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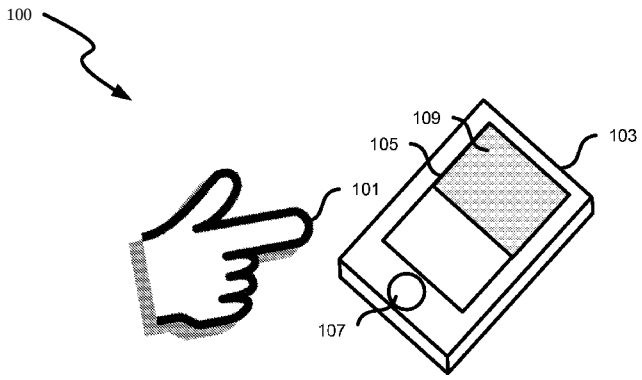

FIG. 1

(57) **Abstract:** Various techniques for gestured-based control of electronic devices are disclosed herein. In one embodiment, a method includes detecting first and second inputs respectively to first and second locations of a detection zone of an input/output device when the electronic device is in a locked mode. The first location is different than the second location. The method also includes determining a gesture that corresponds to both the detected first and second inputs and interpreting the determined gesture as a control signal to a media player on the electronic device. The method further includes controlling the media player based on the interpreted control signal.

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GESTURE-BASED CONTROL OF ELECTRONIC DEVICES

BACKGROUND

[0001] Today's electronic devices are typically multi-functional. For example, a smart phone can include a telephone, a music player, an email reader, a camera, and other functions. A user may access these functions using various buttons, keypads, keyboards, sliders, or other control elements.

SUMMARY

[0002] This Summary is provided to introduce a selection of concepts in a simplified form that are further described below in the Detailed Description. This Summary is not intended to identify key features or essential features of the claimed subject matter, nor is it intended to be used to limit the scope of the claimed subject matter.

[0003] In certain electronic devices, a user may access certain functions even when an electronic device is in a locked mode. For example, a user may start, stop, forward, rewind, or pause a media player on an electronic device by pressing certain soft buttons without unlocking the electronic device. However, the user may need to look at the electronic device to operate these soft buttons; otherwise, the media player may not respond correctly. Thus, the operation may be cumbersome or even unsafe, for example, when the user is driving.

[0004] Several embodiments of the present technology can address at least some of the foregoing drawbacks by detecting gestures in a detection zone on an electronic device and perform control functions according to the detected gestures. The detected gestures can be independent from any soft buttons, sliders, and/or other controls on the electronic device. For example, the electronic device may accept a swipe left, a swipe right, a tap, and/or other gestures to any locations in the detection zone (e.g., top half of a touchscreen). The electronic device may then control a media player, a calendar application, a social media application, a news application, an email application, a text message application, and/or other types of application based on the detected gestures. Thus, control inputs to the electronic device are not limited to only certain small input areas of the electronic device. As a result, a user may not need to look at the electronic device to control functions of the electronic device. Consequently, safety and user friendliness of the electronic device may be improved over conventional devices.

BRIEF DESCRIPTION OF THE DRAWINGS

[0005] Figure 1 is a perspective view of an electronic device configured for gesture-based control in accordance with embodiments of the present technology.

[0006] Figure 2A is a block diagram showing computing components suitable for the electronic device of Figure 1 in accordance with embodiments of the present technology.

[0007] Figure 2B is a block diagram showing software modules suitable for the electronic device of Figure 2A in accordance with embodiments of the present technology.

[0008] Figures 3A-3C are flowcharts illustrating processes of aspects of gesture-based control of electronic devices in accordance with embodiments of the present technology.

[0009] Figures 4A-4D are example locked screens illustrating aspects of gesture-based control of electronic devices in accordance with embodiments of the present technology.

DETAILED DESCRIPTION

[0010] Certain embodiments of systems, devices, components, modules, routines, and processes for gesture-based control of electronic devices are described below. In the following description, example software codes, values, and other specific details are included to provide a thorough understanding of certain embodiments of the present technology. A person skilled in the relevant art will also understand that the technology may have additional embodiments. The technology may also be practiced without several of the details of the embodiments described below with reference to Figures 1-4D.

[0011] Also used herein, the term "gesture" generally refers to a form of non-verbal communication utilizing bodily actions including, for example, movements of a hand, head, finger, or another part of a user's body. An electronic device may detect gestures using, for example, one or more touchscreens, motion sensors, cameras, material deformation sensors, and/or other suitable detectors. Example gestures can include a swipe left, a swipe right, a pull down, a touch, a double touch, and/or another suitable bodily action.

[0012] Also used herein, the term a "locked mode" generally refers to an operational mode under which access to one or more functionalities of an electronic device is restricted. Examples of restricted functionalities can include one or more of application access, system configuration, data entry, system update, and/or other suitable functionalities. A user may be required to perform one or more certain actions in order to receive access to the restricted functionalities. For example, a user may be required to enter a password, use a certain combination of buttons, provide a thumb print, trace a certain pattern, complete a certain gesture, or perform other suitable actions. A user interface displayed when the electronic device is in the locked mode may be generally referred to as a "locked screen". Example locked screens may display interface elements for a time, date, email notification, alarm, and/or other suitable information.

[0013] As described above, certain electronic devices may display locked screens with soft buttons, sliders, or other control elements for forward, rewind, play, pause, or stop of a media player or other applications. As used herein, the term a "control element" generally refers to an interface element configured to accept control inputs to electronic devices. Example control elements can include soft buttons, selectors, sliders, etc. However, to operate such control elements, a user may need to look at the electronic device because input areas associated with the control elements may be limited. For example, a soft button may only have an input area of a small circle. Thus, a cumbersome or even unsafe operating environment may result in many situations, for example, when the user is driving a vehicle.

[0014] Several embodiments of the present technology can address at least some of the foregoing drawbacks by defining a detection zone on a locked screen of an electronic device. The detection zone can be associated with a target application (e.g., a media player) and configured to detect gestures for controlling the application. The detected gestures can be independent from any soft buttons, sliders, and/or other control elements on the electronic device. For example, the electronic device may detect a swipe left, a swipe right, a tap, a hover, and/or other gestures to any locations of the detection zone (e.g., top half of the screen) at the locked screen. The electronic device may then control certain functions of the media player based on the detected gestures. As a result, the user may not need to look at the electronic device to control operations of the electronic device, and thus resulting in improved usability and safety.

[0015] Figure 1 is a perspective view of an electronic device 100 configured for gesture-based control in accordance with embodiments of the present technology. The electronic device 100 can be a mobile phone, a smartphone, a personal data assistant, a tablet computer, a wearable computing or communication device, and/or other suitable computing device. As shown in Figure 1, the electronic device 100 includes a housing 103 carrying an input/output device 105 (e.g., a touchscreen) and a button 107 (e.g., a mechanical, capacitive, or resistive button). In other embodiments, the electronic device 100 can also include a front-facing camera, a rear-facing camera, a microphone, a speaker, an antenna, a keyboard, a processor, a memory, a radio transceiver, and/or other suitable electronic and/or mechanical components (not shown) in addition to or in lieu of the components shown in Figure 1.

