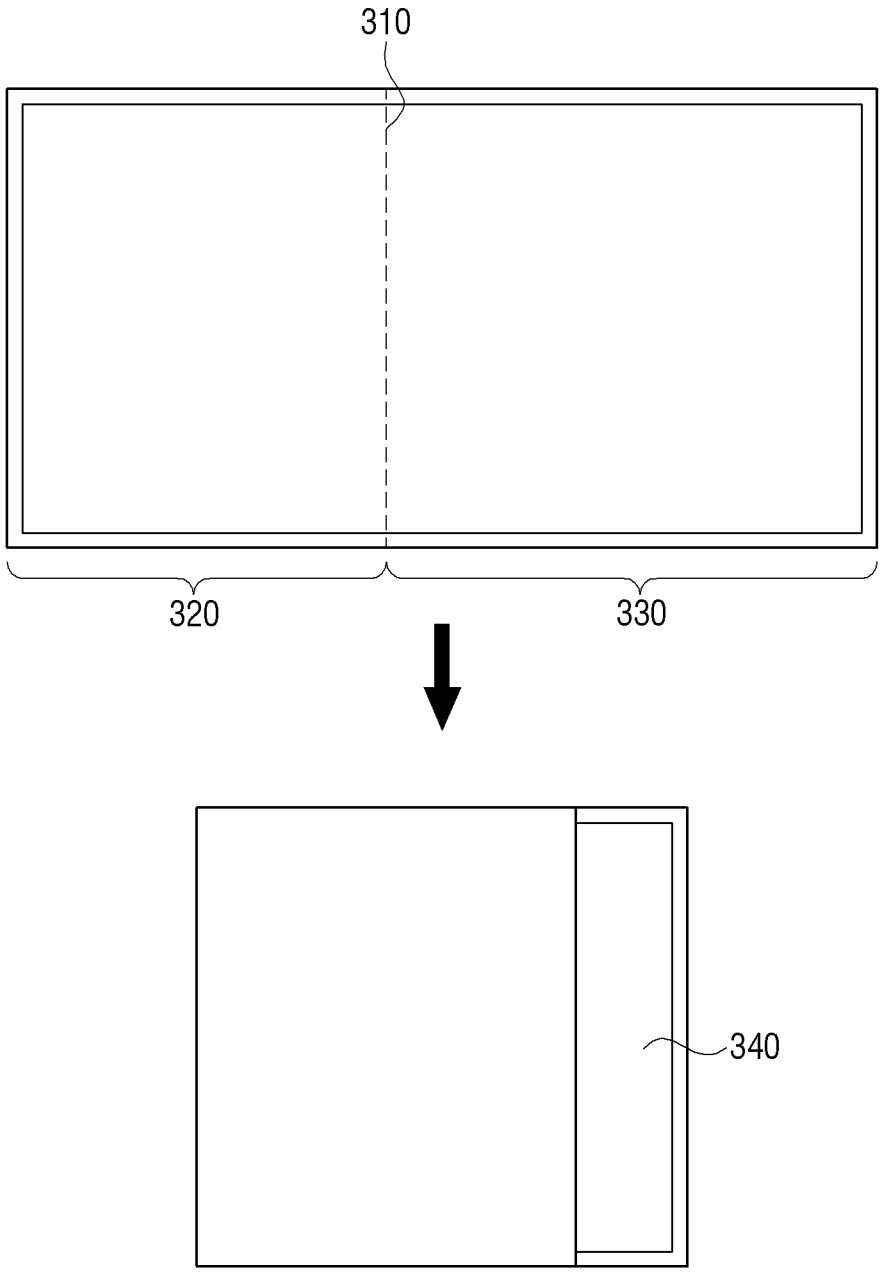


FIG. 3C

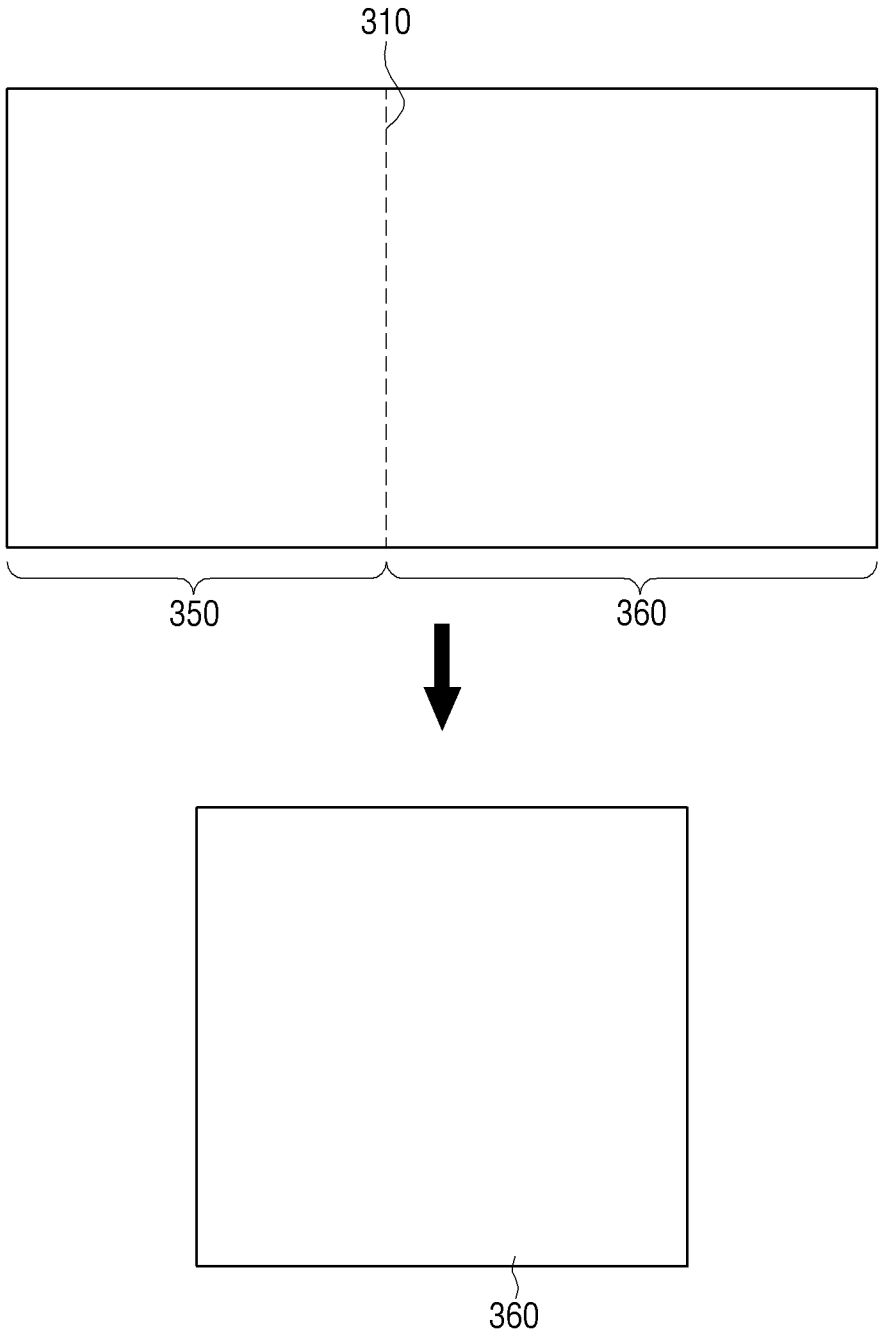


FIG. 3D

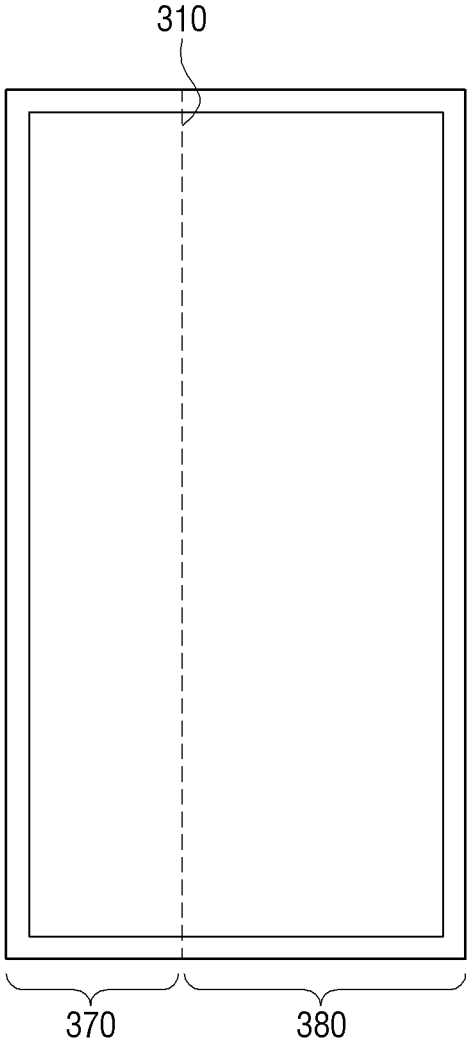


FIG. 3E

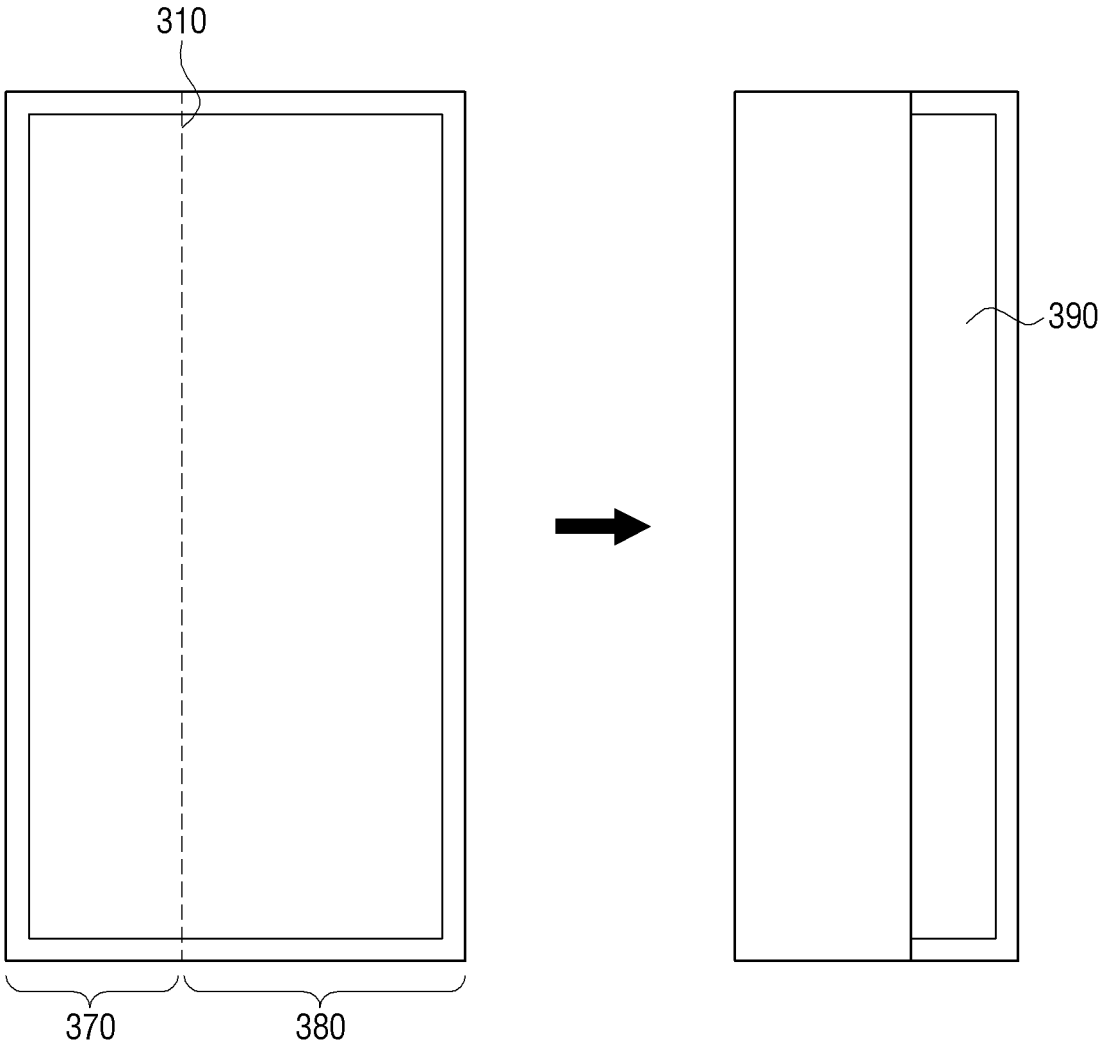


FIG. 4

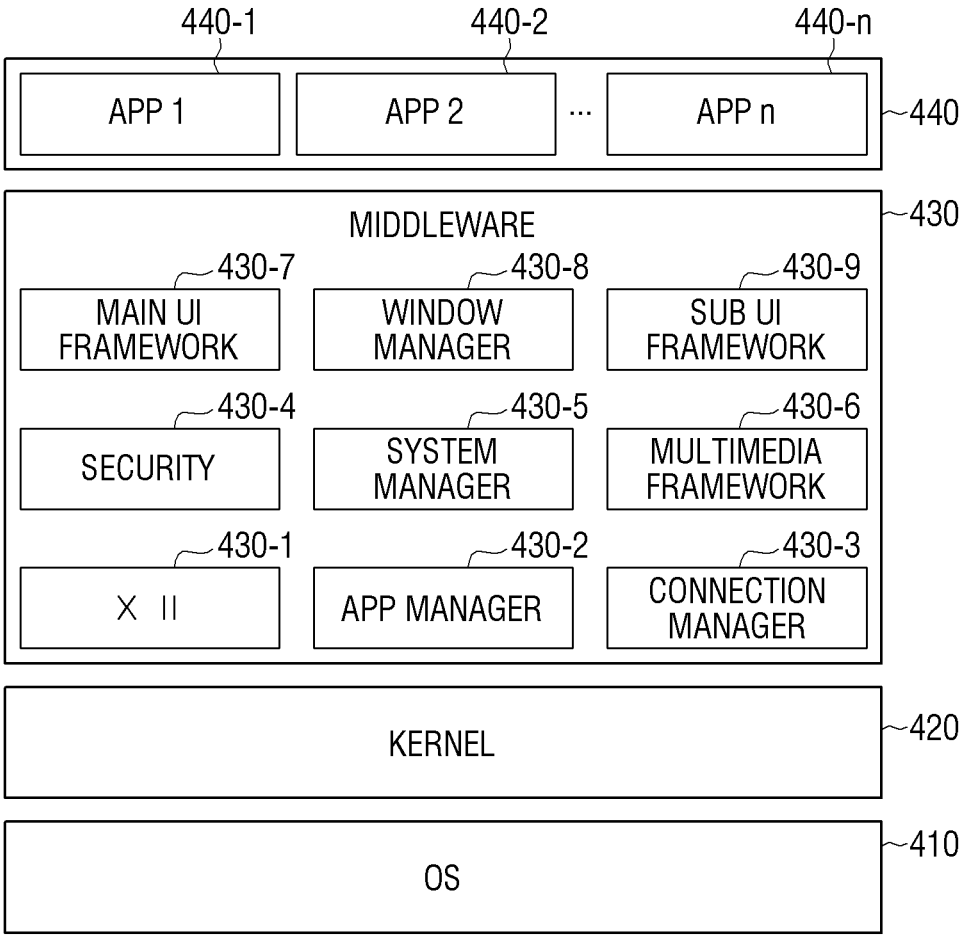

440-1
440-2
440-n
APP 1
APP 2
...
APP n
440
MIDDLEWARE
430
430-7
430-8
430-9
MAIN UI FRAMEWORK
WINDOW MANAGER
SUB UI FRAMEWORK
430-4
430-5
430-6
SECURITY
SYSTEM MANAGER
MULTIMEDIA FRAMEWORK
430-1
430-2
430-3
X 11
APP MANAGER
CONNECTION MANAGER
KERNEL
420
OS
410

