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(12) **United States Patent**
**Sirpal et al.**

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(45) **Date of Patent: *Apr. 23, 2019**

(54) **MAX MODE**

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(72) Inventors: **Sanjiv Sirpal**, Oakville (CA); **Mohammed Selim**, Oakville (CA); **Paul E. Reeves**, Oakville (CA); **Chris Tyghe**, Oakville (CA); **Alexander de Paz**, Burlington (CA); **Paul Webber**, San Diego, CA (US); **Rodney W. Schrock**, San Diego, CA (US); **Brett B. Faulk**, Cypress, TX (US)

(73) Assignee: **Z124**, George Town (KY)

( * ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **15/960,289**

(22) Filed: **Apr. 23, 2018**

(65) **Prior Publication Data**

US 2018/0246620 A1 Aug. 30, 2018

**Related U.S. Application Data**

(63) Continuation of application No. 14/679,746, filed on Apr. 6, 2015, now Pat. No. 9,952,743, which is a (Continued)

(51) **Int. Cl.**
***G06F 1/16*** (2006.01)
***G06F 3/14*** (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC ..... ***G06F 3/0481*** (2013.01); ***G06F 1/1616*** (2013.01); ***G06F 1/1641*** (2013.01); ***G06F 1/1647*** (2013.01); ***G06F 1/1694*** (2013.01); ***G06F 3/0482*** (2013.01); ***G06F 3/0483*** (2013.01); ***G06F 3/04817*** (2013.01);
(Continued)

(58) **Field of Classification Search**
CPC .... G06F 1/1616; G06F 1/1641; G06F 3/0483; G06F 3/04883; G06F 3/1423; G06F 1/1605; G06F 1/1618; G06F 1/1643; G06F 2203/04803
See application file for complete search history.

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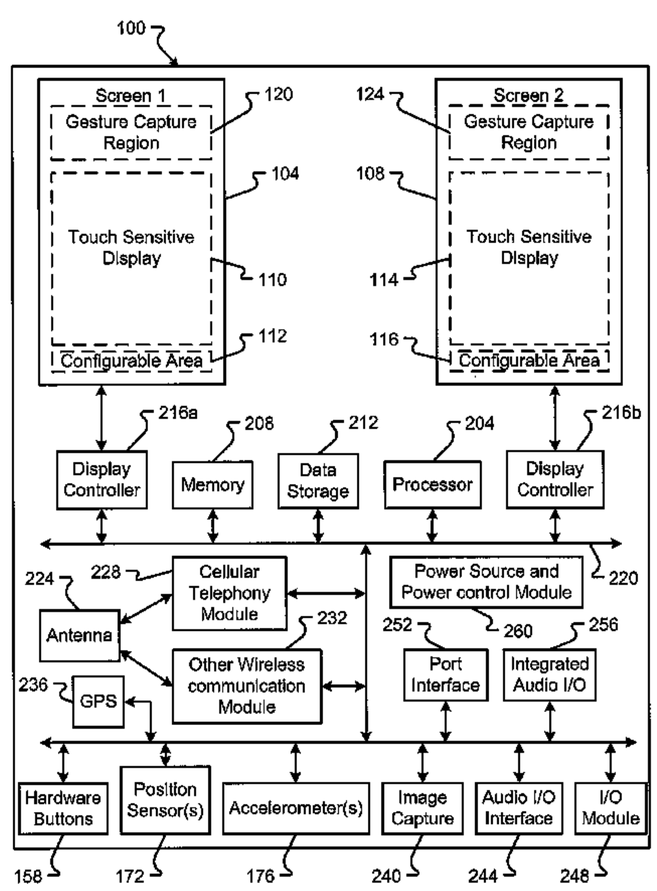
*Primary Examiner* — Haixia Du
(74) *Attorney, Agent, or Firm* — Sheridan Ross P.C.

(57) **ABSTRACT**

A smartpad is provided that has various display modes.

**17 Claims, 76 Drawing Sheets**



**Related U.S. Application Data**

continuation of application No. 13/627,577, filed on Sep. 26, 2012, now Pat. No. 9,001,149, which is a continuation-in-part of application No. 13/247,581, filed on Sep. 28, 2011, now Pat. No. 8,659,565.

(60) Provisional application No. 61/389,000, filed on Oct. 1, 2010, provisional application No. 61/389,117, filed on Oct. 1, 2010, provisional application No. 61/389,087, filed on Oct. 1, 2010, provisional application No. 61/458,150, filed on Nov. 17, 2010, provisional application No. 61/539,884, filed on Sep. 27, 2011.

(51) **Int. Cl.**

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| ***G09G 5/14*** | (2006.01) |
| ***G06F 3/0481*** | (2013.01) |
| ***G06F 3/0482*** | (2013.01) |
| ***G06F 3/0483*** | (2013.01) |
| ***G06F 3/0484*** | (2013.01) |
| ***G06F 3/0488*** | (2013.01) |

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

CPC ..... ***G06F 3/04842*** (2013.01); ***G06F 3/04847*** (2013.01); ***G06F 3/04883*** (2013.01); ***G06F 3/04886*** (2013.01); ***G06F 3/14*** (2013.01); ***G06F 3/1446*** (2013.01); *G06F 3/1423* (2013.01); *G06F 2200/1637* (2013.01); *G06F 2203/04803* (2013.01); *G09G 5/14* (2013.01); *G09G 2340/0492* (2013.01)

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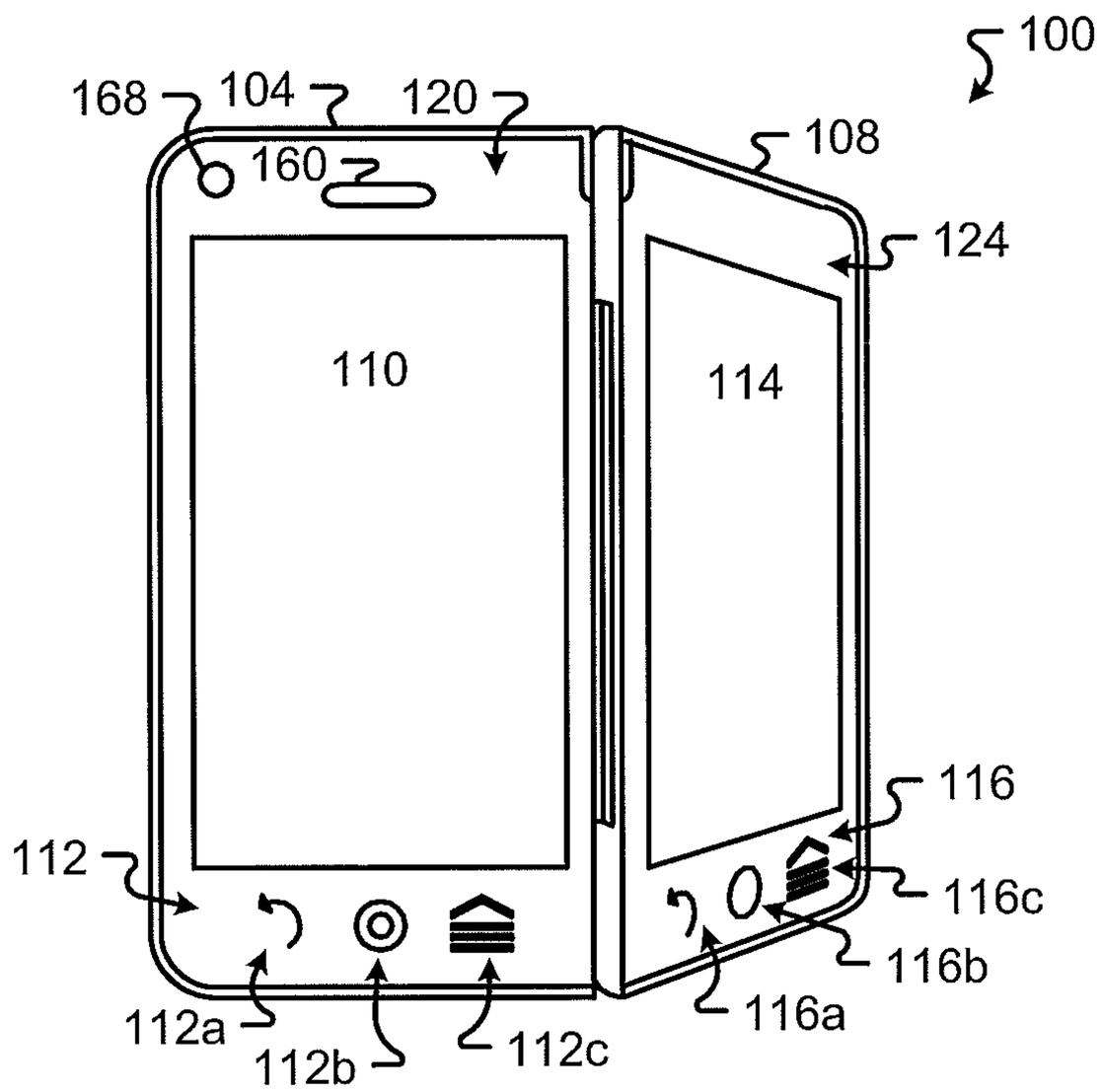
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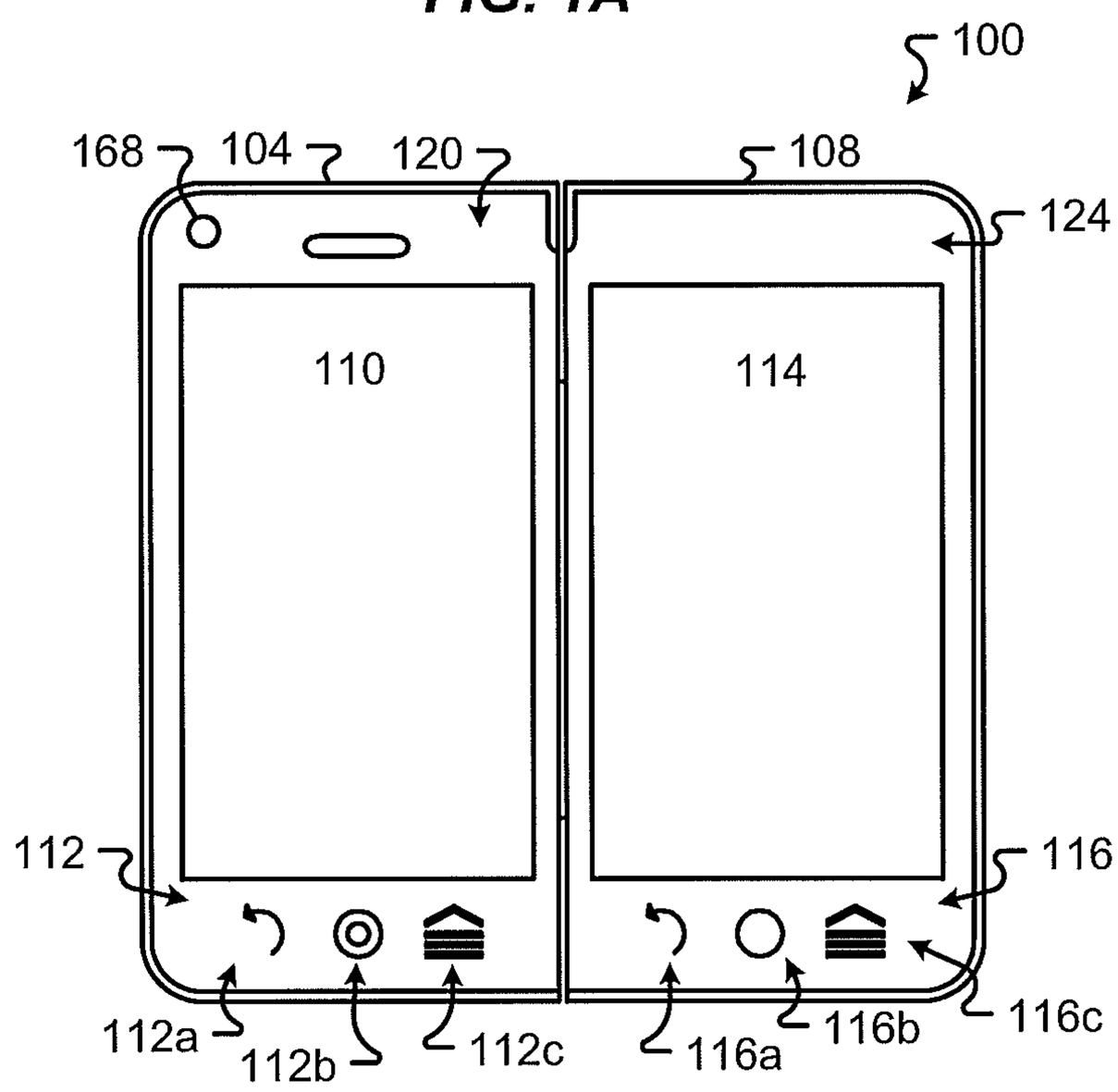
FIG. 1A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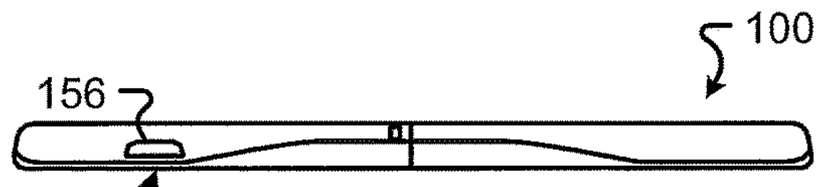