[0016] In operation, the electronic device 100 can accept user inputs via the input/output device 105 and/or the button 107 to perform certain functions when the electronic device 100 is in a locked mode. For example, in one embodiment, a user can activate control for a

media player on the electronic device 100 by single or double pressing the button 107. The electronic device 100 can then define a detection zone 109 configured to detect gestures of the user's finger 101. The electronic device 100 can forward, rewind, pause, stop, or otherwise control operations for the media player based on detected gestures. In other embodiments, the user can also activate control to detect gestures for a calendar application, a social media application, a news application, an email application, a text message application, and/or other types of application on the electronic device 100 instead of or in addition to the media player. As discussed in more detail below with reference to Figures 2A and 2B, the electronic device 100 can also include a processor 122 and a memory 123 (both shown in Figure 2A) that contains instructions to facilitate the foregoing gesture-based control of the electronic device 100 and other functions of the electronic device 100.

[0017] Figure 2A is a block diagram showing computing components suitable for the electronic device 100 of Figure 1 in accordance with embodiments of the present technology. In Figure 2A and in other Figures hereinafter, individual software components, modules, and routines may be a computer program, procedure, or process written as source code in C, C++, Java, and/or other suitable programming languages. The computer program, procedure, or process may be compiled into object or machine code and presented for execution by one or more processors of a computing device. Certain implementations of the source, intermediate, and/or object code and associated data may be stored in a computer memory that includes read-only memory, random-access memory, magnetic disk storage media, optical storage media, flash memory devices, and/or other suitable computer readable storage media. As used herein, the term "computer readable storage medium" excludes propagated signals.

[0018] As show in Figure 2A, the electronic device 100 can include a processor 122 and a memory 123 operatively coupled the input/output device 105. The processor 122 can include a microprocessor, a field-programmable gate array, and/or other suitable logic device. The memory 123 can include volatile and/or nonvolatile computer readable storage media (e.g., ROM, RAM, magnetic disk storage media, optical storage media, flash memory devices, EEPROM, and/or other suitable storage media) configured to store data received from, as well as instructions for, the processor 122.

[0019] The processor 122 can be configured to execute instructions of software components stored in the memory 123. For example, as shown in Figure 2A, software components of the processor 122 can include an input component 132, a database component 134, a process component 136, and an output component 138 interconnected

with one another. In other embodiments, the processor 122 may execute instructions of other suitable software components in addition to or in lieu of the foregoing software components.

[0020] In operation, the input component 132 can accept user inputs 154, for example, via the input/output device 105 and/or the button 107 (Figure 1), and communicates the detected user inputs 154 to other components for further processing. The database component 134 organizes records, including control signal records 142, and facilitates storing and retrieving of these records to and from the memory 123. The control signal records 142 may individually include a control function corresponding to a particular gesture included in the user inputs 154. For example, the control signal records 142 can include a forward, rewind, pause, and stop function individually corresponding to a swipe right, swipe left, a single touch, and a pull down for a media player, respectively. Any type of database organization may be utilized, including a flat file system, hierarchical database, relational database, or distributed database. The process component 136 analyzes the user inputs 154 from the input component 132 and/or other data sources to facilitate gesture-based control of certain functions of the electronic device 100. The output component 138 generates output signals 152 based on the analyzed user inputs 154 and optionally other data and transmits the output signals 152 to control the certain functions. Embodiments of the process component 136 are described in more detail below with reference to Figure 2B.

[0021] Figure 2B is a block diagram showing embodiments of the process component 136 in Figure 2A. As shown in Figure 2B, the process component 136 may further include a sensing module 160, an analysis module 162, a control module 164, and a calculation module 166 interconnected with one another. Each of the modules 160, 162, 164, and 166 may be a computer program, procedure, or routine written as source code in a conventional programming language, or one or more modules may be hardware modules.

[0022] The sensing module 160 can be configured to receive the user inputs 154 to a detection zone and convert the user inputs 154 into input parameters of suitable engineering units. For example, the sensing module 160 may convert the user inputs 154 into at least one of a travel distance (i.e., a length of persistent touch), a duration of persistent touch, and/or a direction of movement of the user's finger 101 (Figure 1). In another example, the sensing module 160 may convert the user inputs 154 into an interval of repeated touches and/or other suitable parameters.

[0023] The calculation module 166 may include routines configured to perform certain types of calculations to facilitate operations of other modules. In one example, the calculation module 166 can include a counter that accumulates a number of user inputs 154

that are outside of the detection zone 109 (Figure 1). In another example, the calculation module 166 can include an accumulation routine that calculates a duration of a persistent touch. In yet another example, the calculation module 166 can include a differentiation routine that calculates an acceleration of the user inputs 154 by differentiating the speed with respect to time. In further examples, the calculation module 166 can include linear regression, polynomial regression, interpolation, extrapolation, and/or other suitable subroutines. In further examples, the calculation module 166 can also include counters, timers, and/or other suitable routines.

[0024] The analysis module 162 can be configured to analyze the sensed and/or calculated user inputs 154 to determine one or more corresponding gestures. For example, in one embodiment, the analysis module 162 can compare a travel distance of one of the user inputs 154 to a predetermined threshold. If the travel distance is greater than the predetermined threshold, the analysis module 162 may indicate that the one of the user inputs 154 corresponds to one of a left swipe, a right swipe, a pull down, or another gesture. In further examples, the analysis module 162 may also determine that the user inputs 154 corresponds to a touch, a click, a double click, and/or other suitable types of gesture.

[0025] In certain embodiments, the analysis module 162 can also be configured to analyze data input 150 to determine if an application is currently running on the electronic device 100 (Figure 1). For example, in one embodiment, the analysis module 162 may receive data input 150 indicating that a media player is currently playing a song, an audio book, a video, and/or other suitable media items. The data input 150 may be provided by an operating system of the electronic device 100, or other suitable sources. In further embodiments, the application can include one of a calendar application, a social media application, a news application, an email application, a text message application, or other suitable application.

[0026] In other embodiments, the analysis module 162 may be configured to analyze the data input 150 to determine if a notification is currently displayed via the input/output device 105 (Figure 1). As used herein, a "notification" generally refers to an electronic announcement. Example notifications can include an indication of an incoming email, an incoming text message, a news bulletin, an appointment reminder, an alarm, a task-due reminder, etc. The notification may be displayed in a pop-up window, a banner, or other suitable types of interface element on the input/output device 105.