FIG. 5A

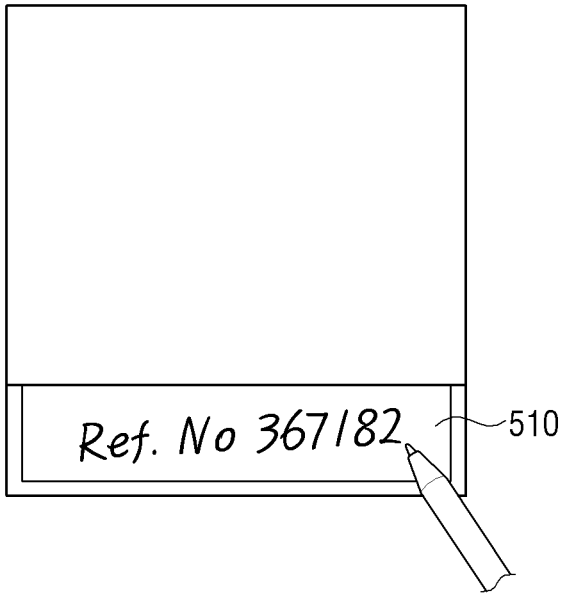


FIG. 5B

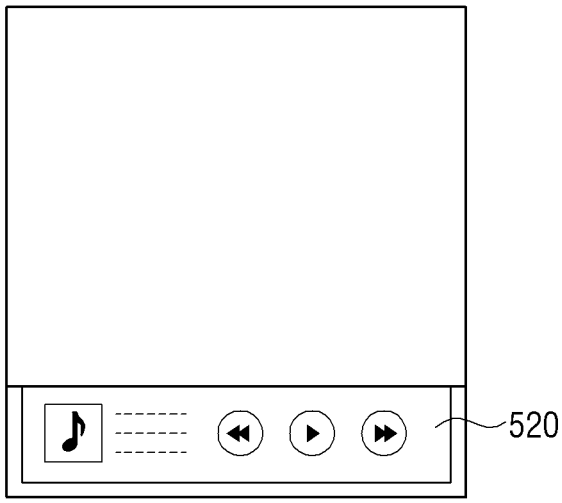


FIG. 5C

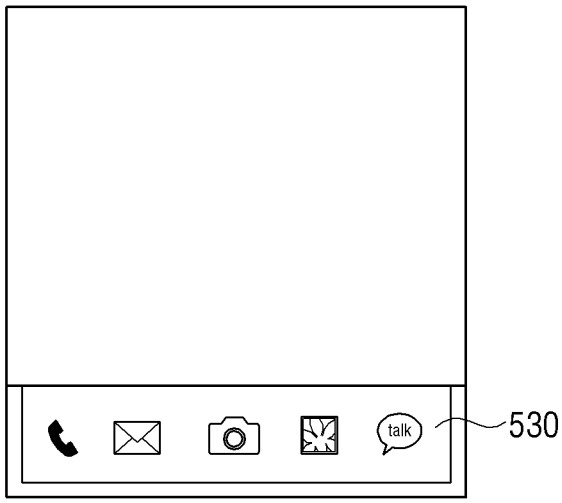


FIG. 5D

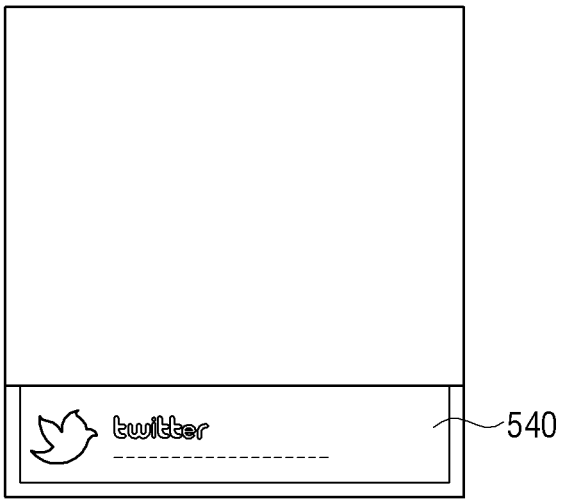


FIG. 6A

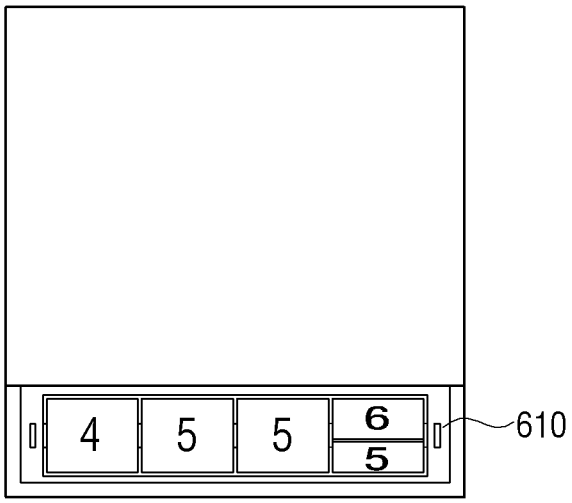


FIG. 6B

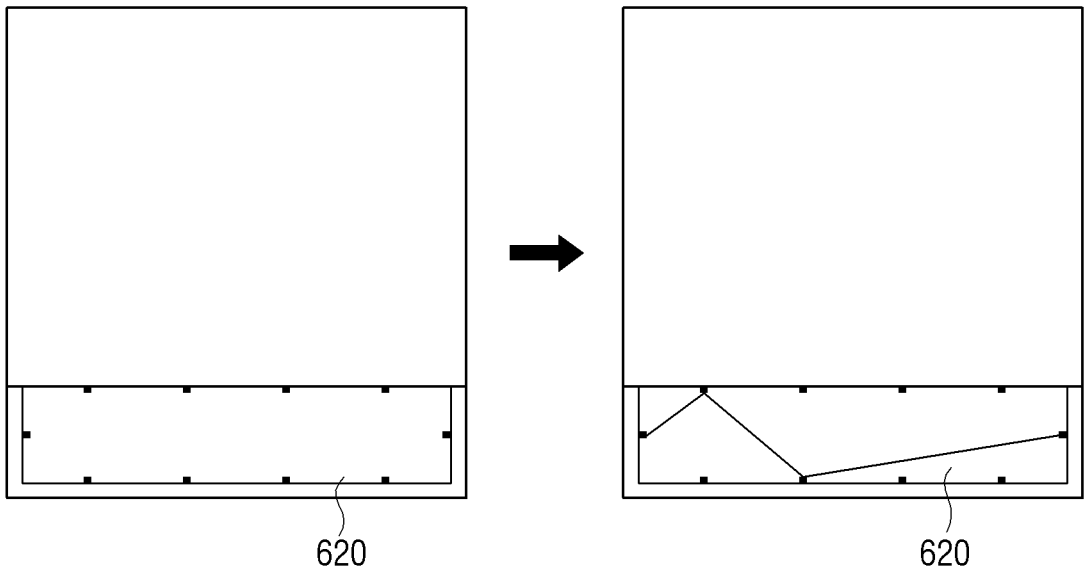


FIG. 6C

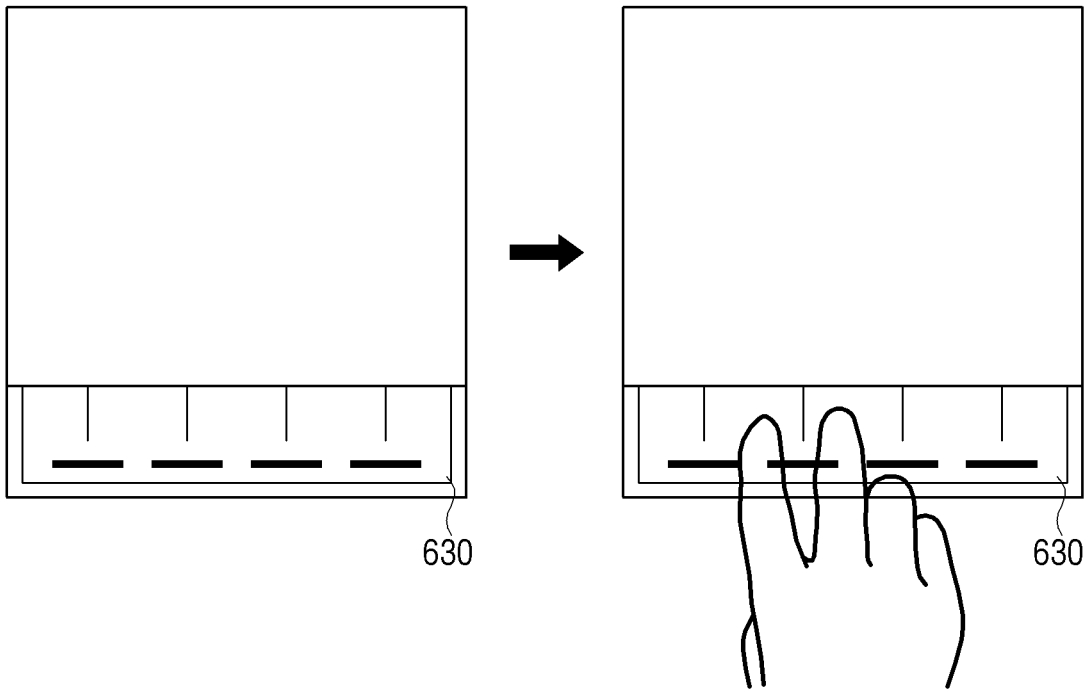


FIG. 6D

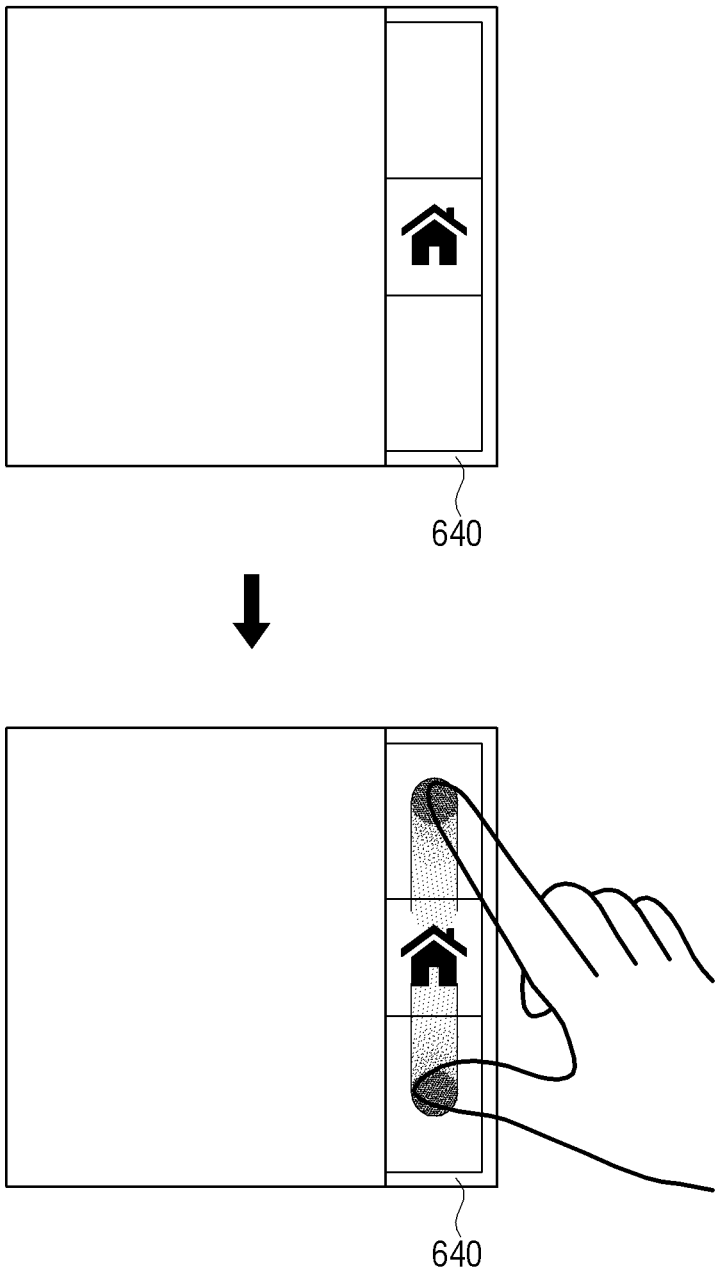


FIG. 7A

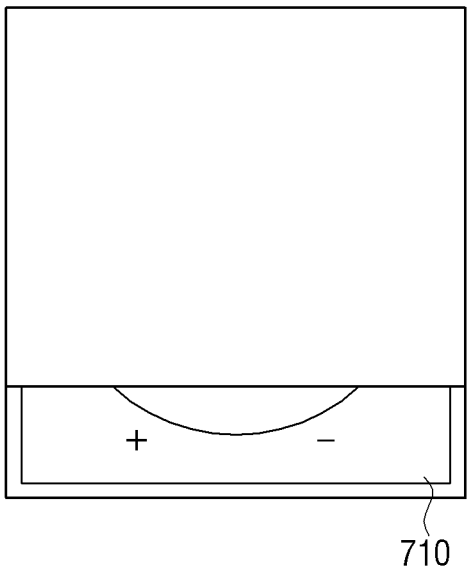


FIG. 7B

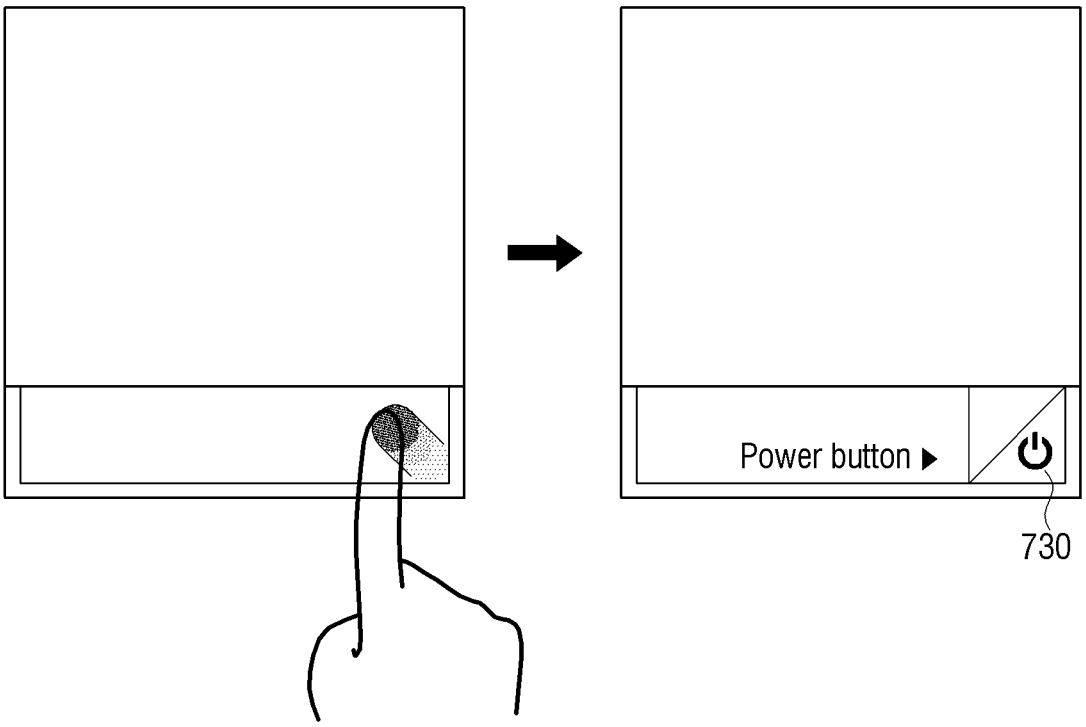


FIG. 8A

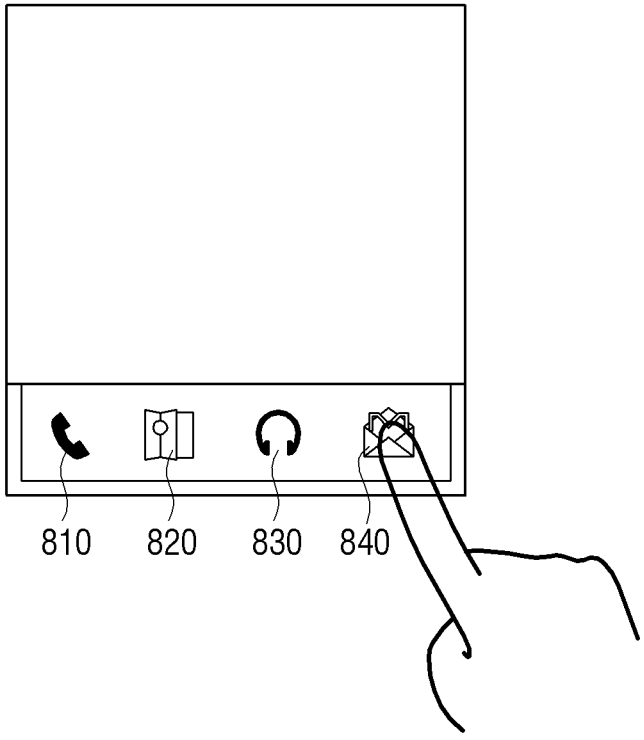


FIG. 8B

Inbox(13)
Yesterday(1)
ascend
10/22/2012
850
Saturday(2)
Hey amigo....
10/20/2012
You have notifi...
10/20/2012
Friday(3)
Do you know .
10/19/2012
Limited Time ...
10/19/2012
Top 3 posts ...
10/19/2012

FIG. 9A

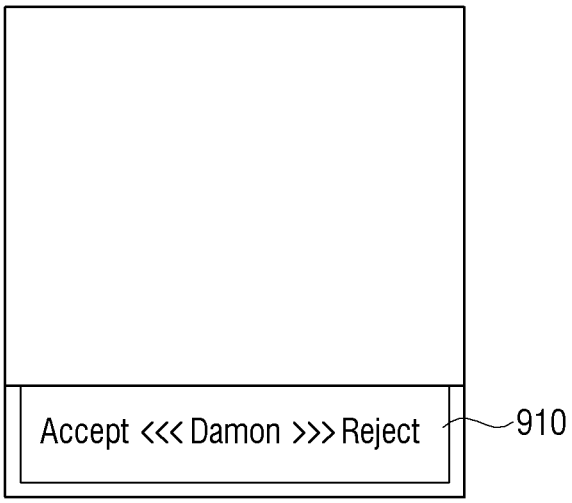


FIG. 9B

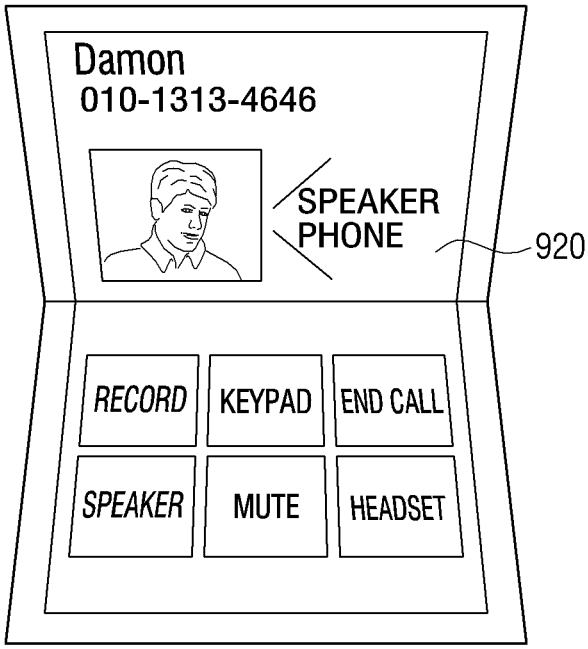

Damon
010-1313-4646
SPEAKER PHONE
920
RECORD
KEYPAD
END CALL
SPEAKER
MUTE
HEADSET

FIG. 10A

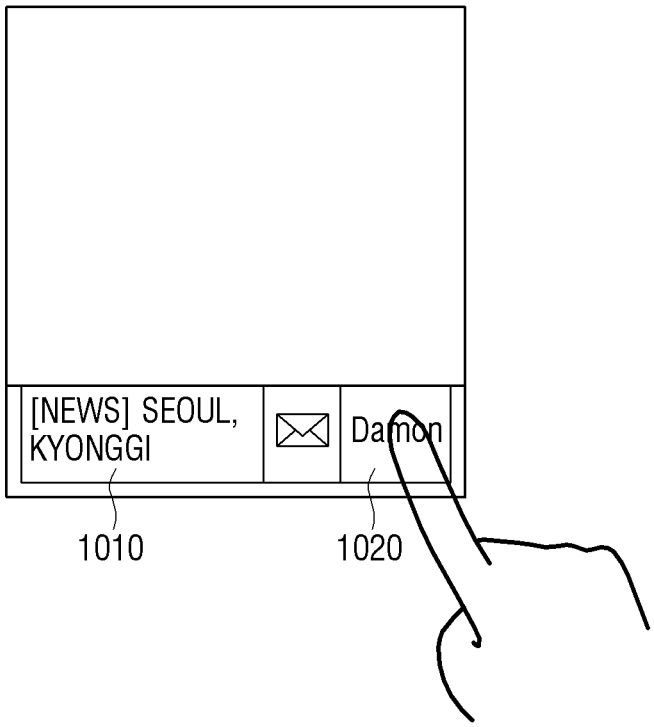


FIG. 10B

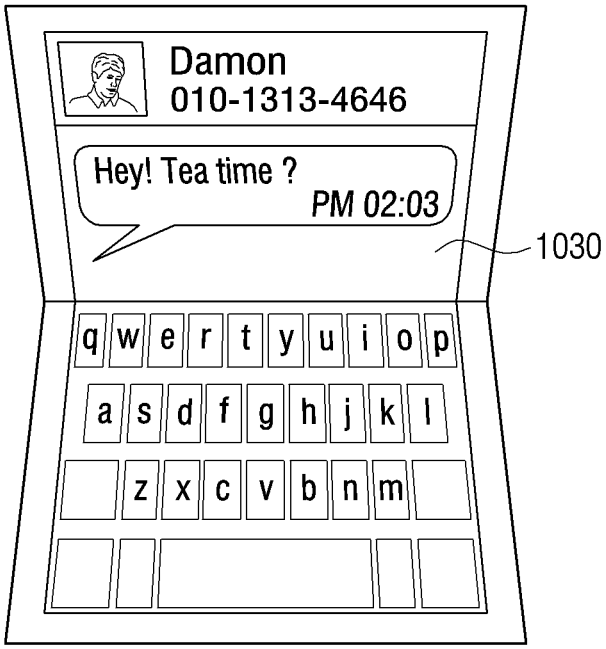

Damon
010-1313-4646
Hey! Tea time ?
PM 02:03
1030
q w e r t y u i o p
a s d f g h j k l
z x c v b n m

FIG. 11A

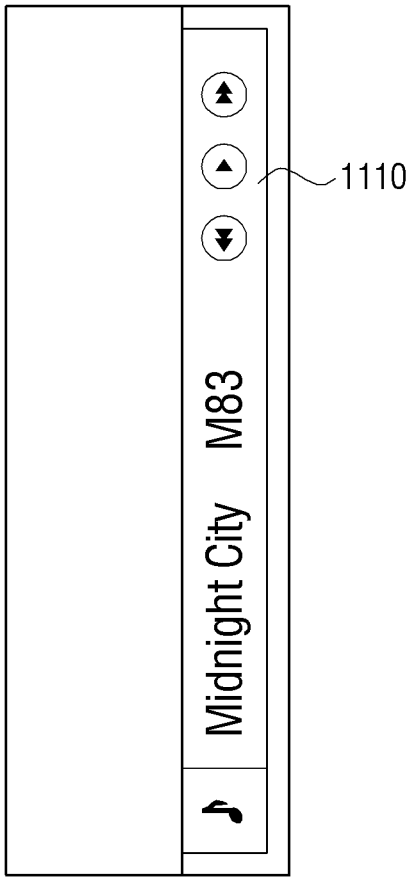


FIG. 11B

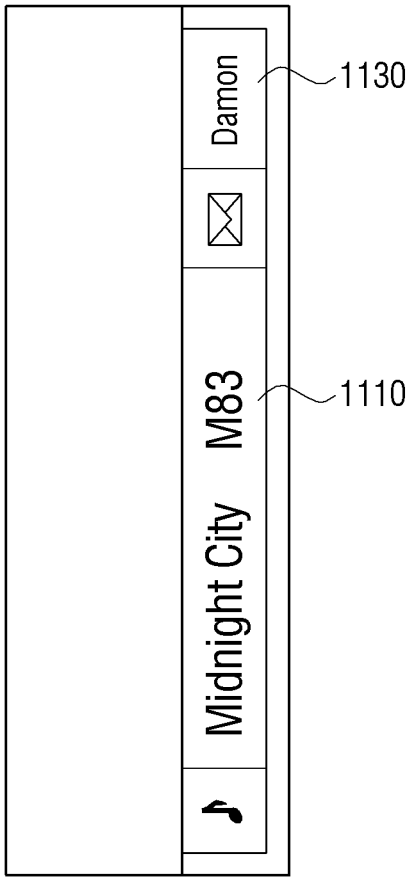


FIG. 11C

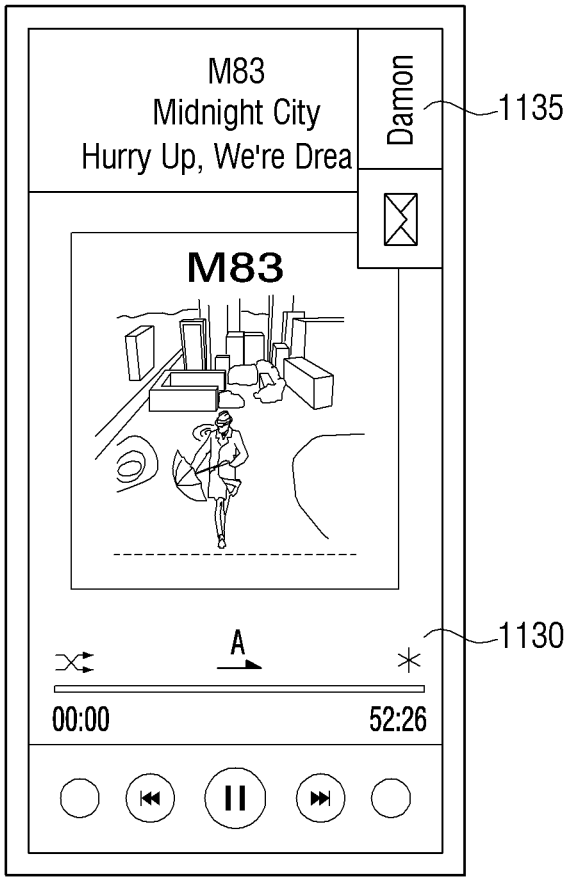

M83
Midnight City
Hurry Up, We're Drea
Damon
1135
M83
A
1130
00:00
52:26

FIG. 11D

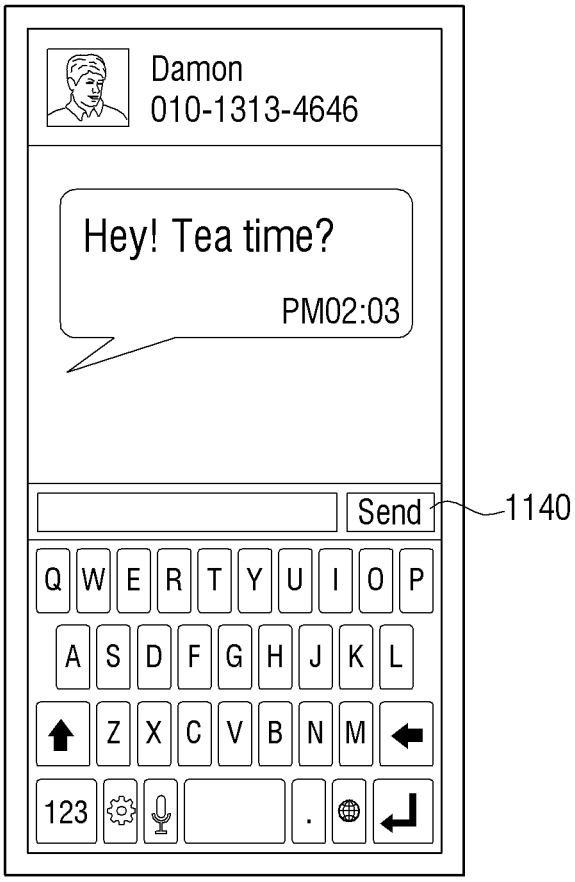

Damon
010-1313-4646
Hey! Tea time?
PM02:03
Send
1140
Q W E R T Y U I O P
A S D F G H J K L
Z X C V B N M
123
.