FIG. 1F

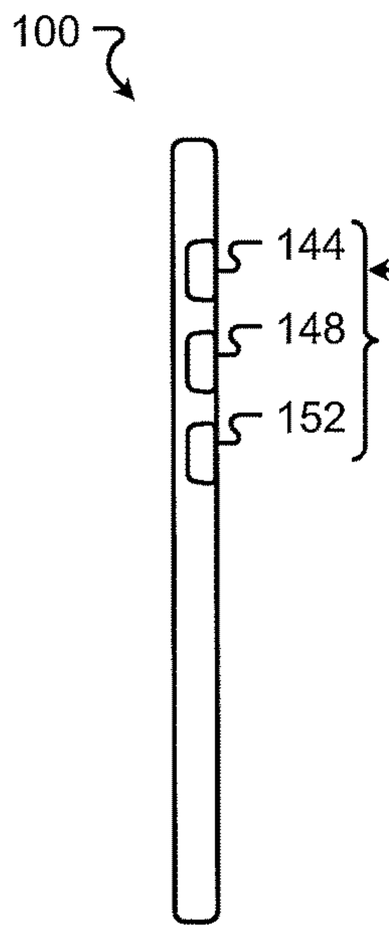



FIG. 1E

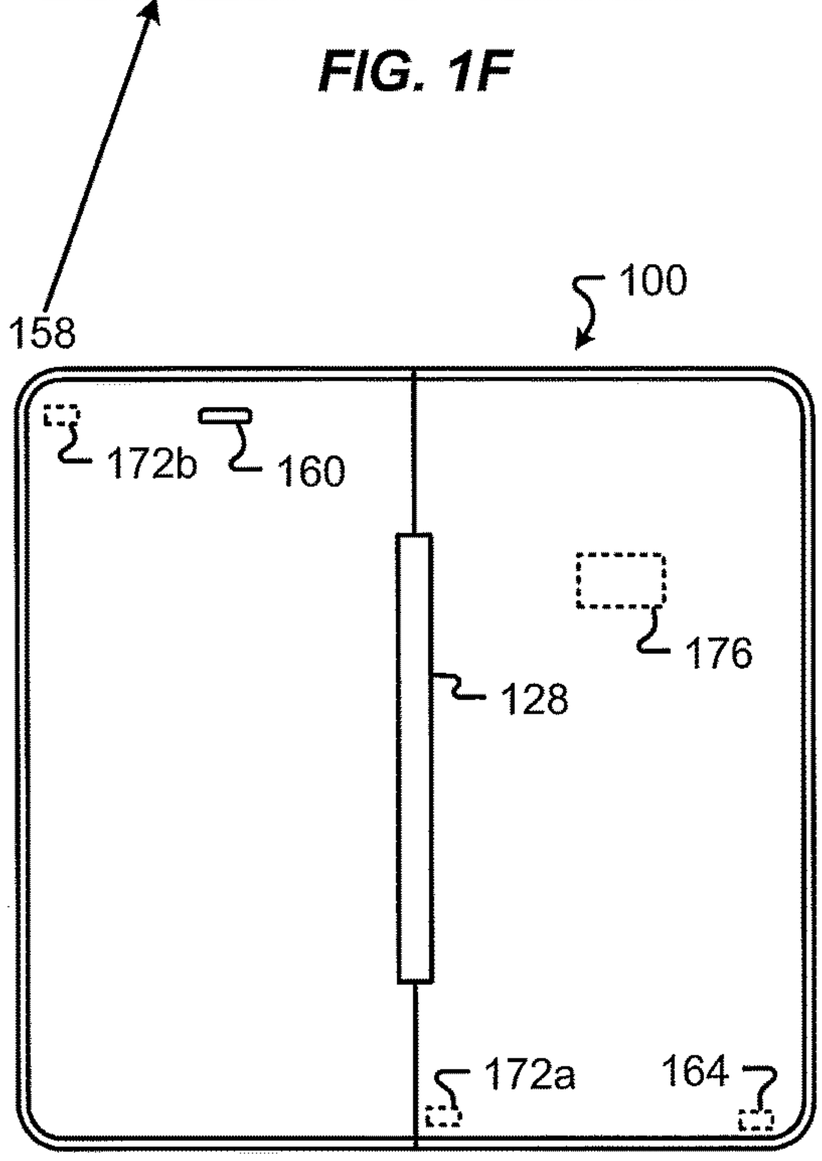



FIG. 1C

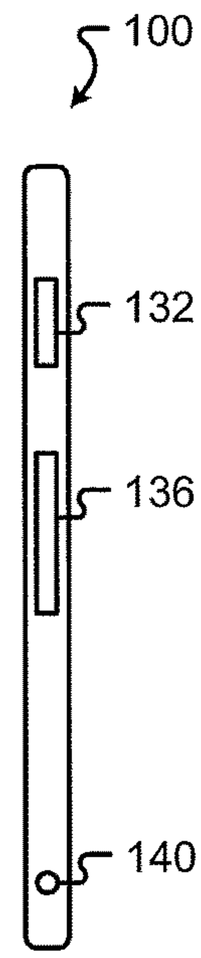



FIG. 1D

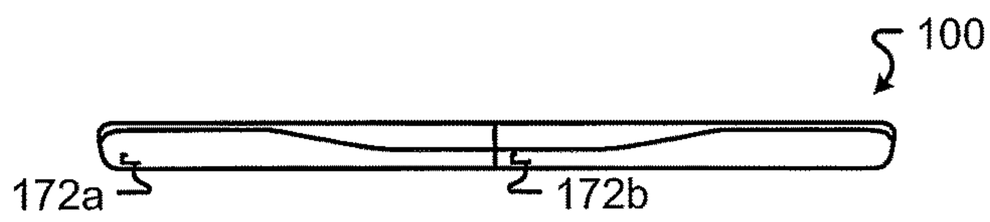



FIG. 1G

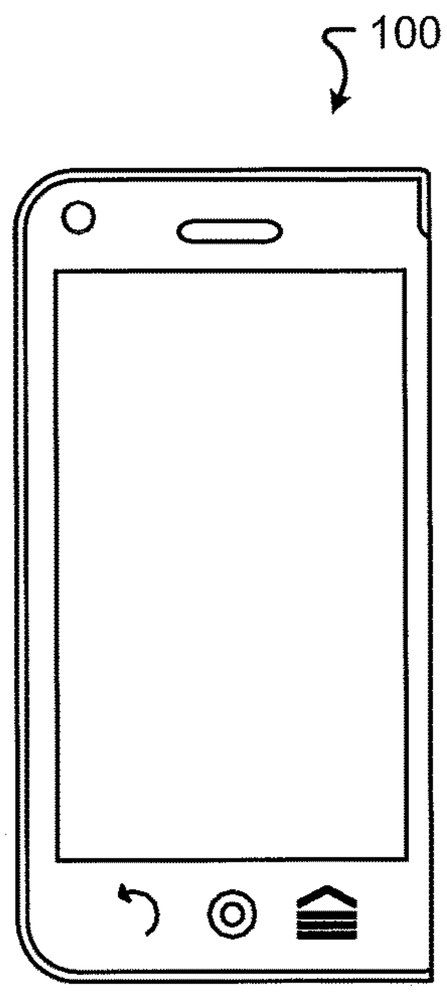



FIG. 1H

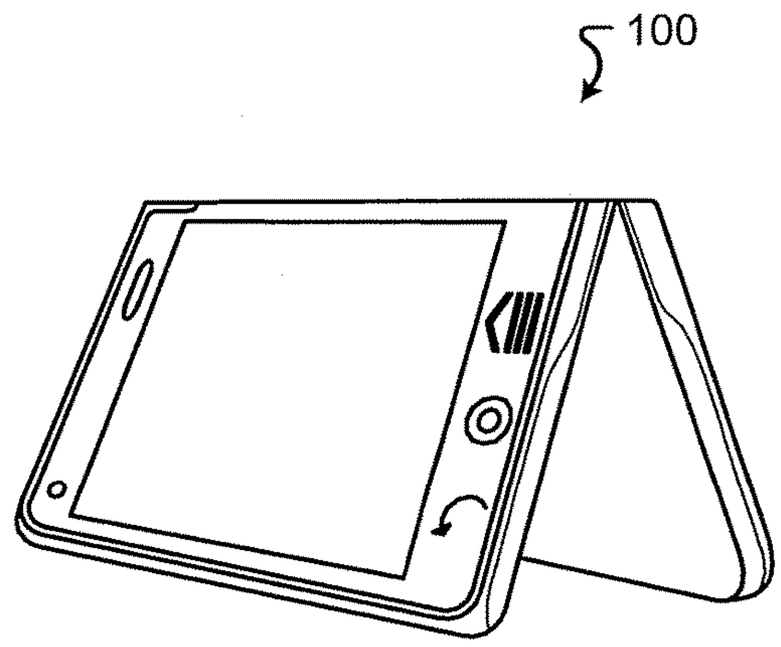



FIG. 1I

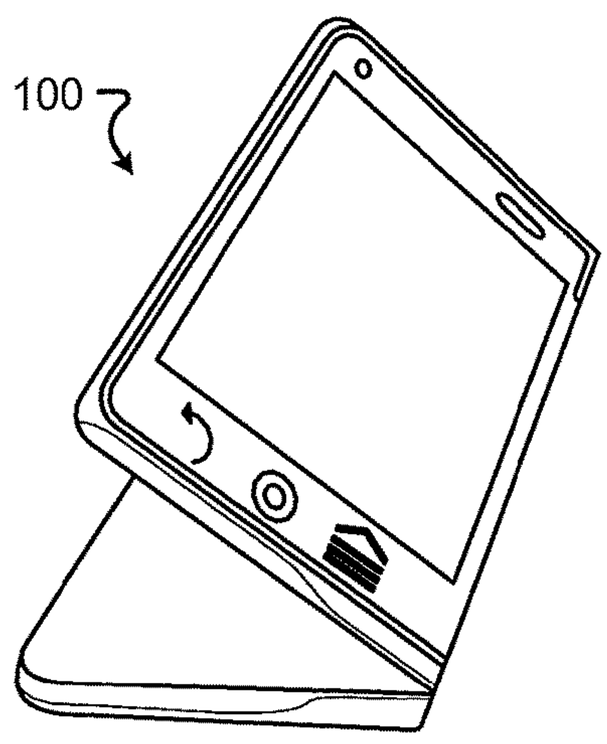
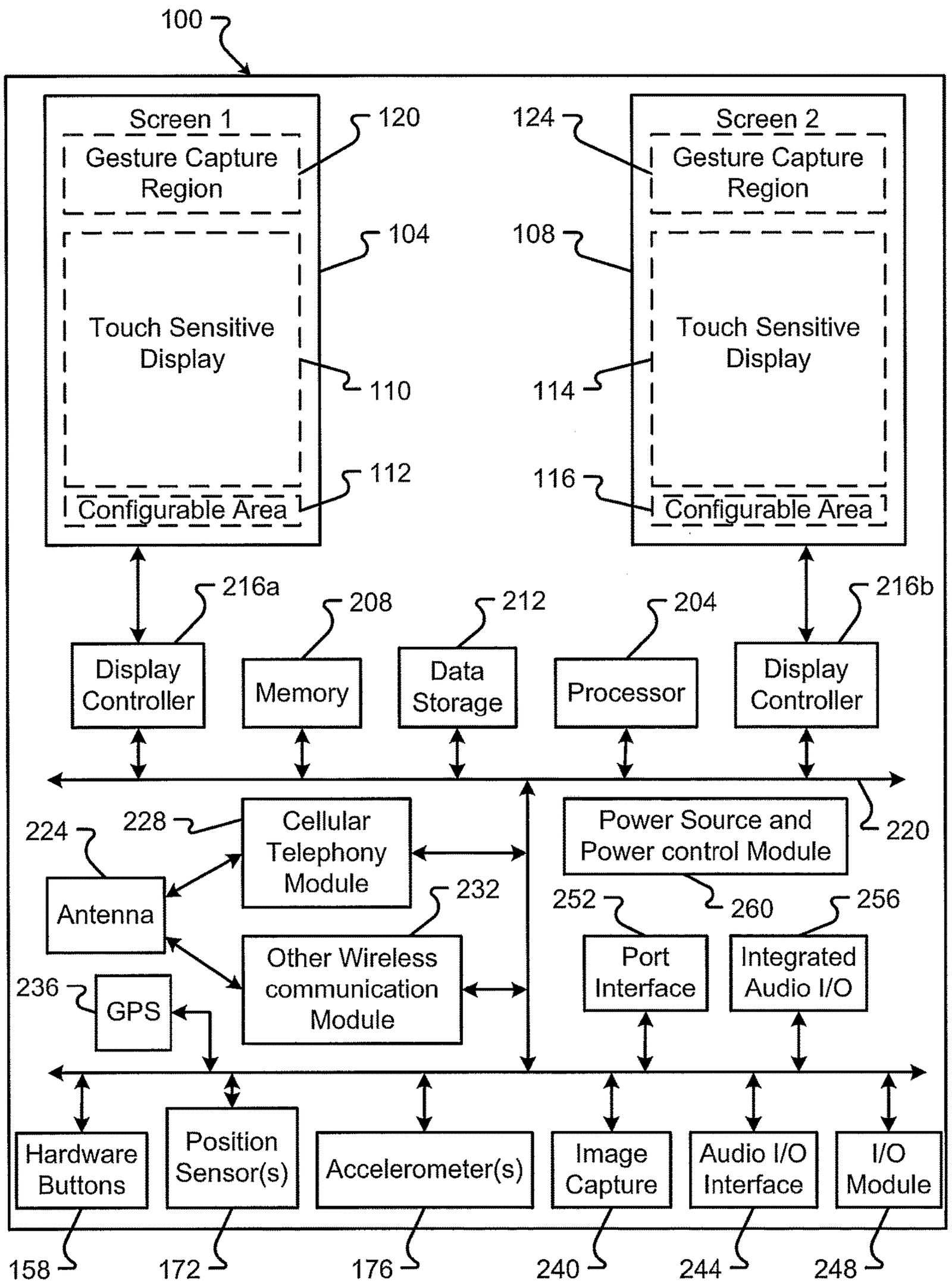



FIG. 1J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120
Touch Sensitive Display
104
110
112
Configurable Area
124
Screen 2
Gesture Capture Region
108
Touch Sensitive Display
114
116
Configurable Area
216a
208
212
204
216b
Display Controller
Memory
Data Storage
Processor
Display Controller
220
224
228
Cellular Telephony Module
Power Source and Power control Module
Antenna
232
252
260
256
Other Wireless communication Module
Port Interface
Integrated Audio I/O
236
GPS
Hardware Buttons
Position Sensor(s)
Accelerometer(s)
Image Capture
Audio I/O Interface
I/O Module
158
172
176
240
244
248

*FIG. 2*

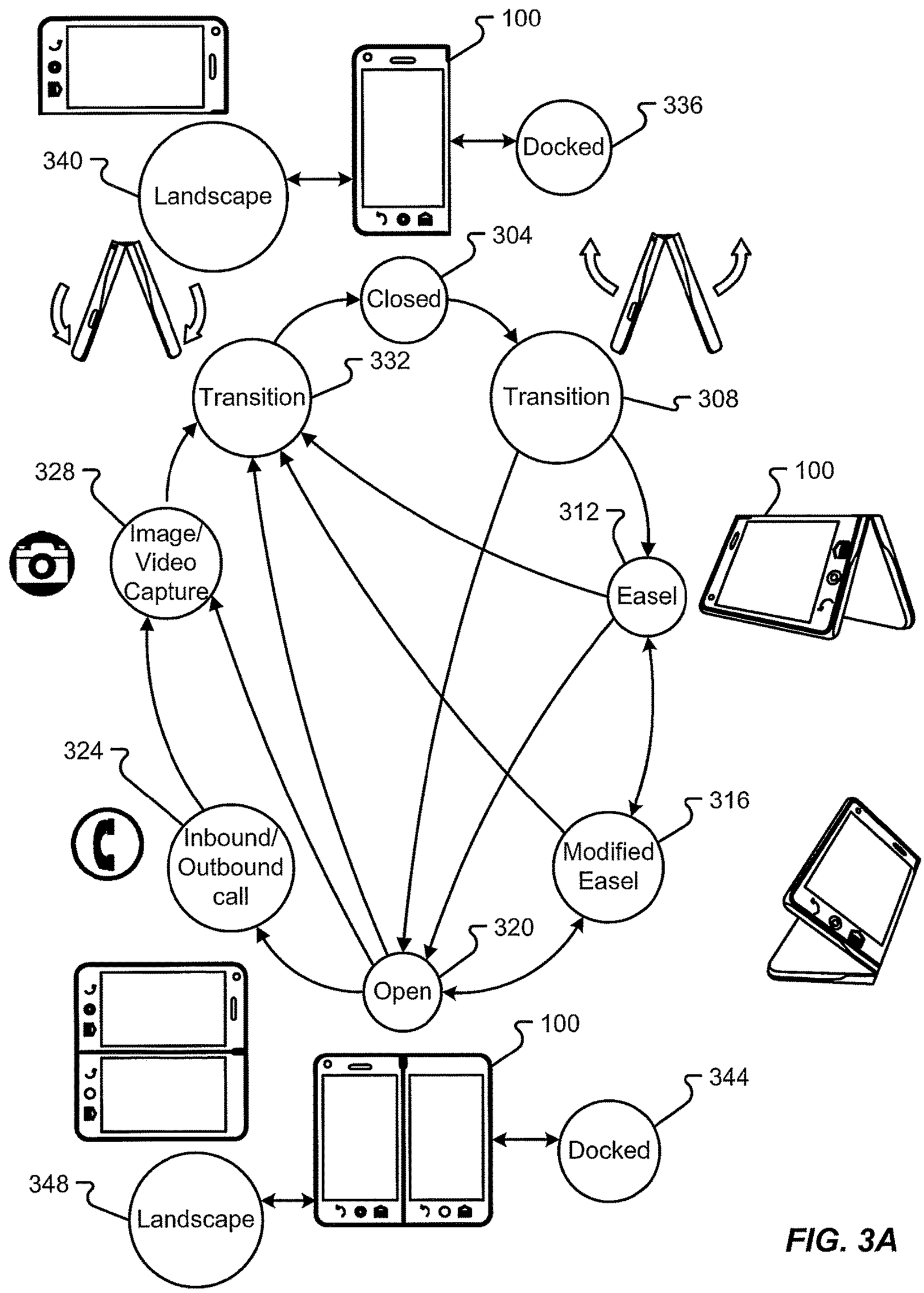

100
336
Docked
340
Landscape
304
Closed
332
Transition
Transition
308
328
Image/
Video
Capture
312
Easel
100
324
Inbound/
Outbound
call
316
Modified
Easel
320
Open
100
344
Docked
348
Landscape

FIG. 3A

| | PORTRAIT | | | | | | LANDSCAPE | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | OPEN | CLOSED | EASEL | MODIFIED EASEL | PHONE | IMAGE / VIDEO | OPEN | CLOSED | EASEL | MODIFIED EASEL | PHONE | IMAGE / VIDEO |
| PORTRAIT OPEN | X | HT | HT | HT | P | I | AT | HAT | **HAT** | HAT | P | I |
| PORTRAIT CLOSED | HT | X | HAT | HAT | P | I | HAT | AT | HAT | HAT | P | I |
| PORTRAIT EASEL | HT | HT | X | X | P | I | HAT | HAT | HAT | HAT | P | I |
| PORTRAIT PHONE | HT | X | HT | HT | X | I | HAT | HAT | HAT | HAT | X | I |
| PORTRAIT IMAGE / VIDEO | HT | HT | HT | X | P | X | HAT | HAT | HAT | HAT | X | HAT |
| | | | | | | | | | | | | |
| LANDSCAPE OPEN | AT | HAT | HAT | HAT | P | I | X | HT | HAT | HAT | P | I |
| LANDSCAPE CLOSED | HAT | AT | HAT | HAT | P | I | HT | X | HAT | HAT | P | I |
| LANDSCAPE EASEL | HAT | HAT | HAT | HAT | P | I | HT | HT | X | HAT | P | I |
| LANDSCAPE MODIFIED EASEL | HAT | HAT | HAT | HAT | P | I | HT | HT | HAT | X | P | I |
| LANDSCAPE IMAGE / VIDEO | HAT | HAT | HAT | HAT | HAT | AT | HT | HT | HT | HAT | P | X |
| | | | | | | | | | | | | |
| DOCKED | DOCKING SIGNAL | | | | | | | | | | | |

356 352 376 360 368 364 372

Key:
H - Hall Effect Sensor(s)
a - accelerometer(s)
T- Timer
P – communications Trigger
I – Image / Video capture Request