[0027] In certain embodiments, the control module 164 may be configured to define a detection zone on the input/output device 105 based on analysis results from the analysis module 162. For example, the control module 164 can define a first detection zone that is

one third, one half, two thirds, or other proportions of an input area of the input/output device 105 for the determined application (e.g., a media player). In one embodiment, the control module 164 can also define one or more additional detection zones based on the determined one or more notifications. For example, in response to a determination that an incoming email notification is currently displayed, the control module 164 can define a second detection zone that is spaced apart from, abutting, or partially overlapping with the first detection zone. In another embodiment, the control module 164 may also adjust the first detection zone to accommodate the second detection zone. In further embodiments, the control module 164 may also define a third, fourth, or any other number of additional detection zones.

[0028] In certain embodiments, the control module 164 may re-position, re-shape, or otherwise manipulate the defined detection zone (or additional detection zones) in response to the number of user inputs 154 being outside of the defined detection zone. For example, the control module 164 may move the detection zone up, down, left, or right on the input/output device 105. In another example, the control module 164 may enlarge the detection zone to encompass locations associated with the previous user inputs 154. In further examples, the control module 164 may adjust both the position and the size of the detection zone to encompass locations associated with the previous user inputs 154. In other embodiments, the control module 164 may maintain the position and/or size of all the detection zones.

[0029] In certain embodiments, the control module 164 may also be configured to control operation of the electronic device 100 based on the analysis results from the analysis module 162. For example, in one embodiment, the control module 164 can perform at least one of a forward, rewind, pause, or stop to a media player on the electronic device 100 based on the detected gestures to the first detection zone. In other embodiments, the control module 164 can dismiss, read, reply, scroll, pan, acknowledge, or otherwise respond to a notification based on gestures to additional detection zones. For example, a user may stop an alarm notification by a persistent touch. In another example, the user may dismiss an email notification by a double tap in the detection zone.

[0030] In certain embodiments, if a detected gesture traverses more than one detection zone, the control module 164 may be configured to determine which detection zone the detected gesture is related to based on certain characteristic of the detected gesture. For example, in one embodiment, if the detected gesture has a beginning portion in a first detection zone and an ending portion is a second detection zone, the control module 164

may determine that the gesture is related to the first detection zone, and vice versa. In another embodiment, if the detected gesture has a longer duration of persistent touch in the first detection zone than in a second detection zone, the control module may determine that the gesture is related to the first detection zone, and vice versa. In further embodiments, the control module 164 may perform the determination based on a trajectory length, a direction, and/or other suitable characteristics of the detected gesture. Certain operations of the sensing, calculation, control, and analysis modules 160, 162, 164, and 166 are described in more detail below with reference to Figures 3A-3C.

[0031] Figure 3A is a flowchart showing a process 200 for gesture-based control of an electronic device in a locked mode in accordance with embodiments of the present technology. Even though the process 200 is described below with reference to the electronic device 100 of Figures 1 and the software components/modules of Figures 2A and 2B, the process 200 may also be applied in other systems with additional or different hardware and/or software components.

[0032] As shown in Figure 3A, the process 200 can include determining if a target application is running when the electronic device 100 is in a locked mode at stage 202. The target application can include a media player, a calendar application, a social media application, a news application, an email application, a text message or other communication or messaging application, and/or other types of application. In one embodiment, the target application can be determined by monitoring a current status of an operating system of the electronic device 100. In another embodiment, the application can be identified by receiving an indication from the application via an application programming interface or other suitable type of interface.

[0033] At stage 204, if the target application is not running, the process reverts to stage 202. In response to a determination that the target application is currently running, the process 200 proceeds to defining a detection zone without requiring unlocking the electronic device 100 at stage 206. The detection zone may be defined on, for example, the input/output device 105 (Figure 1) of the electronic device 100. In one embodiment, the detection zone can include a portion of an input area of the input/output device 105. The detection zone can be configured to detect user inputs of a finger, a stylus, a hand, or other suitable sources. For example, the detection zone can include a top, bottom, left, or right one third, one half, or other suitable portion of the input area. In another embodiment, the detection zone can include the entire input area. In further embodiments, the detection zone may include a volume of space proximate the electronic device 100. Several embodiments of defining the

detection zone under particular operating conditions are described in more detail below with reference to Figures 3B and 3C.

[0034] The process 200 can then include detecting user inputs to the detection zone when the electronic device 100 is in a locked mode at stage 208. In one embodiment, detecting user inputs can include detecting swipes, pull downs, or other gestures of the user's finger 101 (Figure 1) to any locations of the detection zone, not limited to only certain small input areas of the electronic device 100. Thus, user inputs detected at different locations of the detection zone may correspond to the same gesture and control function, as described in more detail below with reference to Figure 4A. User inputs outside of the detection zone may be ignored or optionally counted. As described in more detail below with Figure 3C, the optionally counted outside user inputs may be used to adjust a position and/or size of the detection zone. In another embodiment, detecting user inputs can include detecting a position or movement of the user's hand, arm, head, or whole body in the volume of space proximate the electronic device 100 using, for example, a camera. In further embodiments, the user inputs can be detected using a motion sensor or other suitable detectors.

[0035] Based on the detected user inputs, the process 200 can include determining a control signal associated with the application at stage 210. In one embodiment, determining the control signal can include determining gestures corresponding to the user inputs and correlating the gestures to the control signal based on, for example, the control signal records 142 in the memory 123 (Figure 1). For example, if the detected user inputs represent a persistent touch from left to right of the detection zone, the user inputs may be determined to be corresponding to a swipe right. The process 200 may then include correlating a swipe right to a forward, rewind, pause, or stop for a media player. In other examples, the process 200 may include correlating a swipe right to other suitable functions for other applications.

[0036] The process 200 can then include controlling the application based on the determined control signal at stage 212. For example, in response to a swipe right, a media player may be forwarded to skip a track. In another example, in response to a swipe left, a media player may rewind to a previous track. In yet another example, in response to a pull down, a media player may pause or stop. In further examples, in response to other gestures, a media player or other suitable applications may be otherwise suitably controlled.

[0037] Figure 3B is a flowchart illustrating embodiments of a process 206 for defining the detection zone in accordance with embodiments of the present technology. As shown in Figure 3B, the process 206 includes determining if a notification is present at stage 220. At stage 222, if a notification is not present, the process reverts to stage 220 to continue

monitoring for a notification. In response to a notification being present, the process 206 proceeds to defining one or more additional detection zones at stage 224. In one embodiment, the additional detection zones may be defined to correspond to individual notification, notification type, or an application associated with a notification. In other embodiments, additional detection zones may be defined in other suitable manners.

[0038] Optionally, the process 206 can also include modifying existing detection zone at stage 226. For example, the electronic device 100 (Figure 1) may include a first detection zone for a media player, and a second detection zone for a notification (e.g., an incoming email). The previously defined first detection zone for the media player may be adjusted to accommodate the second detection zone. For instance, at least one of a size, shape, orientation, or other characteristics of the first detection zone may be adjusted. In other embodiments, modifying the existing detection zone may be omitted.