FIG. 12A

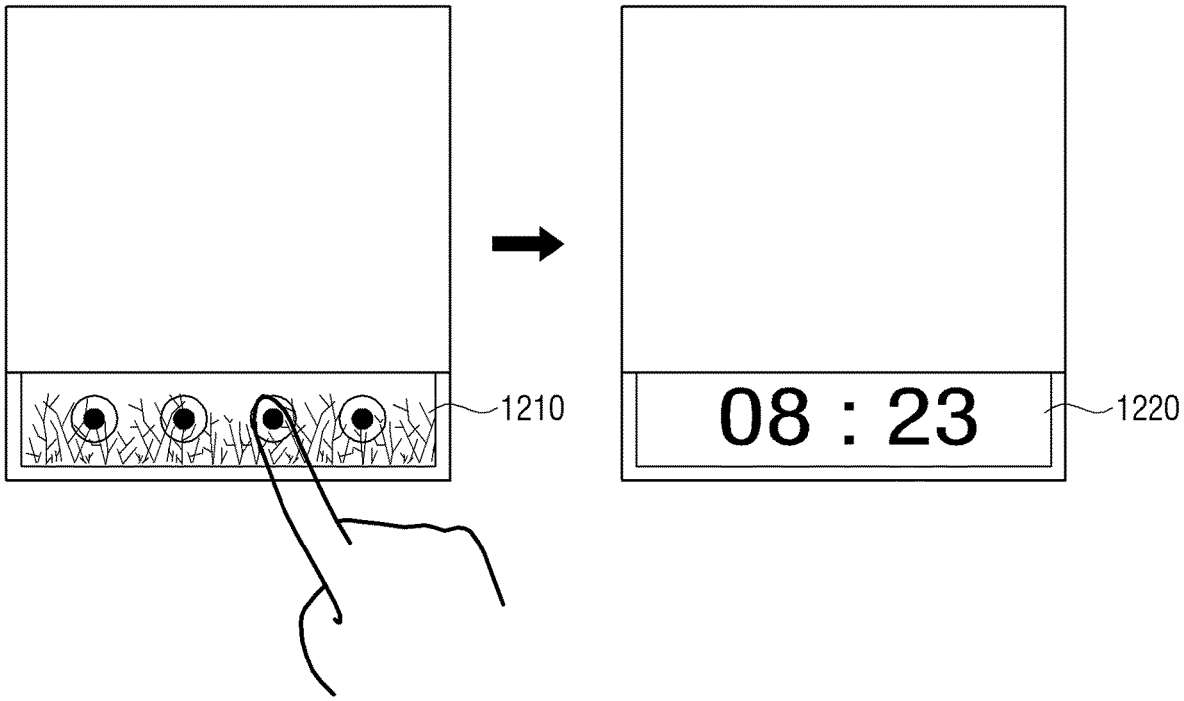


FIG. 12B

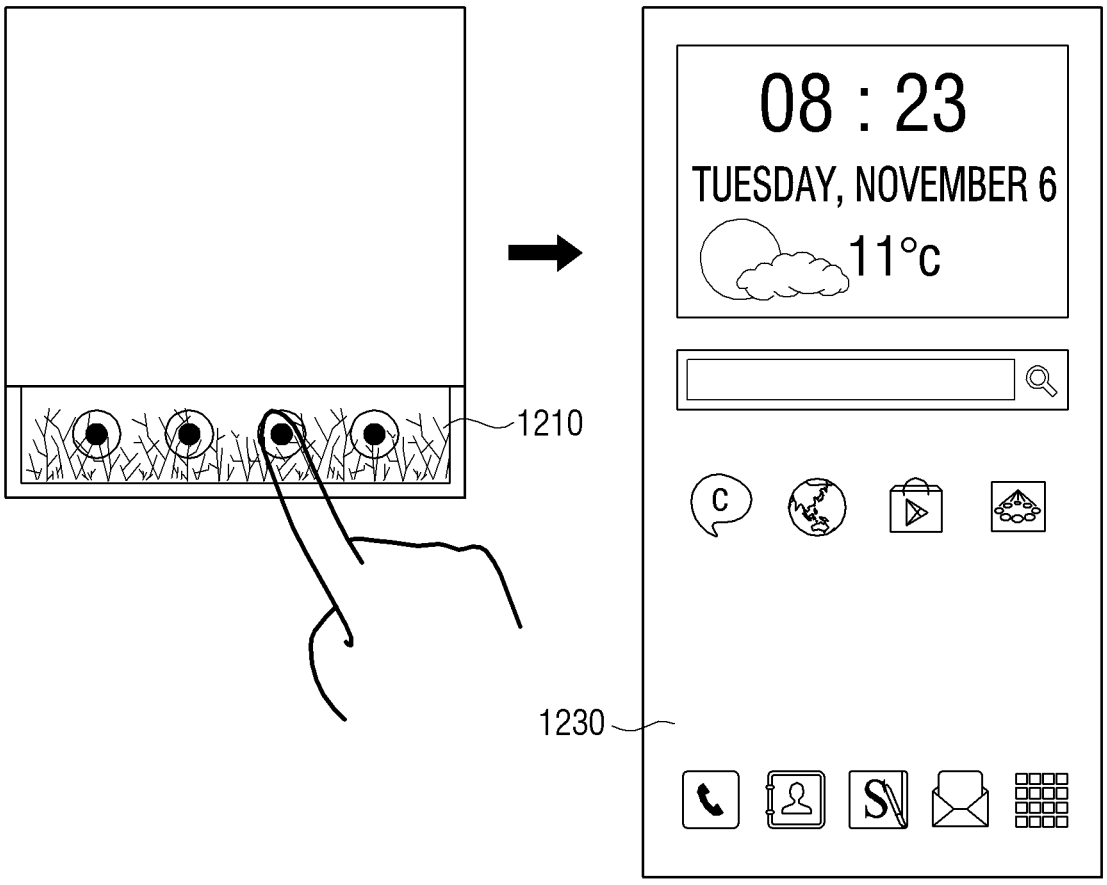


FIG. 12C

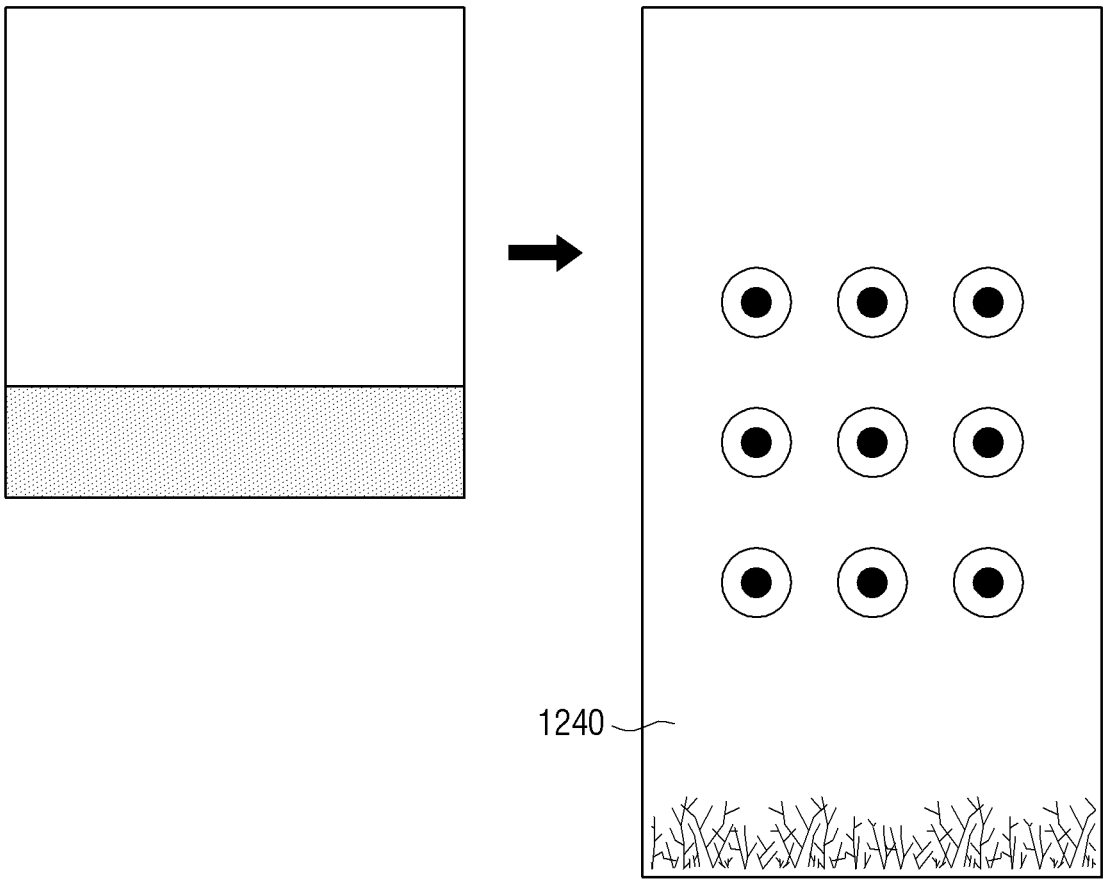


FIG. 13A

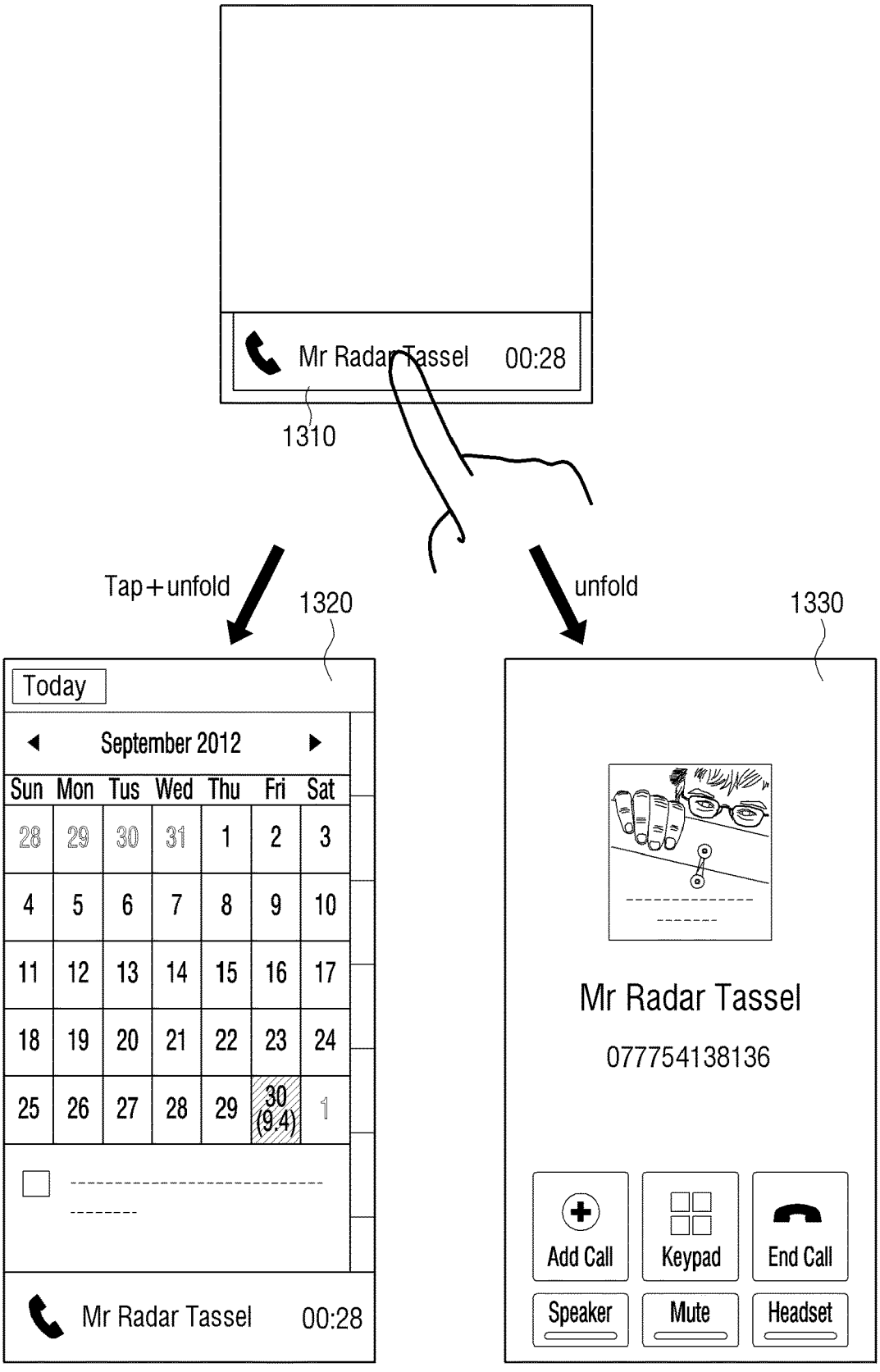

Mr Radar Tassel 00:28
1310
Tap+unfold
1320
unfold
1330
Today
September 2012
Sun Mon Tus Wed Thu Fri Sat
28 29 30 31 1 2 3
4 5 6 7 8 9 10
11 12 13 14 15 16 17
18 19 20 21 22 23 24
25 26 27 28 29 30 (9.4) 1
Mr Radar Tassel 00:28
Mr Radar Tassel
077754138136
Add Call
Keypad
End Call
Speaker
Mute
Headset

FIG. 13B

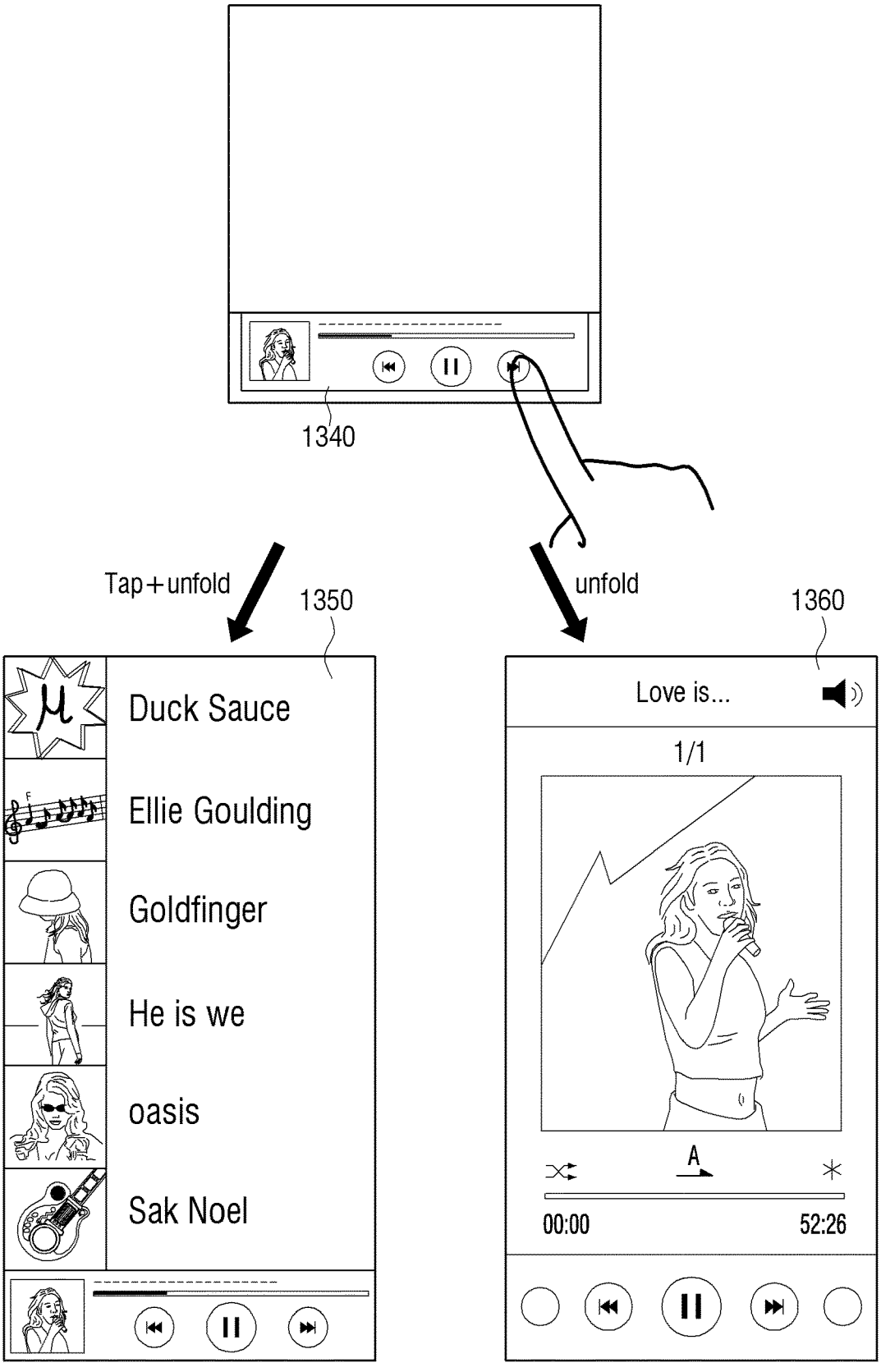

1340
Tap+unfold
1350
unfold
1360
Duck Sauce
Ellie Goulding
Goldfinger
He is we
oasis
Sak Noel
Love is...
1/1
A
00:00
52:26

FIG. 14A

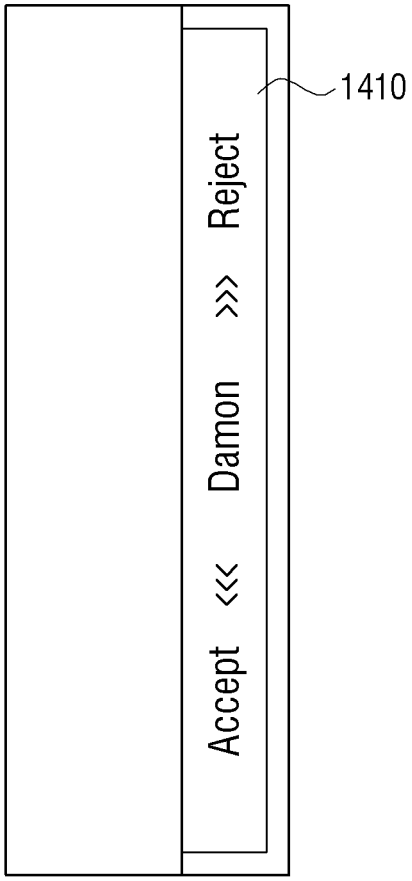


FIG. 14B

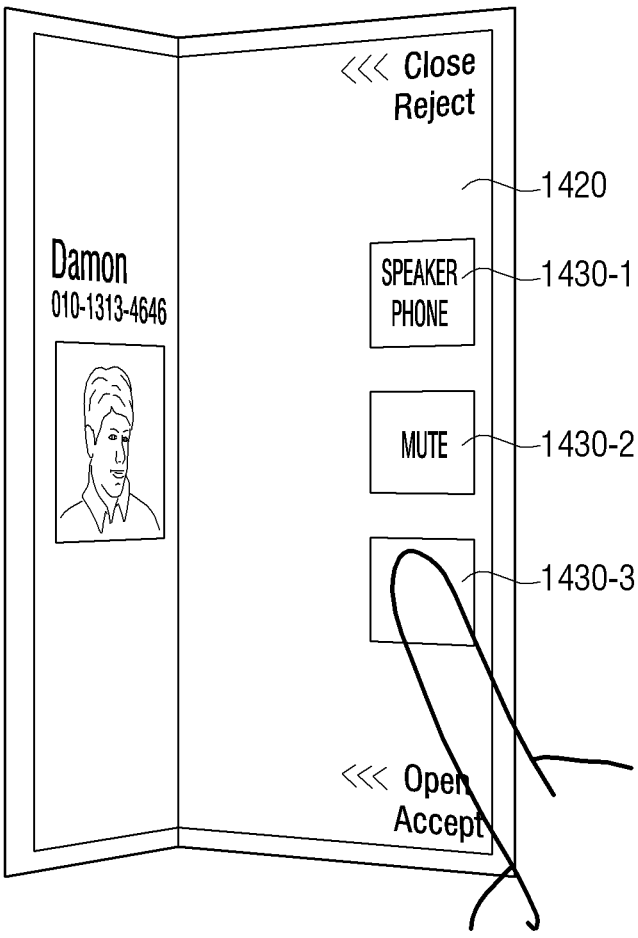

<<< Close
Reject
1420
Damon
010-1313-4646
SPEAKER PHONE
1430-1
MUTE
1430-2
1430-3
<<< Open
Accept

FIG. 14C

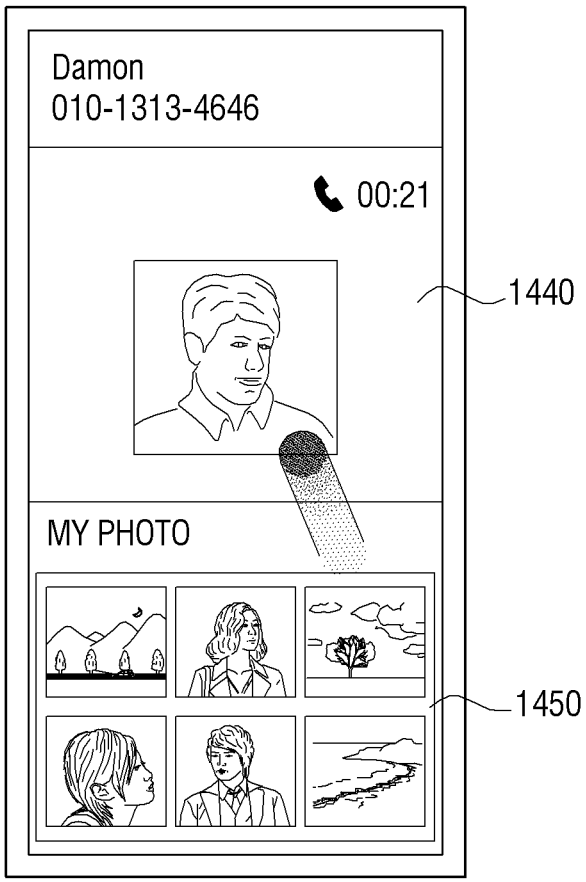


FIG. 15A

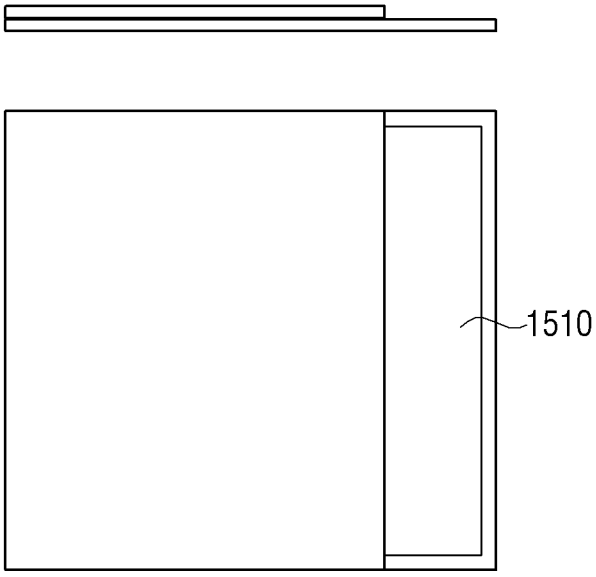


FIG. 15B

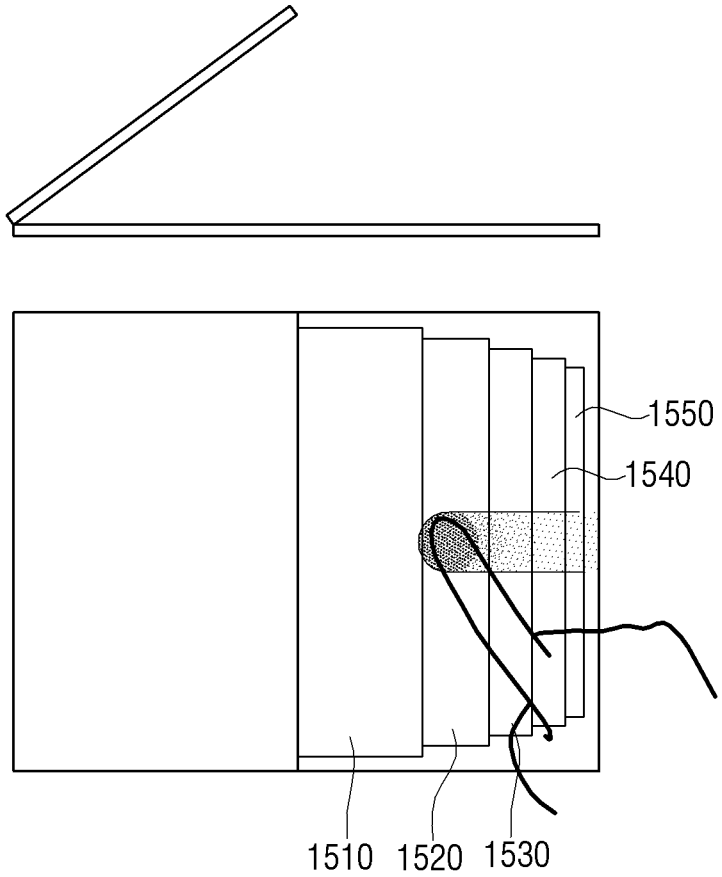


FIG. 15C

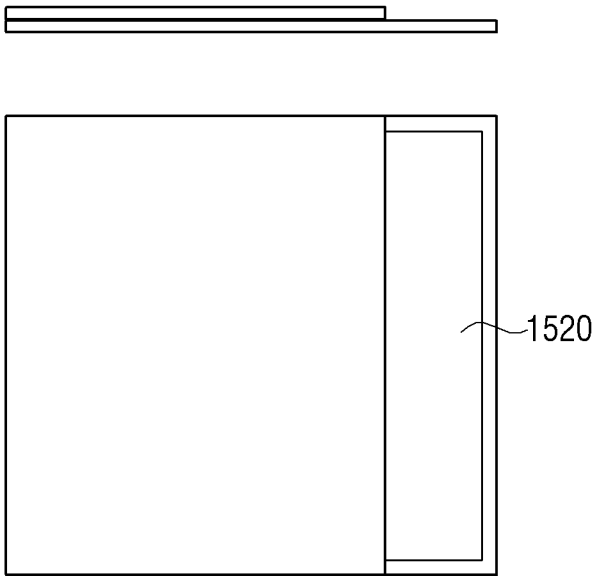


FIG. 15D

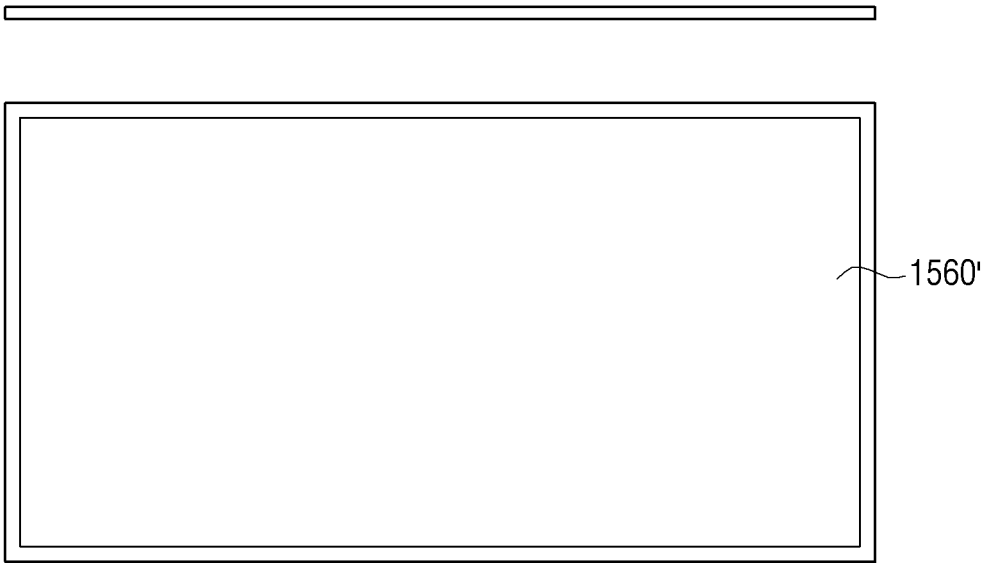


FIG. 16A

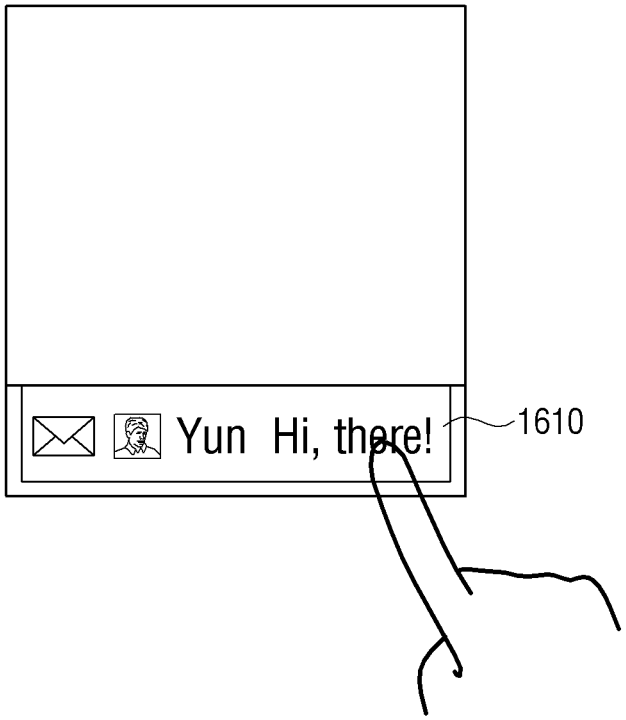


FIG. 16B

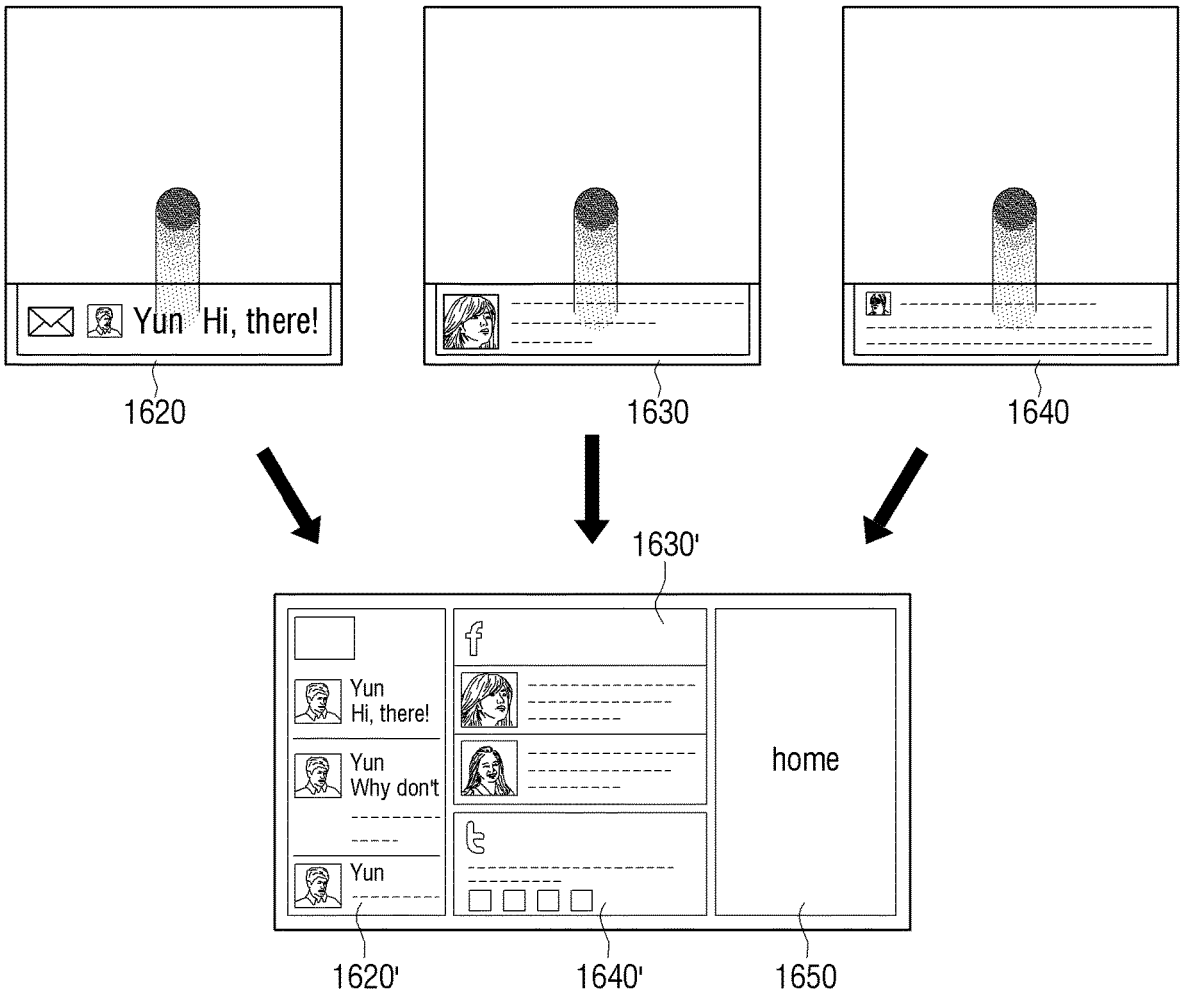

Yun Hi, there!
1620
1630
1640
1630'
Yun
Hi, there!
Yun
Why don't
Yun
home
1620'
1640'
1650