FIG. 3B

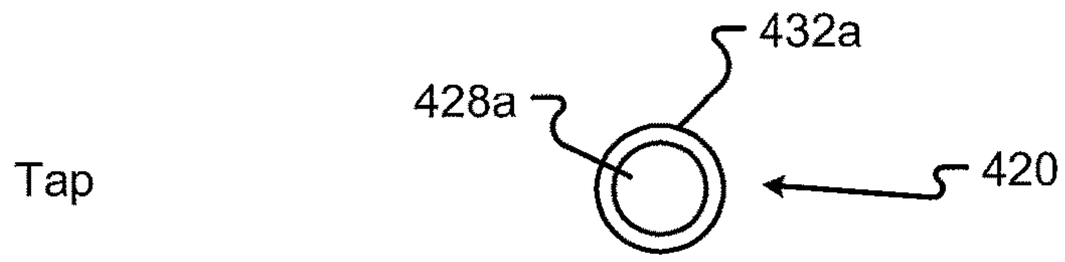



FIG. 4A

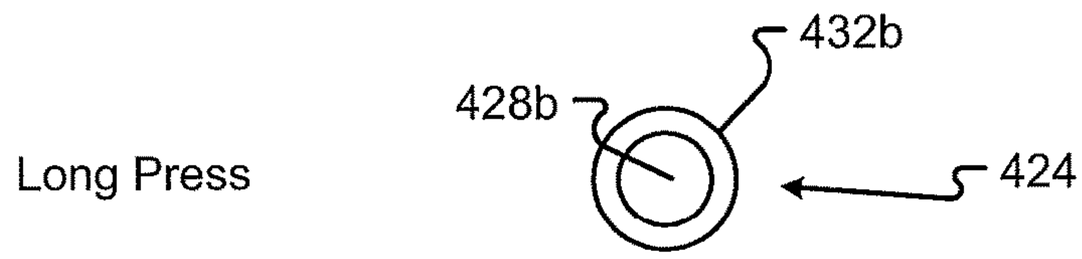



FIG. 4B

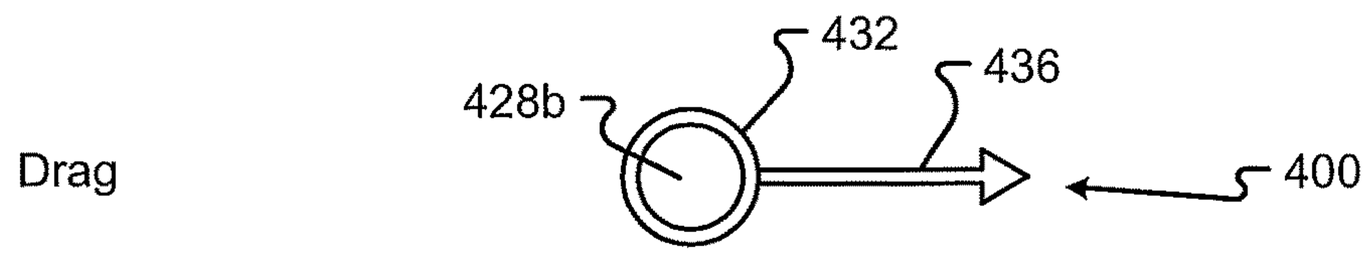



FIG. 4C

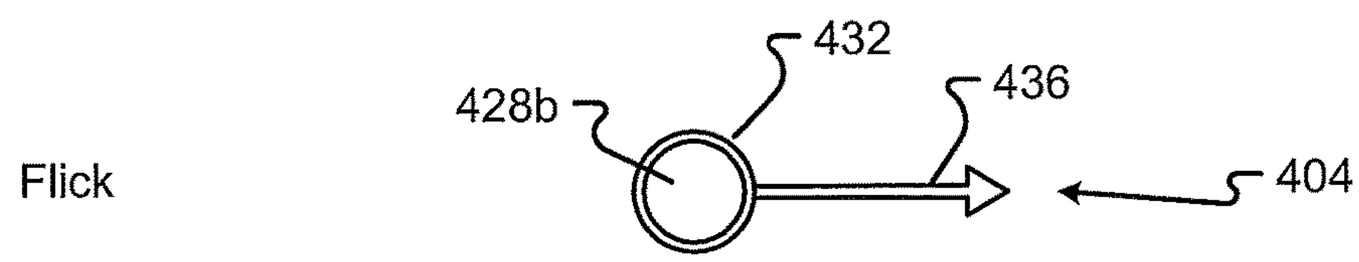



FIG. 4D

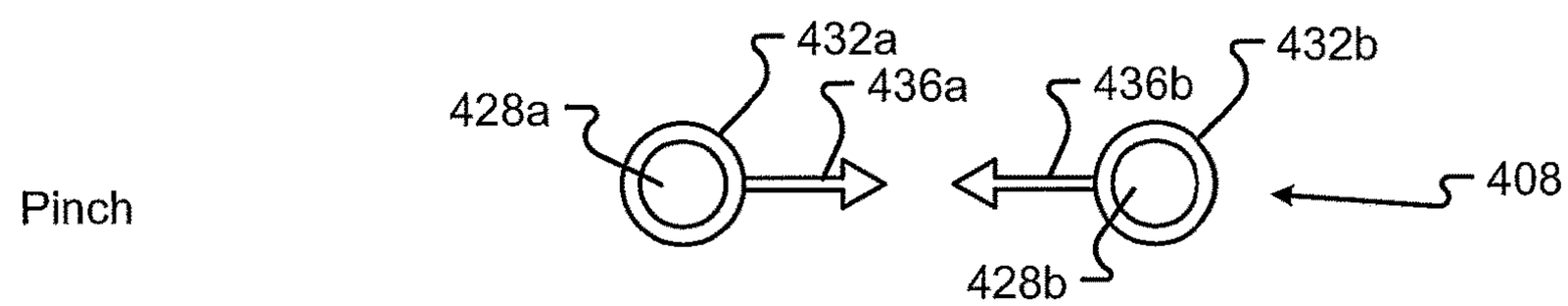



FIG. 4E

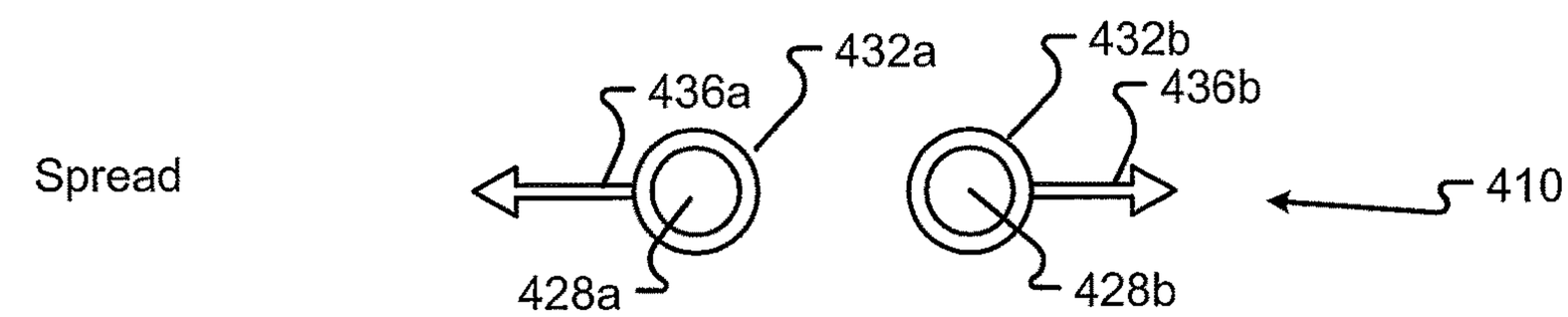



FIG. 4F

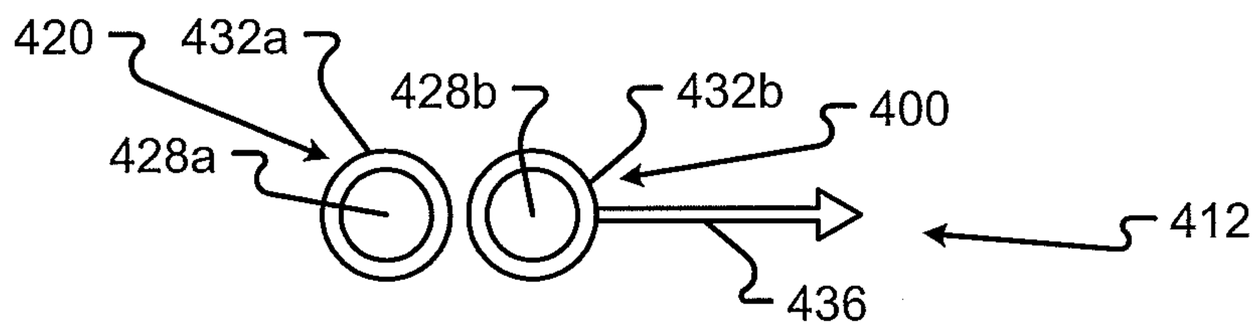

420
432a
428b
432b
400
428a
412
436

FIG. 4G

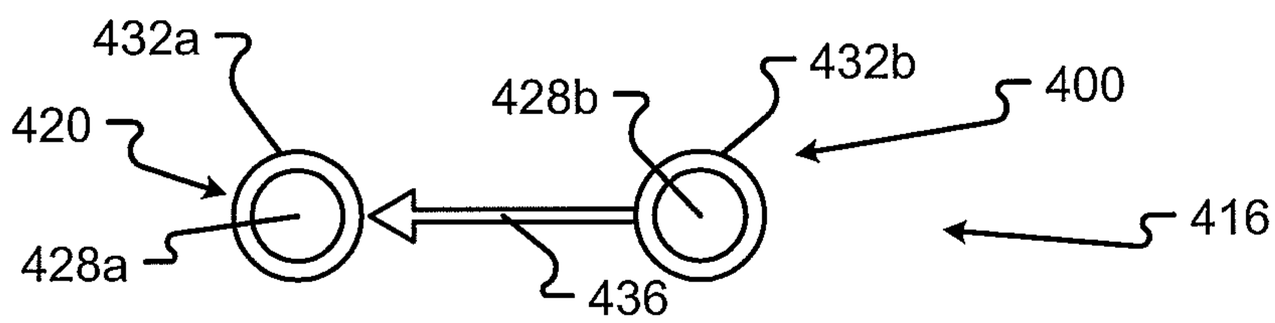

432a
432b
400
428b
420
416
428a
436

FIG. 4H

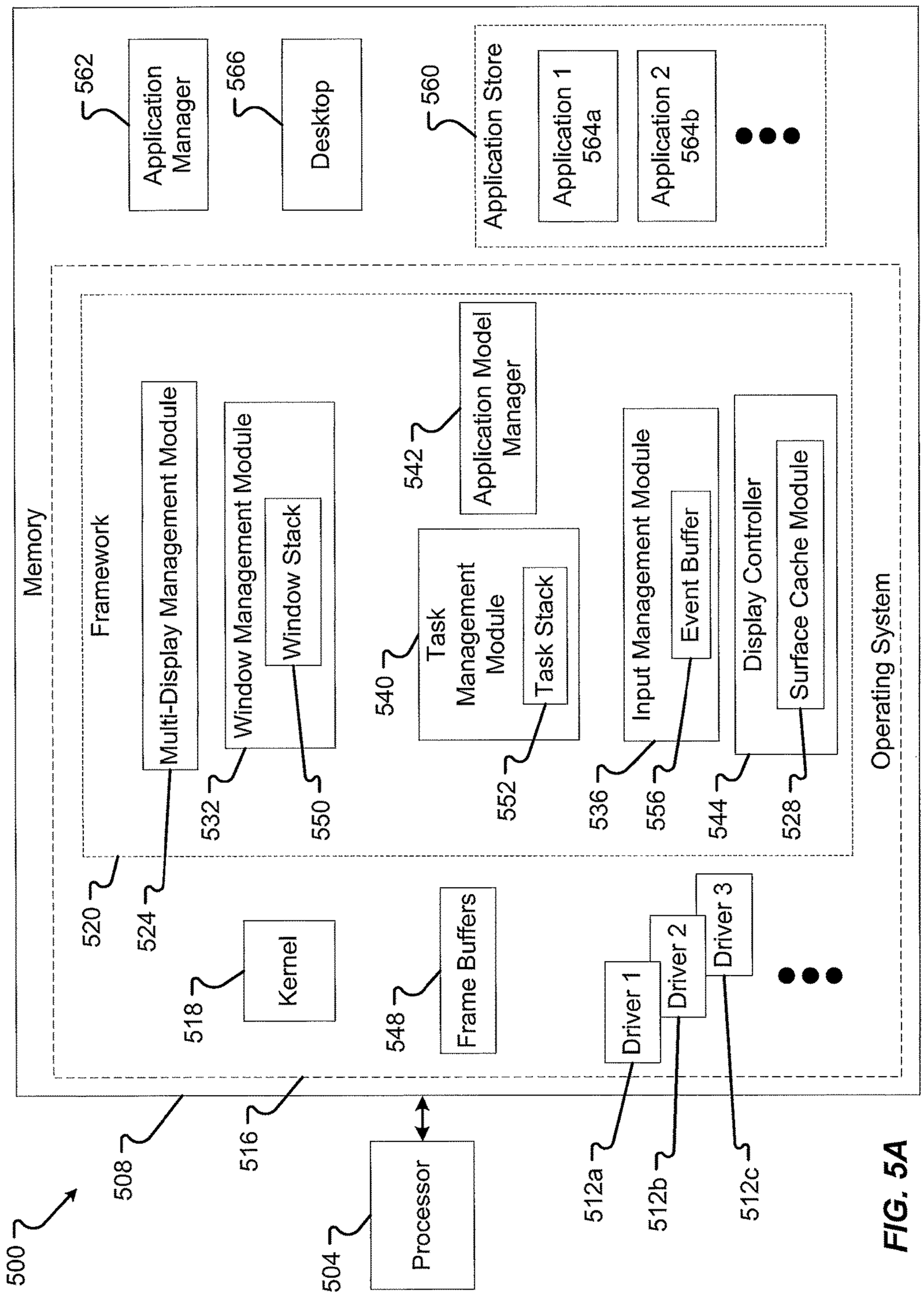

Memory
Application Manager
562
Desktop
566
Application Store
560
Application 1
564a
Application 2
564b
Framework
Multi-Display Management Module
Window Management Module
Window Stack
Application Model Manager
542
Task Management Module
Task Stack
540
Input Management Module
Event Buffer
Display Controller
Surface Cache Module
Operating System
520
524
532
550
552
536
556
544
528
Kernel
518
Frame Buffers
548
Driver 1
Driver 2
Driver 3
500
508
516
504
Processor
512a
512b
512c

FIG. 5A

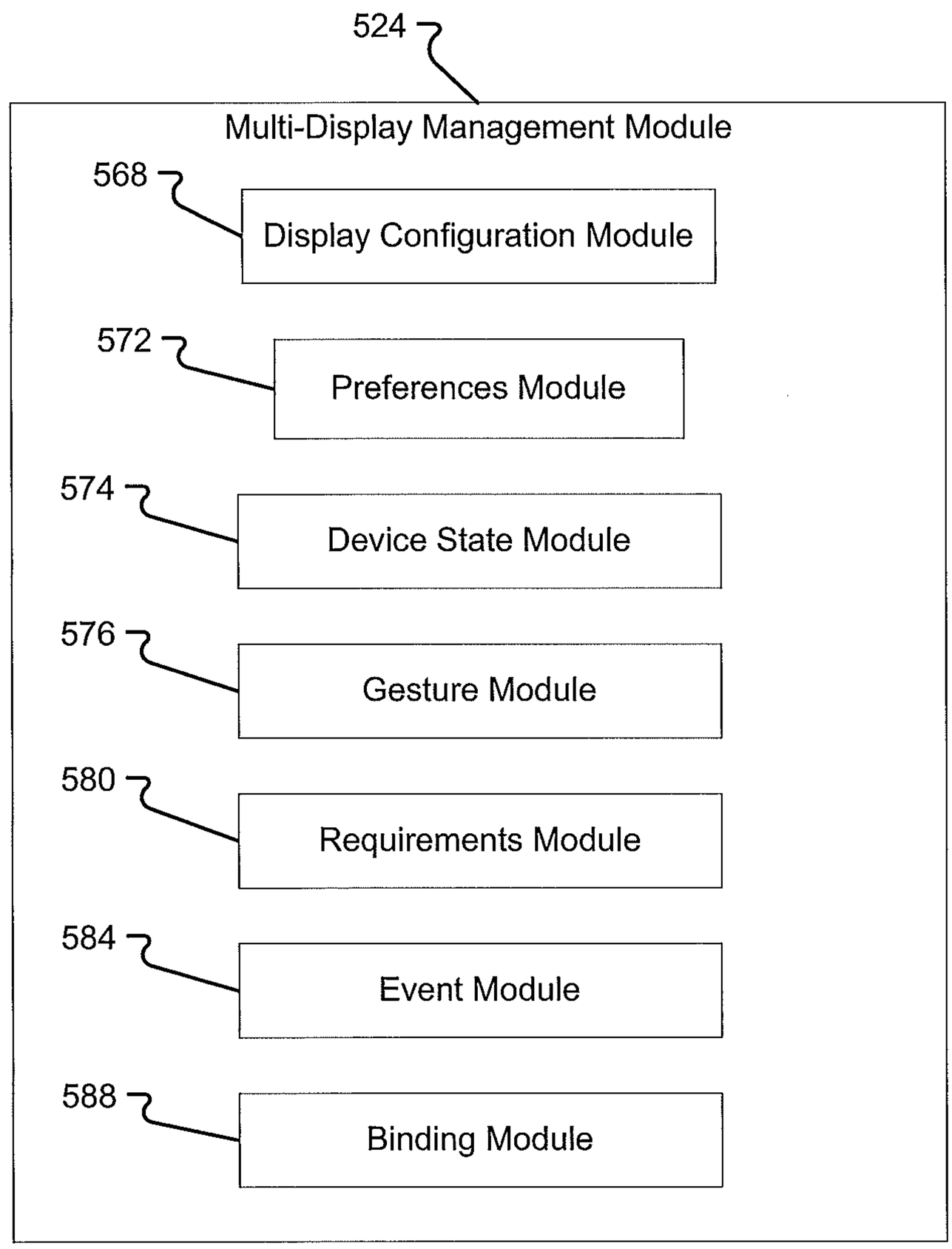

524
Multi-Display Management Module
568
Display Configuration Module
572
Preferences Module
574
Device State Module
576
Gesture Module
580
Requirements Module
584
Event Module
588
Binding Module