[0039] Figure 3C is another flowchart illustrating embodiments of a process 206 for defining a detection zone in accordance with embodiments of the present technology. As shown in Figure 3C, the process 206 includes determining a number of user inputs outside of the detection zone at stage 230. In one embodiment, user inputs are outside of the detection zone when no portion of the user inputs overlap with the detection zone. In another embodiment, user inputs are outside of the detection zone if a duration of persistent touch inside the detection zone is less than a threshold. In other embodiments, user inputs may be deemed outside of the detection zone based on other suitable criteria.

[0040] At stage 232, if the number of user inputs outside of the detection zone does not exceed a threshold, the process reverts to stage 230. In response to the number of user inputs exceeds the threshold, the process proceeds to modifying the existing detection zone at stage 234. In one embodiment, the existing detection zone may be re-positioned to be proximate at least some of the locations associated with the user inputs. In other embodiments, the existing detection zone may be enlarged to encompass all the locations associated with the user inputs. In further embodiments, the existing detection zone may be enlarged, for example, to encompass the entire screen of the input/output device 105. In further embodiments, the existing detection zone may be resized, reshaped, and/or otherwise adjusted.

[0041] Figures 4A-4D are example locked screens illustrating aspects of gesture-based control of electronic devices in accordance with embodiments of the present technology. As shown in Figure 4A, the locked screen 400 can include music information 402 for a media player, time and date 406, and a prompt 408 for unlocking the electronic device 100 (Figure

1). As discussed above, after determining that the media player is currently running, the electronic device 100 can define a detection zone 405 as marked by the dash line 403 for the media player.

[0042] The electronic device 100 can then detect user inputs to any locations in the detection zone 405, not being limited to small input areas of the electronic device 100. For example, as shown in Figure 4A, a first detected user input can correspond to a right swipe 404a at a first location 407a. A second detected user input can correspond to another right swipe 404b at a second location 407b. As shown in Figure 4A, the first and second locations 407a and 407b are spaced apart from each other. However, in response to the detected first and second right swipes 404a and 404b, the electronic device 100 may perform the same function (e.g., forward a track) related to the media player.

[0043] In certain embodiments, as shown in Figure 4B, while the media player is still running, the electronic device 100 may display a notification 410 (e.g., an email). As shown in Figure 4C, in response to the notification, the electronic device 100 may define an additional detection zone 407 adjacent the existing detection zone 405 (delineated by the double-dashed lines). In certain embodiments, the existing detection zone 405 may be adjusted, for example, by resizing or reshaping. In other embodiments, the existing detection zone 405 may remain unchanged. The electronic device 100 may then receive additional user inputs to the existing and/or additional detection zones 405 and 407. For example, the additional user inputs may include a double tap to dismiss the notification 410. In response, as shown in Figure 4D, the additional detection zone 407 (Figure 4C) may be eliminated, and the existing detection zone 405 may return to the original configuration.

[0044] Specific embodiments of the technology have been described above for purposes of illustration. However, various modifications may be made without deviating from the foregoing disclosure. In addition, many of the elements of one embodiment may be combined with other embodiments in addition to or in lieu of the elements of the other embodiments. Accordingly, the technology is not limited except as by the appended claims.

CLAIMS

1. A method performed by a processor of an electronic device having an input/output device coupled to the processor, the method comprising:

detecting first and second inputs to first and second locations of a detection zone of the input/output device, respectively, when the electronic device is in a locked mode, the first location being different than the second location;

determining a gesture that corresponds to both the detected first and second inputs;

interpreting the determined gesture as a control signal to a media player on the electronic device; and

controlling the media player based on the interpreted control signal.

2. The method of claim 1, further comprising:

determining if the media player is currently running on the electronic device; and

in response to the media player currently running on the electronic device, defining the detection zone of the input/output device for detecting the first and second inputs when the electronic device is in the locked mode.

3. The method of claim 1, further comprising:

determining if the media player is currently running on the electronic device; and

in response to the media player currently running on the electronic device, defining the detection zone for detecting the first and second inputs when the electronic device is in the locked mode, the defined detection zone including a portion of an input area of the input/output device.

4. The method of claim 1, further comprising:

determining if the media player is currently running on the electronic device; and

in response to the media player currently running on the electronic device, defining the detection zone for detecting the first and second inputs when the electronic device is in the locked mode, the defined detection zone includes substantially an entire screen area of the input/output device.

5. The method of claim 1 wherein the detection zone is a first detection zone, and wherein the method further includes:

determining if a notification is currently displayed on the input/output device; and

in response to a notification being currently displayed on the input/output device, defining a second detection zone for detecting a third input related to the displayed notification when the electronic device is in the locked mode.

6. The method of claim 1 wherein:

the detection zone is a first detection zone;

the gesture is a first gesture;

the control signal is a first control signal; and

the method further includes:

determining if a notification is currently displayed on the input/output device; and

in response to a notification being currently displayed on the input/output device,

defining a second detection zone, the second detection zone being separate from the first detection zone;

detecting a third input to the second detection zone;

determining a second gesture corresponding to the detected third input;

interpreting the determined second gesture as a second control signal to an application related to the displayed notification; and

controlling the application related to the displayed notification based on the interpreted control signal.

7. The method of claim 1 wherein:

the detection zone is a first detection zone;

the gesture is a first gesture;

the control signal is a first control signal; and

the method further includes:

determining if a notification is currently displayed on the input/output device; and

in response to a notification being currently displayed on the input/output device,

determining an application related to the displayed notification;

defining a second detection zone, the second detection zone being separate from the first detection zone;

detecting a third input to the second detection zone;

determining a second gesture corresponding to the detected second input;

interpreting the determined second gesture as a second control signal to an application related to the displayed notification; and

controlling the determined application based on the interpreted second control signal.

8. The method of claim 7 wherein the application is a calendar application, a social media application, a news application, an email application, or a text message application.

9. The method of claim 1, further comprising:

determining if the media player is currently running on the electronic device; and

in response to the media player not currently running on the electronic device, dynamically adjusting the detection zone when the electronic device is in the locked mode.

10. An electronic device, comprising a processor and an input/output device operatively coupled to the processor, the processor is configured to perform a process according to one of claims 1-9.