FIG. 17A

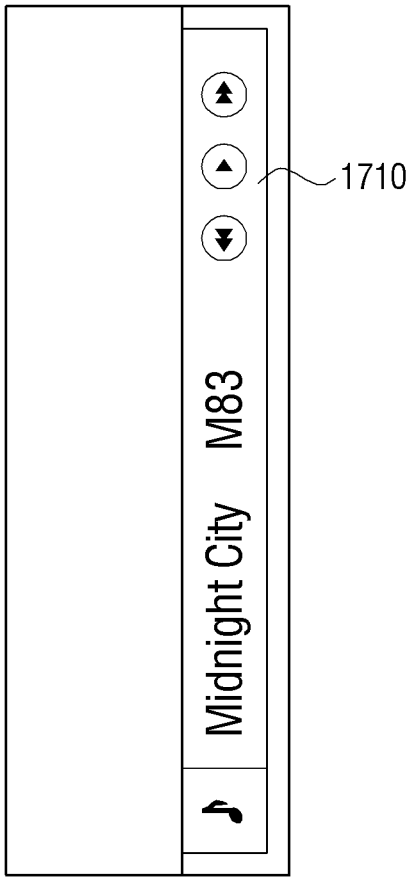


FIG. 17B

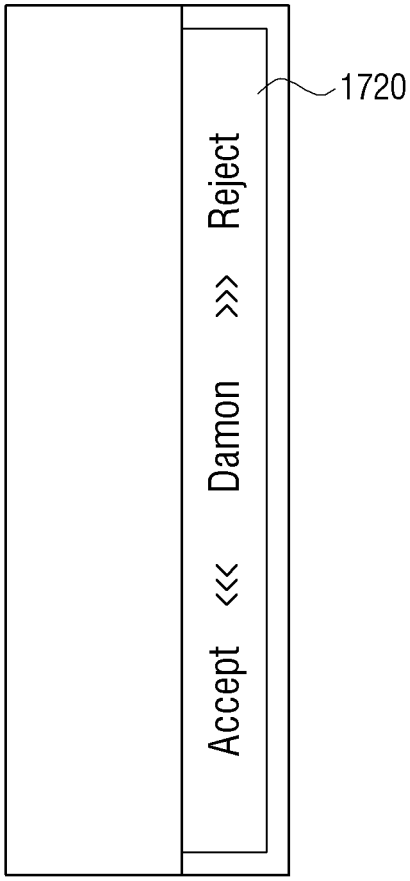


FIG. 17C

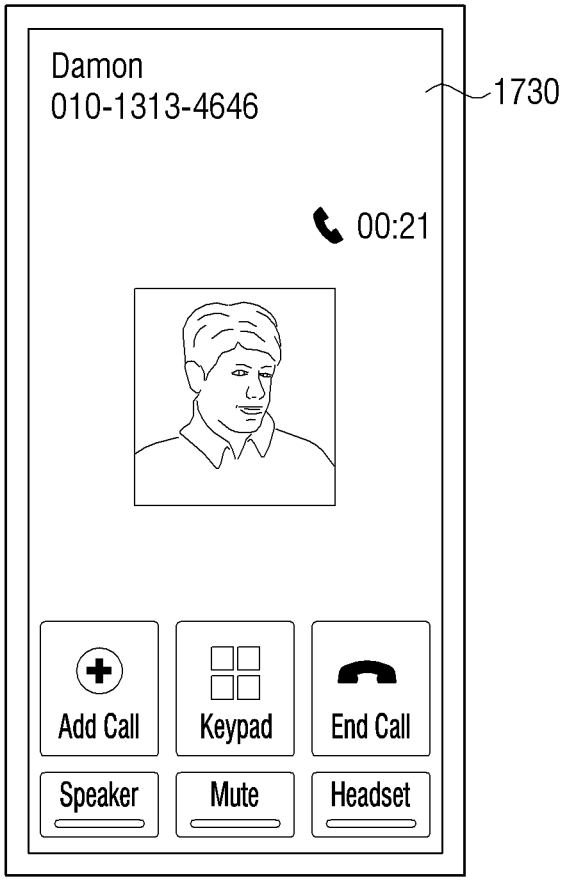

Damon
010-1313-4646
1730
00:21
Add Call
Keypad
End Call
Speaker
Mute
Headset

FIG. 17D

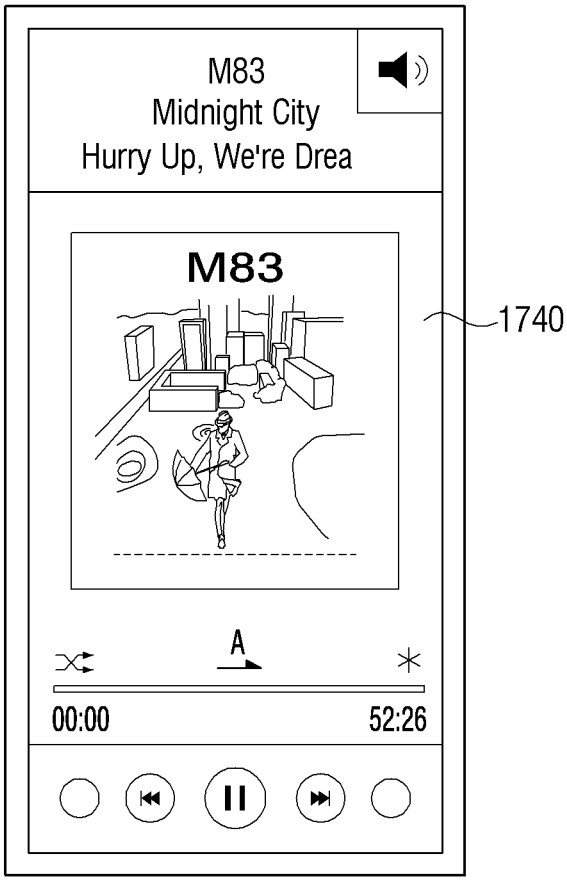


FIG. 17E

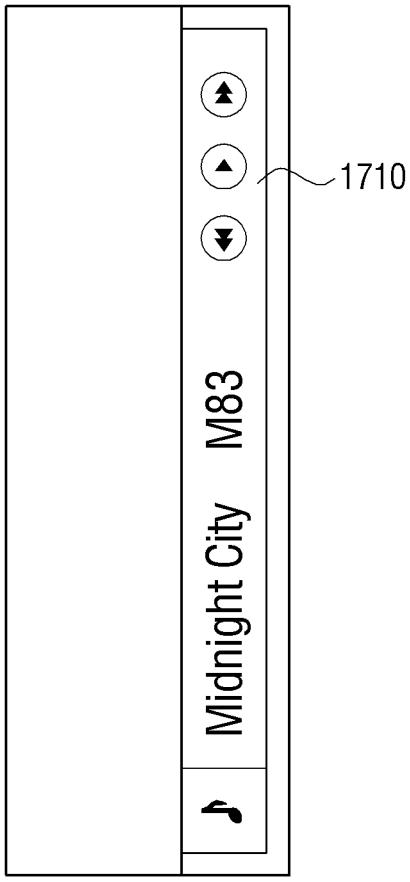


FIG. 18A

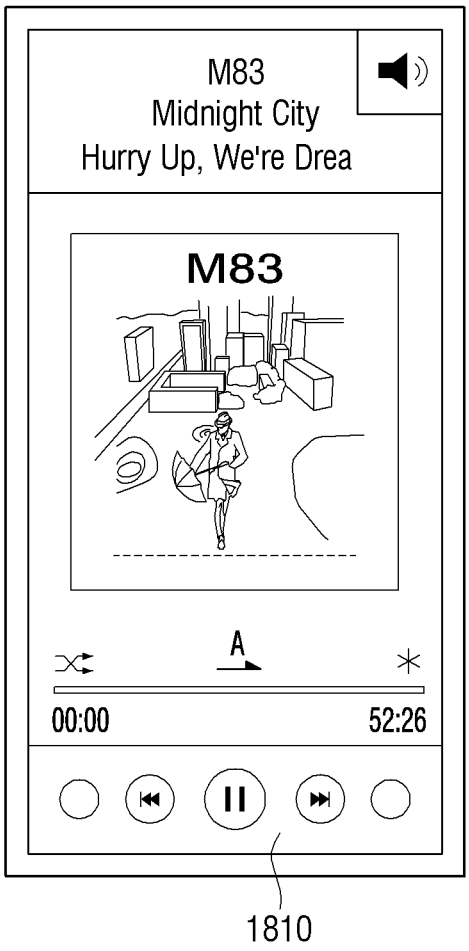


FIG. 18B

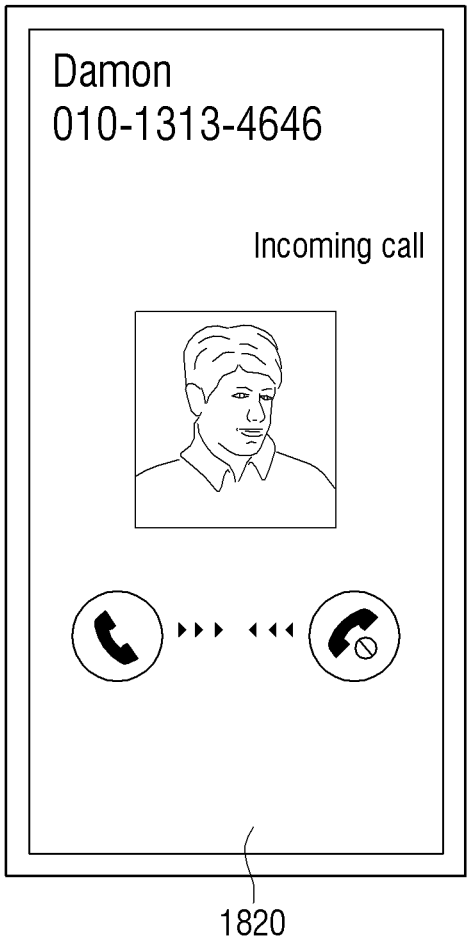


FIG. 18C

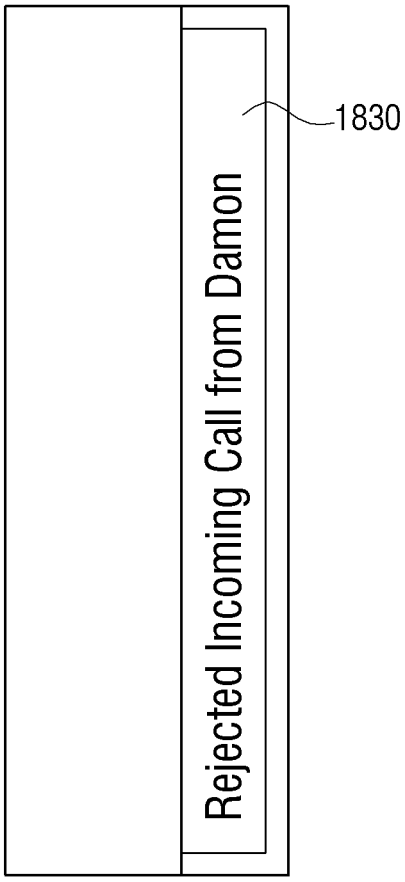


FIG. 18D

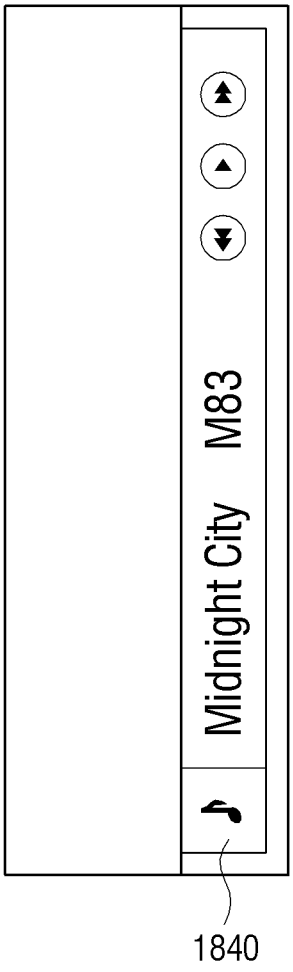


FIG. 18E

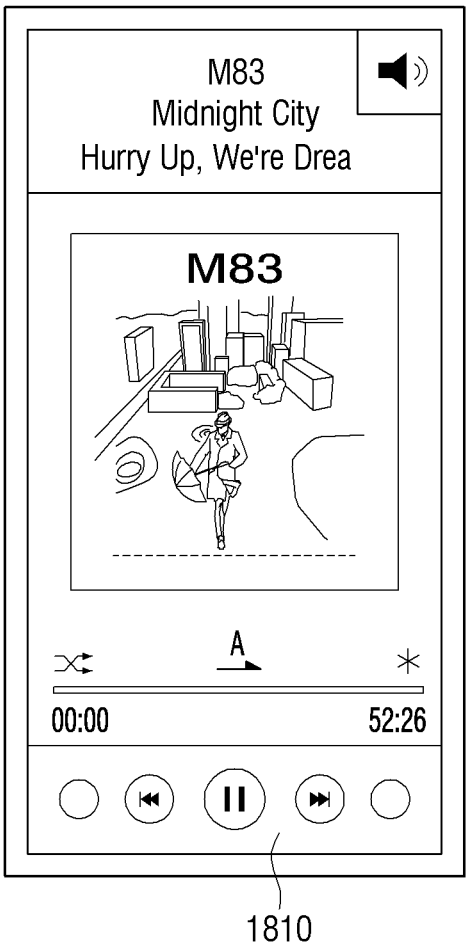


FIG. 19A

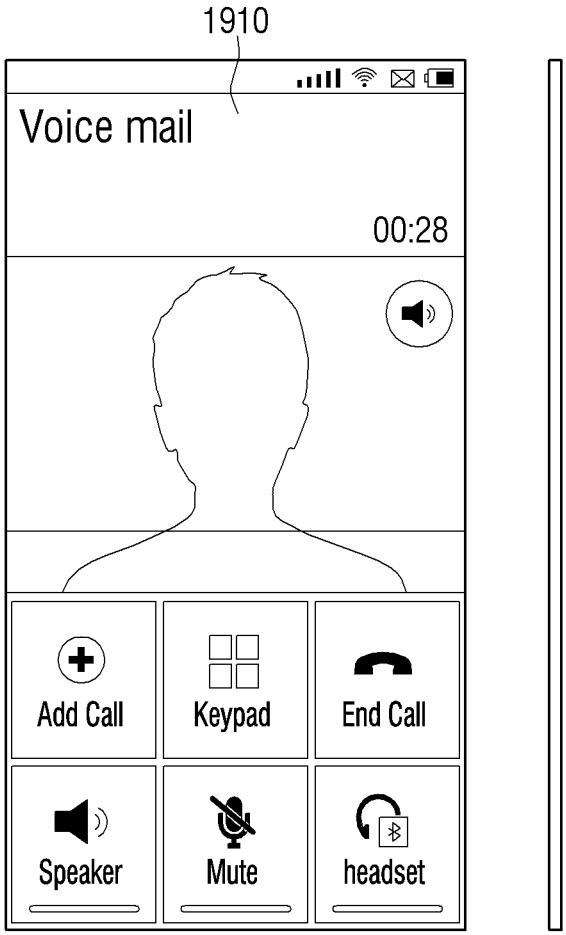

1910
Voice mail
00:28
Add Call
Keypad
End Call
Speaker
Mute
headset

FIG. 19B

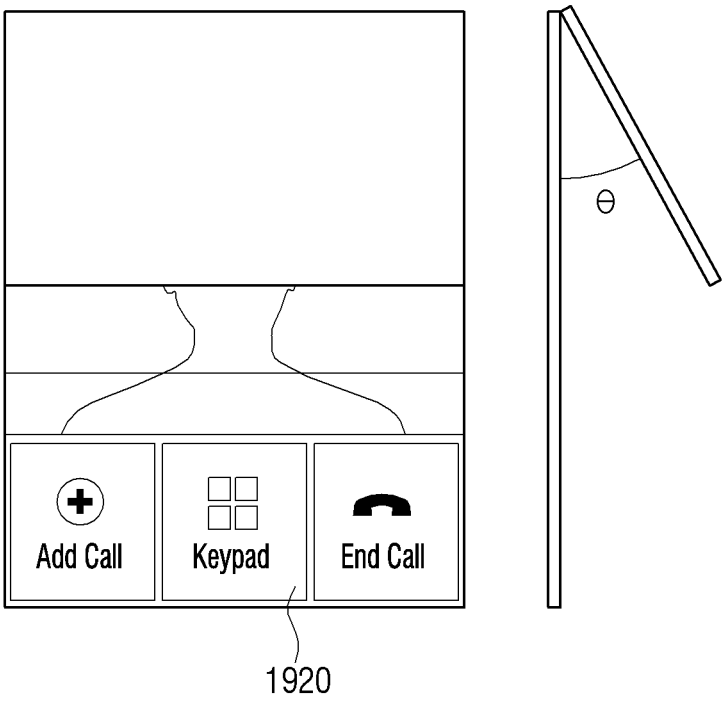


FIG. 19C

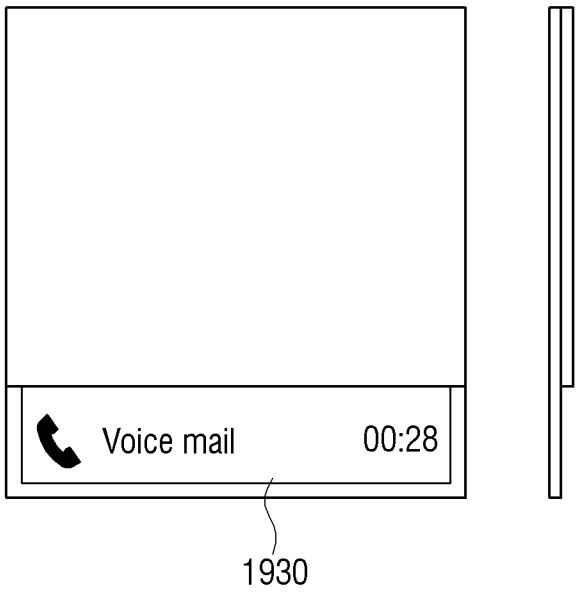


FIG. 20A

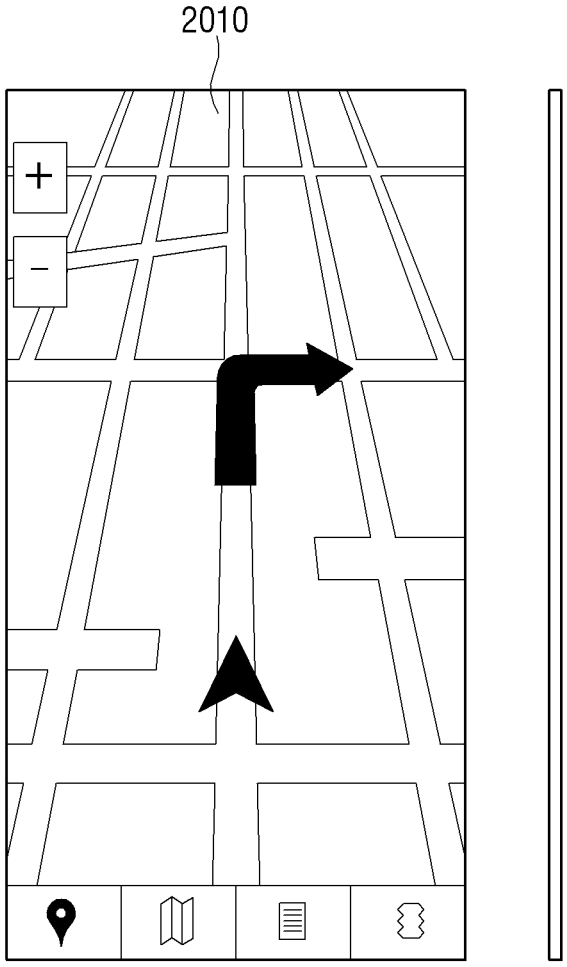


FIG. 20B

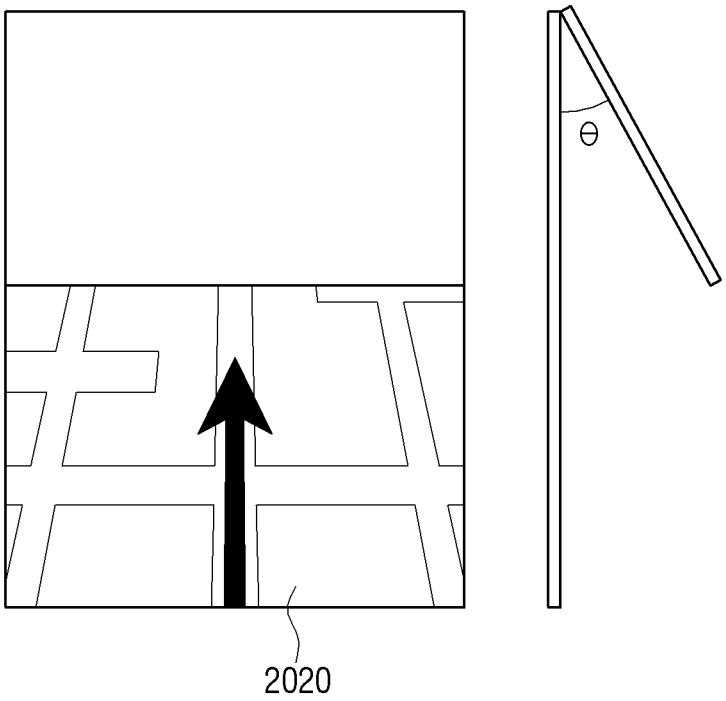


FIG. 20C

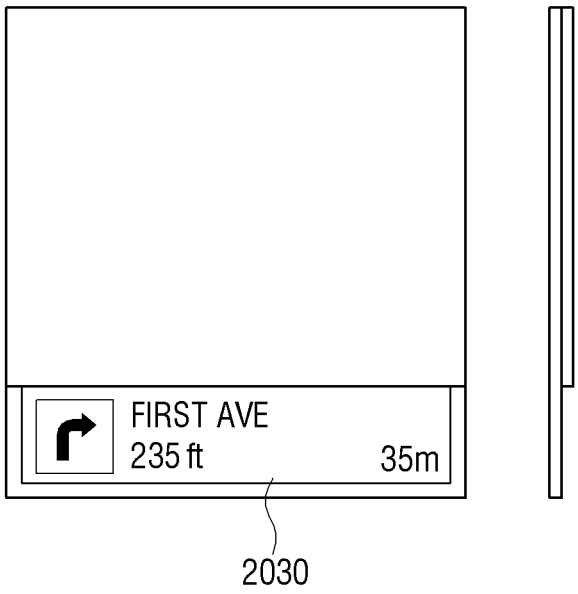


FIG. 21A

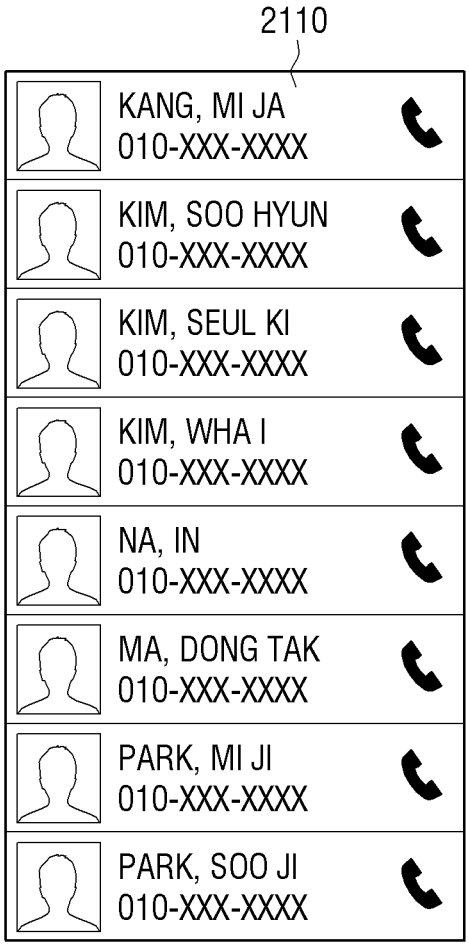

2110
KANG, MI JA
010-XXX-XXXX
KIM, SOO HYUN
010-XXX-XXXX
KIM, SEUL KI
010-XXX-XXXX
KIM, WHA I
010-XXX-XXXX
NA, IN
010-XXX-XXXX
MA, DONG TAK
010-XXX-XXXX
PARK, MI JI
010-XXX-XXXX
PARK, SOO JI
010-XXX-XXXX