*FIG. 5B*

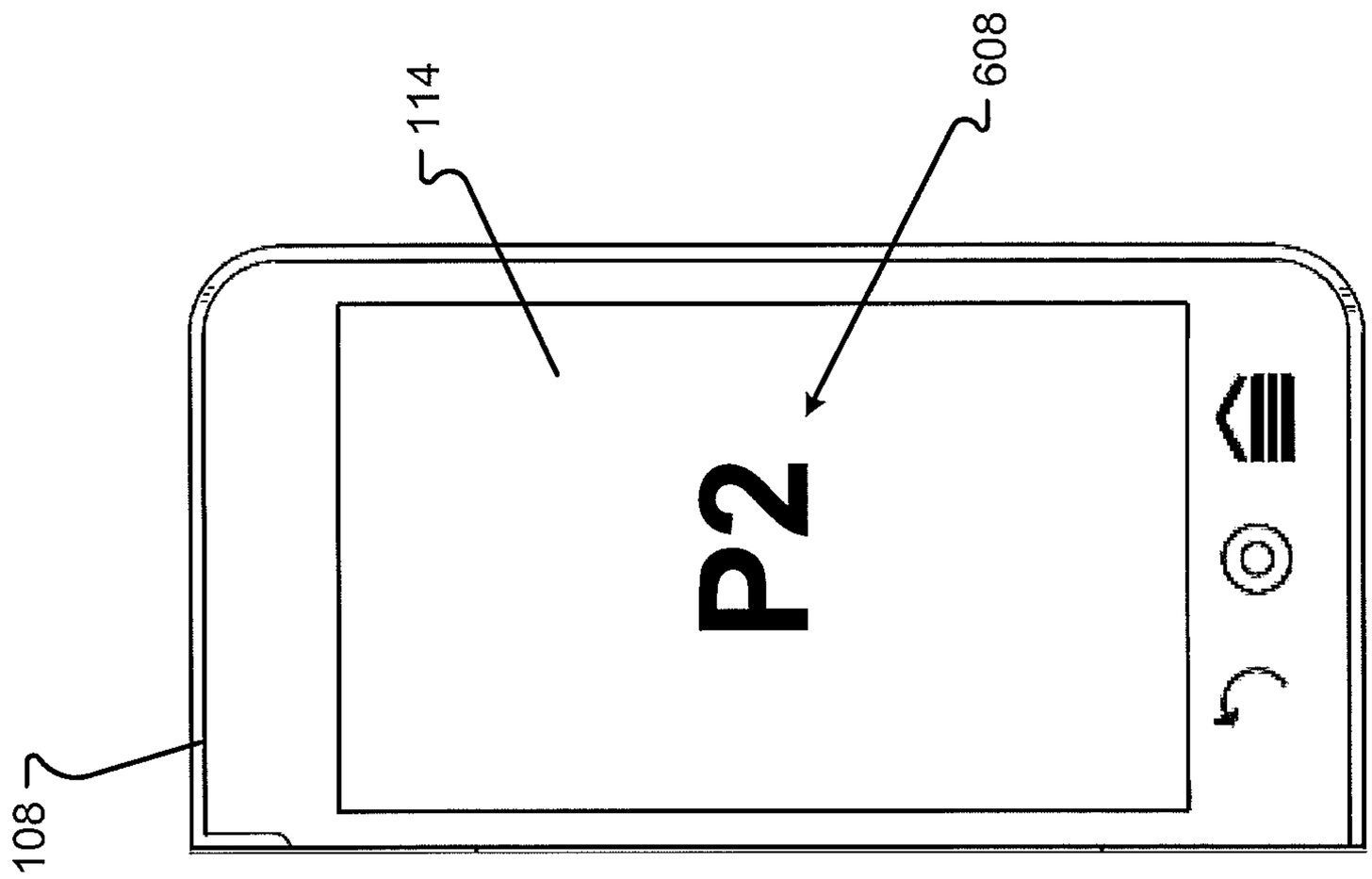



FIG. 6B

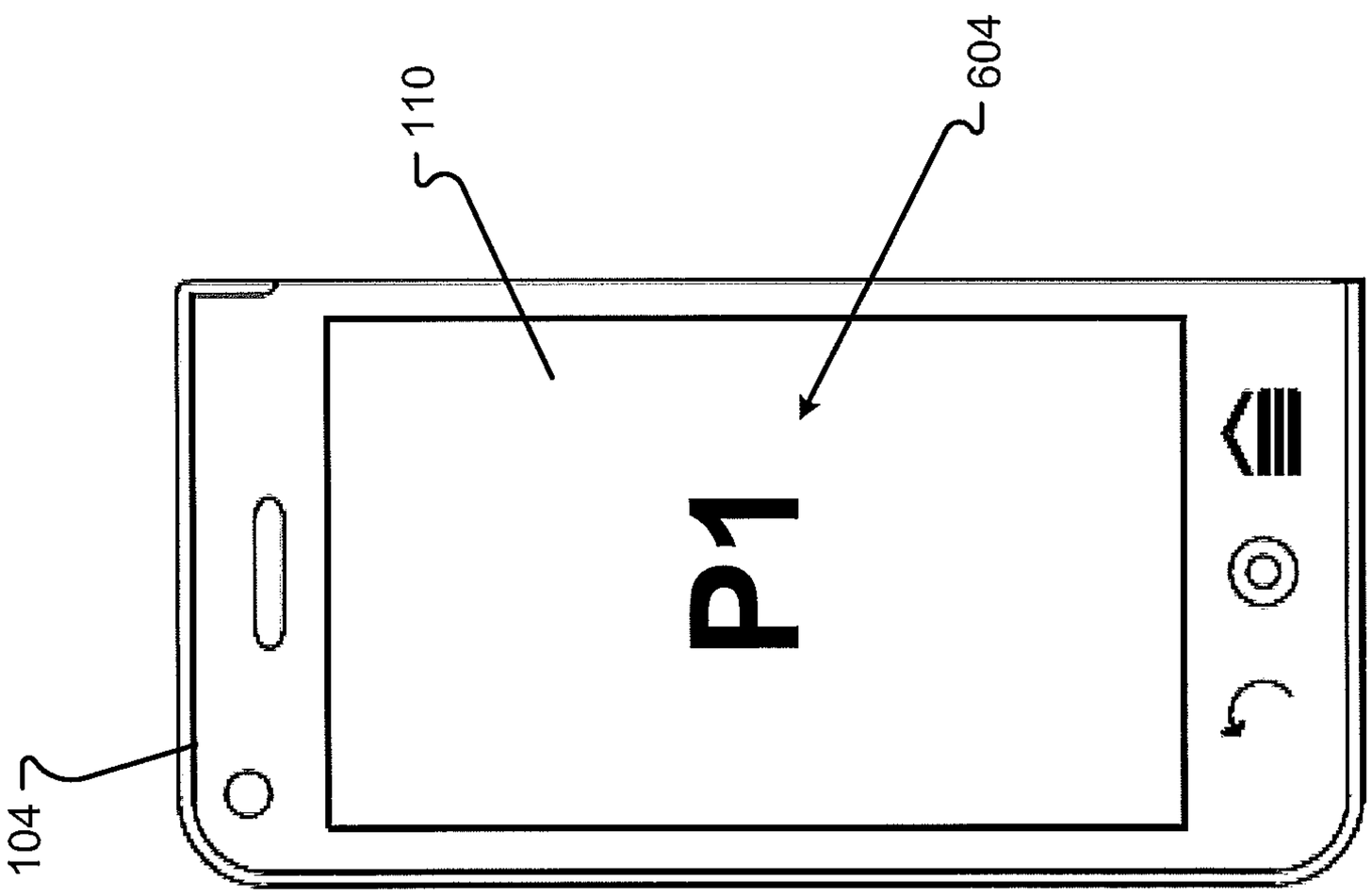



FIG. 6A

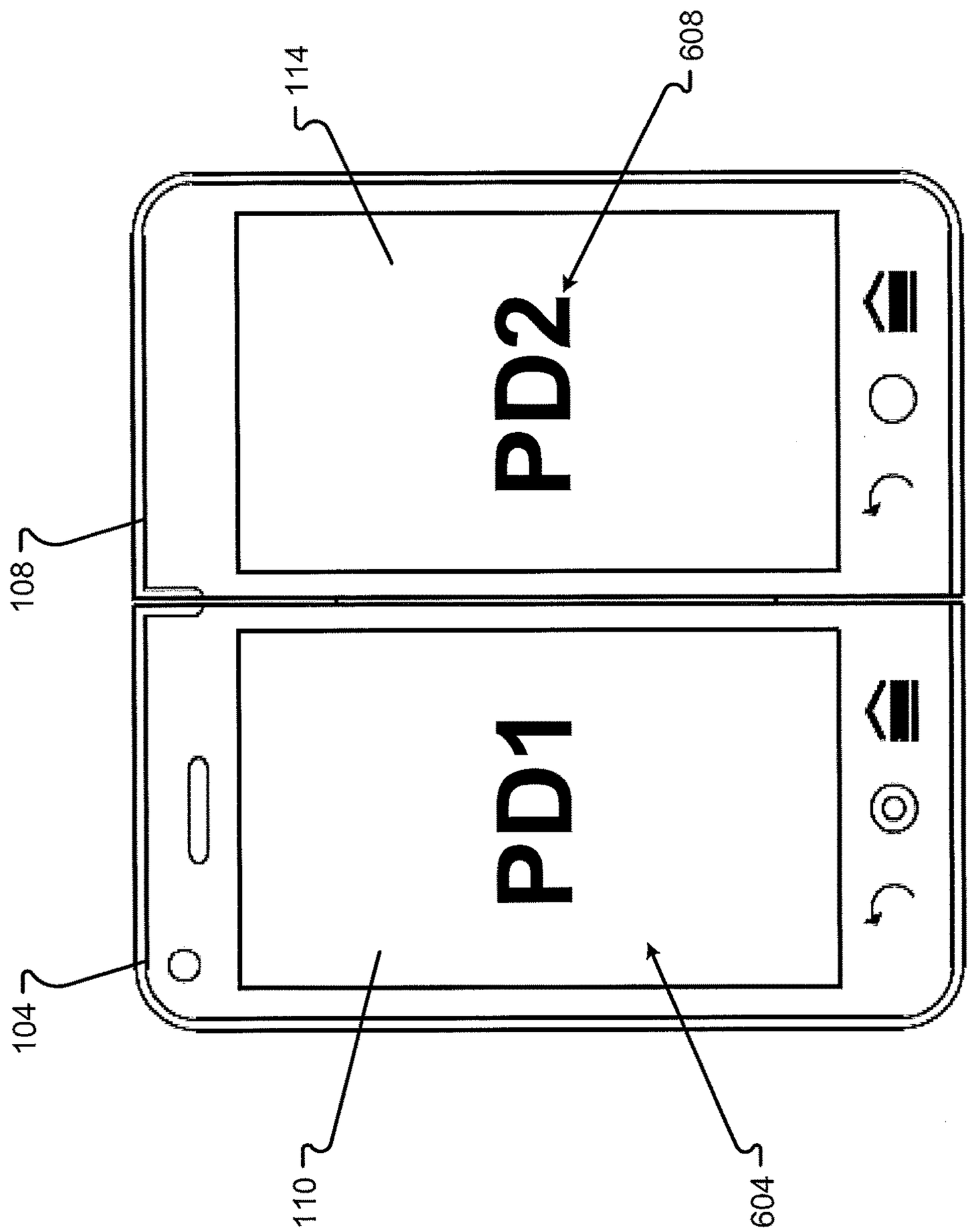



FIG. 6C

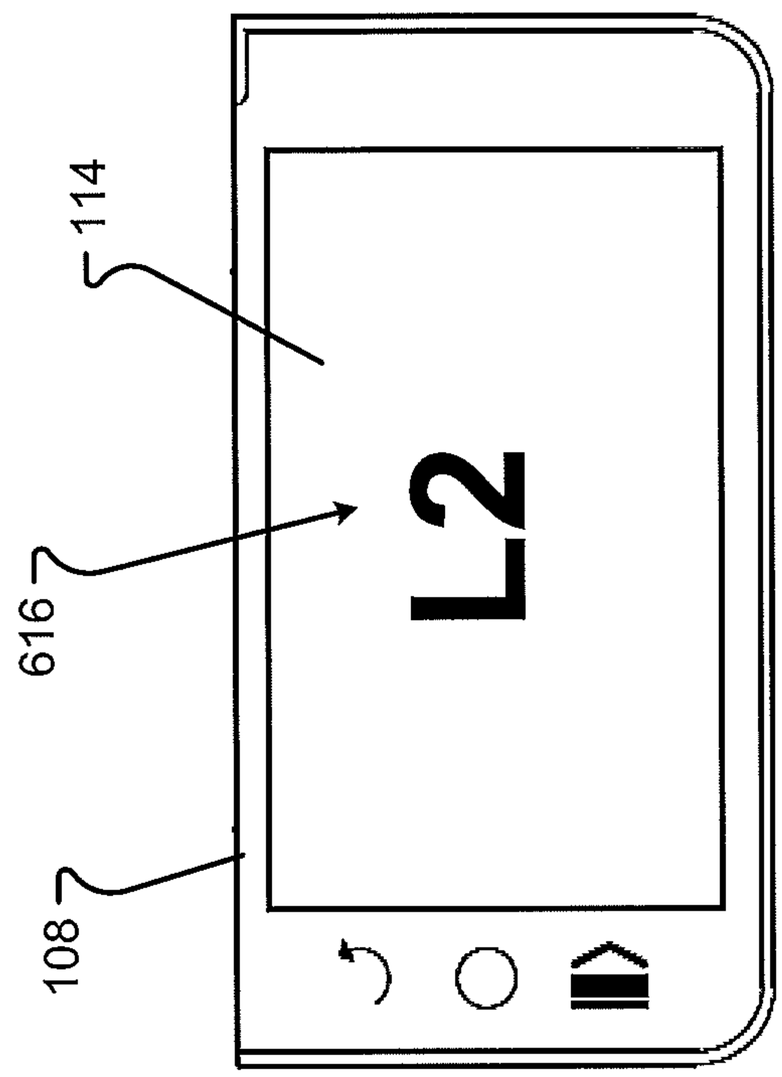



FIG. 6E

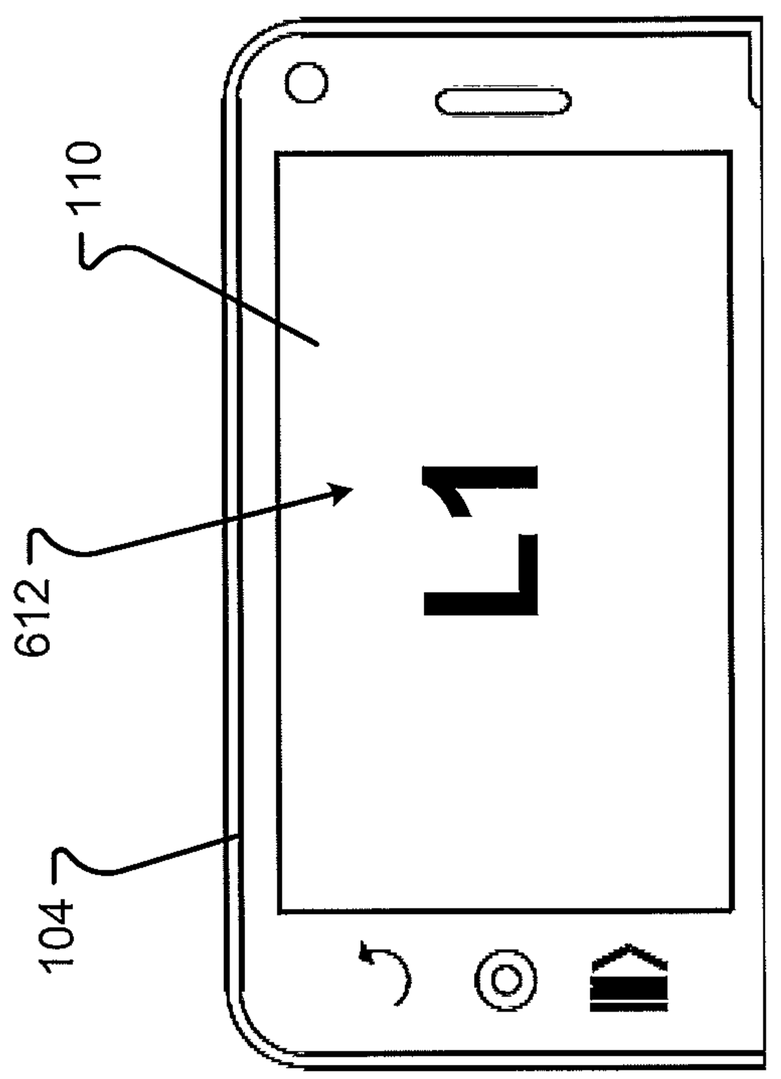



FIG. 6D

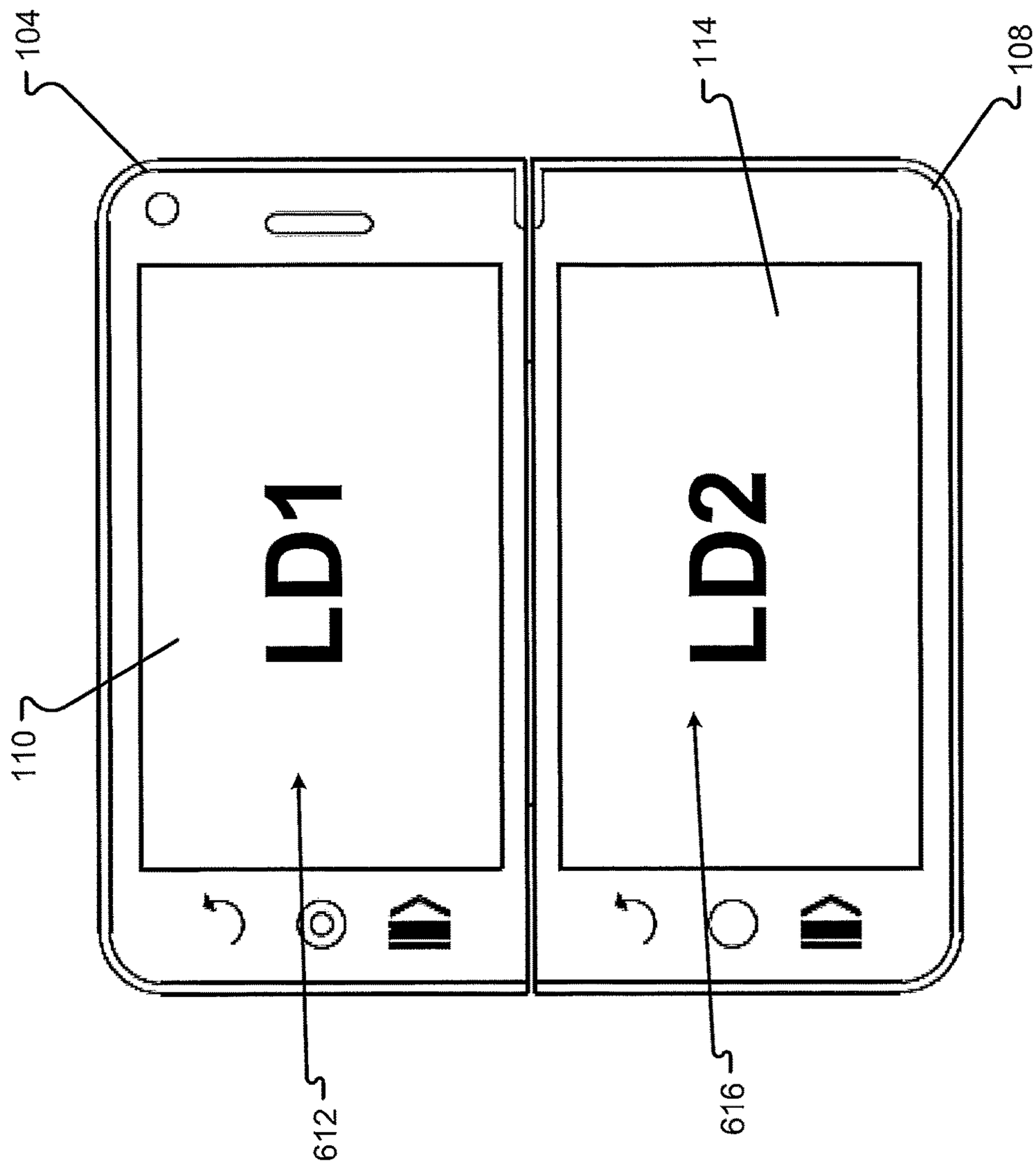



FIG. 6F

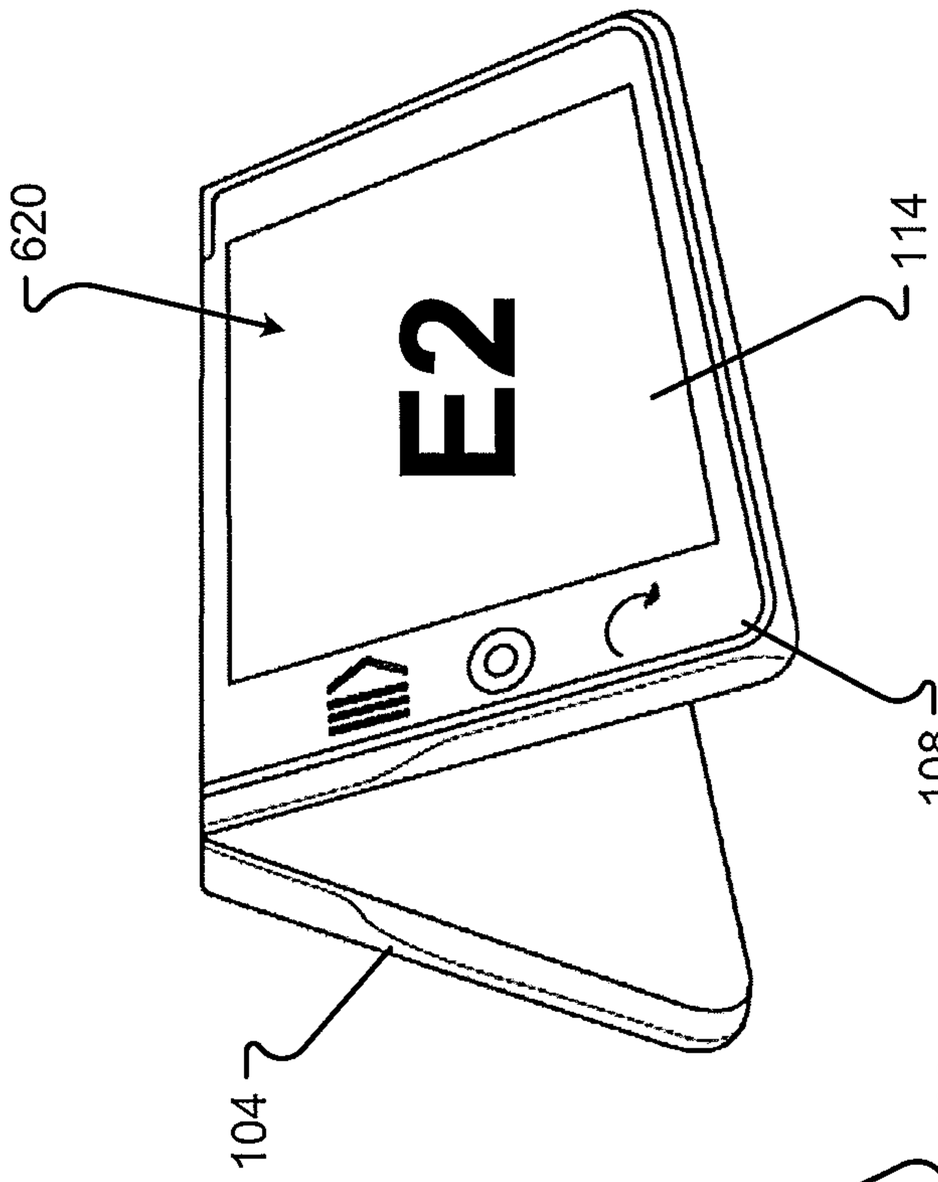



FIG. 6H

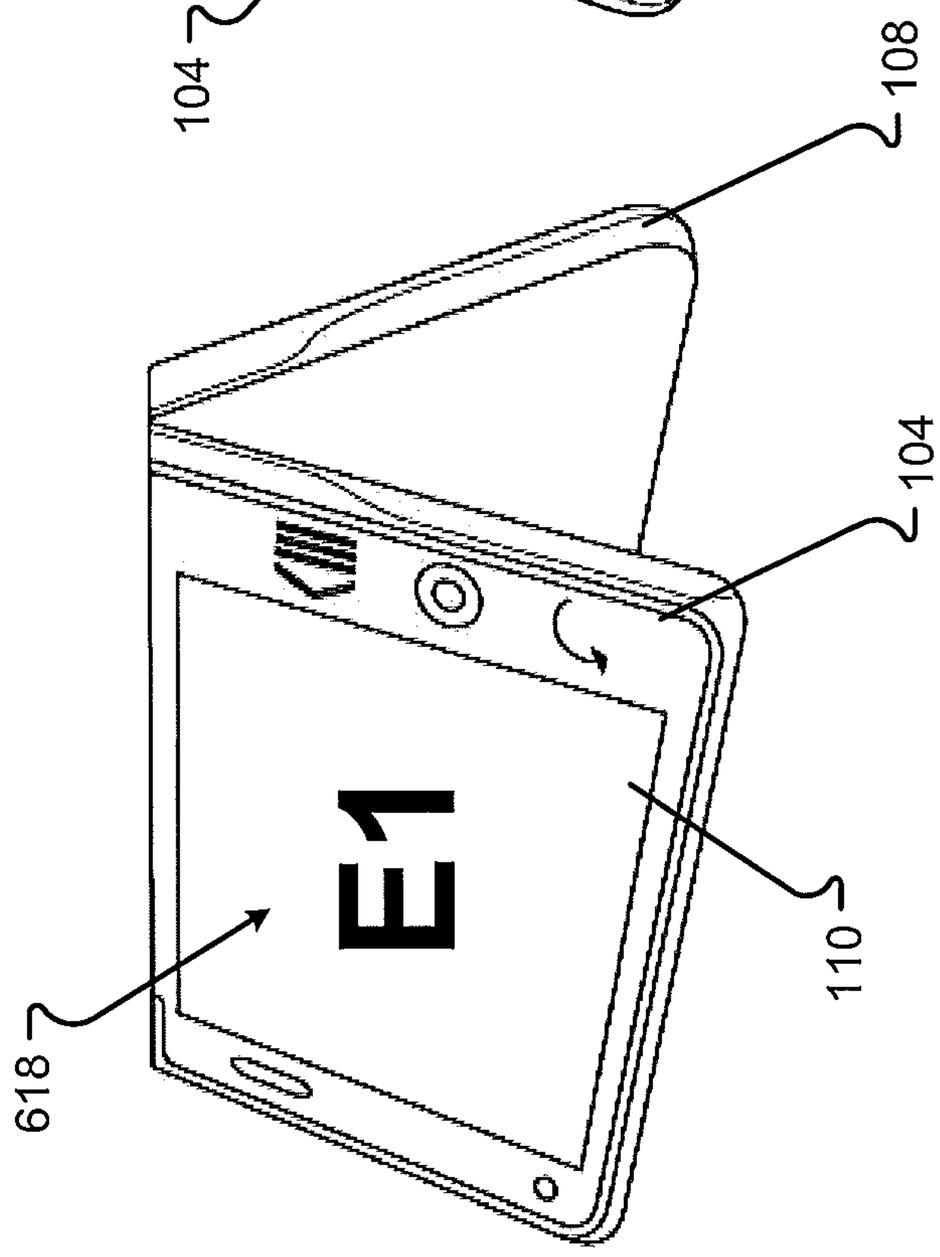



FIG. 6G

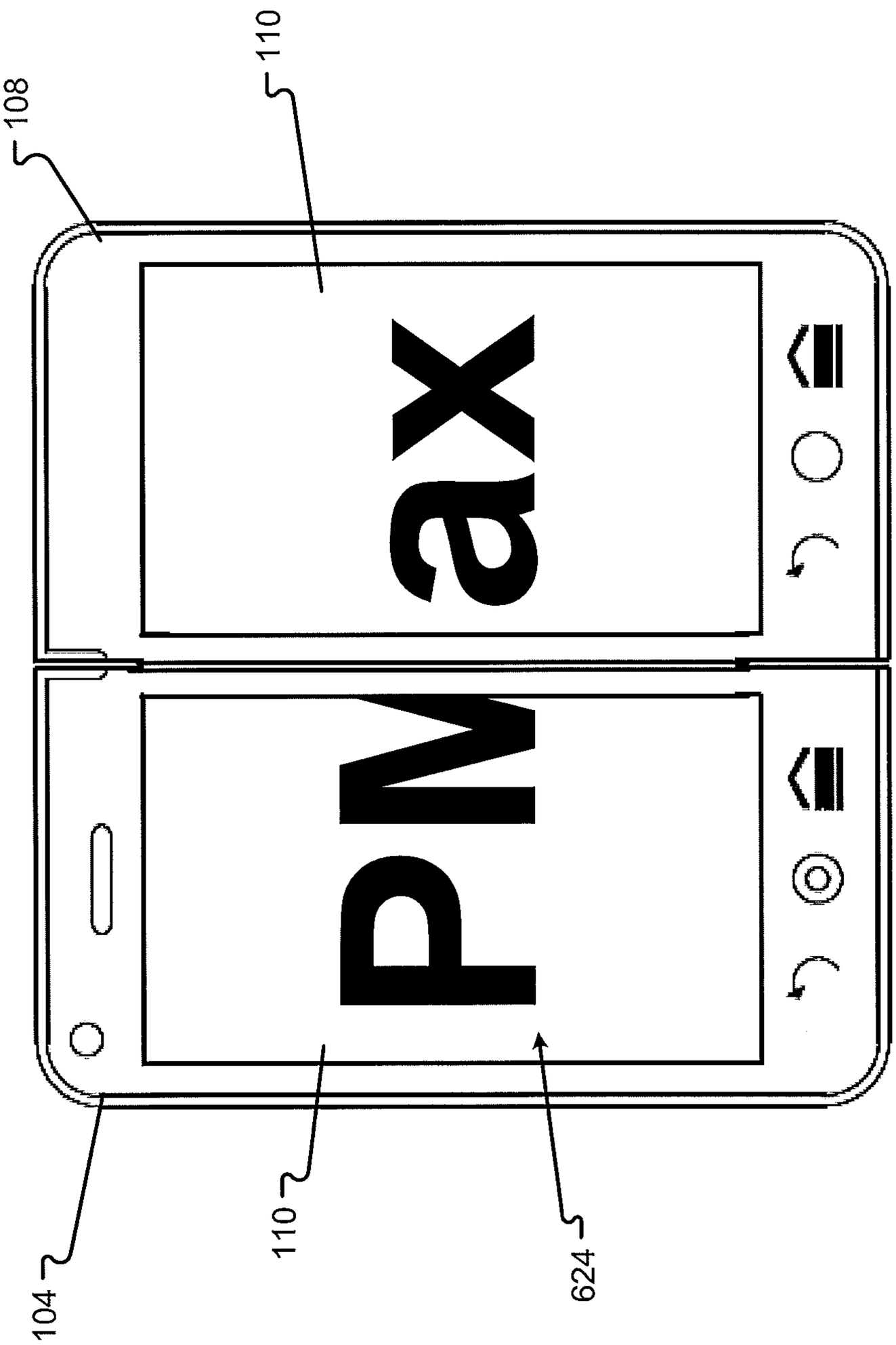



FIG. 6I

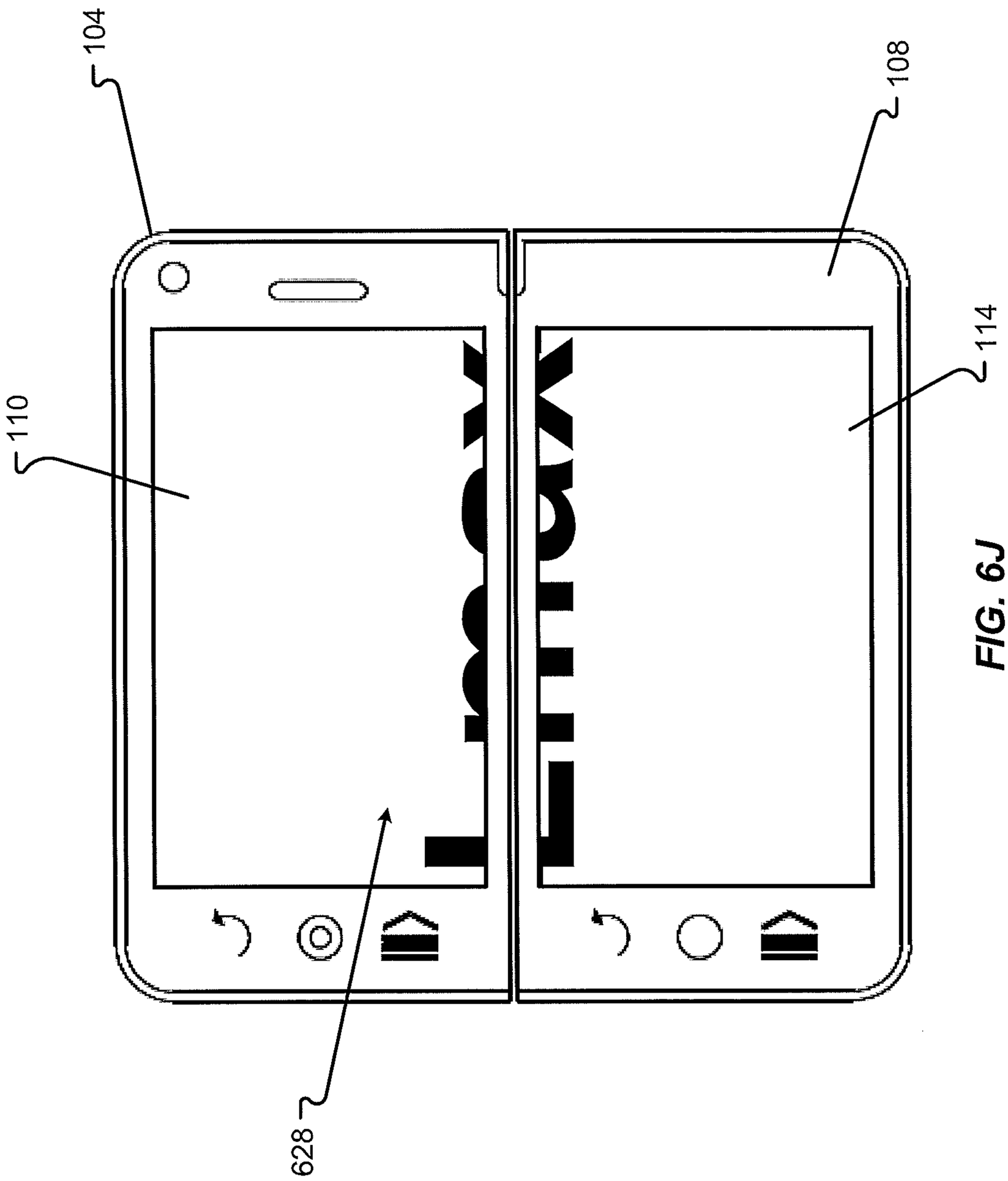



FIG. 6J

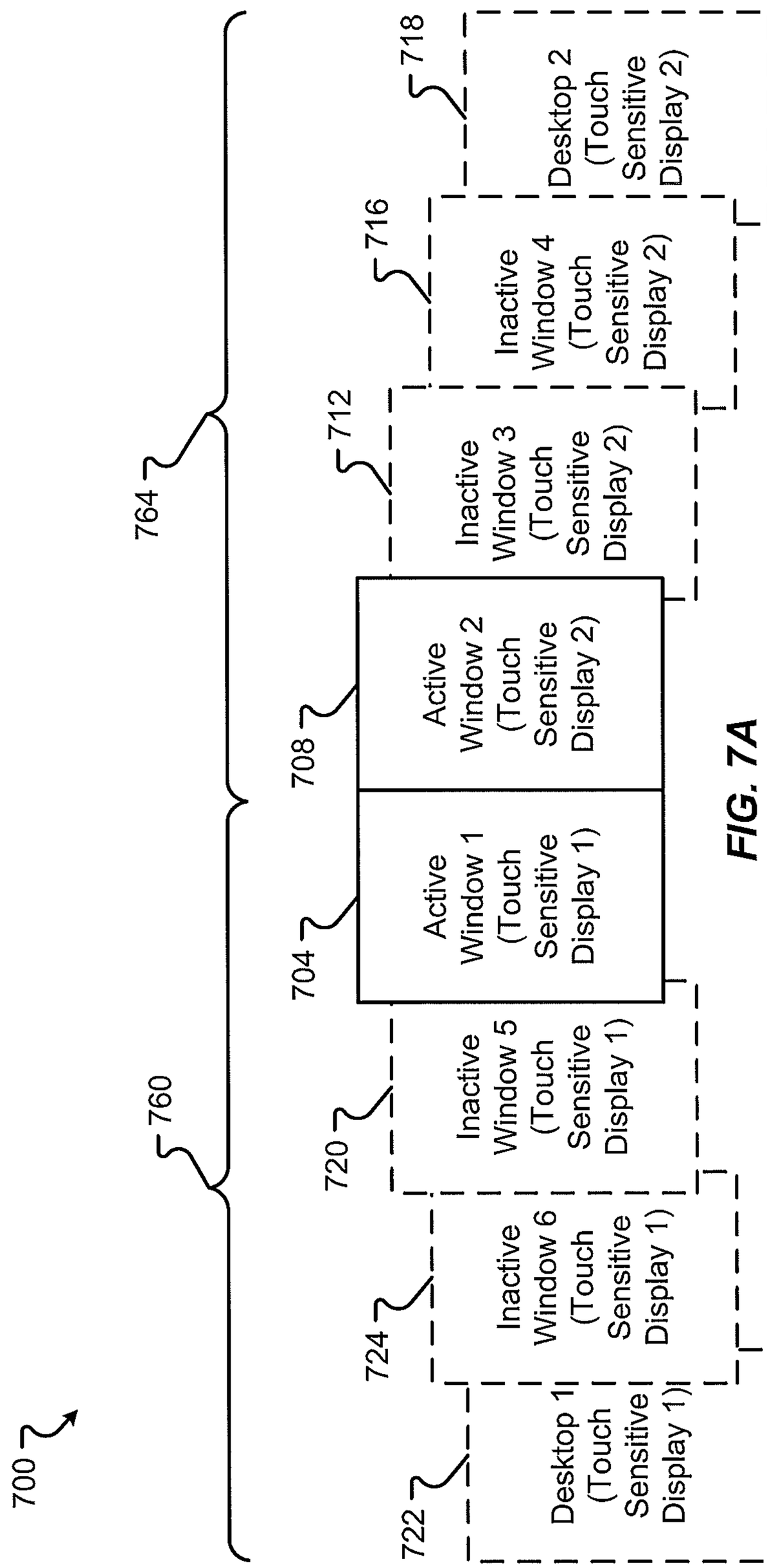

700
760
764
704
Active Window 1 (Touch Sensitive Display 1)
708
Active Window 2 (Touch Sensitive Display 2)
712