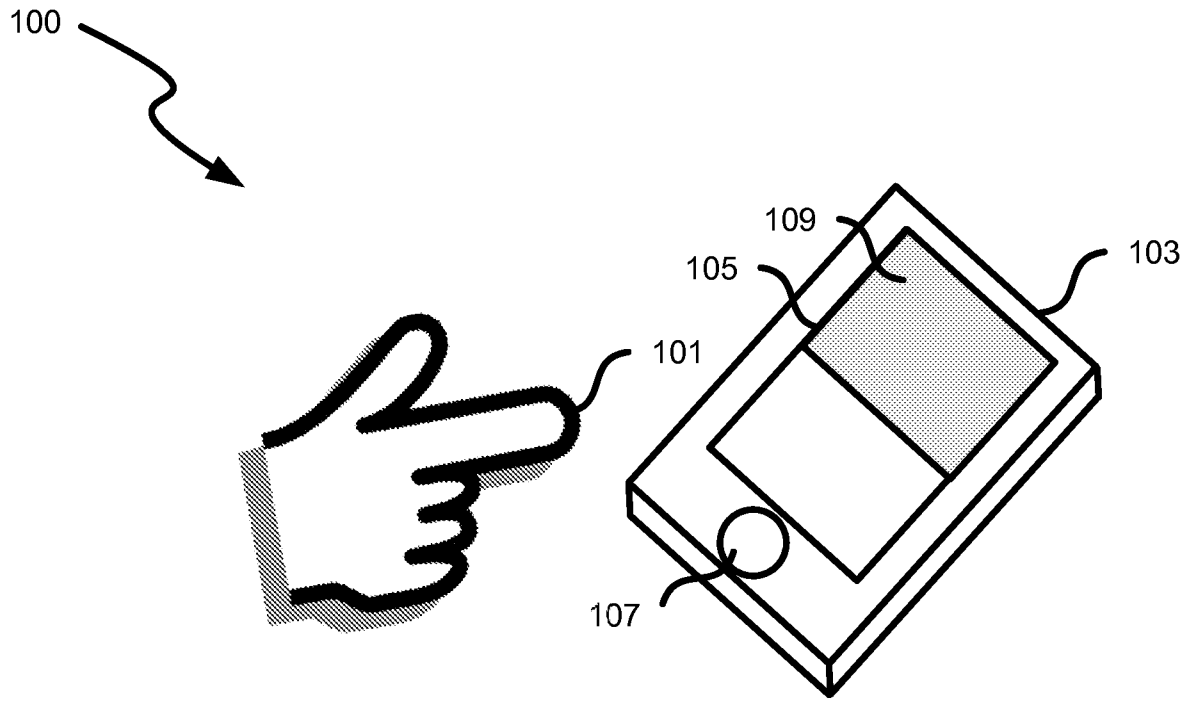

FIG. 1

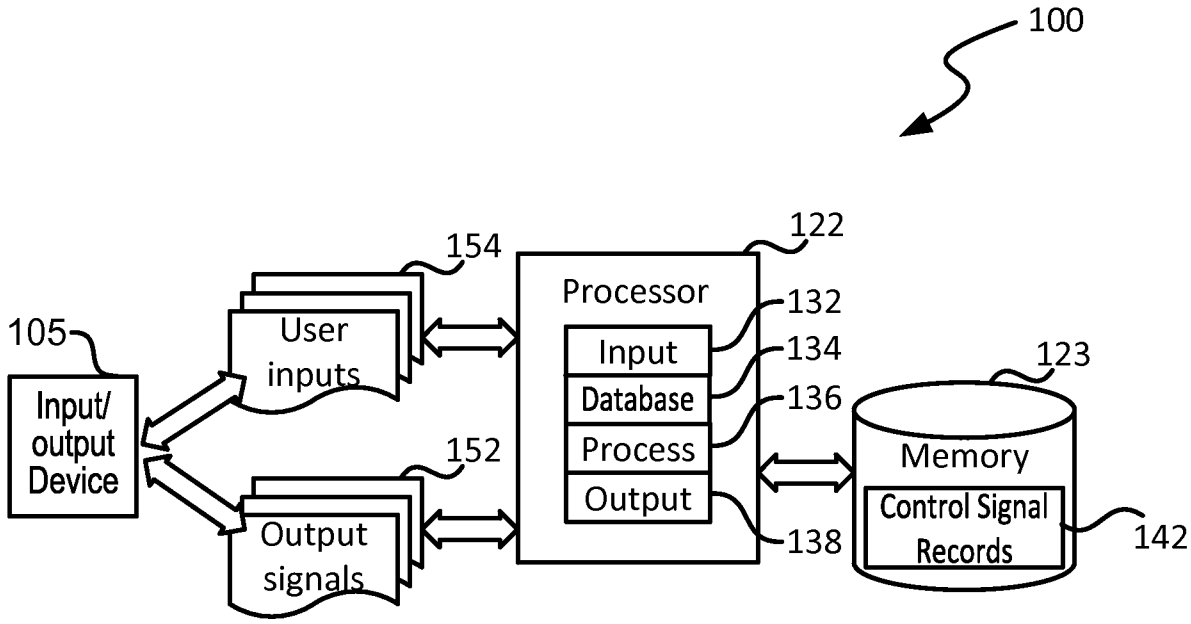
100
154
122
Processor
132
105
User inputs
Input
134
123
Input/ output Device
Database
136
Process
Memory
152
Output signals
Output
Control Signal Records
142
138

FIG. 2A

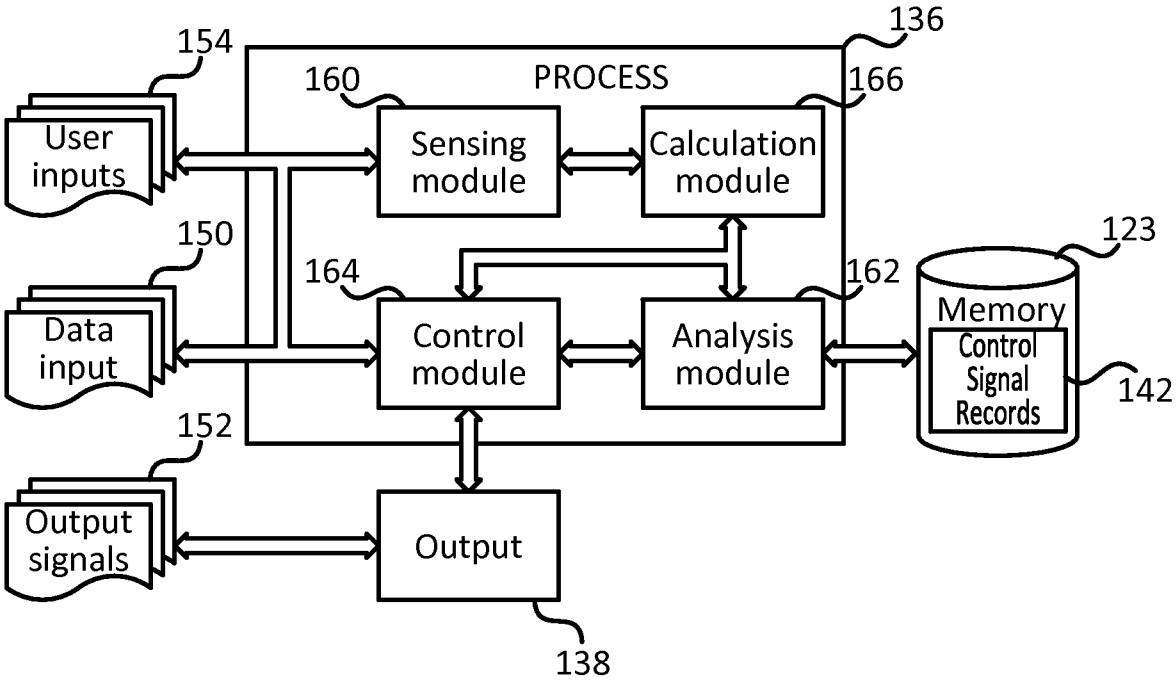
136
154
160
PROCESS
166
User inputs
Sensing module
Calculation module
150
123
164
162
Data input
Control module
Analysis module
Memory
Control Signal Records
142
152
Output signals
Output
138