FIG. 21B

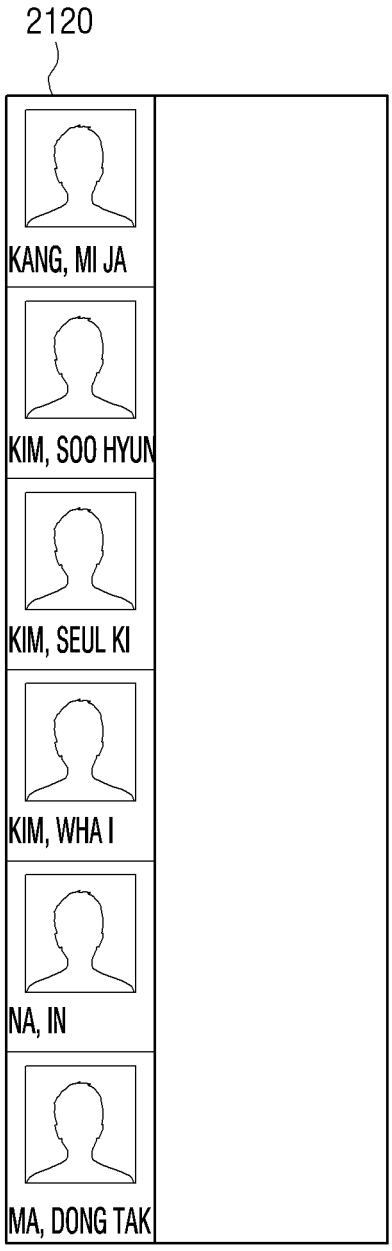

2120
KANG, MI JA
KIM, SOO HYUN
KIM, SEUL KI
KIM, WHA I
NA, IN
MA, DONG TAK

FIG. 22A

FIG. 22B

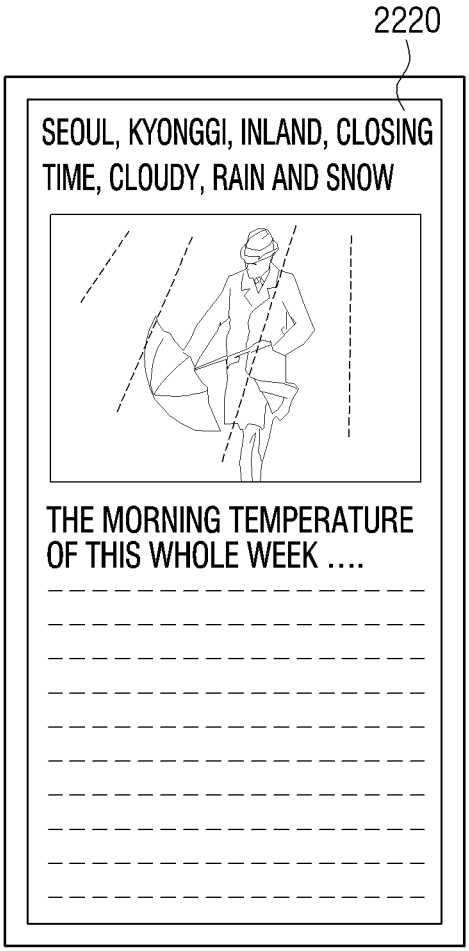

2220
SEOUL, KYONGGI, INLAND, CLOSING TIME, CLOUDY, RAIN AND SNOW
THE MORNING TEMPERATURE OF THIS WHOLE WEEK ....

FIG. 23A

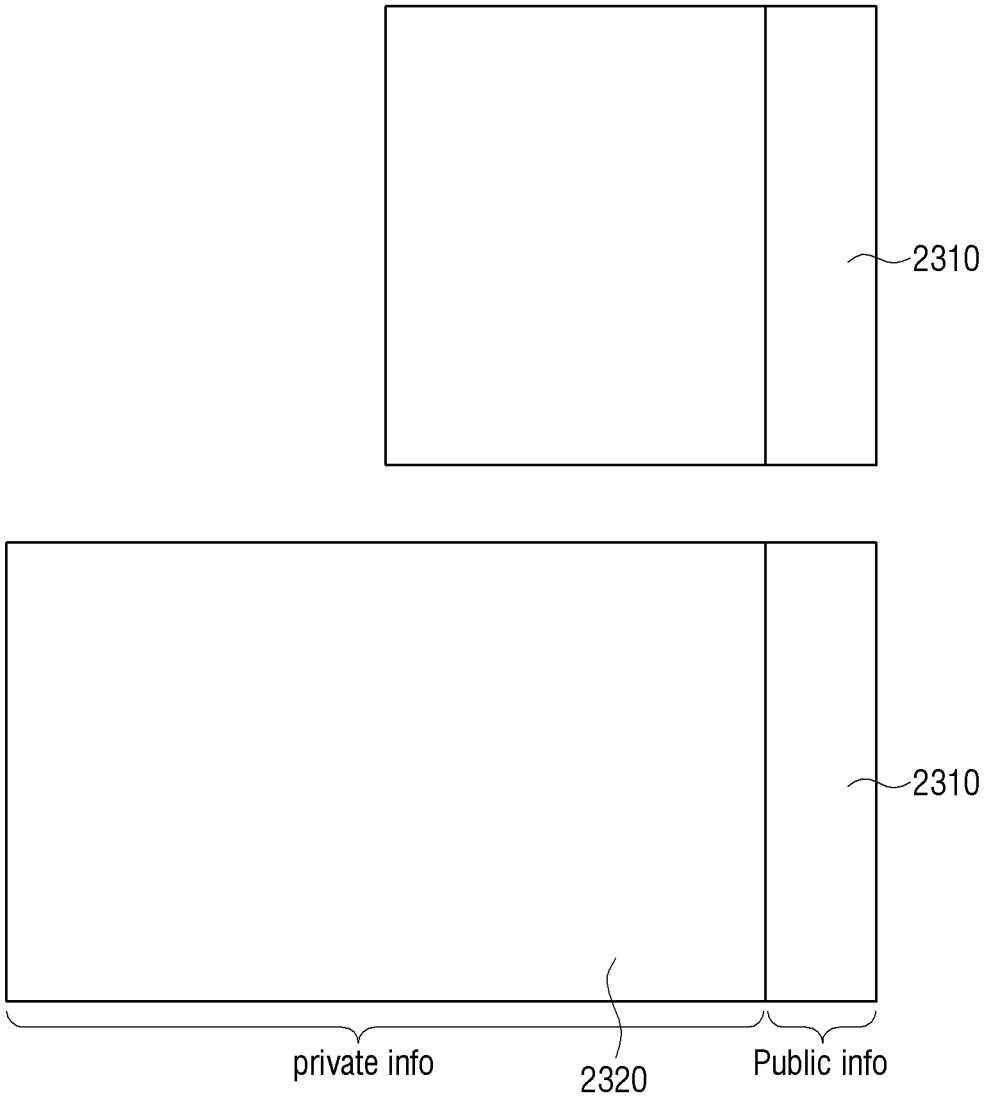


FIG. 23B

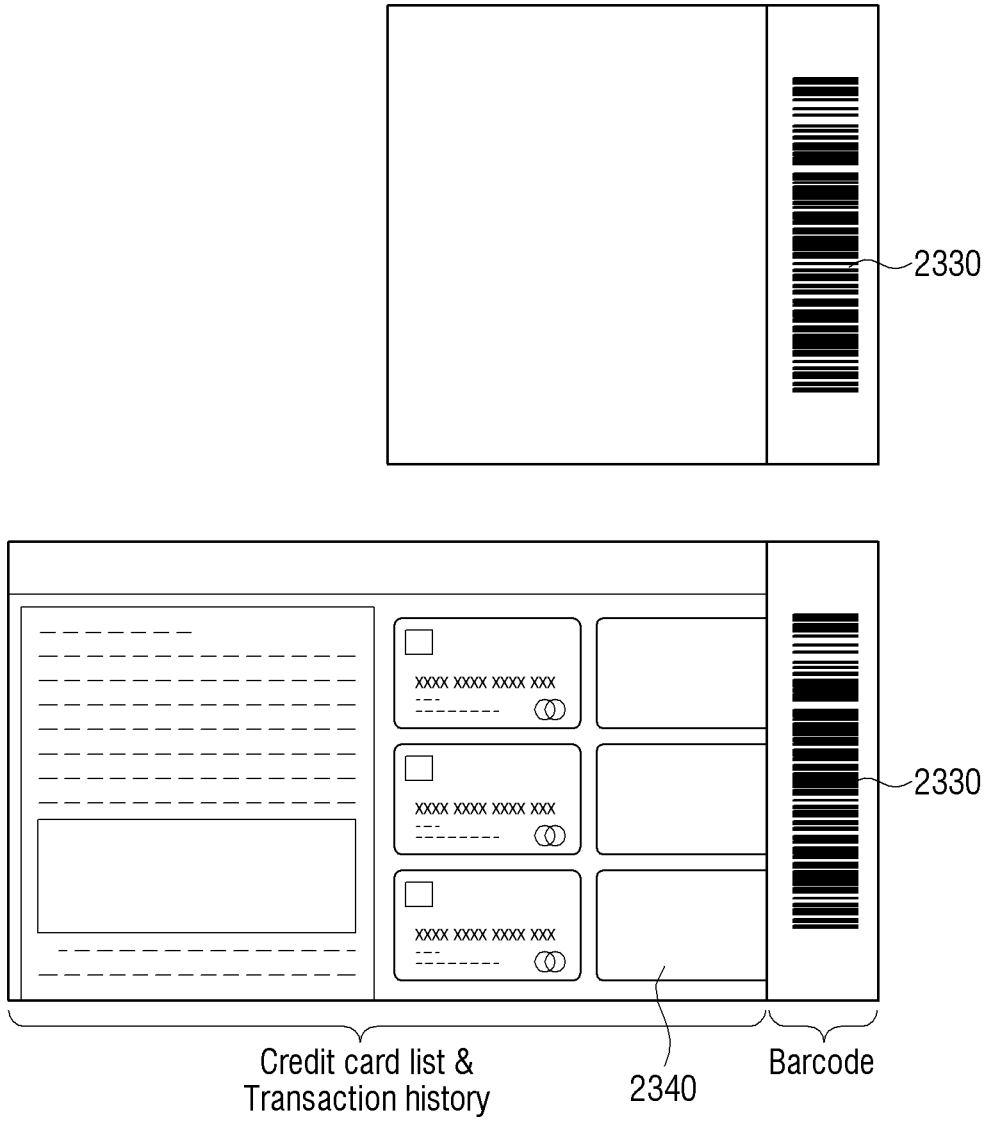

2330
xxxx xxxx xxxx xxx
xxxx xxxx xxxx xxx
xxxx xxxx xxxx xxx
2330
Credit card list &
Transaction history
2340
Barcode

FIG. 24

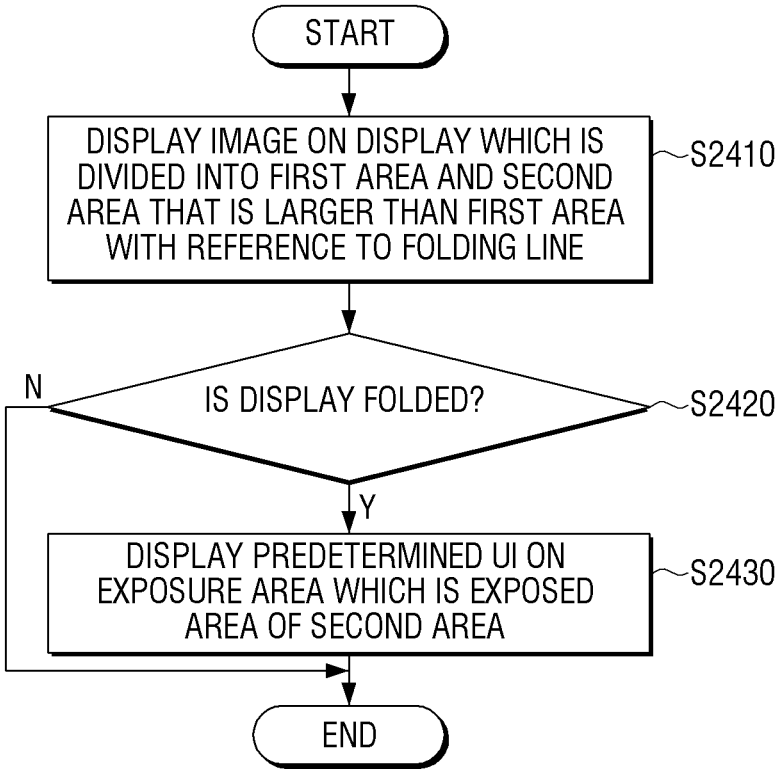

START
DISPLAY IMAGE ON DISPLAY WHICH IS DIVIDED INTO FIRST AREA AND SECOND AREA THAT IS LARGER THAN FIRST AREA WITH REFERENCE TO FOLDING LINE
S2410
IS DISPLAY FOLDED?
S2420
N
Y
DISPLAY PREDETERMINED UI ON EXPOSURE AREA WHICH IS EXPOSED AREA OF SECOND AREA
S2430
END

FIG. 25A

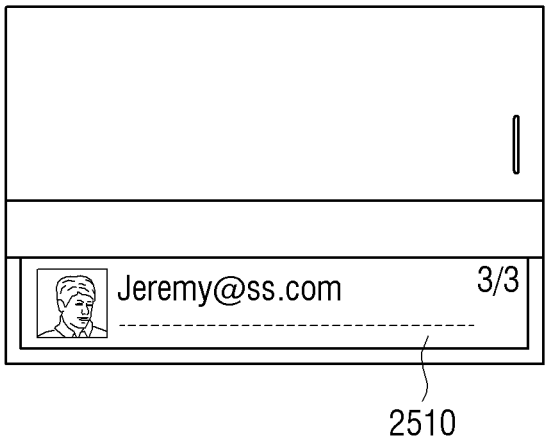


FIG. 25B

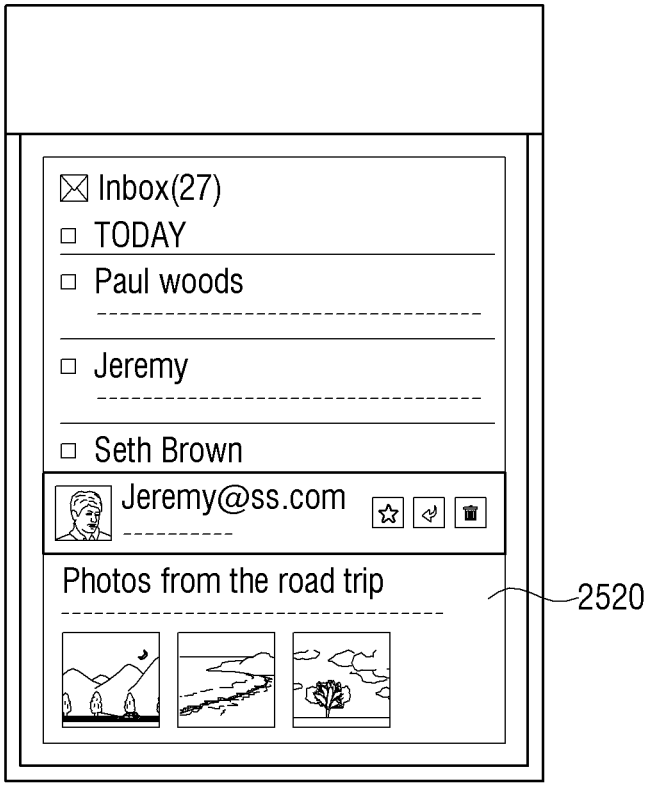

Inbox(27)
TODAY
Paul woods
Jeremy
Seth Brown
Jeremy@ss.com
Photos from the road trip
2520