Inactive Window 3 (Touch Sensitive Display 2)
716
Inactive Window 4 (Touch Sensitive Display 2)
718
Desktop 2 (Touch Sensitive Display 2)
720
Inactive Window 5 (Touch Sensitive Display 1)
722
Desktop 1 (Touch Sensitive Display 1)
724
Inactive Window 6 (Touch Sensitive Display 1)

FIG. 7A

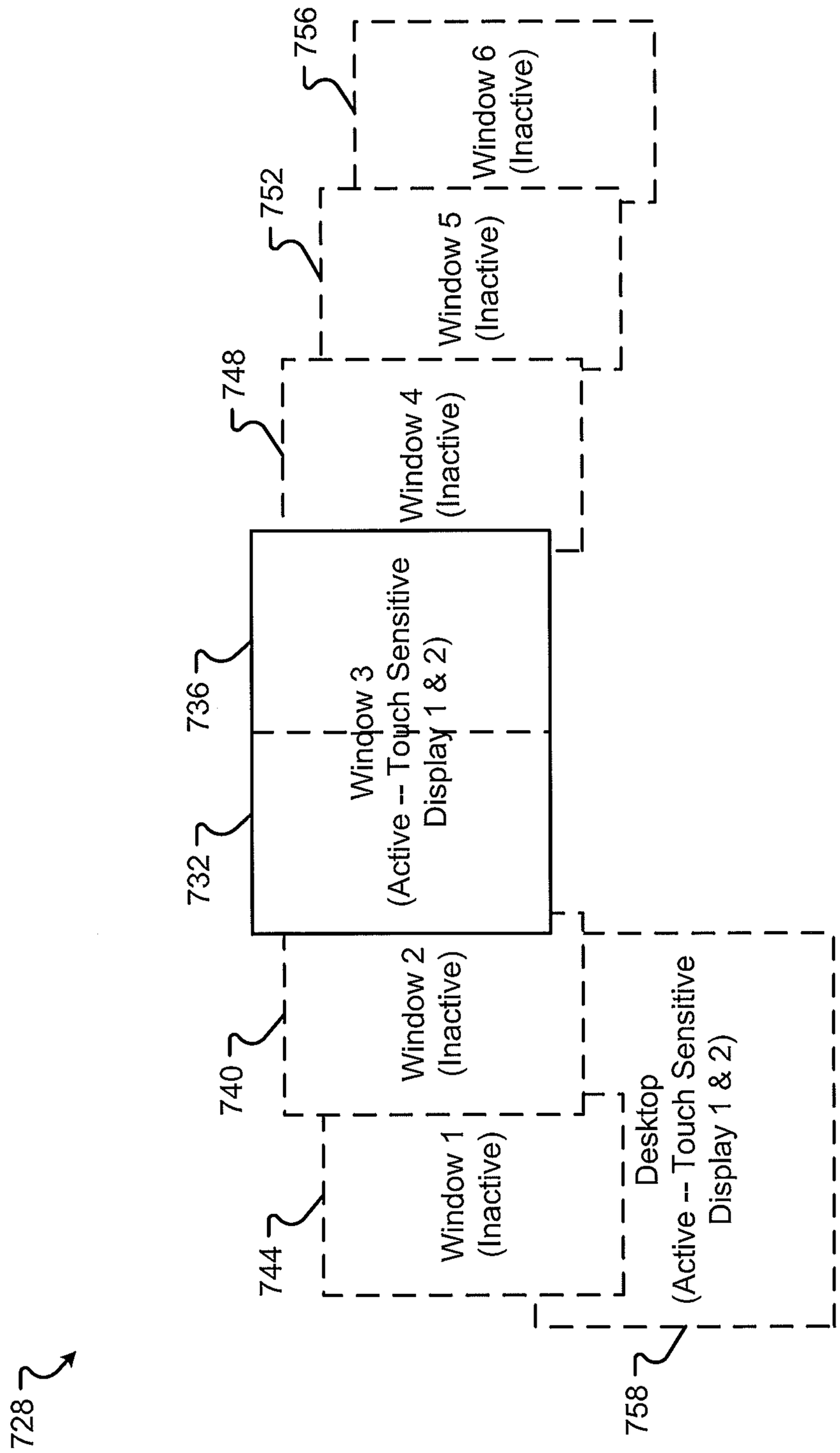

728
732
Window 3
(Active -- Touch Sensitive
Display 1 & 2)
736
740
Window 2
(Inactive)
744
Window 1
(Inactive)
748
Window 4
(Inactive)
752
Window 5
(Inactive)
756
Window 6
(Inactive)
758
Desktop
(Active -- Touch Sensitive
Display 1 & 2)

FIG. 7B

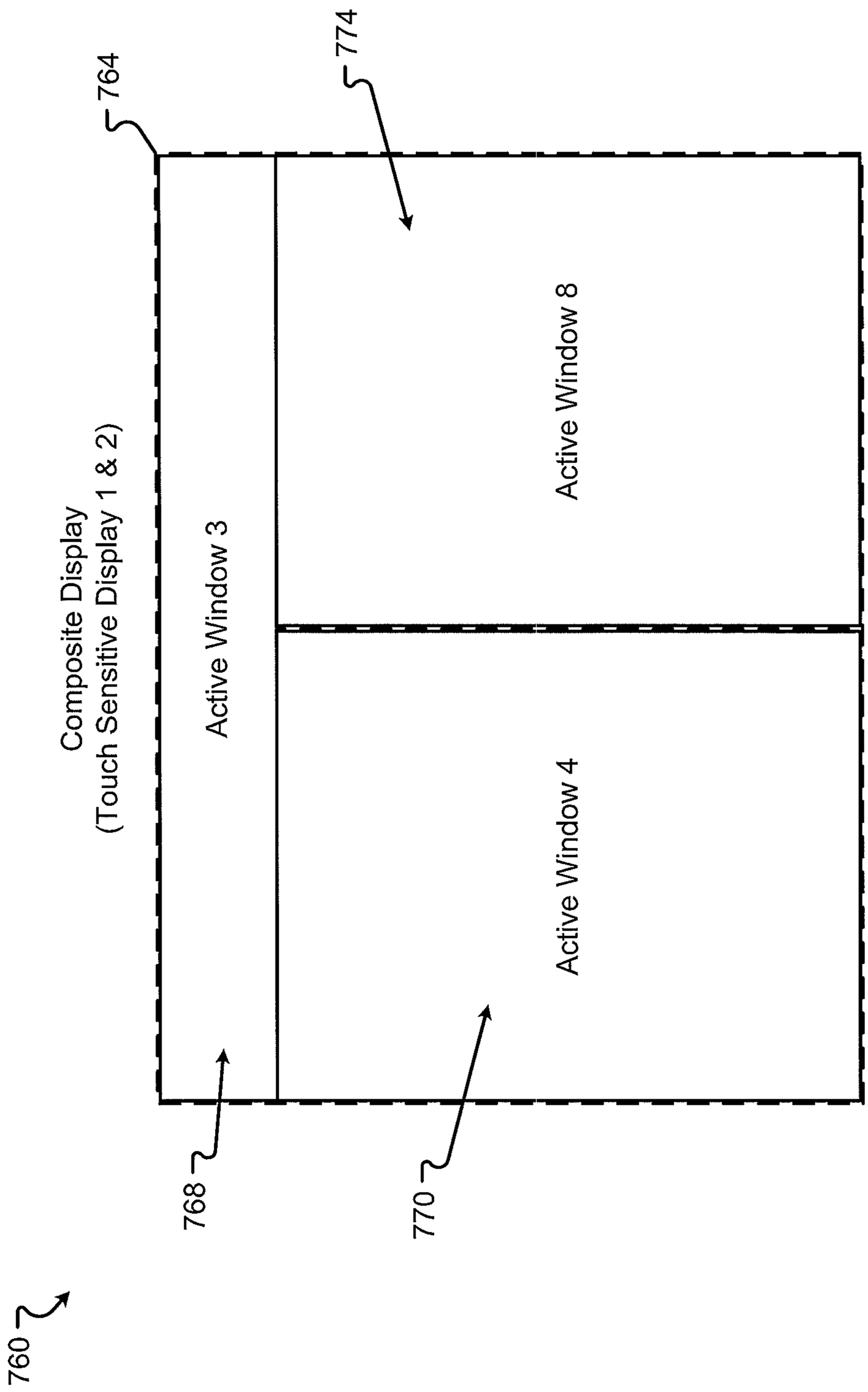

760
764
774
Composite Display
(Touch Sensitive Display 1 & 2)
Active Window 3
Active Window 8
Active Window 4
768
770