FIG. 2B

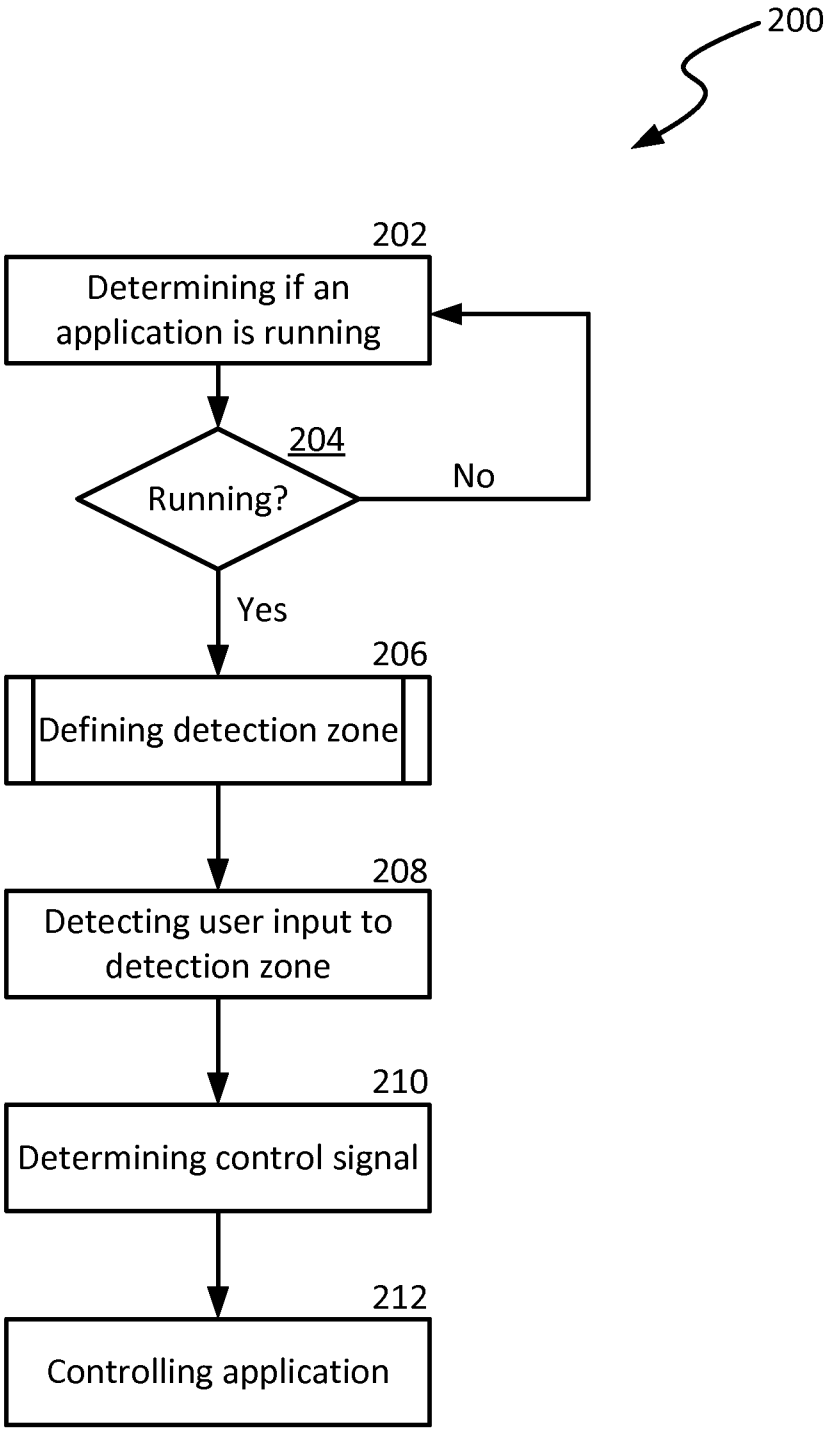
200
202
Determining if an application is running
204
Running?
No
Yes
206
Defining detection zone
208
Detecting user input to detection zone
210
Determining control signal
212
Controlling application

FIG. 3A

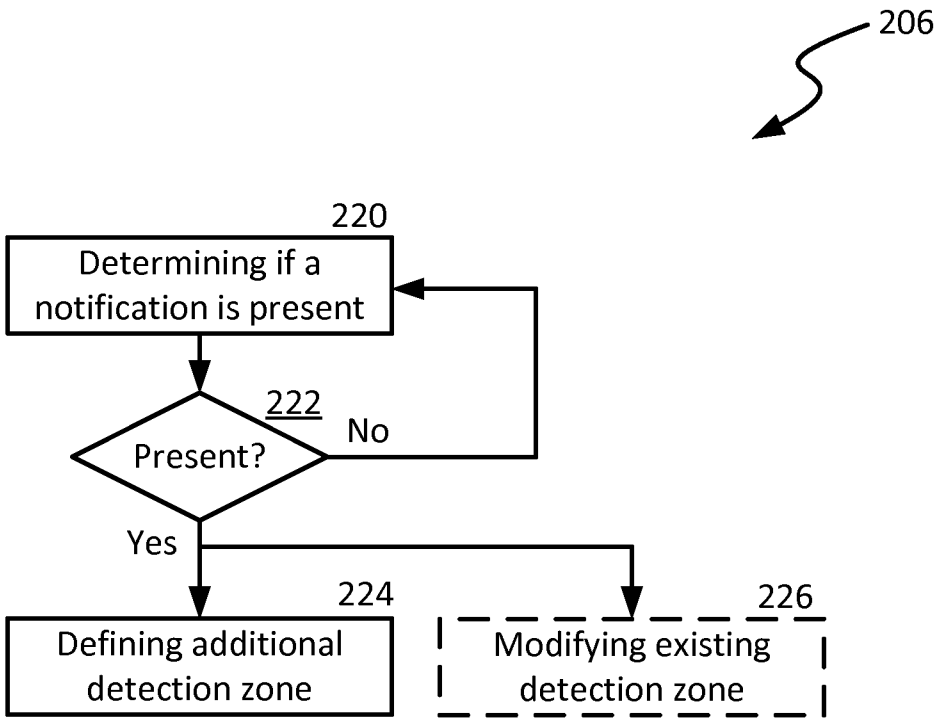
206
220
Determining if a notification is present
222
Present?
No
Yes
224
Defining additional detection zone
226
Modifying existing detection zone