FIG. 26A

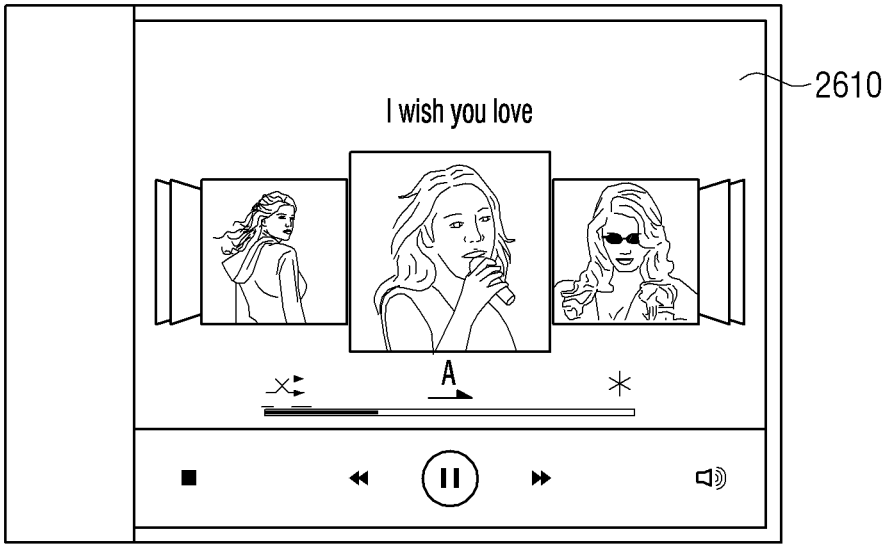


FIG. 26B

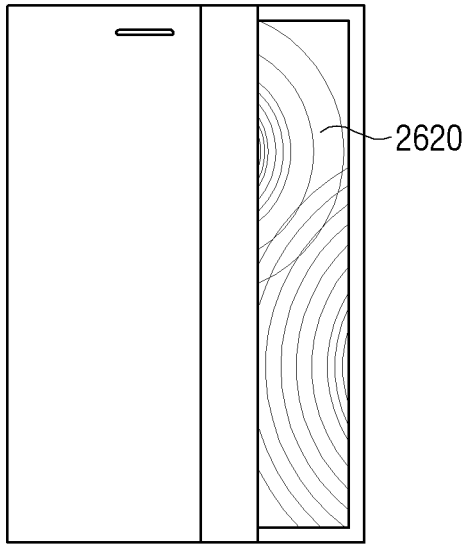


FIG. 27A

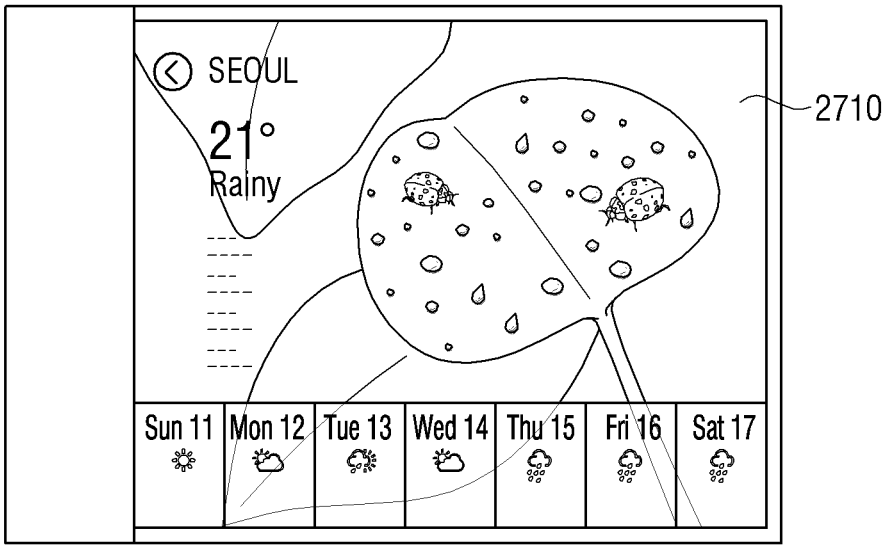

SEOUL
21°
Rainy
2710
Sun 11
Mon 12
Tue 13
Wed 14
Thu 15
Fri 16
Sat 17

FIG. 27B

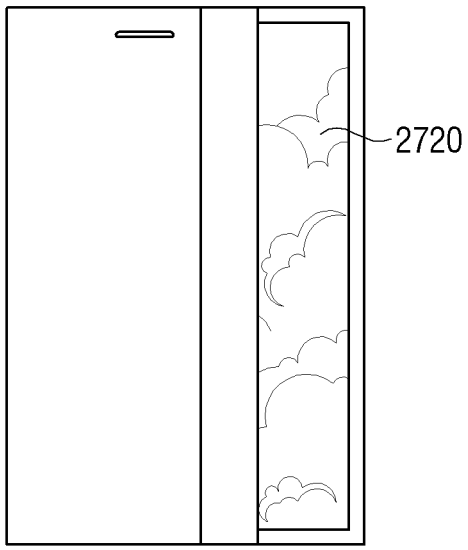


FIG. 28A

FIG. 28B

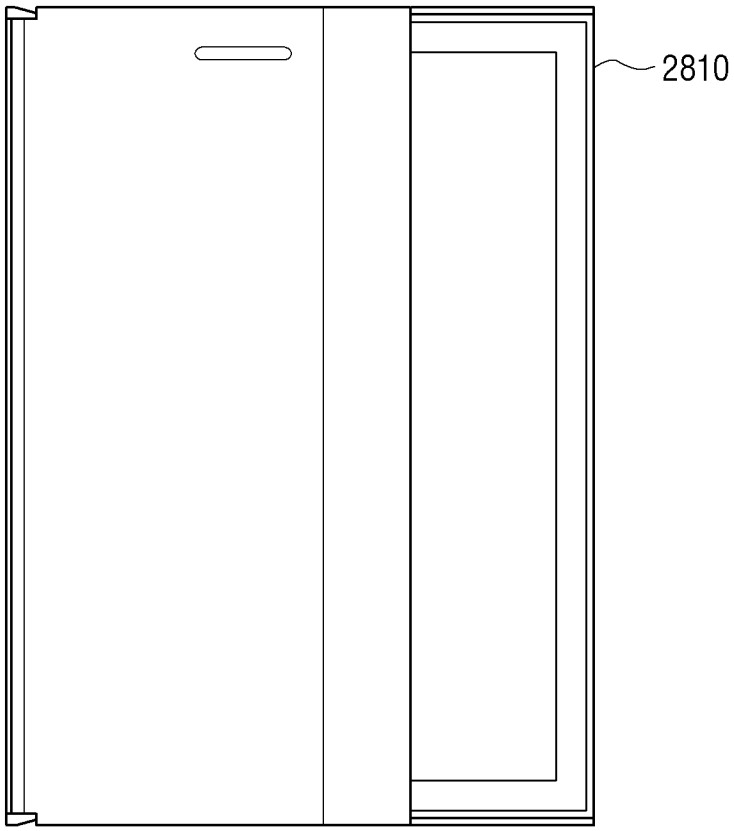


FIG. 28C

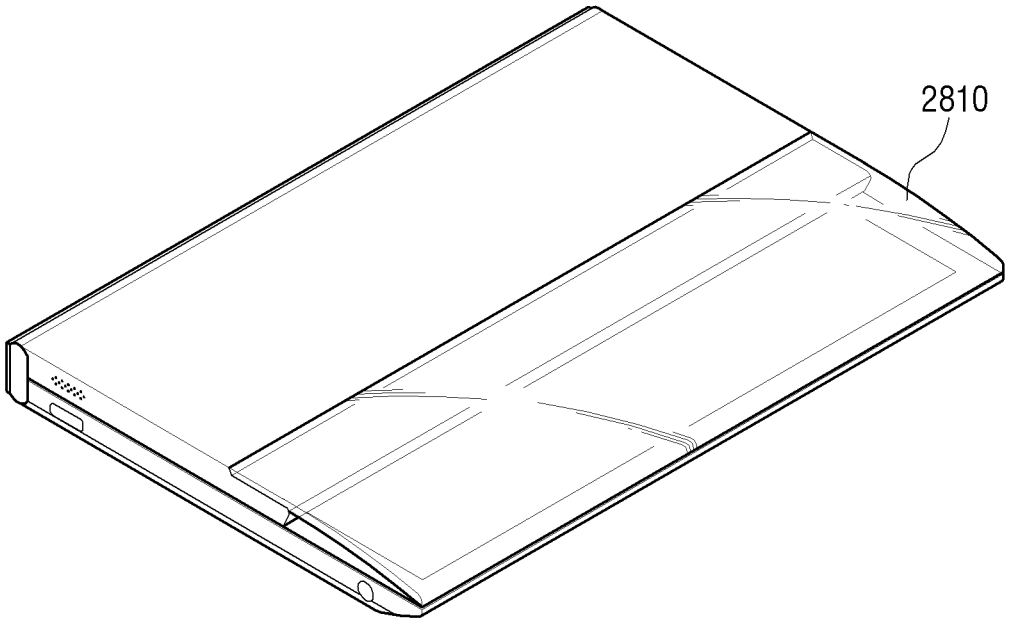


FIG. 28D

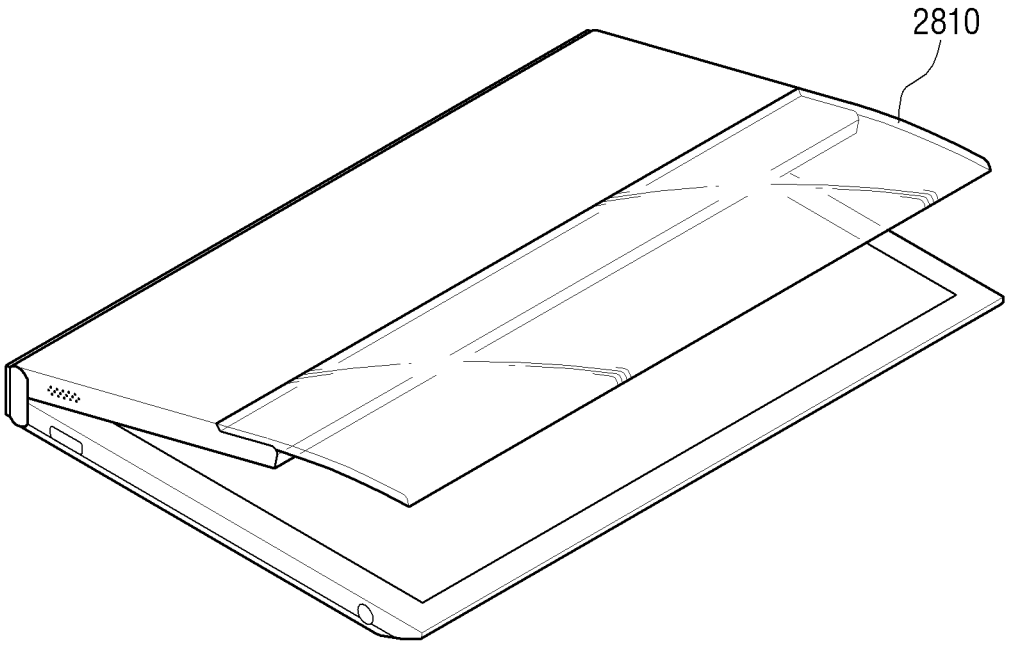


FIG. 29A

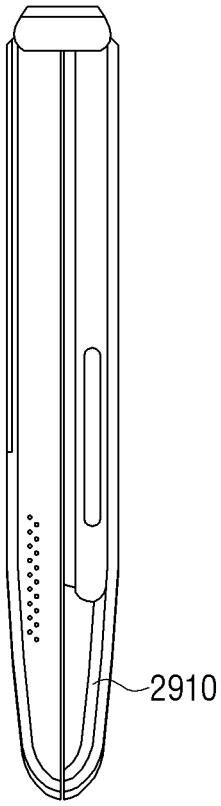


FIG. 29B

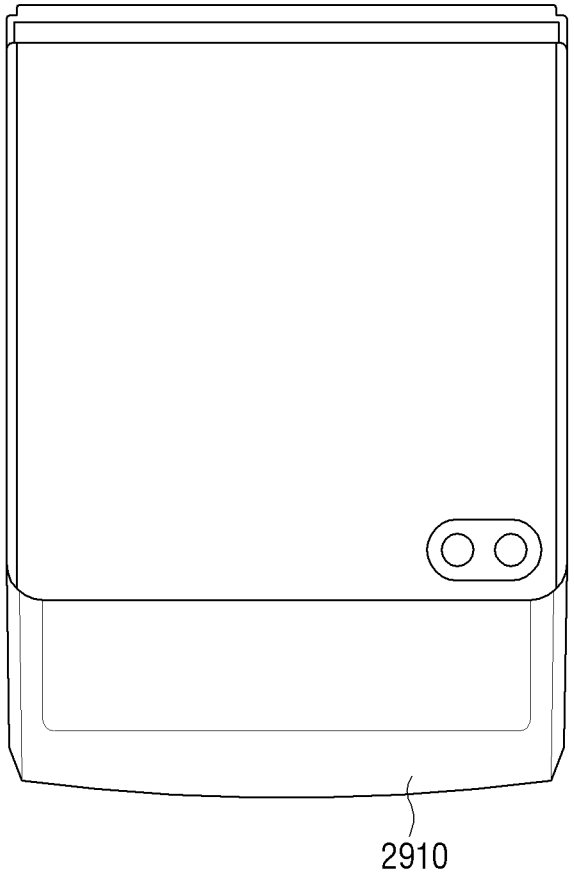


FIG. 29C

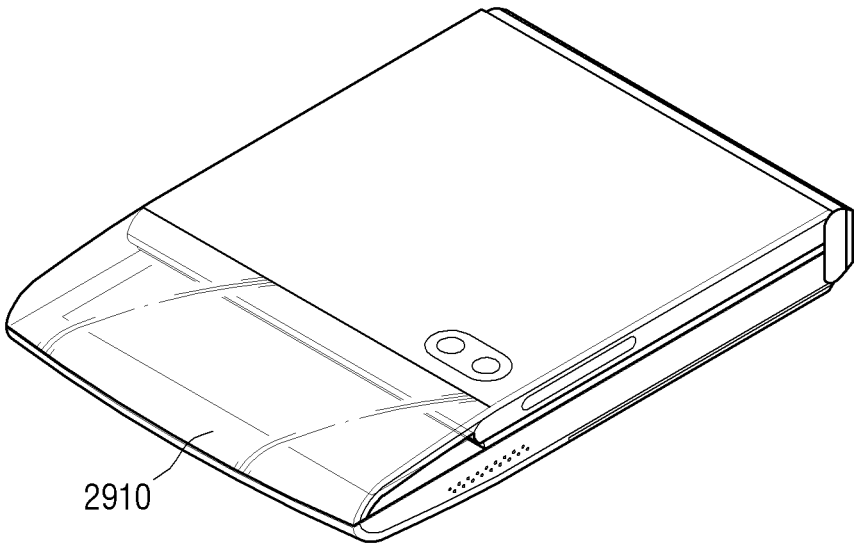


FIG. 30A

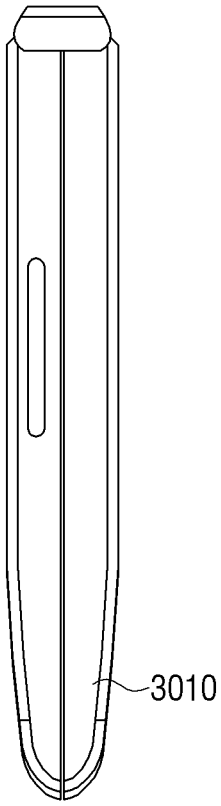


FIG. 30B

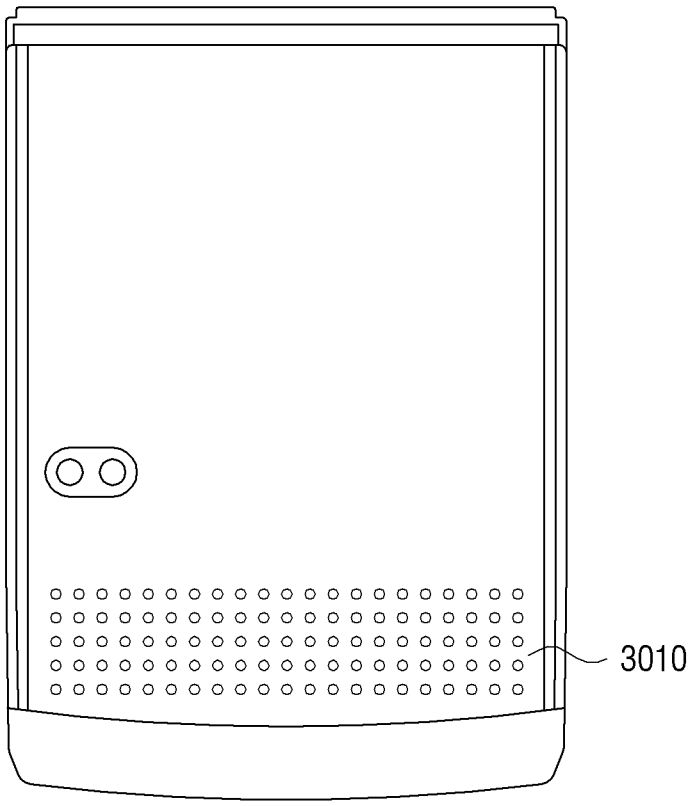


FIG. 30C

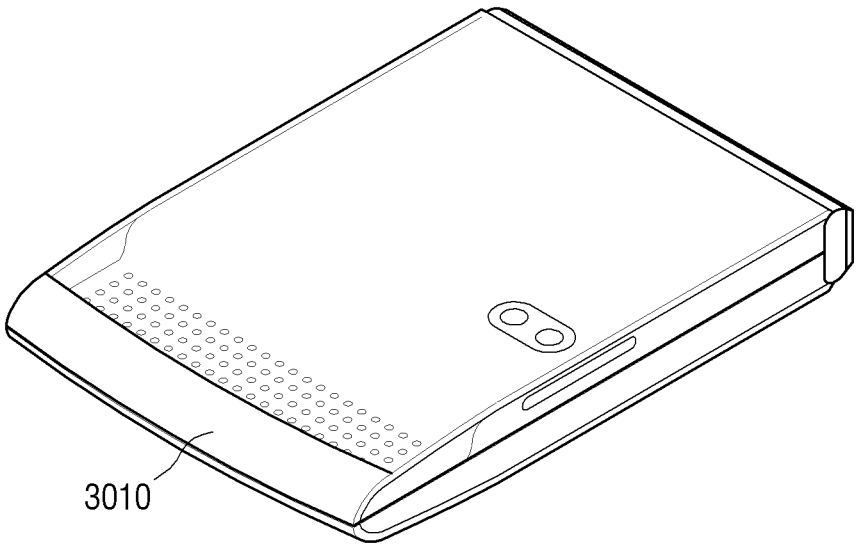


FIG. 31A

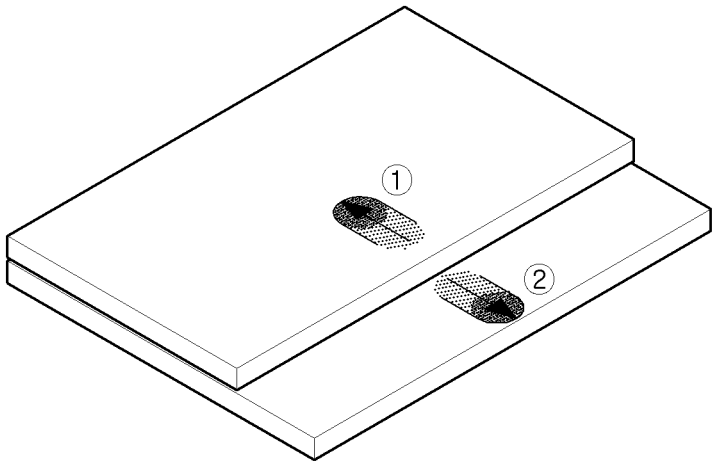
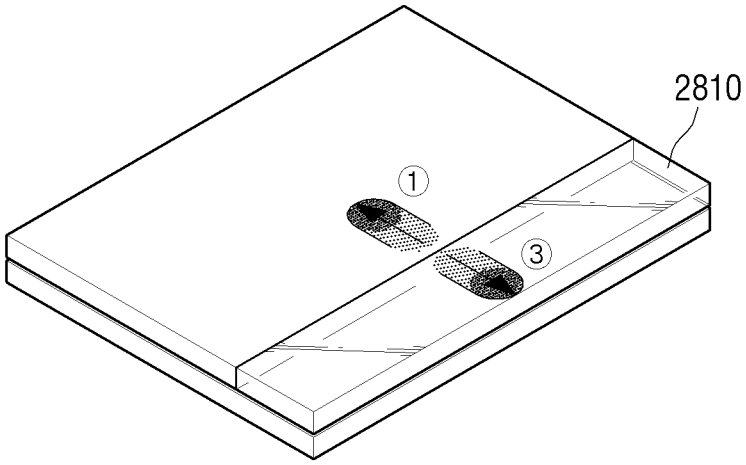


FIG. 31B



USER TERMINAL DEVICE AND DISPLAYING METHOD THEREOF

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application is a continuation of U.S. patent application Ser. No. 14/618,223, filed on Feb. 10, 2015, which claims priority from Korean Patent Application No. 10-2014-0134886, filed in the Korean Intellectual Property Office on Oct. 7, 2014, and claims the benefit of U.S. Provisional Application No. 61/937,744, filed in the United States Patent and Trademark Office on Feb. 10, 2014, the disclosures of which are incorporated herein by reference in their entireties.

BACKGROUND

1. Field

[0002] Apparatuses and methods consistent with exemplary embodiments relate to a user terminal device and a displaying method thereof, and more particularly, to a user terminal device where a display is folded asymmetrically with reference to a folding line so as to expose a part of the display and a displaying method thereof.

2. Description of Related Art

[0003] With the development of electronic technology, various types of user terminal devices have been developed and distributed. Recently, the size of such user terminal devices has been minimized while the functions of the devices have become diverse and thus, the demands for user terminal devices have been increasing continuously.

[0004] A user terminal device may provide various contents such as multimedia contents and application screens according to a user's request. A user may select a desired function using a button or a touch screen provided with a user terminal device. A user terminal device may execute a program selectively according to a user interaction and display the result of execution.

[0005] Meanwhile, as a user terminal device provides more diverse functions, there are various needs for a method of displaying contents or a user interface method. In other words, as the method of displaying contents has changed and the type and function of contents have been increasing, the existing interaction methods such as simply selecting a button or touching a screen may not be sufficient to perform various functions of a user terminal device.

[0006] Particularly, a user terminal device of which display can be folded with reference to a folding line has been developed in order to minimize the size of the user terminal device. When the display is folded symmetrically with reference to the folding line, however, the display is folded completely and a user may not use or watch the display.

SUMMARY

[0007] Aspects of one or more exemplary embodiments relate to a user terminal device that, when a display is folded asymmetrically with reference to a folding line, exposing a part of the display, provides various User Interface (UI) through the exposed area, and a display method thereof.

[0008] According to an aspect of an exemplary embodiment, there is provided a user terminal device which includes a display configured to be divided into a first area and a second area which is larger than the first area with reference to a folding line, a detector configured to detect a user interaction, and a controller configured to, in response to detecting a folding of the display along the folding line, control the display to display a predetermined UI on an exposure area which is an exposed part of the second area.

[0009] The controller, in response to detecting a folding of the display along the folding line while the user terminal device executes a specific application, may be configured to control the display to display a UI for controlling the specific application on the exposure area.

[0010] The controller, in response to detecting a predetermined user interaction while the display is folded, may be configured to control the display to display a UI for releasing a lock state of the user terminal device on the exposure area.

[0011] The controller, in response to detecting a predetermined user interaction while the display is folded, may be configured to control the display to display a UI for changing a setting of the user terminal device on the exposure area.

[0012] The device may further include a communicator configured to send and receive messages, and the controller, in response to receiving a message while the display is folded, may be configured to control the display to display a UI for informing that the message is received on the exposure area.

[0013] The controller, in response to detecting an unfolding of the display up to a predetermined angle while the UI for informing that a message is received on the exposure area, may be configured to control the display to display a message window for responding to the message.

[0014] The controller, in response to one or more icons being displayed on the exposure area while the display is folded, and detecting an unfolding of the display while one of the icons is touched, may be configured to control the display to display a screen corresponding to the touched icon.

[0015] The controller, in response to the touched icon being a photo icon, may be configured to control the display to display a call screen on an upper area and a list for selecting a photo to be shared.

[0016] The controller, in response to receiving a message while a specific application is executed as the display is in a folded state, may be configured to control the display to display a UI for informing that the message is received on the exposure area, in response to detecting an unfolding of the display while the UI for informing that the message is received is touched, may be configured to control the display to display a message window for responding to the message, and in response to detecting an unfolding of the display while a UI for informing that the message is received is not touched, may be configured to control the display to display an execution screen of the specific application.

[0017] The controller, in response to a UI for releasing a lock state of the user terminal device being displayed on the exposure area as the display is in a folded state, and detecting an unfolding of the display after a lock release command is input through the UI for releasing the lock state of the user terminal device, may be configured to control the display to display a home screen, and in response to detecting an unfolding of the display while the lock release command is not input through a UI for releasing the lock state of the user terminal device, may be configured to control the display to display a UI for releasing the lock state of the user terminal device on full screen.

[0018] The controller, in response to a telephone call request being received while the display is folded, may be configured to control the display to display a UI for informing that a telephone call request is received on the exposure area, in response to the display being unfolded to a first angle range, may be configured to control the display to display at least one icon for controlling a function of the telephone call, and in response to the display being unfolded to a second angle range that is more than the first angle range, may be configured to accept the telephone call request and control the display to display a telephone call screen.

[0019] The controller, in response to a telephone call request being received while a specific application is executed as the display is in a folded state, may be configured to control the display to display a UI for informing that the telephone call request is received on the exposure area, in response to detecting an unfolding of the display, may be configured to accept the telephone call request and control the display to display a telephone call screen, and in response to terminating the telephone call, may be configured to control the display to display an execution screen of the specific application.

[0020] The controller, in response to detecting a folding of the display to a first angle while an execution screen of a specific application is displayed on the display, may be configured to control the display to display at least part of an execution screen of the specific application on at least part of the second area, and in response to detecting a folding of the display such that the first area of the display comes in contact with a second area, may be configured to control the display to display a brief information providing screen of the specific application on the exposure area.

[0021] According to an aspect of another exemplary embodiment, there is provided a displaying method of a user terminal device which includes displaying an image on a display which is divided into a first area and a second area that is larger than the first area with reference to a folding line and, in response to a detecting a folding of the display with reference to the folding line, displaying a predetermined UI on an exposure area which is an exposed part of the second area.

[0022] The displaying may include, in response to detecting a folding of the display with reference to a folding line while the user terminal device executes a specific application, displaying a UI for controlling the specific application on the exposure area.

[0023] The method may include, in response to detecting a predetermined user interaction while the display is folded, displaying a UI for releasing a lock state of the user terminal device on the exposure area.

[0024] The method may include, in response to detecting a predetermined user interaction while the display is folded, displaying a UI for changing a setting of the user terminal device on the exposure area.

[0025] The method may include, in response to receiving a message while the display is folded, displaying a UI for informing that the message is received on the exposure area.

[0026] The method may include, in response to the UI for informing that the message is received being displayed on the exposure area while the display is folded, and detecting an unfolding of the display up to a predetermined angle while the UI for informing that the message is received on the exposure area, displaying a message window for responding to the message.

[0027] The displaying may include displaying one or more icons on the exposure area, and in response to the one or more icons being displayed on the exposure area while the display is folded, and detecting an unfolding of the display while one of the plurality of icons is touched, displaying a screen corresponding to the touched icon.

[0028] The method may include, in response to a message being received while a specific application is executed as the display is in a folding state, displaying a UI for informing that the message is received on the exposure area, in response to detecting an unfolding of the display while the UI for informing that the message is received is touched, displaying a message window for responding to the message, and in response to detecting an unfolding of the display while the UI for informing that the message is received is not touched, displaying an execution screen of the specific application.

[0029] The displaying may include displaying a UI for releasing a lock state of the user terminal device on the exposure area while the display is folded, and in response to a UI for releasing a lock state of the user terminal device being displayed on the exposure area while the display is folded, and detecting an unfolding of the display after a lock release command is input through the UI for releasing the lock state of the user terminal device, displaying a home screen, and in response to detecting an unfolding of the display while a lock release command is not input through the UI for releasing the lock state of the user terminal device, displaying a UI for releasing the lock state of the user terminal device on full screen.

[0030] The displaying may include, in response to a telephone call request being received while the display is folded, displaying a UI for informing that a telephone call request is received on the exposure area, in response to the display being unfolded to a first angle range, displaying at least one icon for controlling a function of the telephone call, and in response to the display being unfolded to a second angle range that is more than the first angle range, accepting the telephone call request and displaying a telephone call screen.

[0031] The method may include, in response to a telephone call request being received f while a specific application is executed as the display is in a folding state, displaying a UI for informing that the telephone call request is received on the exposure area, in response to detecting an unfolding of the display, accepting the telephone call request and displaying a telephone call screen, and in response to the telephone call being terminated, displaying an execution screen of the specific application.

[0032] The method may include, in response to detecting a folding of the display to a first angle while an execution screen of a specific application is displayed on the display, displaying part of an execution screen of the specific application on at least part of the second area, and in response to detecting a folding of the display such that the first area of the display comes in contact with the second area, displaying a brief information providing screen of the specific application on the exposure area.

[0033] According to another aspect of an exemplary embodiment, there is provided a foldable display device including a display comprising a first area and a second area that is greater than the first area, wherein the display is configured to fold along an axis dividing the first area and the second area; a detector comprising: a touch detector configured to detect a user input; and a folding detector

configured to detect a folding angle of the display; and a controller configured to control the display to display a user interface on an exposure area of the second area.

[0034] The controller may be configured to control the display to display a different number of guidance messages according to the folding angle of the display.

[0035] The controller, in response to the folding angle of the display being within a first angle range, may be configured to control the display to display two guidance messages; and in response to the hinge angle of the display being within a second angle range, which is greater than the first angle range, may be configured to control the display to display three guidance messages.

[0036] As described above, according to one or more exemplary embodiments, a user may perform various functions of a user terminal device through a UI displayed on the exposure area even when the display is folded, and may be provided with various pieces of information.

BRIEF DESCRIPTION OF THE DRAWINGS

[0037] The above and/or other aspects of exemplary embodiments will be more apparent with reference to the accompanying drawings, in which:

[0038] FIG. **1** is a block diagram illustrating configuration of a user terminal device according to an exemplary embodiment;

[0039] FIG. **2** is a block diagram illustrating a detailed configuration of a user terminal device according to an exemplary embodiment;

[0040] FIGS. **3**A to **3**E are views illustrating a user terminal device with a rectangular display panel according to an exemplary embodiment;

[0041] FIG. **4** is a view illustrating a configuration of software stored in a storage according to an exemplary embodiment;

[0042] FIGS. **5**A to **7**B are views illustrating a UI displayed on an exposure area according to various exemplary embodiments;

[0043] FIGS. **8**A to **16**B are views illustrating an exemplary embodiment where a user terminal device performs various functions according to a folding interaction and an unfolding interaction according to various exemplary embodiments;

[0044] FIGS. **17**A to **23**B are views illustrating an exemplary embodiment where a user terminal device maintains a function when a folding interaction and an unfolding interaction are detected according to various exemplary embodiments;

[0045] FIG. **24** is a flowchart illustrating a display method of a user terminal device according to an exemplary embodiment;

[0046] FIGS. **25**A to **27**B are views illustrating an exemplary embodiment where a user terminal device performs various functions according to a folding interaction and an unfolding interaction; and

[0047] FIGS. **28**A to **31**B are views illustrating an exemplary embodiment where a cover covers up an exposure area according to another exemplary embodiment.

DETAILED DESCRIPTION

[0048] One or more exemplary embodiments may vary and may be provided in different types of exemplary embodiments. Specific exemplary embodiments will be described with reference to accompanying drawings and detailed explanation. However, this does not necessarily limit the scope of the exemplary embodiments to a specific embodiment form. Instead, modifications, equivalents and replacements included in the disclosed concept and technical scope of this specification may be employed. While describing exemplary embodiments, if a specific description regarding a known technology might obscure the gist of an inventive concept, the specific description may be omitted.

[0049] In the present disclosure, relational terms such as first and second, and the like, may be used to distinguish one entity from another entity, without necessarily implying any actual relationship or order between such entities.

[0050] The terms used in the following description are provided to explain a specific exemplary embodiment and are not intended to limit the scope of rights. A singular term includes a plural form unless it is expressly says otherwise. The terms "include", "comprise", "is configured to," etc., of the description are used to indicate that there are features, numbers, steps, operations, elements, parts or combination thereof, and they should not exclude the possibilities of combination or addition of one or more features, numbers, steps, operations, elements, parts or combination thereof.