FIG. 7C

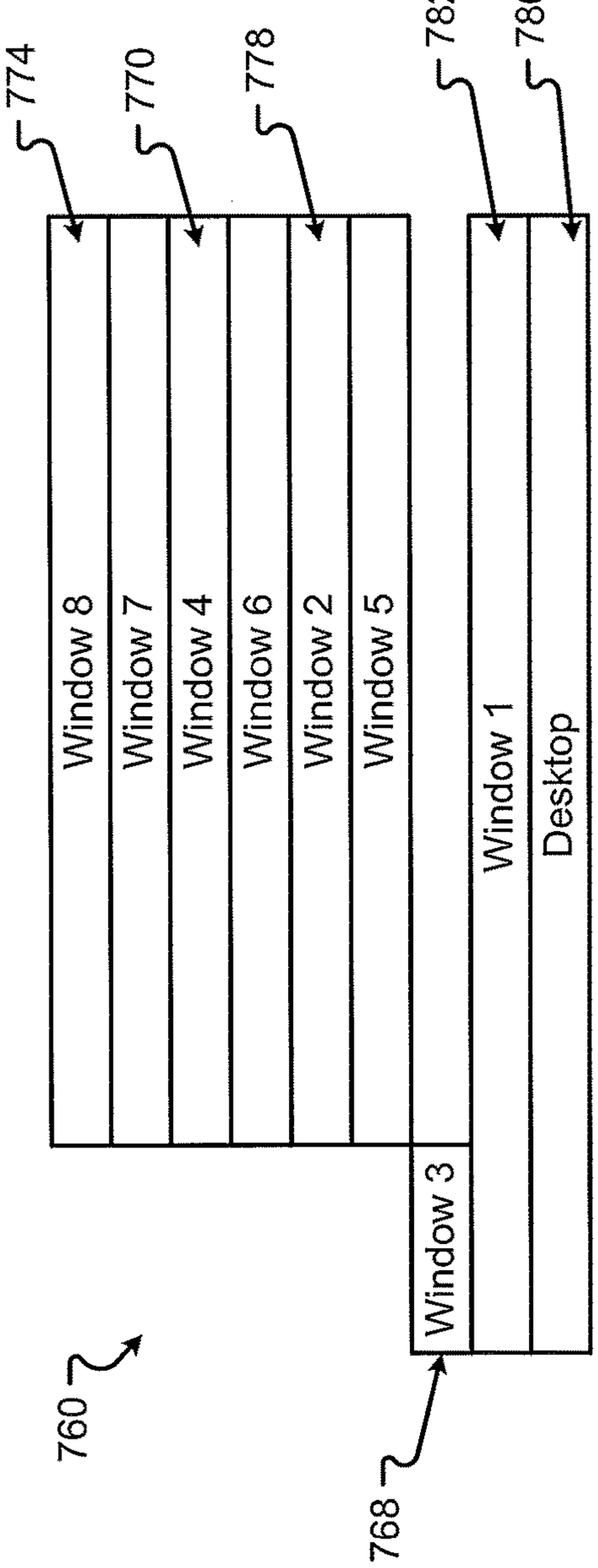

774
770
778
782
786
Window 8
Window 7
Window 4
Window 6
Window 2
Window 5
Window 1
Desktop
Window 3
760
768

FIG. 7D

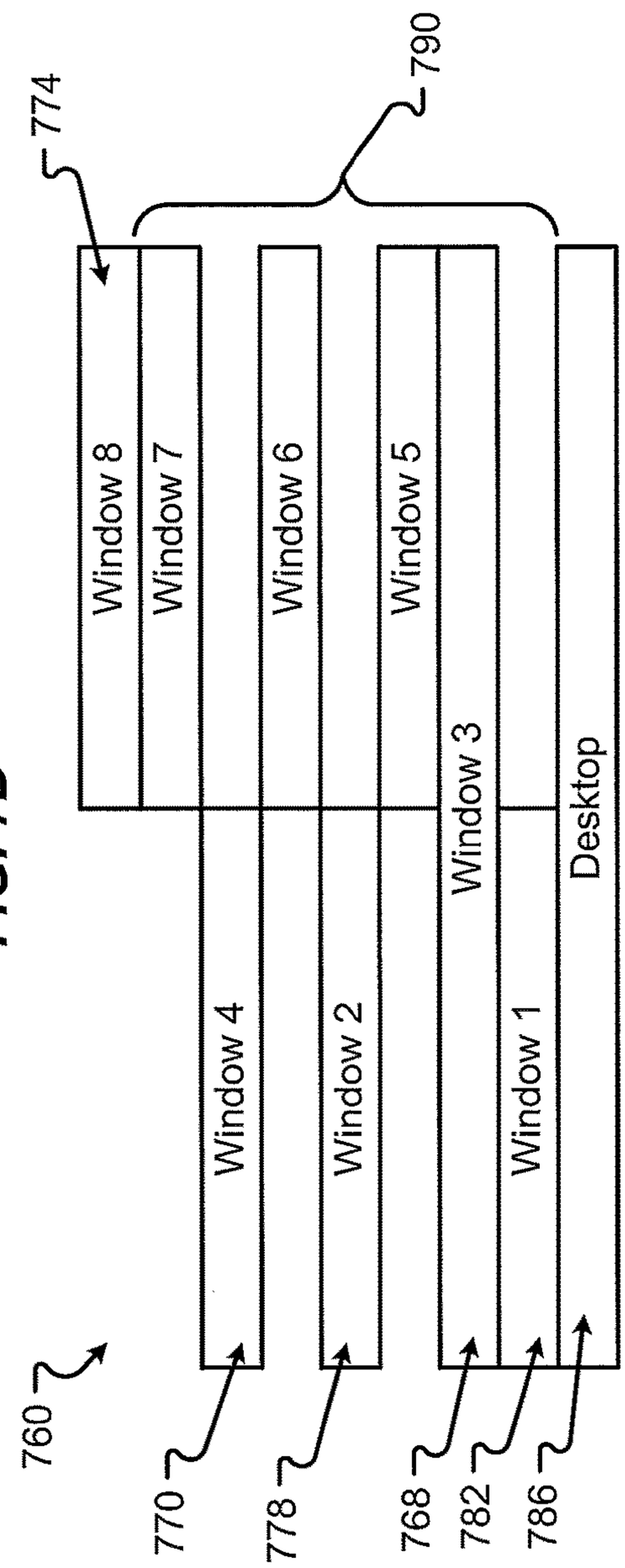

790
774
Window 8
Window 7
Window 6
Window 5
Window 4
Window 2
Window 3
Window 1
Desktop
760
770
778
768
782
786

FIG. 7E

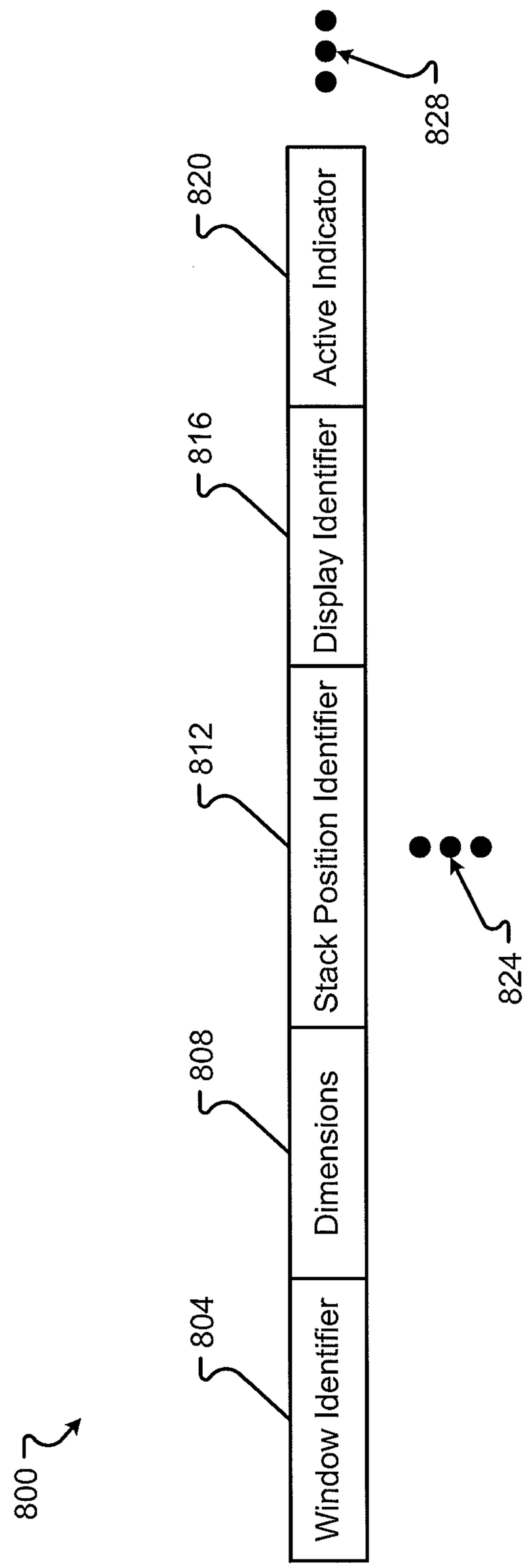

800
Window Identifier
804
Dimensions
808
Stack Position Identifier
812
Display Identifier
816
Active Indicator
820
824
828

FIG. 8

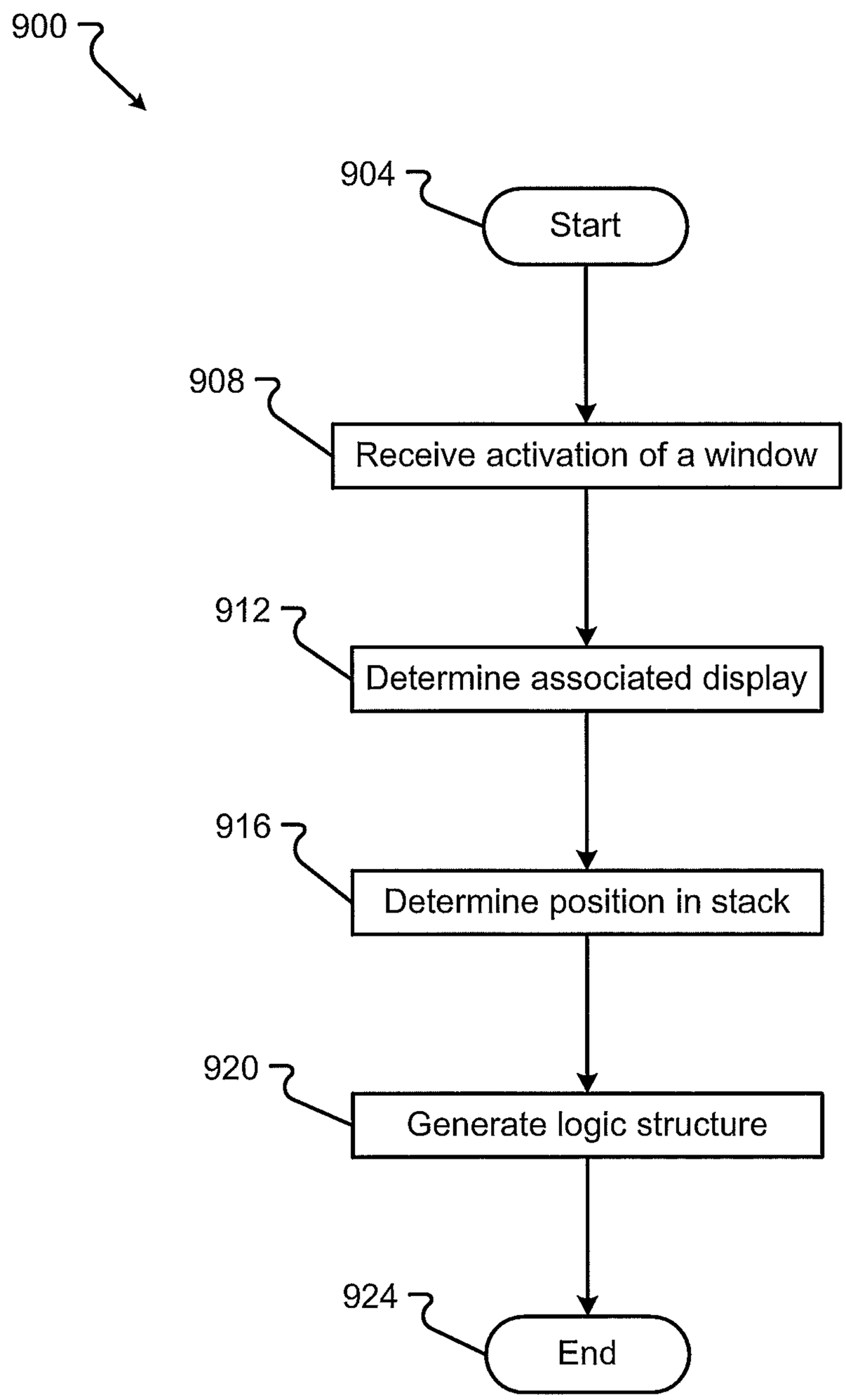

900
904
Start
908
Receive activation of a window
912
Determine associated display
916
Determine position in stack
920
Generate logic structure
924
End