FIG. 3B

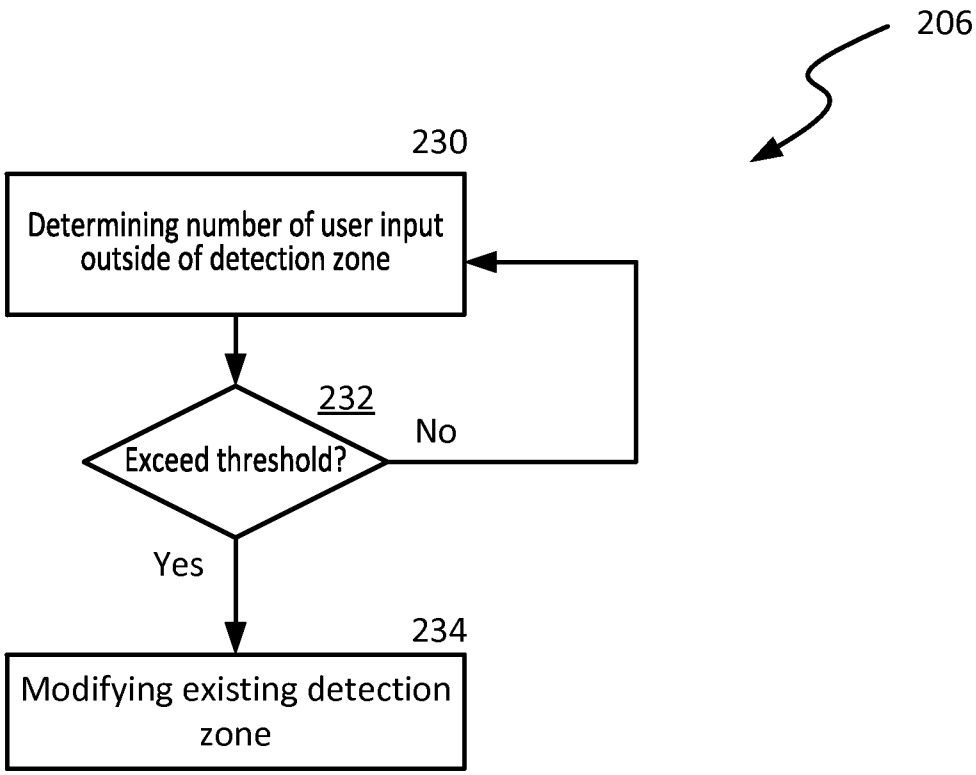
206
230
Determining number of user input outside of detection zone
232
Exceed threshold?
No
Yes
234
Modifying existing detection zone

FIG. 3C

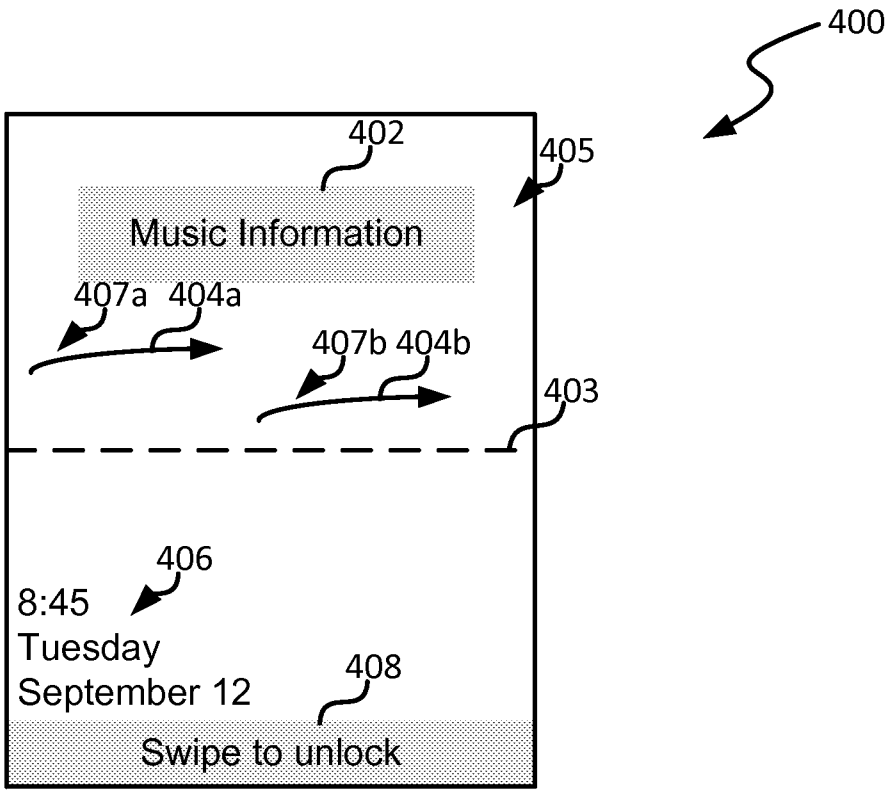
400
402
405
Music Information
407a
404a
407b
404b
403
406
8:45
Tuesday
September 12
408
Swipe to unlock

FIG. 4A

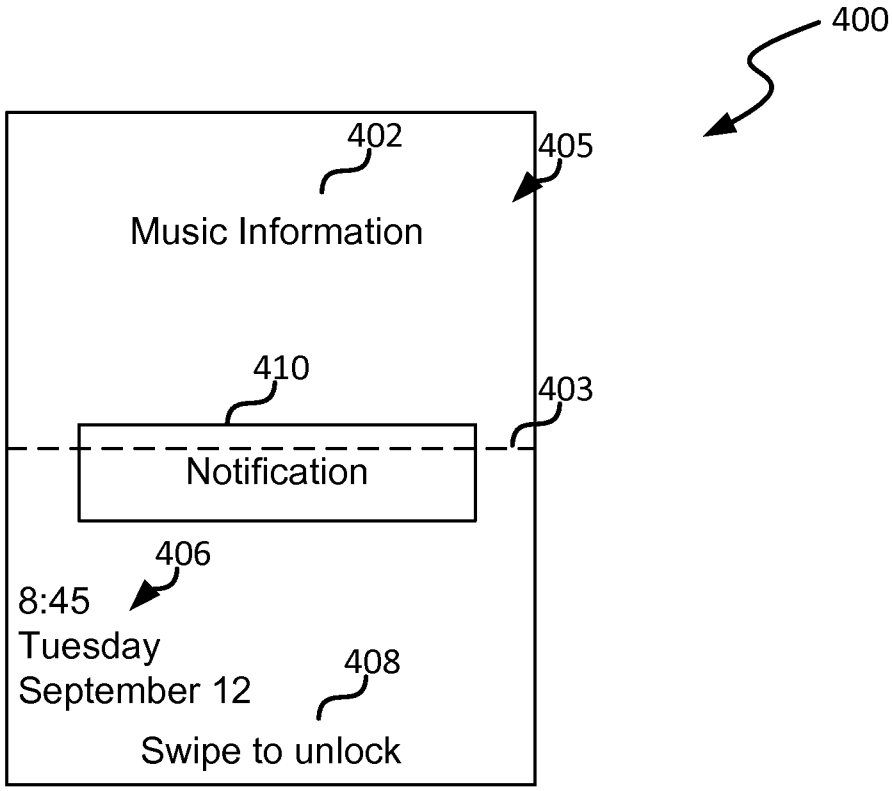
400
402
405
Music Information
410
403
Notification
406
8:45
Tuesday
September 12
408
Swipe to unlock