[0051] In an exemplary embodiment, 'a module' or 'a unit' performs at least one function or operation, and may be realized as hardware, software, or a combination thereof. In addition, a plurality of 'modules' or a plurality of 'units' may be integrated into at least one module and may be realized as at least one processor except for 'modules' or 'units' that should be realized in a specific hardware.

[0052] An exemplary embodiment will now be described in detail with accompanying drawings. FIG. **1** is a block diagram illustrating configuration of a user terminal device **100** according to an exemplary embodiment. As illustrated in FIG. **1**, the user terminal device **100** includes a display **110**, a detector **120**, and a controller **130**. The user terminal device **100** may be realized as various types of devices such as a TV, monitor, PC, laptop PC, mobile phone, tablet PC, touchscreen, PDA, MP3 player, kiosk, electronic album, table display device, LCD display, LED display, OLED display, camera, watch, wearable device, etc. If a user terminal device is realized as portable device such as mobile phone, tablet PC, PDA, MP3 player, laptop PC, watch, wearable device, etc., the user terminal device may be referred to a mobile device. Throughout this specification, for convenience and not for any limiting purposes, it may be referred to as a user terminal device.

[0053] The display **110** displays various image data and UIs. In particular, the display **110** may be realized as a touch screen as it is combined with a touch detector. In addition, the display **110** may include a folding line so that the display **110** may be folded.

[0054] In particular, the display **110** consists of a first area and a second area which is larger than the first area with reference to the folding line. If the display is folded such that the first area comes in touch with the second area with reference to the folding line, the display **110** may display on an exposure area of the second area, the area being exposed while the display **110** is folded, at least one of a UI including information regarding the user terminal device **100** and a UI for controlling the user terminal device **100**.

[0055] The detector **120** detects a user interaction. In particular, the detector **120** may include a touch detector which detects a user's touch interaction. In addition, the

detector **120** may include a folding detector which detects a folding interaction where the display **110** is folded with reference to the folding line and an unfolding interaction where the display **110** is unfolded with reference to the folding line.

[0056] The controller **130** controls overall operations of the user terminal device **100**. In particular, if the display is folded with reference to the folding line, the controller **130** may control the display **110** to display a predetermined UI on an exposure area of the second area. In this case, the predetermined UI may include at least one of a UI representing state information of the user terminal device **100** and a UI for controlling the user terminal device **100**. In addition, the exposure area represents an area of the second area, which is exposed to the outside when the first area completely comes into contact with the second area.

[0057] In particular, if a folding interaction of folding the display **110** with reference to the folding line is detected through the detector **120** while the user terminal device **100** executes a specific application, the controller **130** may control the display **110** to display a UI for controlling the specific application in the exposure area of the second area. For example, if a folding interaction of folding the display **110** with reference to the folding line is detected through the detector while the user terminal device **100** executes a music application, the controller **130** may control the display **110** to display a UI for controlling reproduction of music on the exposed area.

[0058] In addition, if a predetermined user interaction occurs (for example, a touch interaction of touching the exposed area) while the display **110** is folded, the controller **130** may control the display **110** to display a UI for releasing a lock state of the user terminal device **100** on the exposure area of the second area.

[0059] If a predetermined user interaction occurs (for example, a touch interaction of touching the exposed area) while the display **110** is folded, the controller **130** may control the display **110** to display a UI for changing the setting of the user terminal device on the exposed area. For example, if a touch interaction of touching the exposure area is detected while the display **110** is folded, the controller **130** may control the display **110** to display a UI for changing an audio, video or other setting of the user terminal device on the exposed area.

[0060] In addition, if a message is received from outside of the device while the display **110** is folded, the controller **130** may control the display **110** to display a UI for informing that the message is received on the exposed area. In this case, the UI displayed on the exposure area may include information regarding a sender and the message.

[0061] If the UI informing that a message is received is displayed on the exposure area while the display **110** is folded and an unfolding interaction of unfolding the display to a predetermined angle is detected while the UI is touched, the controller **130** may control the display **110** to display a message window for responding to the received message.

[0062] However, the device is not limited to a using a predetermined angle. It may be a range of angles. It may also be an angle or a range of angles that may be set by a user.

[0063] In addition, the controller **130** may control the display **110** to display a plurality of icons on the exposure area while the display **110** is folded. If one of the plurality of icons is touched through the detector **120** while the plurality of icons are displayed on the exposure area while the display **110** is folded and an unfolding interaction of unfolding the display **110** is detected through the detector **120** while one of the plurality of icons is touched, the controller **130** may control the display **110** to display a screen corresponding to the touched icon. For example, if an unfolding interaction of unfolding the display **110** is detected while a message icon from among the plurality of icons is touched, the controller **130** may control the display **110** to display a message window corresponding to the message icon. Of course, the device is not limited to a message icon. It could be any number of icons, e.g., a music icon, a telephone icon, a document icon, etc.

[0064] In addition, if a message is received from outside while the user terminal device executes a specific application in a folding state, the controller **130** may control the display **110** to display a UI informing that the message is received on the exposed area. If an unfolding interaction of unfolding the display **110** is detected through the detector **120** while the UI is touched, the controller **130** may control the display **110** to display a message window for responding to the message. If an unfolding action of unfolding the display is detected through the detector **120** while the UI is not touched, the controller **130** may control the display **110** to display an execution screen for the specific application.

[0065] If a UI for releasing a lock state of the user terminal device **100** is displayed on the exposure area while the display **110** is folded, a lock release command is input through the UI and then, an unfolding interaction of unfolding the display **110** is detected through the detector **120**, the controller **130** may control the display **110** to display a home screen. However, if a lock release command is not input through the UI, and an unfolding interaction of unfolding the display **110** is detected through the detector **120**, the controller **130** may control the display **110** to display the UI for releasing the lock state of the user terminal device **100** on full screen.

[0066] In addition, if a call request is received from outside while the display **110** is folded, the controller **130** may control the display **110** to display a UI on the exposed area for informing that a call request is received from outside. If an unfolding interaction of unfolding the display to a first angle range is detected, the controller **130** may control the display **110** to display at least one icon for controlling a telephone call function. If an unfolding interaction of unfolding the display to a second angle that is greater than the first angle scope is detected, the controller **130** may accept the call request and control the display **110** to display a telephone call screen.

[0067] If a call request is received from outside while the display executes a specific application as it is being folded, the controller **130** may control the display **110** to display a UI for informing that a call request is received on the exposed area. If an unfolding interaction of unfolding the display **110** is detected through the detector **120**, the controller **130** may accept the call request and control the display **110** to display a telephone call screen. When a telephone call is completed, the controller **130** may control the display **110** to display the execution screen of the specific application again.

[0068] If a first folding interaction of folding the display to the first angle is detected while the display **110** displays the execution screen of a specific application, the controller **130** may control the display **110** to display part of the execution screen of the specific application on at least part of the

second area. If a second folding interaction of folding the display **110** such that the first area and the second area of the display **110** come in contact with each other is detected, the controller **130** may control the display **110** to display a brief information providing screen of the specific application on the exposed area.

[0069] In the above-described one or more exemplary embodiments, a user may perform various functions of a user terminal device through a UI displayed on the exposure area even when the display **110** is in a folding state and thus, the user may be provided with various information and options for interaction.

[0070] One or more exemplary embodiments will be described in greater detail with reference to FIGS. **2** to **23**B. FIG. **2** is a block diagram illustrating configuration of a user terminal device **200** in detail according to an exemplary embodiment. As illustrated in FIG. **2**, the user terminal device includes an image receiver **210**, an image processor **220**, a display **230**, a communicator **240**, a storage **250**, an audio processor **260**, a speaker **270**, a detector **280**, and a controller **290**.

[0071] Meanwhile, FIG. **2** illustrates various components comprehensively, assuming that the user terminal device **200** is an apparatus having various functions such as contents providing function, display function, etc. Accordingly, depending on one or more exemplary embodiments, a part of the components illustrated in FIG. **2** may be omitted or changed, or other components may be further added.

[0072] The image receiver **210** receives image data through various sources. For example, the image receiver **210** may receive broadcasting data from an external broadcasting station, VOD data in real time from an external server, or image data from an external apparatus.

[0073] The image processor **220** processes image data received from the image receiver **210**. The image processor **220** may perform various image processing with respect to image data, such as decoding, scaling, noise filtering, frame rate conversion, resolution conversion, etc.

[0074] The display **230** displays at least one of a video frame which is generated as the image processor **220** processes image data received from the image receiver **220** and various screens generated by a graphic processor **293**.

[0075] In particular, as illustrated in FIG. **3**A, the display **230** may consist of a first area **320** and a second area **330** which is larger than the first area **320** with reference to a folding line **310**. As illustrated in FIG. **3**B, if the display **230** is folded with reference to the folding line **310**, the display **230** may include an exposure area **340** which is the exposed part of the second area **330**. Meanwhile, FIG. **3**C is a view illustrating a cover which is on the rear side of the user terminal device **200** when the user terminal device **200** is folded.

[0076] Meanwhile, in the above-described exemplary embodiment, the length of the folding line **310** is in parallel with a short side, but this is only an example. As illustrated in FIG. **3**D, the length of the folding line **310** may be in parallel with a long side. In this case, the display **230** may consist of a first area **350** and a second area **360** with reference to the folding line **310**. As illustrated in FIG. **3**E, if the display **230** is folded with reference to the folding line **310**, the display **230** may include an exposure area **370** of the second area **360**, which is exposed to outside.

[0077] Meanwhile, in the above-exemplary embodiment, the folding line **310** may be a line which is generated by a physical hinge. In addition, if the display **230** is a flexible display, the folding line **310** may be a line which can be folded by a user.

[0078] The communicator **240** performs communication with various types of external apparatuses according to various types of communication methods. The communicator **240** may include a WiFi chip **241**, a Bluetooth chip **242**, a wireless communication chip **243**, and a Near Field Communication (NFC) chip **244**. The controller **290** performs communication with various external apparatuses using the communicator **240**.

[0079] In particular, the WiFi chip **241** and the Bluetooth chip **242** perform communication according to a WiFi method and a Bluetooth method, respectively. In the case of the WiFi chip **241** or the Bluetooth chip **242**, various connection information such as SSID and a session key may be transmitted/received first for communication connection and then, various information may be transmitted/received. The wireless communication chip **243** represents a chip which performs communication according to various communication standards such as IEEE, Zigbee, 3rd Generation (3G), 3rd Generation Partnership Project (3GPP), Long Term Evolution (LTE) and so on. The NFC chip **244** represents a chip which operates according to an NFC method which uses 13.56 MHz band among various RF-ID frequency bands such as 135 kHz, 13.56 MHz, 433 MHz, 860-960 MHz, 2.45 GHz, and so on.

[0080] The storage **250** may store various programs and data necessary to operate the user terminal device **200**. Specifically, the storage **250** may store programs and data to configure various screens to be displayed on a main area and a sub area. FIG. **4** is a view provided to explain the structure of software stored in the user terminal device **200**. According to FIG. **4**, the storage **250** may store an Operating System (OS) **410**, a kernel **420**, middleware **430**, an application **440**, etc.

[0081] The OS **410** controls and manages overall operations of hardware. In other words, the OS **410** manages hardware and is responsible for basic functions such as memory and security.

[0082] The kernel **420** serves as a path transmitting various signals detected at the display **230**, such as a touch signal, to the middleware **430**.

[0083] The middleware **430** includes various software modules for controlling the operation of the user terminal device **200**. According to FIG. **4**, the middleware **430** includes an X11 module **430-1**, an APP manager **430-2**, a connection manager **430-3**, a security module **430-4**, a system manager **430-5**, a multimedia framework **430-6**, a UI framework **430-7**, a window manager **430-8**, and a writing recognition module **430-9**.

[0084] The X11 module **430-1** receives various event signals from various hardware provided in the user terminal device **200**. Herein, the event may vary, ranging from an event of setting of a system alarm, an event of executing or terminating a specific program, etc.

[0085] The APP manager **430-2** manages the execution state of various applications **440** which are installed in the storage **250**. When an application execution event is detected from the X11 module **430-1**, the APP manager **430-2** calls and executes an application corresponding to the event.

[0086] The connection manager **430-3** supports wired or wireless network connection. The connection manager

430-3 may include various detailed modules such as a DNET module, a UPnP module, etc.

[0087] The security module **430-4** supports certification, permission, secure storage, etc. with respect to hardware.

[0088] The system manager **430-5** monitors the state of each element of the user terminal device **200**, and provides the monitoring result to other modules. For example, if there is not enough battery left, an error occurs, or connection is cut off, the system manager **430-5** may provide the monitoring result to a main UI framework **430-7** or a sub UI framework **430-9** and output an alarm message or an alarm sound.

[0089] The multimedia framework **430-6** may be stored in the user terminal device **200**, or may reproduce multimedia contents provided from an external source. The multimedia framework **430-6** may include a player module, a camcorder module, a sound processing module, etc. Accordingly, the multimedia framework **430-6** may reproduce various multimedia contents, and generate and reproduce screens and sounds.

[0090] The main UI framework **430-7** provides various UIs to be displayed on a main area of the display **230**, and the sub UI framework **430-9** provides various UIs to be displayed on a sub area. The main UI framework **430-7** and the sub UI framework **430-9** may include an image composite module to configure various objects, a coordinates composite module to calculate a coordinates where an object is to be displayed, a rendering module to render the configured object on the calculated coordinates, a 2D/3D UI toolkit to provide a tool for configuring a UI in 2D or 3D form, etc. The main UI framework **430-7** and the sub UI framework **430-9** may include an image composite module to configure various objects, a coordinates composite module to calculate a coordinates where an object is to be displayed, a rendering module to render the configured object on the calculated coordinates, a 2D/3D UI toolkit to provide a tool for configuring a UI in 2D or 3D form, etc.

[0091] The window manager **430-8** may detect a touch event using a user's body part or pen or other input events. When such an event is detected, the window manager **430-8** transmits an event signal to the main UI framework **430-7** or the sub UI framework **430-9** so that an operation corresponding to the event is performed.

[0092] In addition, if a user touches and drags a screen, various program modules such as a writing module for drawing a line according to a drag trace and an angle calculation module for calculating a pitch angle, a roll angle, a yaw angle, etc. based on a sensor value sensed by a movement detector **282** may be stored.

[0093] The application module **440** includes applications **440-1-440-*n*** for supporting various functions. For example, program modules for providing various services, such as a navigation program module, a game module, an electronic book module, a calendar module, an alarm management module, a music module, an electronic banking module, a stock module, a calculator module, an electronic mail module, a spreadsheet module, a word processor module, etc. may be included. Such applications may be set as default or may be set temporarily by a user when necessary. If an object is selected, the main CPU **294** may execute an application corresponding to the selected object using the application module **440**.

[0094] The software structure displayed in FIG. **4** is only an example and thus, an exemplary embodiment is not necessarily limited thereto. Thus, part of the structure may be omitted or changed, or new structure may be added, if necessary. For example, the storage **250** may additionally provide various programs such as a sensing module for analyzing signals sensed by various sensors, a messaging module including a messenger program, a Short Message Service (SMS) & Multimedia Message Service (MMS) program, an e-mail program, etc., a call info aggregator program module, a VoIP module, a web browser module, etc.

[0095] Referring back to FIG. **2**, the audio processor **260** processes audio data of image contents. The audio processor **260** may perform various processing such as decoding, amplification, noise filtering, compression, equalization, noise cancellation, echo or reverb removal or addition, etc., with respect to audio data. The audio data processed by the audio processor **260** may be output to the audio output unit **270** (e.g., audio outputter).

[0096] The audio output unit **270** outputs not only various audio data which is processed in many ways such as decoding, amplification, and noise filtering by the audio processor **260** but also various alarm sounds or voice messages. In particular, the audio output unit **270** may be realized as a speaker, but this is only an example. The audio output unit **270** may be realized as an output terminal which may output audio data.

[0097] The detector **280** detects various user interactions. In particular, the detector **280** may include a touch detector **281**, a movement detector **282**, and a folding detector **283** as illustrated in FIG. **2**.

[0098] Specifically, the touch detector **281** may detect a user's touch interaction using a touch panel attached to the rear side of a display panel. The movement detector **282** may detect a movement (for example, a rotation movement, a vertical movement, or a horizontal movement, etc.) of the user terminal device **100** using at least one of an accelerator sensor, a geomagnetic sensor, and a gyro sensor. The folding detector **283** may detect at least one of whether the user terminal device **200** is folded with reference to the folding line **310** and the angle at which the terminal device **200** is folded using a bending sensor (for example, a light sensor, a fiber optic sensor, a conductive ink-based sensor, a conductive fabric sensor, etc.).

[0099] Meanwhile, the touch detector **281** might activate only a touch sensor disposed on the exposure area while the display **230** is folded, and inactivate a touch sensor disposed on the other areas.

[0100] The controller **290** controls overall operations of the user terminal device **200** using various programs stored in the storage **250**.

[0101] As illustrated in FIG. **2**, the controller **290** includes a RAM **291**, a ROM **292**, a graphic processor **293**, a main CPU **294**, a first to an nth interface **295-1-295-*n***, and a bus **296**. In this case, the RAM **291**, the ROM **292**, the graphic processor **293**, the main CPU **294**, the first to the nth interface **295-1-295-*n***, etc. may be interconnected through the bus **296**.

[0102] The ROM **292** stores a set of commands for system booting. If a turn-on command is input and thus, power is supplied, the main CPU **294** copies O/S stored in the storage **250** in the RAM **291** according to a command stored in the ROM **292**, and boots a system by executing the O/S. When the booting is completed, the main CPU **294** copies various application programs stored in the storage **250** in the RAM

291, and executes the application programs copied in the RAM **291** to perform various operations.

[0103] The graphic processor **293** generates a screen including various objects such as an icon, an image, a text, etc. using a computing unit (e.g., computer) and a rendering unit (e.g., renderer). The computing unit computes property values such as coordinates, shape, size, and color of each object to be displayed according to the layout of the screen using a control command received from the detector **280**. The rendering unit generates a screen with various layouts including objects based on the property values computed by the computing unit. The screen generated by the rendering unit is displayed in a display area of the display **230**.

[0104] The main CPU **294** accesses the storage **250**, and performs booting using the O/S stored in the storage **250**. The main CPU **294** performs various operations using various programs, contents, data, etc. stored in the storage **250**.

[0105] The first to the nth interface **295-1**-**295-***n* are connected to the above-described various elements. One of the above interface may be a network interface which is connected to an external apparatus via network.

[0106] In particular, the controller **290** may provide various functions using an exposure area which is exposed to the outside when the display **110** is folded.

<A UI Provided on the Exposure Area>

[0107] If the display **230** is folded with reference to the folding line **310** such that the first area **320** and the second area **330** come in contact with each other, the controller **290** may control the display **230** to display a predetermined UI on the exposure area **340** of the second area **320**, which is exposed to the outside. In this case, the predetermined UI may include at least one of a UI including the state information of the user terminal device **200** and a UI for controlling the user terminal device **200**.

[0108] In an exemplary embodiment, if a folding interaction of folding the display **230** with reference to the folding line **310** such that the first area **320** and the second area **330** come in contact with each other is detected, the controller **290** may control the display **230** to display a UI **510** providing a memo function on the exposure area as illustrated in FIG. **5**A. In this case, if a user input, e.g., a finger, pen, or stylus, is detected through the UI **510** which provides a memo function, the controller **290** may control the display **230** to display an image according to the user input.

[0109] In addition, the controller **290** may control the display **230** to display a UI for controlling a specific application on the exposure area. Specifically, if a folding interaction of folding the display **230** with reference to the folding line **310** such that the first area **320** and the second area **330** come in contact with each other is detected while a specific application is executed, the controller **290** may control the display **230** to display a UI for controlling the specific application on the exposure area. For example, if a folding interaction of folding the display **230** with reference to the folding line **310** such that the first area **320** and the second area **330** come in contact with each other is detected while a music application is executed, the controller **290** may control the display **230** to display a UI **520** controlling the music application on the exposure area as illustrated in FIG. **5**B. In this case, the UI **520** for controlling a music application may include information regarding currently-played music, a play/stop icon, a skip icon, a rewind icon, a next song, a past song, thumbs up, thumbs down, etc.

[0110] In addition, the controller **290** may control the display **230** to display a UI including a hot key icon for checking the current state of the user terminal device **200** on the exposure area. For example, if a predetermined user interaction (for example, an interaction of touching or tapping the exposure area twice in a row) is detected while the display **230** is folded, the controller **290** may control the display **230** to display a UI **530** including a hot key icon for checking the current state of the user terminal device **200** on the exposure area as illustrated in FIG. **5**C. In this case, the hot key icon for checking the current state of the user terminal device **200** may include a hot key icon for checking a battery state, a hot key icon for checking a network state, a hot key icon for checking display brightness setting, etc.

[0111] In addition, the controller **290** may control the display **230** to display a UI informing that a message or data is received from the outside on the exposure area. For example, if an SNS message or SMS message is received from the outside through the communicator **240** while the display **230** is folded, the controller **290** may control the display **230** to display a UI **540** informing that the SNS message or SMS message is received on the exposure area as illustrated in FIG. **5**D. In this case, the UI **540** informing that an SNS message or SMS message is received may include at least one of information regarding a sender and information regarding the SNS message or SMS message.

[0112] Further, the controller **290** may control the display **230** to display various types of UIs for releasing a lock state of the user terminal device **200** on the exposure area.

[0113] Specifically, as illustrated in FIG. **6**A, the controller **290** may control the display **230** to display a UI **610** for inputting a pin number to release the lock state of the user terminal device **200** on the exposure area. In this case, the UI **610** for inputting a pin number may change the pin number by a touch interaction of swiping up and down. If a predetermined pin number is input on the UI **610** displayed on the exposure area, the controller **290** may release the lock state of the user terminal device **200**. Additionally, the user may set the pin number through user input.

[0114] In addition, as illustrated in FIG. **6**B, the controller **290** may control the display **230** to display a UI **620** including a plurality of dots on a corner of the exposure area to release the lock state of the user terminal device **200** on the exposure area. In this case, if a touch interaction of connecting dots in a predetermined pattern is detected on the UI **620**, the controller **290** may release the lock state of the user terminal device **200**. Additionally, the user may set the pattern through user input.

[0115] As illustrated in FIG. **6**C, the controller **290** may control the display **230** to display a UI **630** in the form of a keyboard, i.e., piano to release the lock state of the user terminal device **200** on the exposure area. In this case, if a touch interaction of touching the keyboard, i.e., piano in a predetermined rhythm is detected on the UI **630**, the controller may release the lock state of the user terminal device **200**.

[0116] In addition, as illustrated in FIG. **6**D, the controller **290** may control the display **230** to display a UI **640** including a home icon to release the lock state of the user terminal device on the exposure area. In this case, if a touch interaction of pinching out with reference to the home icon

included in the UI **640** is detected, the controller **290** may release the lock state of the user terminal device **200**.

[0117] The controller **290** may control the display **230** to display a UI for changing the setting of the user terminal device **200** on the exposure area.

[0118] Specifically, as illustrated in FIG. **7**A, the controller **290** may control the display **230** to display a UI **710** in the form of an arc for adjusting the volume of the user terminal device **200**. Meanwhile, in the above exemplary embodiment, the UI displayed on the exposure area adjusts the volume, but this is only an example. A UI for adjusting another setting of the user terminal device **200** (for example, display brightness, etc.) may be displayed.

[0119] In addition, as illustrated in FIG. **7**B, if a touch interaction of dragging one of a plurality of vertexes included in the exposure area in a diagonal direction is detected, the controller **290** may control the display **230** to display a UI **720** for turning off the power of the user terminal device **200** at the corner area corresponding to the vertex where the touch interaction is detected.

<A Folding Interaction and an Unfolding Interaction>

[0120] If a plurality of icons are displayed on the exposure area while the display **230** is folded, and an unfolding interaction of unfolding the display **230** while one of the plurality of icons is touched, the controller **290** may control the display **230** to display a screen corresponding to the touched icon on full screen.

[0121] Specifically, as illustrated in FIG. **8**A, the display **230** displays the first to the fourth icons **810** to **840** while the display **230** is folded. If an unfolding interaction of unfolding the display **230** is detected while the fourth icon **840** out of the first to the fourth icon **810** to **840** is touched, the controller **290** may control the display **230** to display a message window **850** corresponding to the fourth icon **840** on full screen as illustrated in FIG. **8**B.

[0122] Meanwhile, in the above exemplary embodiment, an unfolding interaction is detected while the fourth icon **840** is touched, but this is only an example. If an unfolding interaction is detected while another icon is touched, a screen corresponding to the other-touched icon may be displayed on the full screen of the display **230**. For example, if an unfolding interaction is detected while the first icon **810** is touched, the controller **290** may control the display **230** to display an execution screen of a call application corresponding to the first icon **810** (for example, a recent call list screen, an address book screen, a call sending screen, etc.) on full screen. In addition, if an unfolding interaction is detected while the second icon **820** is touched, the controller **290** may control the display **230** to display a web browser screen corresponding to the second icon **820** on full screen. If an unfolding interaction is detected while the third icon **830** is touched, the controller **290** may control the display **230** to display an execution screen of a music application corresponding to the third icon **830** (for example, a music play screen, a music list screen, etc.) on full screen.