*FIG. 9*

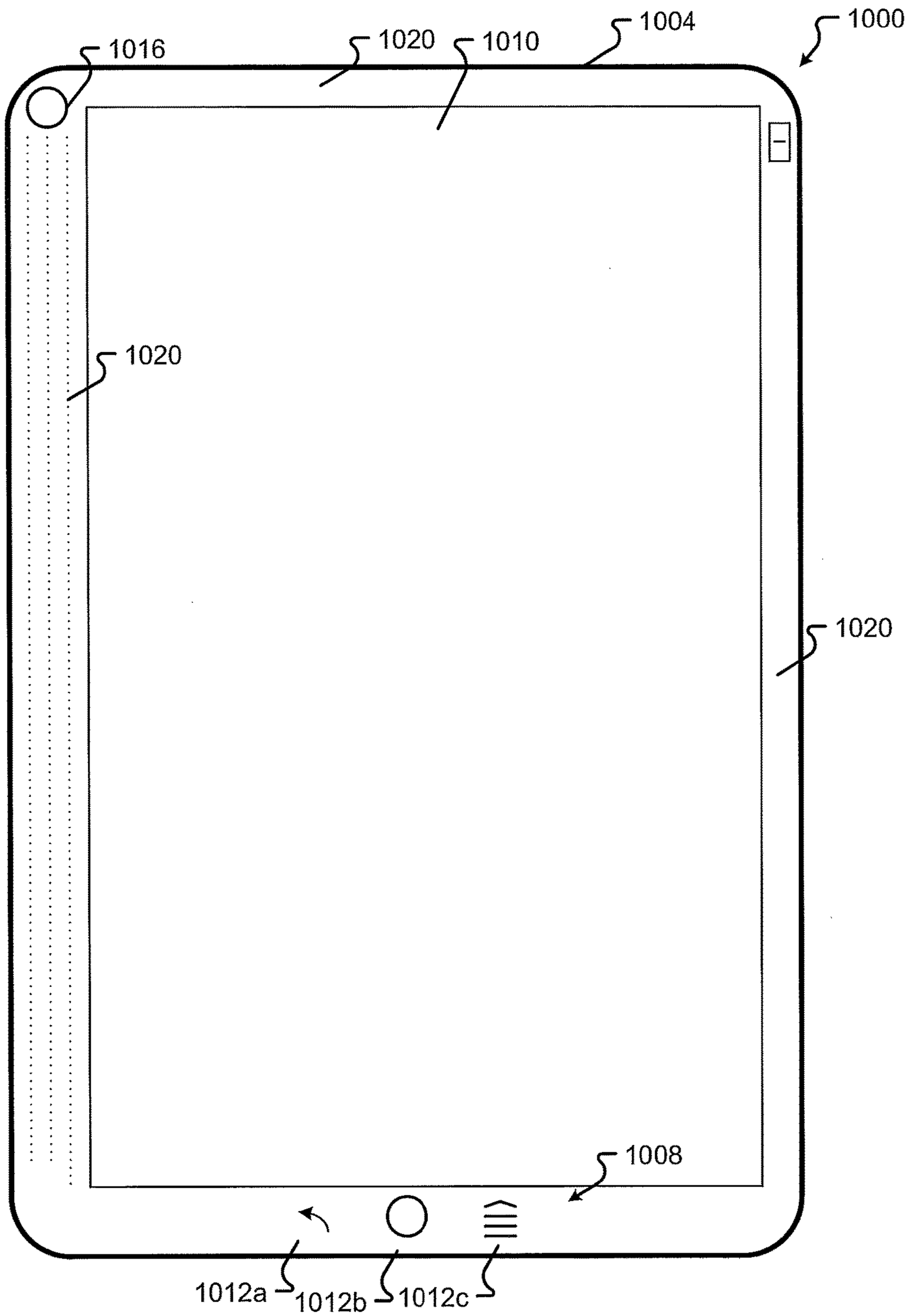



FIG. 10

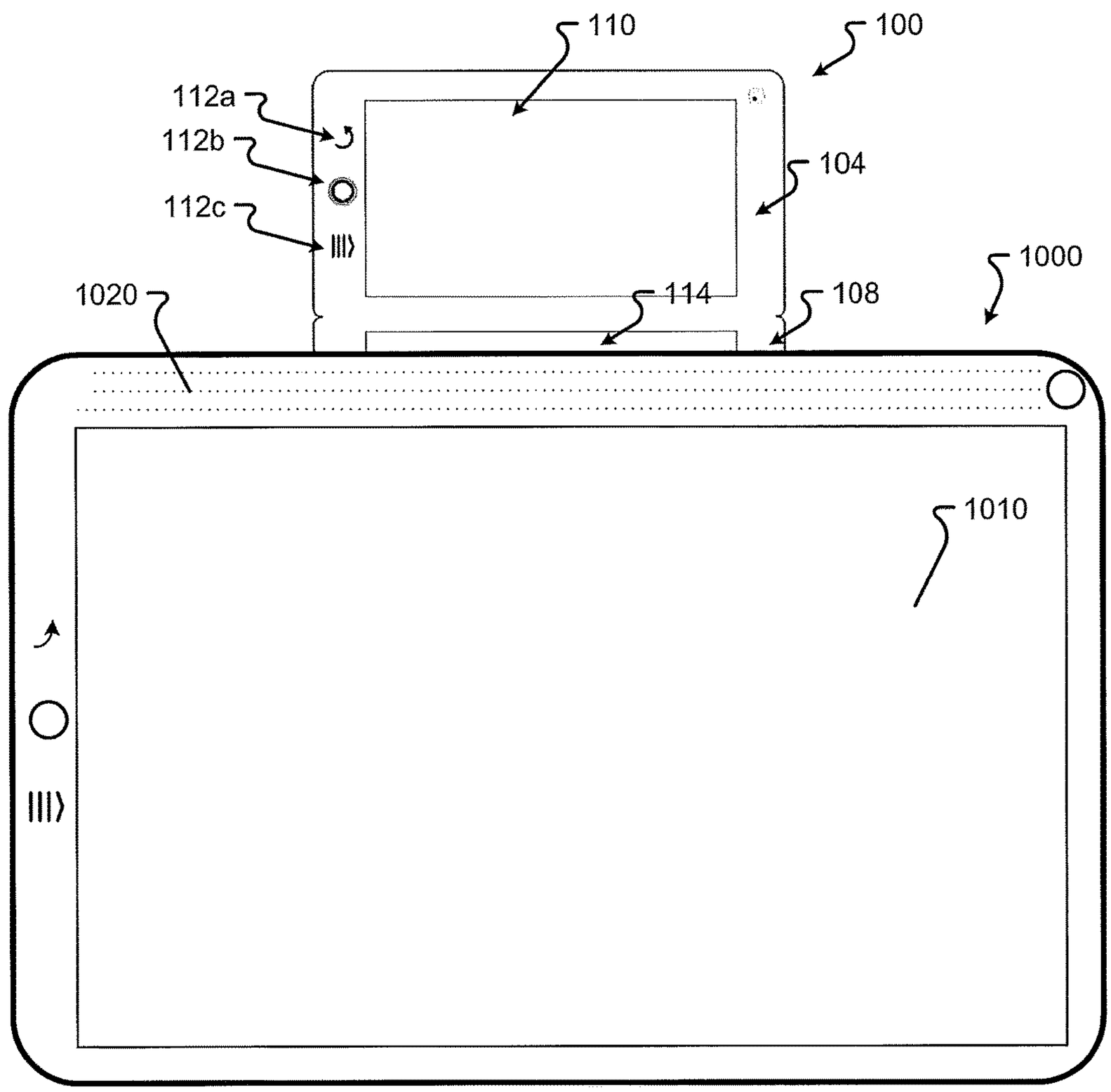



FIG. 11

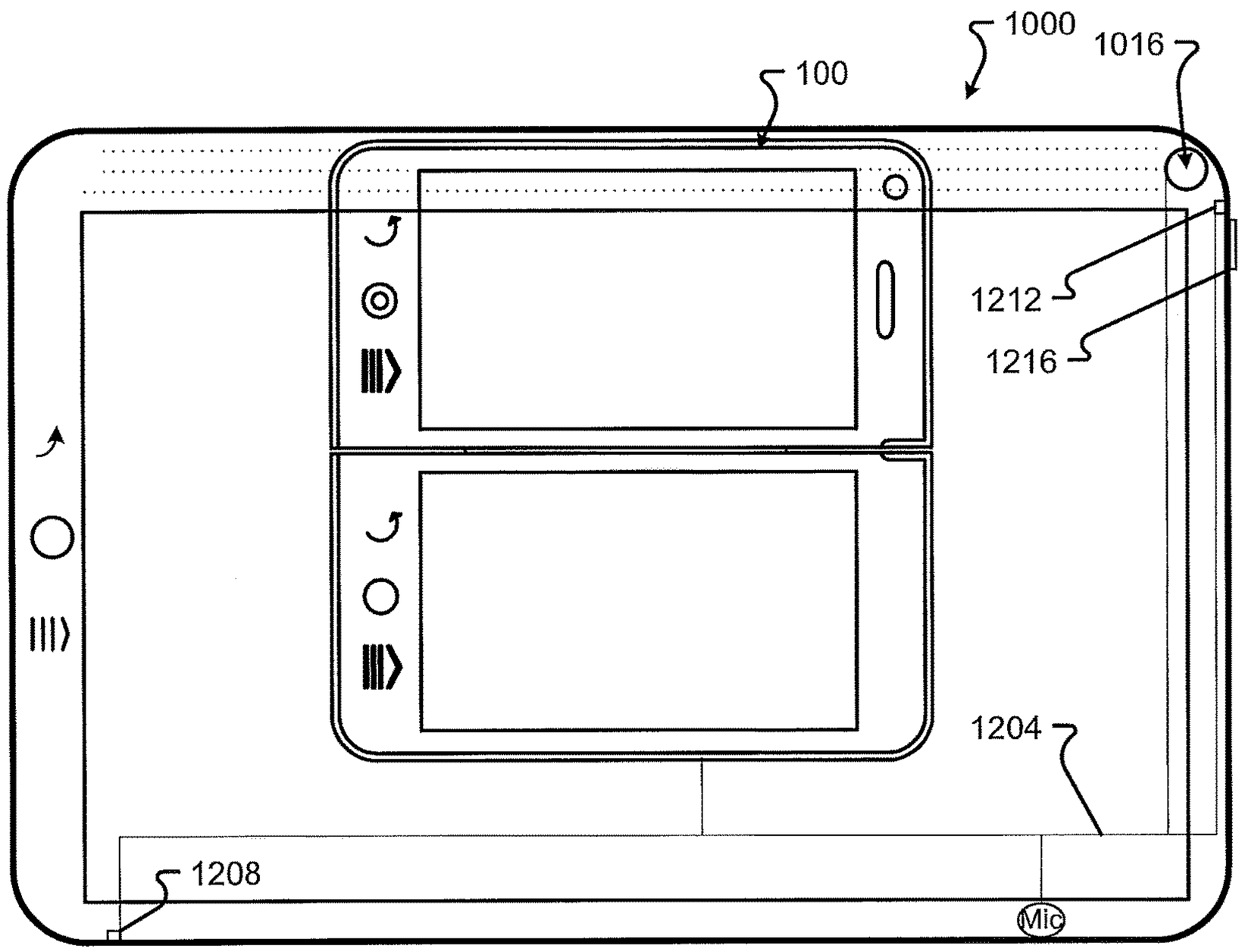



FIG. 12

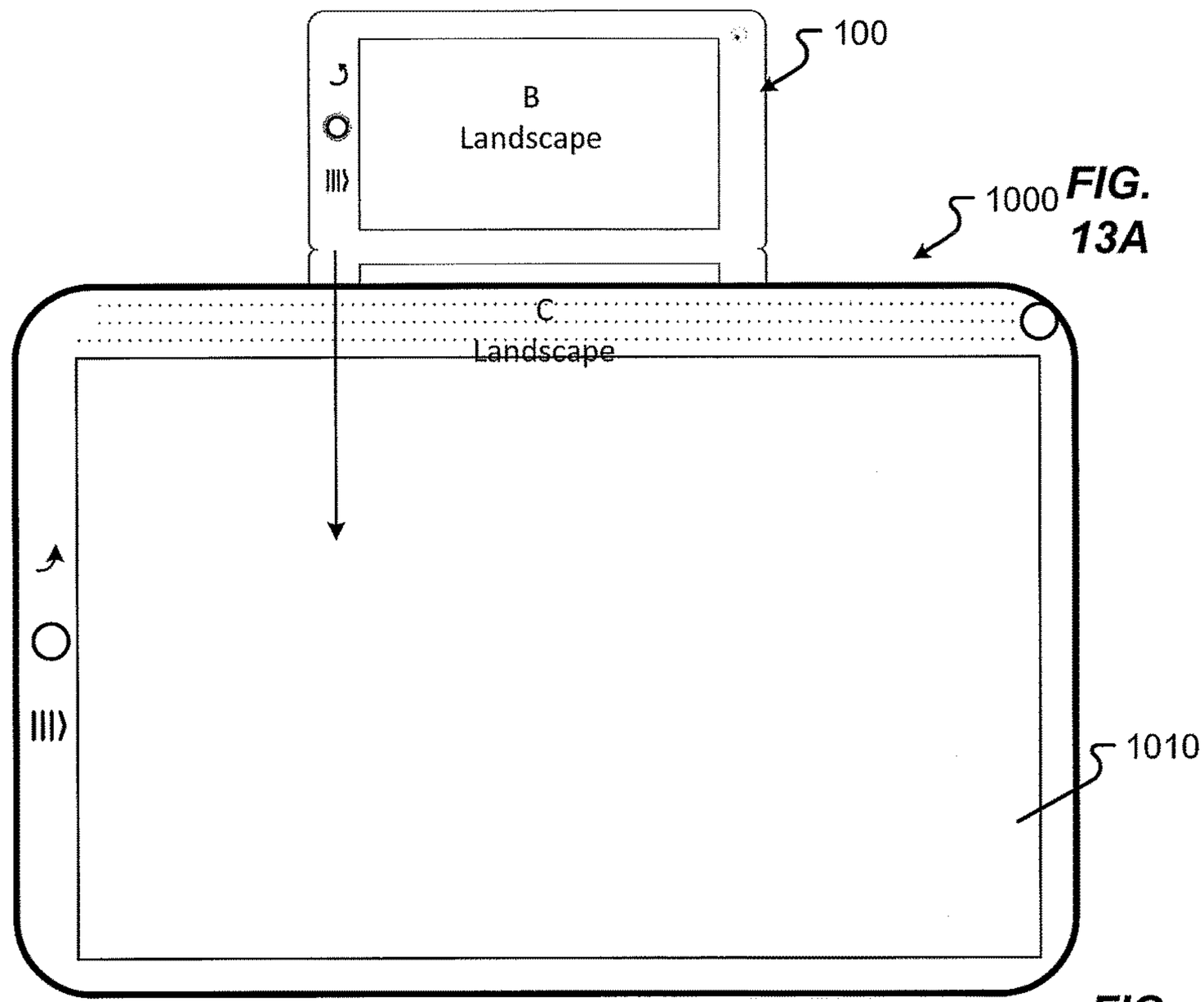



FIG. 13A

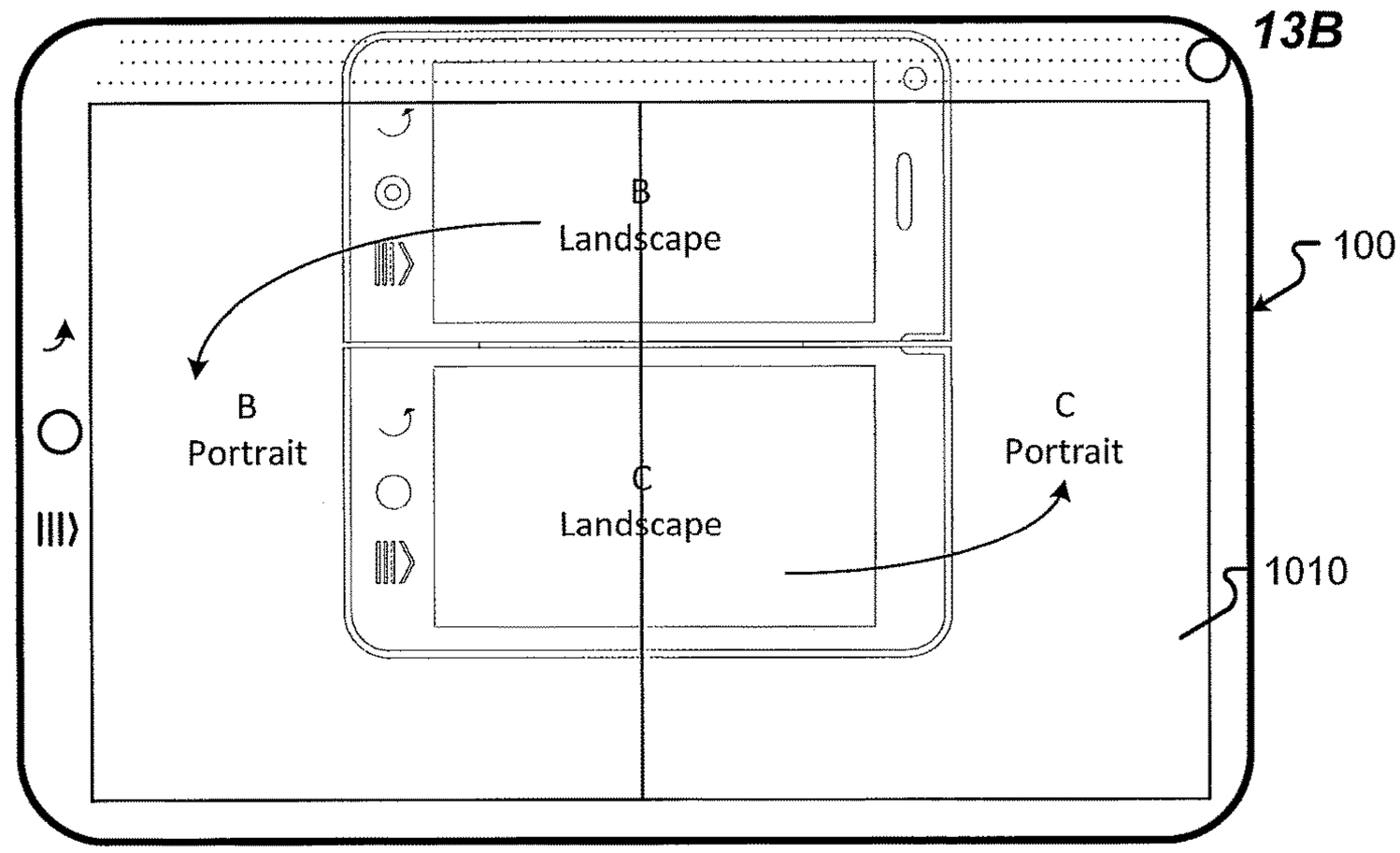



FIG. 13B

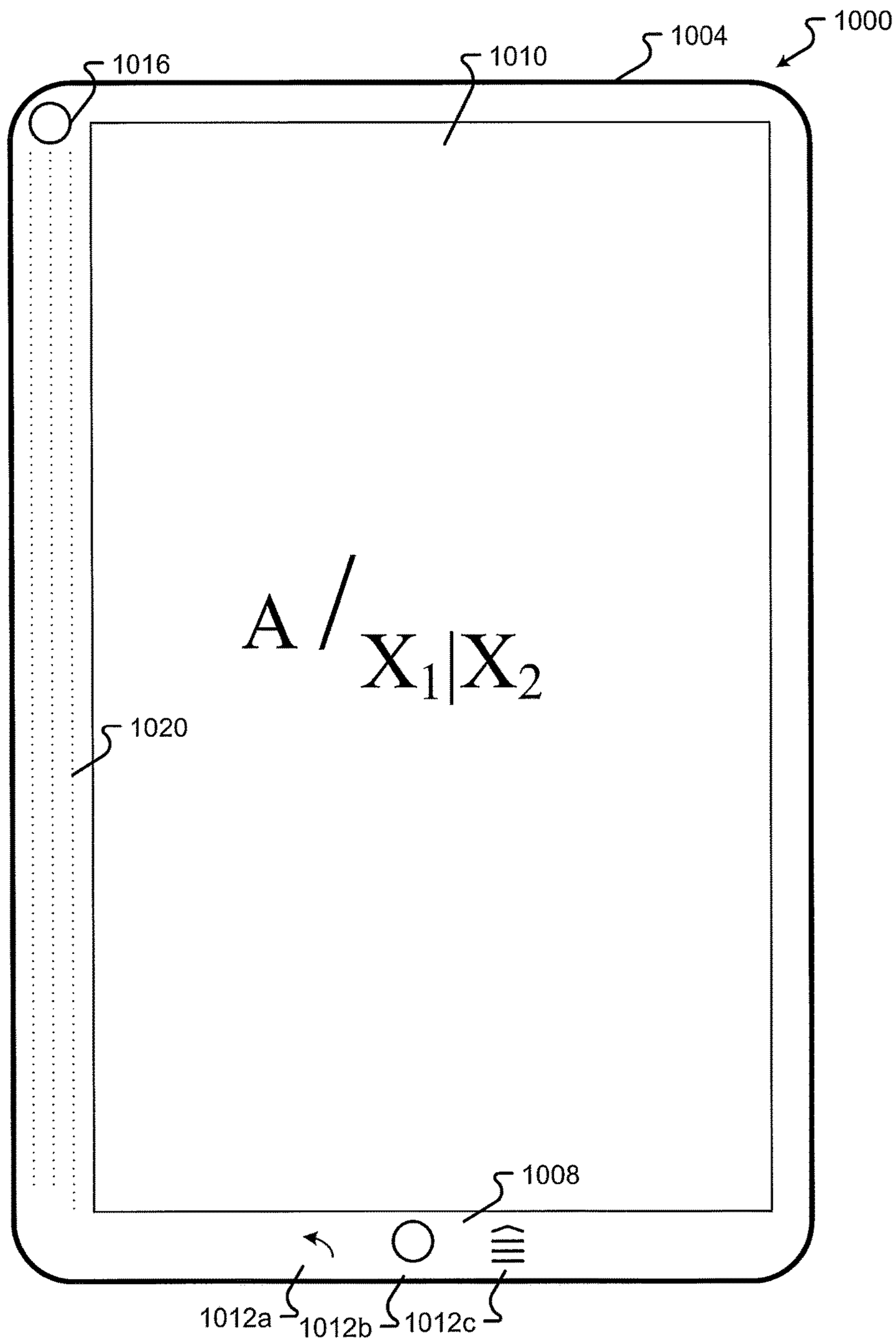



FIG. 14

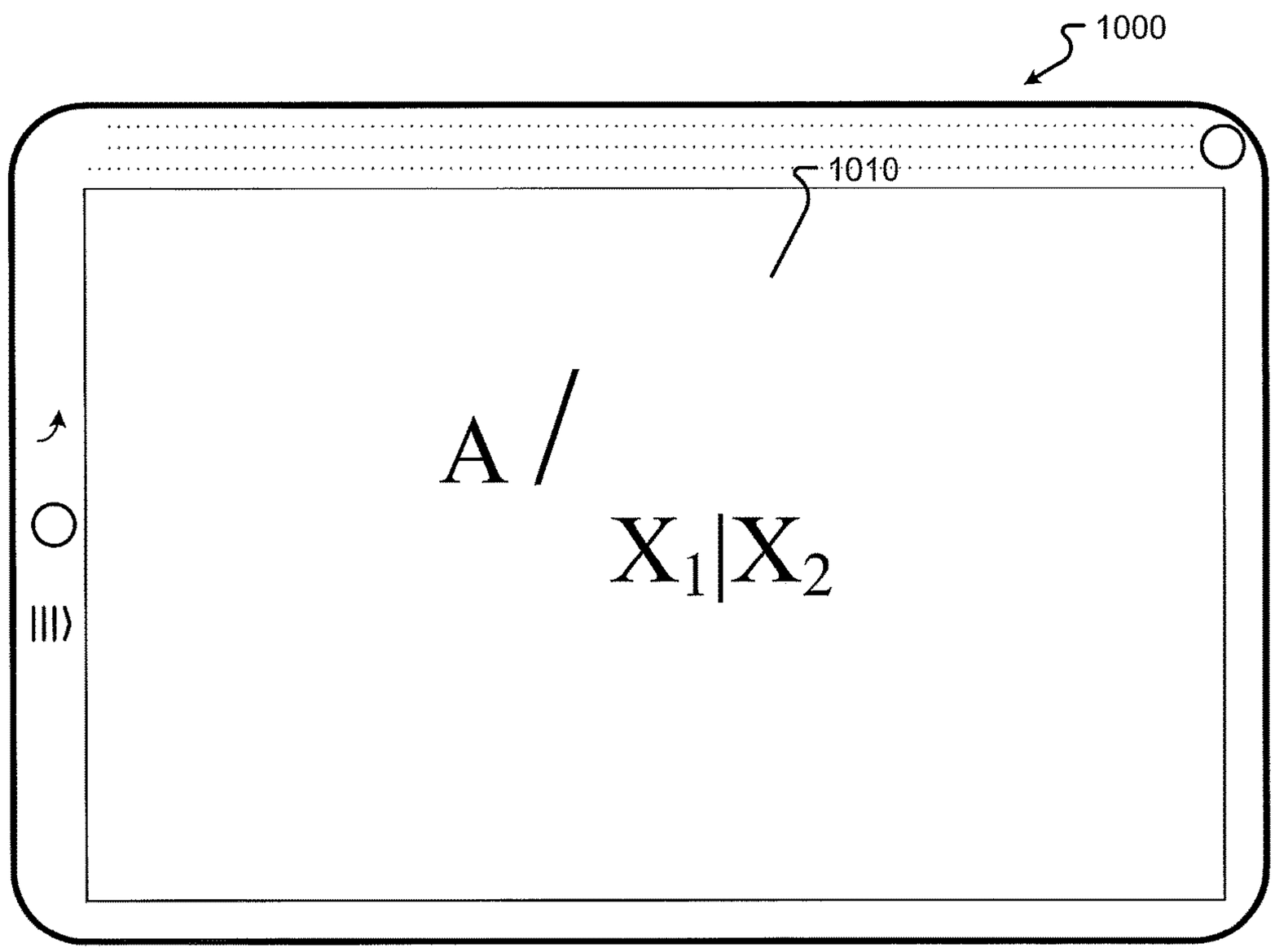



FIG. 15

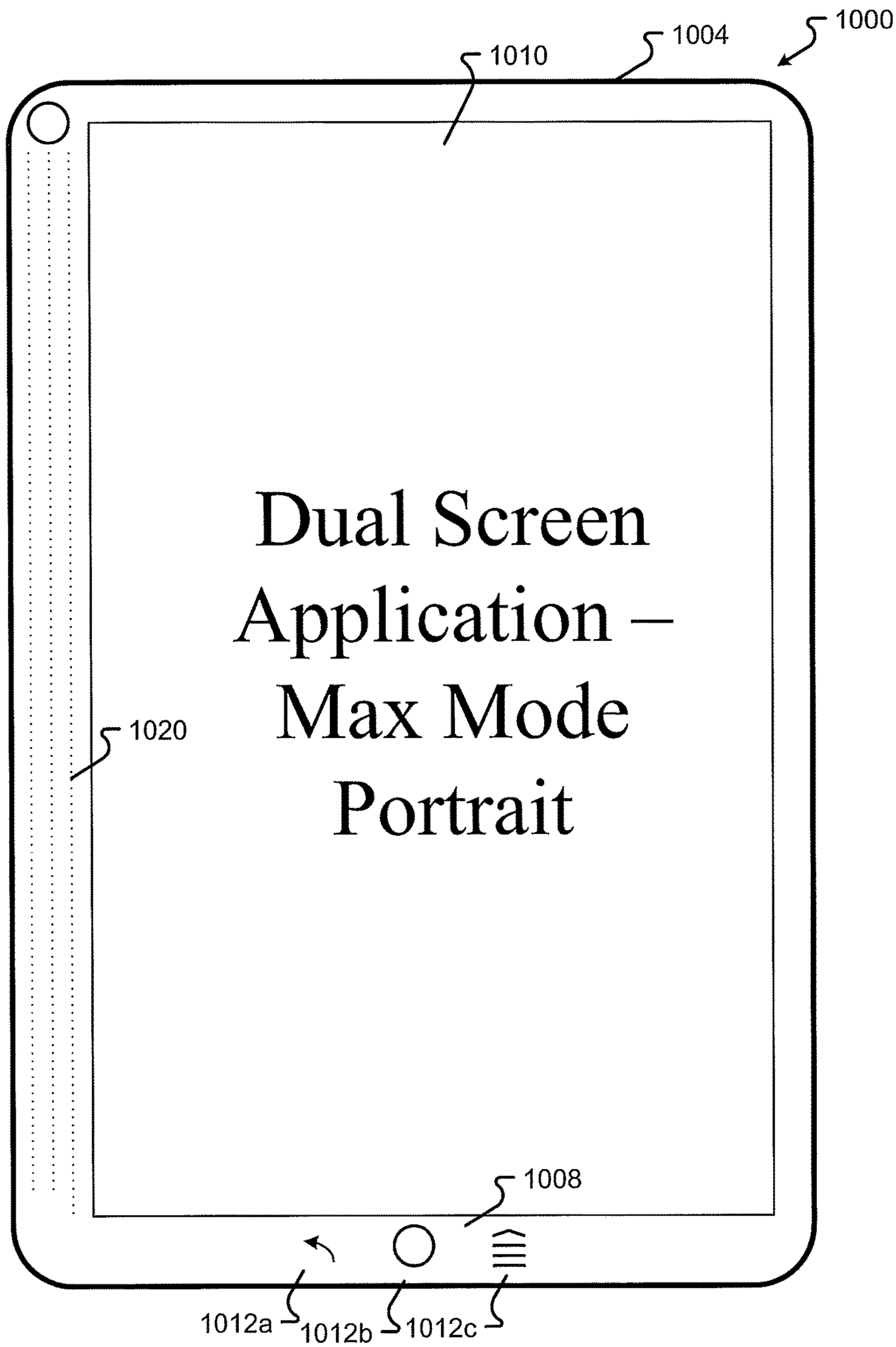

1000
1004
1010
Dual Screen Application – Max Mode Portrait
1020
1008
1012a
1012b
1012c

FIG. 16

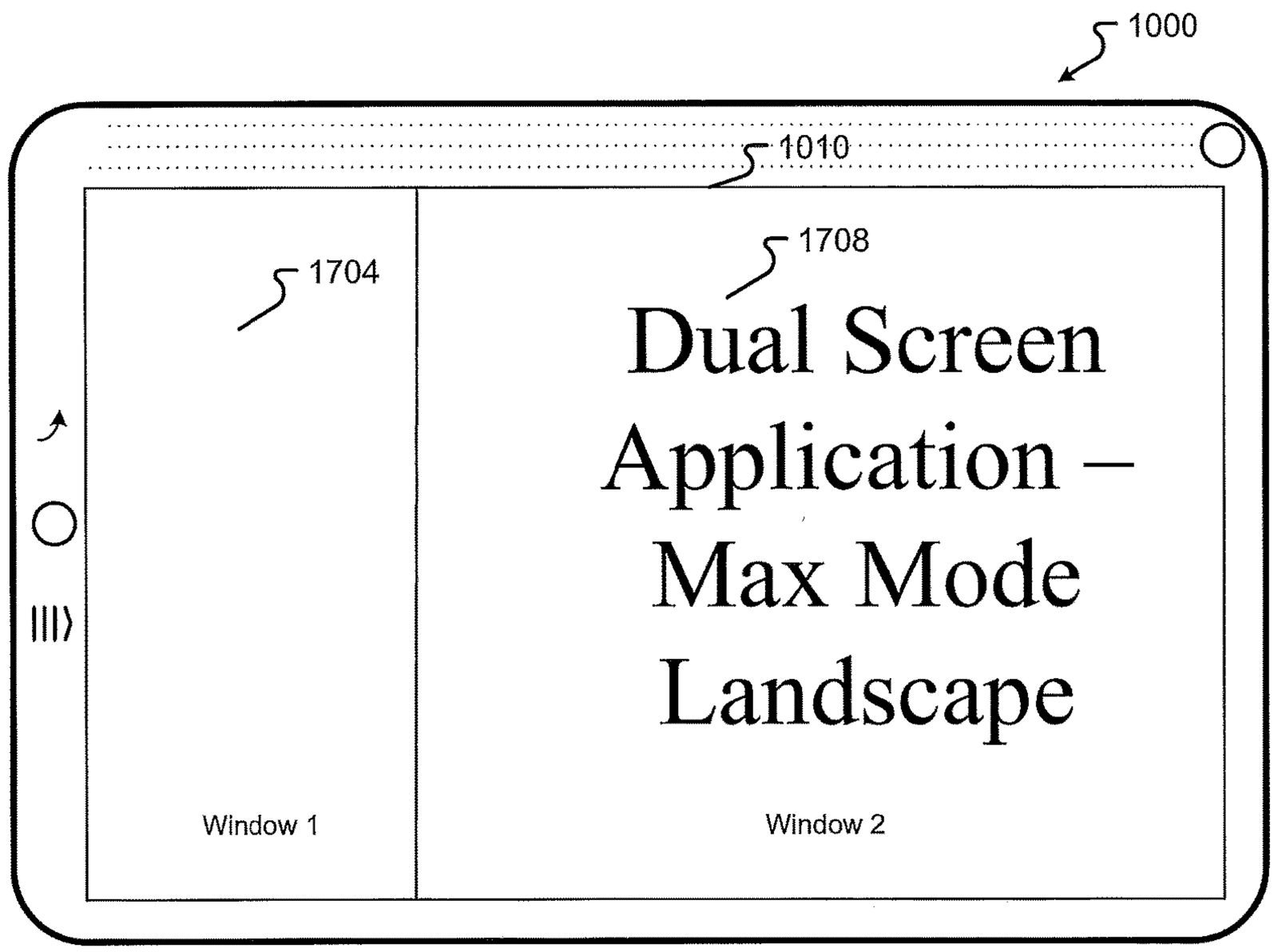

1000
1010
1704
1708
Dual Screen Application – Max Mode Landscape