FIG. 4B

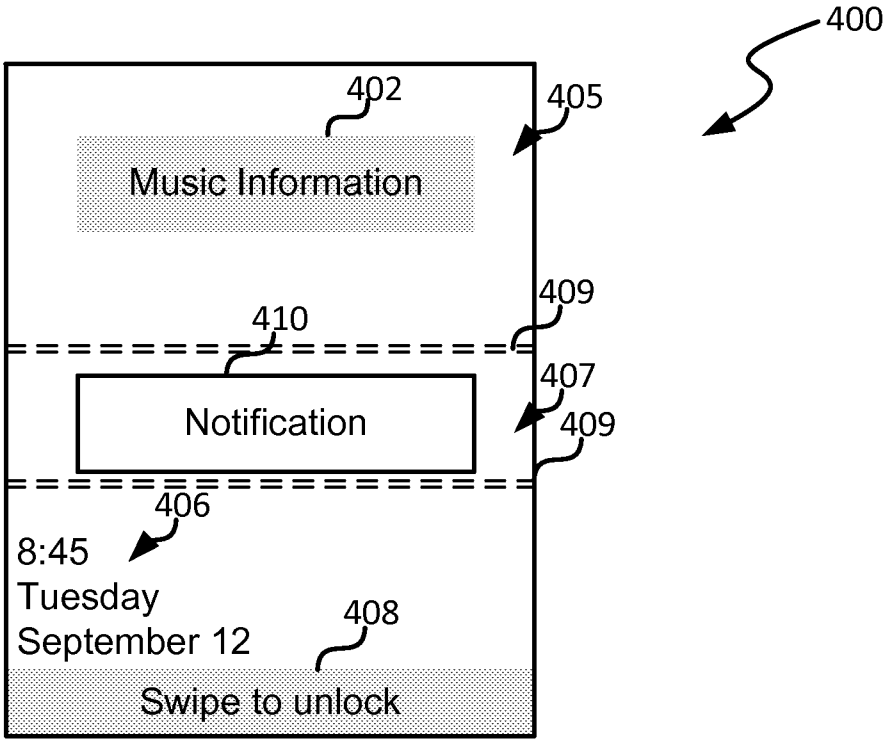
400
402
405
Music Information
409
410
407
Notification
409
406
8:45
Tuesday
September 12
408
Swipe to unlock

FIG. 4C

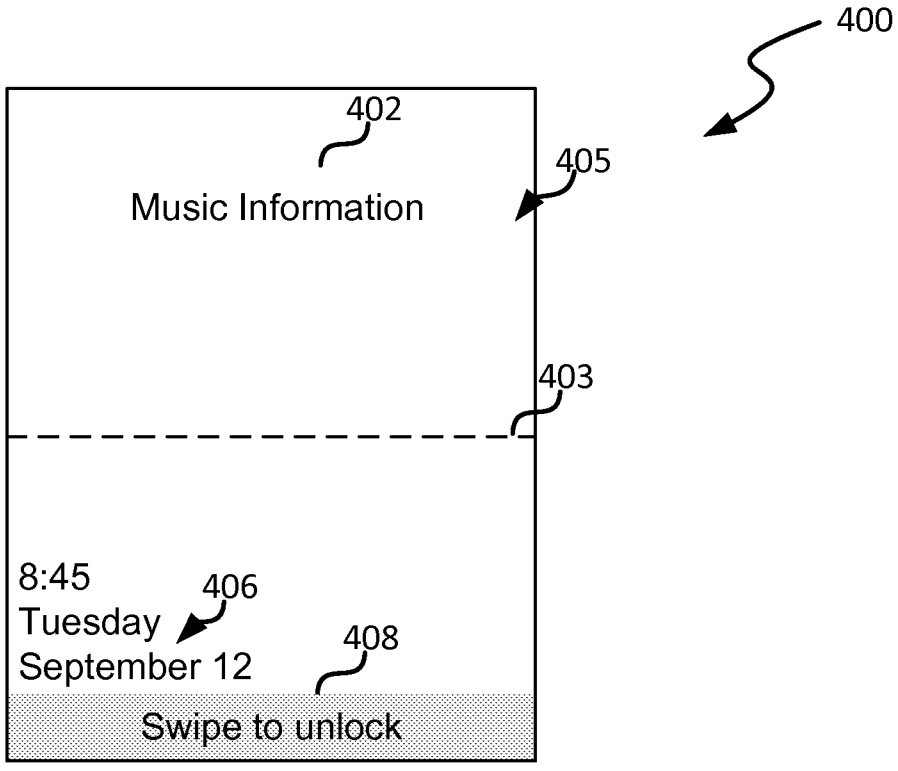
400
402
405
Music Information
403
8:45
406
Tuesday
September 12
408
Swipe to unlock

FIG. 4D

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2014/046775

A. CLASSIFICATION OF SUBJECT MATTER
INV. G06F3/0488
ADD. G06F21/36

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
G06F H04M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal , WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2010/060586 Al (PISULA CHARLES J [US] ET AL) 11 March 2010 (2010-03-11) paragraph [0024] - paragraph [0025] paragraph [0159] paragraph [0179] - paragraph [0181] paragraph [0207] paragraph [0216] f i gure 4Z	1-10
X	US 2011/163972 Al (ANZURES FREDDY ALLEN [US] ET AL) 7 July 2011 (2011-07-07)	1-3 , 10
A	paragraph [0189] - paragraph [0201]	4-9
X	US 2012/233571 Al (WEVER PASCAL [US] ET AL) 13 September 2012 (2012-09-13)	1-3 , 10
A	paragraph [0005] paragraph [0039] - paragraph [0041] paragraph [0045] - paragraph [0051]	4-9

-/- ·

[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
22 October 2014	30/10/2014

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Bedari da, Al essandro

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INTERNATIONAL SEARCH REPORT

International application No
PCT/US2014/046775

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2010/162169 A1 (SKARP ARI-PEKKA [FI]) 24 June 2010 (2010-06-24)	1-3,10
A	paragraph [0022] - paragraph [0032]	4-9

1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2014/046775

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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US 2011163972 A1	07-07-2011	NONE	
US 2012233571 A1	13-09-2012	CN 103649892 A	19-03-2014
		EP 2684115 A1	15-01-2014
		TW 201239764 A	01-10-2012
		US 2012233571 A1	13-09-2012
		WO 2012120416 A1	13-09-2012
US 2010162169 A1	24-06-2010	TW 201027418 A	16-07-2010
		US 2010162169 A1	24-06-2010
		WO 2010072886 A1	01-07-2010