[0123] In addition, if the exposure area is touched while the display **230** is folded and then, an unfolding interaction of unfolding a hinge angle of the display **230** as much as a predetermined angle is detected, the controller **290** may control the display **230** to display a screen for executing a specific function.

[0124] Specifically, if a call request is received while the display **230** is folded, the controller **290** may control the display **230** to display a UI **910** informing that a call request is received on the exposure area as illustrated in FIG. **9**A. If an unfolding interaction of unfolding a hinge angle of the display **230** as much as a predetermined angle (for example, 70° to 120°) is detected while the UI **910** informing that a call request is received is touched, the controller **290** may accept the call request, execute a speaker phone function, and control the display **230** to display an execution screen **920** including various icons as illustrated in FIG. **9**B.

[0125] Specifically, if a message is received from outside while news information **1010** is displayed at the same as the display **230** is folded, the controller **290** may control the display **230** to display a UI **1020** informing that the message is received along with the news information **1010** on the exposure area as illustrated in FIG. **10**A. If an unfolding interaction of unfolding a hinge angle of the display **230** as much as a predetermined angle (for example, 70° to 120°) is detected while the UI **1020** informing that a message is received is touched, the controller **290** may control the display **230** to display a message window **1030** for writing a reply to the received message as illustrated in FIG. **10**B.

[0126] In addition, the controller **290** may control the display **230** to display different screens when the exposure area is touched and then, an unfolding interaction is detected and when an unfolding interaction is detected.

[0127] Specifically, the controller **290** may control the display **230** to display a UI **1110** corresponding to a music application on the exposure area as illustrated in FIG. **11**A.

[0128] If a message is received from outside while the UI **1110** corresponding to a music application is displayed on the exposure area, the controller **290** may control the display **230** to display a UI **1120** informing that the message is received along with the music application UI **1110** on the exposure area as illustrated in FIG. **11**B.

[0129] In this case, if an unfolding interaction of unfolding the display **230** is detected while the exposure area is not touched, the controller **290** may control the display **230** to display an execution screen **1130** of the existing music application as illustrated in FIG. **11**C. In this case, a UI **1135** informing that a message is received may be displayed on one area of the execution screen **1130** of the music application for a predetermined time.

[0130] However, if an unfolding interaction of unfolding the display **230** is detected while the UI **1120** informing that a message is received is displayed on the exposure area, the controller **290** may control the display **230** to display a message window **1140** for writing a reply to the received message as illustrated in FIG. **11**D.

[0131] In addition, the controller **290** may control the display **230** to display different screens according to the order of detecting an unfolding interaction and a touch interaction for lock-releasing.

[0132] Specifically, as illustrated in the left side of FIG. **12**A, if a touch interaction for lock-releasing is detected while a UI **1210** for releasing the lock of the user terminal device **200** is displayed on the exposure area, the controller **290** may release the lock state of the user terminal device **200**, and as illustrated in the right side of FIG. **12**A, may control the display **230** to display a first home screen **1220** including time information on the exposure area.

[0133] In addition, as illustrated in the left side of FIG. **12**B, if a touch interaction for lock-releasing is detected while the UI **1210** for releasing the lock of the user terminal device **200** is displayed on the exposure area, and an

unfolding interaction is detected, the controller **290** may release the lock state of the user terminal device **200**, and as illustrated in the right side of FIG. **12**B, may control the display **230** to display a second home screen **1230** on full screen.

[0134] As illustrated in the left side of FIG. **12**C, if an unfolding interaction is detected while an image is not displayed on the exposure area, the controller **290** may control the display **230** to display a UI **1240** for releasing the lock of the user terminal device on full screen as illustrated in the right side of FIG. **12**C. If a touch interaction for lock-releasing is detected on the UI **1240** for releasing the lock of the user terminal device **200**, which is displayed on full screen, the controller **290** may release the lock state of the user terminal device **200**, and as illustrated in the right side of FIG. **12**B, may control the display **230** to display the second home screen **1230** on full screen.

[0135] In addition, the controller **290** may control the display **230** to display distinctively a screen which is displayed when only an unfolding interaction is detected while a UI corresponding to a specific application is displayed on the exposure area and a screen which is displayed when an unfolding interaction is detected after the exposure area is touched.

[0136] Specifically, if a call request is received from outside while the display **230** is folded, the controller **290** may control the display **230** to display a UI **1310** informing a call request is received on the exposure area as illustrated in the left side of FIG. **13**A. If the UI **1310** displayed on the exposure area is touched and then, an unfolding interaction of unfolding the display **230** is detected, the controller **290** may control the display **230** to display an execution screen **1320** of a calendar application which is related to a call request function on full screen (in another example, an execution screen of a memo application) as illustrated in the lower left side of FIG. **13**A. On the other hand, if an unfolding interaction of unfolding the display **230** is detected while the UI **1310** displayed on the exposure area is not touched, the controller **290** may control the display **230** to display a call screen **1330** on full screen as illustrated in the lower right side of FIG. **13**A.

[0137] If a folding interaction of folding the display **230** is detected while a music application is executed, the controller **290** may control the display **230** to display a UI **1340** for controlling the music application on the exposure area as illustrated in the upper portion of FIG. **13**B. If the UI **1430** displayed on the exposure area is touched and then, an unfolding interaction of unfolding the display **230** is detected, the controller **290** may control the display **230** to maintain music play and display a play list **1350** on full screen as illustrated in the lower left side of FIG. **13**B. On the other hand, if an unfolding interaction of unfolding the display **230** is detected while the UI **1340** displayed on the exposure area is not touched, the controller **290** may control the display **230** to display a music player screen **1360** on full screen as illustrated in the lower right side of FIG. **13**B.

[0138] If a first unfolding interaction of unfolding a hinge angle of the display **230** as much as a predetermined angle is detected, the controller **290** may control the display **230** to display at least one icon for executing a specific function. If a second unfolding interaction of unfolding the display **230** completely while at least one icon is touched, the controller **290** may execute a function corresponding to the touched icon.

[0139] According to an exemplary embodiment, if a call request is received from outside while the display **230** is folded, the controller **290** may control the display **230** to display a UI **1410** informing that a call request is received on the exposure area as illustrated in FIG. **14**A.

[0140] If the first unfolding interaction of unfolding a hinge angle of the display **230** as much as a predetermined angle (for example, 30° to 150°) is detected while the UI **1410** informing that a call request is received is displayed, the controller **290** may control the display **230** to display a UI **1420** including a plurality of icons **1430-1** to **1430-3** for performing various functions in relation with making a call as illustrated in FIG. **14**B.

[0141] If an unfolding interaction of unfolding the display **230** completely (that is, unfolding the display **230** such that a hinge angle of the display **230** becomes 180°) is detected while a photo sharing icon is touched from among the plurality of icons **1430-1** to **1430-3**, the controller **290** may accept a call request, and as illustrated in FIG. **14**C, may control the display **230** to display a call screen **1440** on the upper area and a list **1450** for selecting a photo to be shared. In this case, if a touch interaction of dragging one of a plurality of photos included in the list **1450** to the call screen **1440** is selected, the controller **290** may control the communicator **240** to transmit the photo where the touch interaction is detected to a receiver.

[0142] If an unfolding interaction is detected, the controller **290** may control the display **230** to display a plurality of guidance messages according to a hinge angle of the display **230** while the unfolding interaction is detected. In this case, the guidance messages may include a guidance message for informing an incoming text message, a guidance message for informing an absence call, a guidance message for informing an incoming an SNS message or SMS message, a guidance message for informing update of applications, etc.

[0143] Specifically, as illustrated in FIG. **15**A, the controller **290** may control the display **230** to display one guidance message while the display **230** is folded. Subsequently, if an unfolding interaction of unfolding the display **230** is detected, the controller **290** may control the display **230** to display the different number of guidance messages according to a hinge angle of the display **230**. For example, if a hinge angle of the display **230** is within a first angle range (for example, between 5° and 15°), the controller **290** may control the display **230** to display two guidance messages **1510**, **1520**. If a hinge angle of the display **230** is within a second angle range (for example, between 15° and 25°), the controller **290** may control the display **230** to display three guidance messages **1510**, **1520**, **1530**. That is, the controller **290** may increase the number of guidance messages displayed as a hinge angle of display **230** becomes greater.

[0144] If a hinge angle of the display **230** is within a fourth angle range (for example, between 35° and 45°), the controller **290** may control the display **230** to display five guidance messages (possibly overlapping) **1510** to **1550** as illustrated in FIG. **15**B. In this case, as illustrated in FIG. **15**B, the first guidance message **1510** which is updated most recently may be disposed on the top.

[0145] As illustrated in FIG. **15**B, if a folding interaction of folding the display **230** again is detected when the second guidance message **1520** is touched while the five guidance messages **1510** to **1550** are displayed, the controller **290** may

control the display **230** to display the second guidance message **1520** on the exposure area as illustrated in FIG. **15**C.

[0146] In addition, as illustrated in FIG. **15**B, if an unfolding interaction of unfolding the display **230** completely is detected when the second guidance message **1520** is touched while the five guidance messages **1510** to **1550** are displayed, the controller **290** may control the display **230** to display a screen corresponding to the second guidance message **1520** on full screen as illustrated in FIG. **15**D.

[0147] Further, the controller **290** may perform different functions according to the direction of a touch interaction which is detected on the exposure area while the display **230** is folded.

[0148] Specifically, if a message is received from outside while the display **230** is folded, the controller **290** may control the display **230** to display a UI **1610** informing that the message is received on the exposure area as illustrated in FIG. **16**A.

[0149] In this case, if a touch interaction in the left-and-right direction is detected on the UI **1610** informing that a message is received, the controller **290** may control the display **230** to display a UI informing the previous message or the next message on the exposure area according to the touch interaction.

[0150] If a touch interaction in the down direction is detected on the UI **1610** informing that a message is received, the controller **290** may delete a currently-received message.

[0151] If a touch interaction in the up direction is detected on the UI **1610** informing that a message is received, the controller **290** may store the received messages. Specifically, as illustrated in the upper left side of FIG. **16**B, if a touch interaction in the up direction is detected on a UI **1620** informing that a first message is received, a touch interaction in the up direction is detected on a UI **1630** informing a second message is received, a touch interaction in the up direction is detected on a UI **1640** informing that a third message is received and then, an unfolding interaction of unfolding the display **230** is detected, the controller **290** may control the display **230** to display a screen **1620'** including the first message, a screen **1630'** including the second message, a screen **1640'** including the third message and a home screen **1650** as illustrated in the lower right side of FIG. **16**B.

<Maintain the Current Function Despite the Change in the Shape of the Display **230**>

[0152] The controller **290** may maintain the current function even if the shape of the display **230** changes according to a folding interaction or an unfolding interaction, and control the display **230** to display a screen corresponding to the current function.

[0153] According to an exemplary embodiment, if a folding interaction of folding the display **230** is detected while a music application is executed, the controller **290** may control the display **230** to display a UI **1710** corresponding to the music application on the exposure area as illustrated in FIG. **17**A. If a call request is received while the UI **1710** corresponding to the music application is displayed on the exposure area, the controller **290** may control the display **230** to display a UI **1720** informing that a call request is received on the exposure area as illustrated in FIG. **17**B. If an unfolding interaction of unfolding the display **230** is detected while the UI **1720** informing that a call request is received is displayed on the exposure area, the controller **290** may control the display **230** to display a call screen **1730** on full screen as illustrated in FIG. **17**C. Subsequently, when the telephone call is completed, the controller **290** may control the display **230** to display an execution screen **1740** of the music application on full screen as illustrated in FIG. **17**D. If a folding interaction of folding the display **230** is detected again, the controller **290** may control the display **230** to display the UI corresponding to the music application on the exposure area as illustrated in FIG. **17**E.

[0154] According to another exemplary embodiment, as illustrated in FIG. **18**A, the controller **290** may control the display **230** to display an execution screen **1810** of a music application on full screen while the music application is executed. If a call request is received from outside, the controller **290** may control the display **230** to display a screen **1820** for confirming whether to accept the call request as illustrated in FIG. **18**B. If a folding interaction of folding the display **230** is detected while the screen **1820** for confirming whether to accept the call request is displayed, the controller **290** may control the display **230** to display a UI **1830** informing that a call request is rejected on the exposure area as illustrated in FIG. **18**C. When the telephone call is completed, the controller **290** may control the display **230** to display a UI **1840** corresponding to the music application on the exposure area as illustrated in FIG. **18**D. Subsequently, if an unfolding interaction of unfolding the display **230** is detected again, the controller **290** may control the display **230** to display the execution screen **1810** of the music application on full screen as illustrated in FIG. **18**E.

[0155] The controller **290** may determine a display area which can be watched by a user according to a hinge angle of the display **230**, and control the display **230** to display a screen including different amount of information on the determined display area. In this case, the hinge angle of the display **230** may be matched with the watchable display area and then stored.

[0156] According to an exemplary embodiment, if the display **230** is unfolded while a telephone call is performed, the controller **290** may control the display **230** to display a first telephone call screen **1910** on full screen as illustrated in FIG. **19**A.

[0157] If a hinge angle of the display **230** is folded as much as Θ while a telephone call is performed, the controller **290** may determine a display area corresponding to the hinge angle, and as illustrated in FIG. **19**B, may control the display **230** to display a second telephone call screen **1920** on the determined display area. In this case, the second telephone call screen **1920** may include the amount of information and icons which are smaller than those included in the first telephone call screen **1910**.

[0158] In addition, if the display **230** is folded while a telephone call is performed, the controller **290** may control the display **230** to display a UI **1930** informing that a telephone call is being performed on the exposure area as illustrated in FIG. **19**C.

[0159] According to another exemplary embodiment, if the display **230** is unfolded while a navigation application is executed, the controller **290** may control the display **230** to display a first navigation screen **2010** on full screen as illustrated in FIG. **20**A.

[0160] If a hinge angle of the display **230** is folded as much as Θ while a navigation application is executed, the

controller **290** may determine a display area corresponding to the hinge angle, and as illustrated in FIG. **20**B, may control the display **230** to display a second navigation screen **2020** on the determined display area. In this case, the guiding area of the second navigation screen **2020** may be smaller than the guiding area of the first navigation screen **2010**.

[0161] If the display **230** is folded while a navigation application is executed, the controller **290** may control the display **230** to display a third navigation screen **2030** on the exposure area as illustrated in FIG. **20**C. In this case, the third navigation screen **2030** might include only direction information and distance information instead of a map screen included in the first navigation screen **2010** and the second navigation screen **2020**. However, a map screen may also be included on the exposure area in third navigation screen **2030**.

[0162] Whenever if a folding interaction or an unfolding interaction is detected, the controller **290** may control the display **230** to reconfigure and display information such that the information corresponds to the size and direction of a screen.

[0163] Specifically, as illustrated in FIG. **21**A, if a folding interaction of folding the display **230** is detected while a first address book list **2110** is displayed on full screen, the controller **290** may control the display **230** to display a second address book list **2120** on the exposure area as illustrated in FIG. **21**B. In this case, the first address book list **2110** might include user information such as image, name, telephone number, direct call icon, etc., and the second address book list **2120** might include user information such as image and name only, but the display is not limited to this.

[0164] In addition, as illustrated in FIG. **22**A, if an unfolding interaction of unfolding the display **230** is detected while a news title **2210** is displayed on the exposure area when the display **230** is folded, the controller **290** may control the display **230** to display a full screen **2220** including not only the news title but also the news image and the news text as illustrated in FIG. **22**B.

[0165] In addition, the controller **290** may control the display **230** to display different information on the exposure area and the hidden area when the display **230** is folded. In this case, as illustrated in FIG. **23**A, the controller **290** may control the display **230** to display public information on an exposure area **2310** and private information on a hidden area **2320**. For example, as illustrated in FIG. **23**B, the controller **290** may control the display **230** to display barcode information which is public information on the exposure area **2330**, and credit card list and transaction information which is private information on the hidden area **2340**.

[0166] Hereinafter, a displaying method of the user terminal device **200** according to an exemplary embodiment will be described with reference to FIG. **24**.

[0167] Specifically, the user terminal device **200** displays an image on the display **230** which is divided into a first area and a second area which is larger than the first area with reference to a folding line (S**2410**).

[0168] The user terminal device **200** determines whether the display **230** is folded or not (S**2420**).

[0169] If the display **230** is folded (S**2420**-Y), the user terminal device **200** displays a predetermined UI on the exposure area which is an exposed part of the second area (S**2430**). In this case, the predetermined UI may include a UI including state information of the user terminal device **200** and a UI for controlling the user terminal device **200**.

[0170] As described above, a UI is displayed on the exposure area which is exposed to outside when the display **230** is folded and thus, a user may perform various functions of the user terminal device through the UI displayed on the exposure area and receive various information even if the display is folded.

[0171] FIGS. **25**A to **27**B are views provided to explain an exemplary embodiment of performing various functions of a user terminal device based on a folding interaction and an unfolding interaction according to various exemplary embodiments.

[0172] According to an exemplary embodiment, if an unfolding interaction is detected while a UI for informing that a message is received from outside is displayed when the display **230** is folded, the controller **290** may control the display **230** to display the message received from outside.

[0173] Specifically, if an SNS message or SMS message is received while the display **230** is folded, the controller **290** may control the display **230** to display a UI **2510** informing that the SNS message or SMS message is received on the exposure area as illustrated in FIG. **25**A. In this case, the UI **2510** informing that an SNS message or SMS message is received may include sender, time of the message being sent, message title, and partial content, etc. of the received SNS message or SMS message. If an unfolding interaction of unfolding the display **230** which is in a folding state is detected, the controller **290** may control the display **230** to display the detailed contents of the SNS message or SMS message received as illustrated in FIG. **25**B. In this case, the detailed contents of the SNS message or SMS message may include sender, the time of the message being sent, message title, the detailed contents, SNS message editing icon, or SMS message editing icon, etc.

[0174] According to another exemplary embodiment, if a folding interaction is detected while a specific application is executed when the display **230** is in an unfolding state, the controller **290** may control the display **230** to display a graphic effect related to the execution screen of the specific application on the exposure area.

[0175] Specifically, as illustrated in FIG. **26**A, if a folding interaction is detected while an execution screen **2610** of a music application is displayed when the display **230** is in an unfolding state, the controller **290** may control the display **230** to display an equalizer animation **2620** of the music which is currently played on the exposure area as illustrated in FIG. **26**B.

[0176] In addition, as illustrated in FIG. **27**A, if a folding interaction is detected while an execution screen **2710** of a weather application is displayed when the display **230** is in an unfolding state, the controller **290** may control the display **230** to display an animation **2720** related to the current weather (for example, cloudy sky) on the exposure area as illustrated in FIG. **27**B.

[0177] Meanwhile, in the above exemplary embodiment, the exposure area is an area exposed to outside, without being covered by a specific cover, but this is only an example. The exposure area may be protected and covered by a specific cover.

[0178] According to an exemplary embodiment, the user terminal device **200** may include a transparent cover on the exposure area in order to protect the exposure area.

[0179] For example, if a folding line is in parallel with a longer side, the user terminal device **200** may include a transparent cover **2810** as illustrated in FIGS. **28**A to **28**D. FIG. **28**A is a side view of the user terminal device **200** including the transparent cover **2810**, FIG. **28**B is a plane view of the user terminal device **200** including the transparent cover **2810**, FIG. **28**C is a perspective view of the user terminal device including the transparent cover **2810** which is in a folding state, and FIG. **28**D is a perspective view of the user terminal device **200** including the transparent cover **2810**, which is unfolded at a specific angle.

[0180] If a folding line is in parallel with a shorter side, the user terminal device **200** may include a transparent cover **2910** as illustrated in FIGS. **29**A to **29**C. FIG. **29**A is a side view of the user terminal device **200** including the transparent cover **2910**, FIG. **29**B is a plane view of the user terminal device **200** including the transparent cover **2910**, and FIG. **29**C is a perspective view of the user terminal device **200** including the transparent cover **2910**, which is in a folding state.

[0181] According to another exemplary embodiment, the user terminal device **200** may include a punching cover on the exposure area in order to protect the exposure area.

[0182] Specifically, the user terminal device **200** may include a punching cover **3010** where punch holes are formed on the lower side which comes in contact with the exposure area as illustrated in FIGS. **30**A to **30**C. FIG. **30**A is a side view of the user terminal device **200** including the punching cover **3010**, FIG. **30**B is a plane view of the user terminal device **200** including the punching cover **3010**, and FIG. **30**C is a perspective view of the user terminal device **200** including the punching cover **3010**, which is in a folding state. In particular, with the punching cover **3010**, the user terminal device **200** may provide various information (for example, the current time, weather, a UI informing that a message is received, etc.) and image effects to a user by using the holes formed on the punching cover **3010**.

[0183] With the transparent cover **2810**, **2910**, the controller **290** may sense a touch input in an area where the transparent cover **2810**, **2910** is located while the display **230** is folded.

[0184] If a touch interaction of terminating a touch input is detected on a display cover area or a bezel area rather than the exposure area after the exposure area is touched while the display **230** is folded, the controller **290** may perform a predetermined function according to the detected touch interaction.

[0185] Specifically, as illustrated in ① of FIGS. **31**A and **31**B, if a touch interaction of terminating a touch input is detected on the upper side of the display cover area after the exposure area is touched when the display **230** is in a folding state, the controller **290** may perform a first function (for example, storing a message, etc.) according to the touch interaction. In addition, as illustrated in ② of FIG. **31**A, if a touch interaction of terminating a touch input is detected on a bezel area of the lower side after the exposure area is touched when the display **230** is in a folding state, the controller **290** may perform a second function perform a second function (for example, deleting a message, etc.) according to the touch interaction. As illustrated in ③ of FIG. **31**B, if a touch interaction of terminating a touch input is detected on a bezel area of the lower side after the exposure area is touched while the display **230** of the user terminal device **200** including the transparent cover **2810** is folded, the controller **290** may perform the second function (for example, deleting a message, etc.) according to the touch interaction.

[0186] A displaying method of a user terminal device according to one or more exemplary embodiments may be realized as a program and provided in a user terminal device. Specifically, a non-transitory computer readable medium which stores a program including a controlling method of a user terminal device may be provided.

[0187] The non-transitory recordable medium refers to a medium which may store data semi-permanently and may be readable by an apparatus. Specifically, the non-transitory readable medium may be CD, DVD, hard disk, Blu-ray disk, USB, memory card, ROM, etc.

[0188] The foregoing embodiments and advantages are merely exemplary and are not to be construed as limiting the present invention. The present teaching can be readily applied to other types of apparatuses. Also, the description of exemplary embodiments of the present inventive concept is intended to be illustrative, and not to limit the scope of the claims, and many alternatives, modifications, and variations will be apparent to those skilled in the art.

What is claimed is:

1. A user terminal device, comprising:

a display configured to be divided into a first area and a second area which is larger than the first area with reference to a folding line;

a detector configured to detect a user interaction; and

a controller configured to, based on an event being received while the user terminal device is being folded, control the display to display information related to an event on an exposure area of the second area, and

based on the information related to the event being touched and the user terminal device being unfolded, control the display to display an application screen related to the event.

2. The user terminal device of claim **1**, wherein the controller is further configured to, based on a message being received from an external device while the user terminal device is being folded, control the display to display information related to the message on the exposure area, and

based on the information related to the message being touched and the user terminal device being unfolded, control the display to display an application screen for providing a response to the message.

3. The user terminal device of claim **2**, wherein the information related to the message includes an indicator indicating that the message is received.

4. The user terminal device of claim **1**, wherein the controller is further configured to,

based on a call reception event being received from an external device while the user terminal device is being folded, control the display to display information related to the call reception event on the exposure area, and

based on the information related to the call reception event being touched, and the user terminal device being unfolded, control the display to display an application screen related to the call reception event.

5. The user terminal device of claim **4**, wherein the information related to the call reception event includes a UI element for accepting or refusing the call reception event.

6. The user terminal device of claim 1, wherein the controller is further configured to display information on the exposure area while the user terminal device is being folded, and

based on the event being received while the information is being displayed on the exposure area, control the display to display information related to the event on the exposure area together with the information.

7. A displaying method of a user terminal device comprising a display configured to be divided into a first area and a second area which is larger than the first area with reference to a folding line, comprising:

based on an event being received while the user terminal device is being folded, displaying information related to the event on an exposure area of the second area; and

based on the information related to the event being touched and the user terminal device being unfolded, displaying an application screen related to the event.

8. The displaying method of claim 7, wherein the displaying of the information related to the event comprises, based on a message being received from an external device while the user terminal device is being folded, displaying information related to the message on the exposure area, and

wherein the displaying of the application screen comprises, based on the information related to the message being touched and the user terminal device being unfolded, displaying an application screen for providing a response to the message.

9. The displaying method of claim 8, wherein the information related to the message includes an indicator indicating that the message is received.

10. The displaying method of claim 7, wherein the displaying of the information related to the event comprises, based on a call reception event being received from an external device while the user terminal device is being folded, displaying information related to the call reception event on the exposure area, and

wherein the displaying of the application screen comprises, based on the information related to the call reception event being touched and the user terminal device being unfolded, displaying an application screen related to the call reception event.

11. The displaying method of claim 10, wherein the information related to the call reception event includes a UI element for accepting or refusing the call reception event.

12. The displaying method of claim 7, further comprising:

displaying information on the exposure area while the user terminal device is being folded,

wherein the displaying of the information related to the event comprises, based on the event being received while information is being displayed on the exposure area, displaying the information related to the event on the exposure area together with the information.

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