Window 1
Window 2

FIG. 17

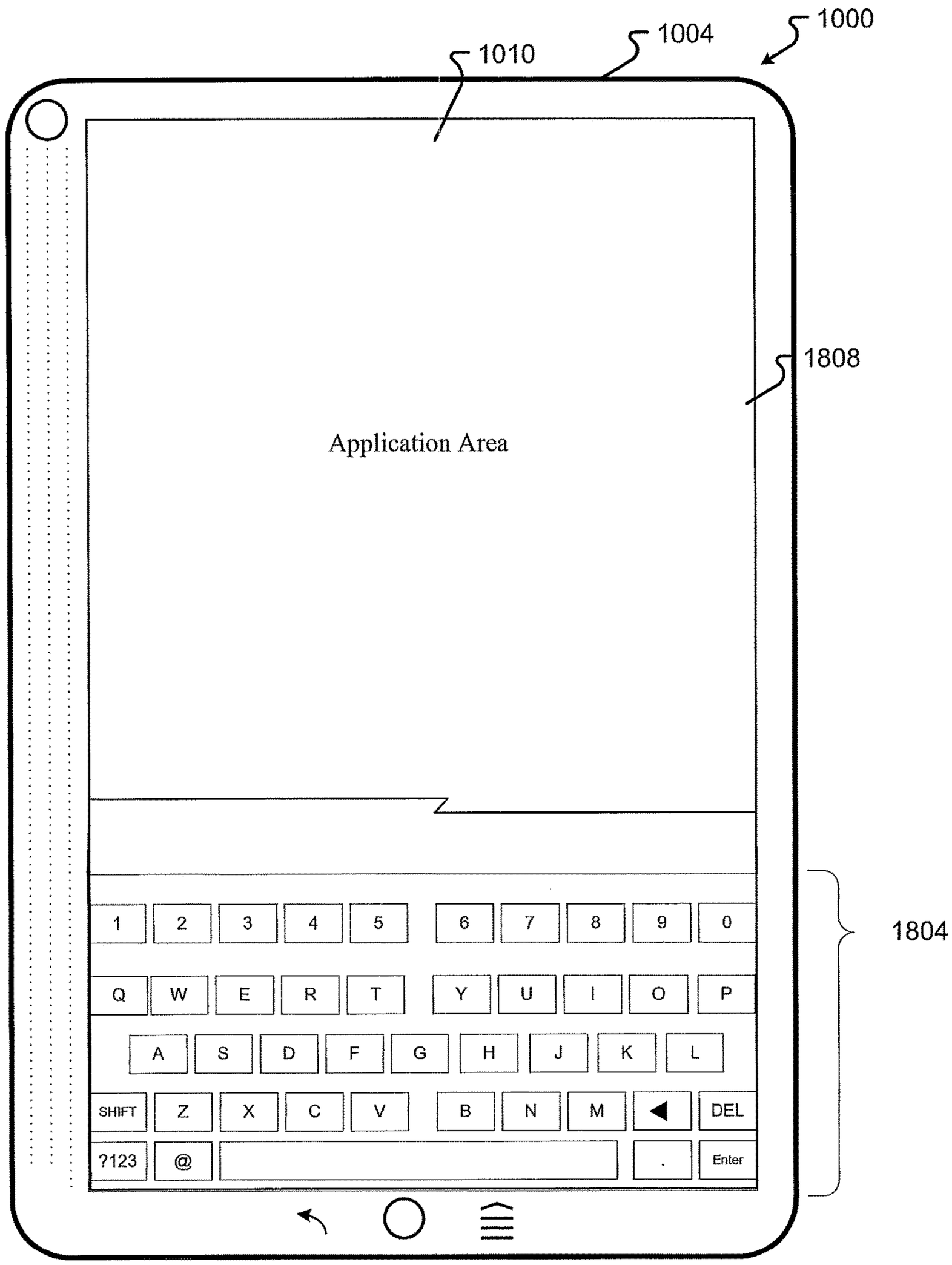

1000
1004
1010
1808
Application Area
1804
1 2 3 4 5 6 7 8 9 0
Q W E R T Y U I O P
A S D F G H J K L
SHIFT Z X C V B N M DEL
?123 @ . Enter

FIG. 18

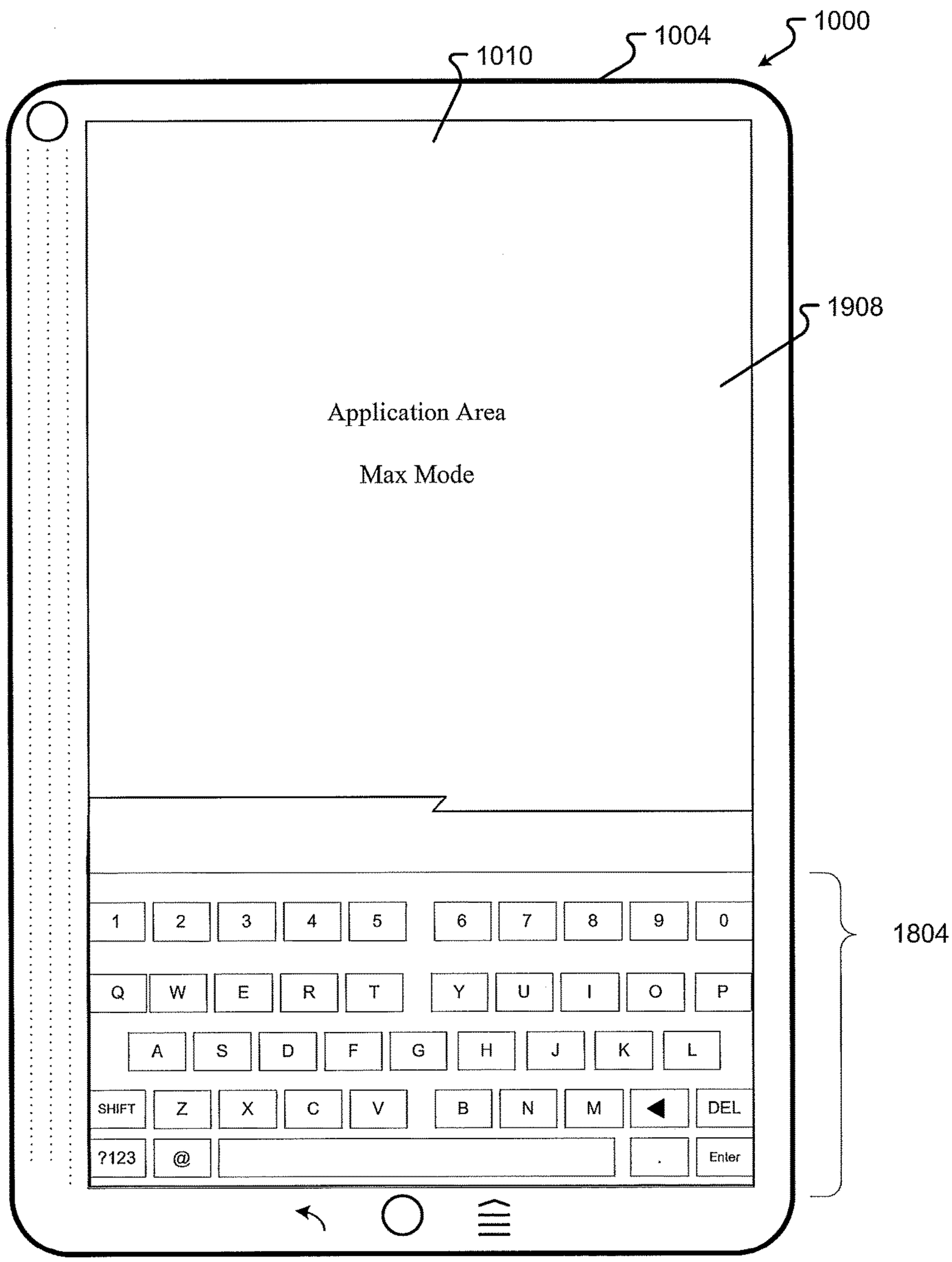

1000
1004
1010
1908
Application Area
Max Mode
1804
1 2 3 4 5 6 7 8 9 0
Q W E R T Y U I O P
A S D F G H J K L
SHIFT Z X C V B N M DEL
?123 @ . Enter

FIG. 19

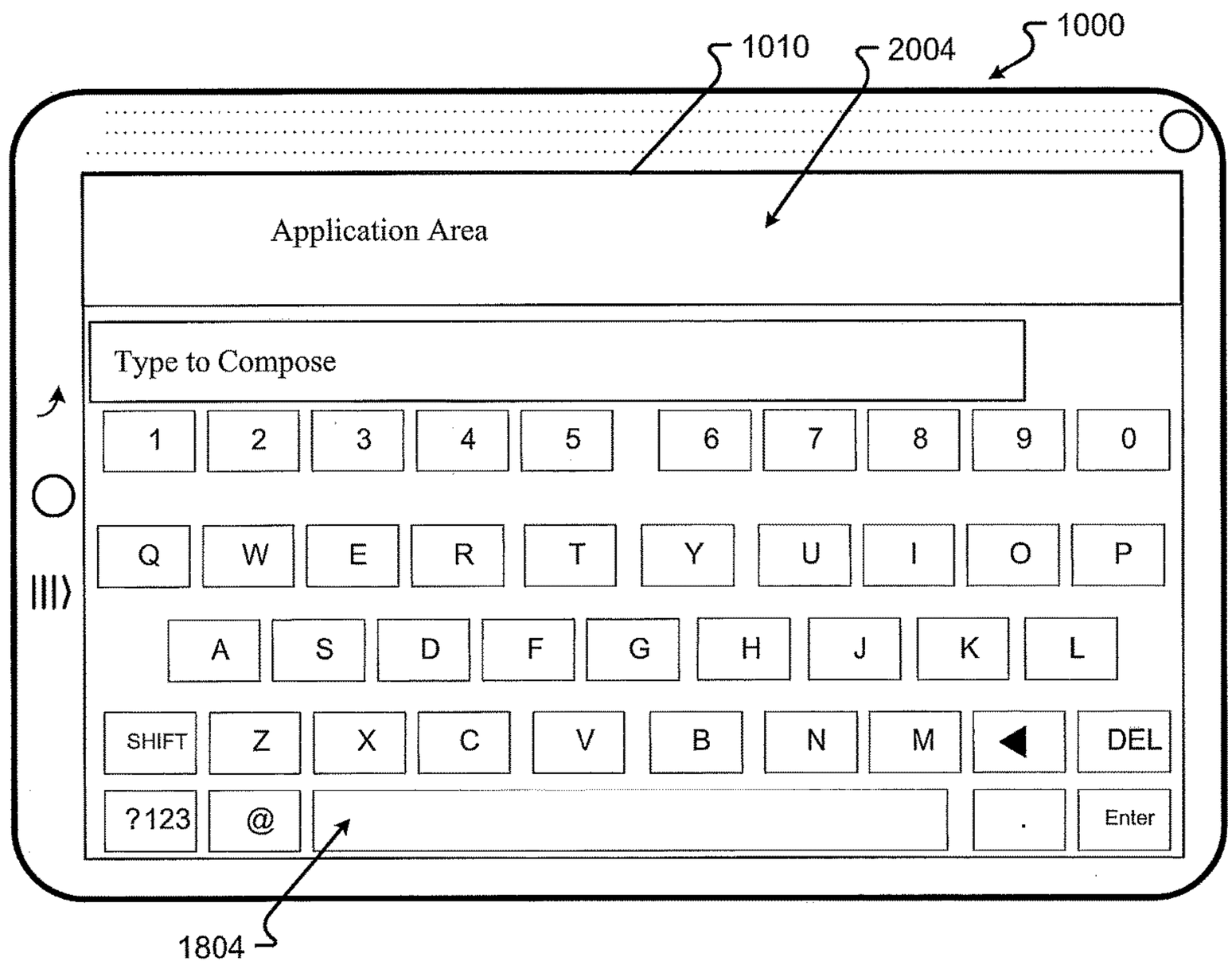

1010
2004
1000
Application Area
Type to Compose
1 2 3 4 5 6 7 8 9 0
Q W E R T Y U I O P
A S D F G H J K L
SHIFT Z X C V B N M DEL
?123 @ . Enter
1804

FIG. 20

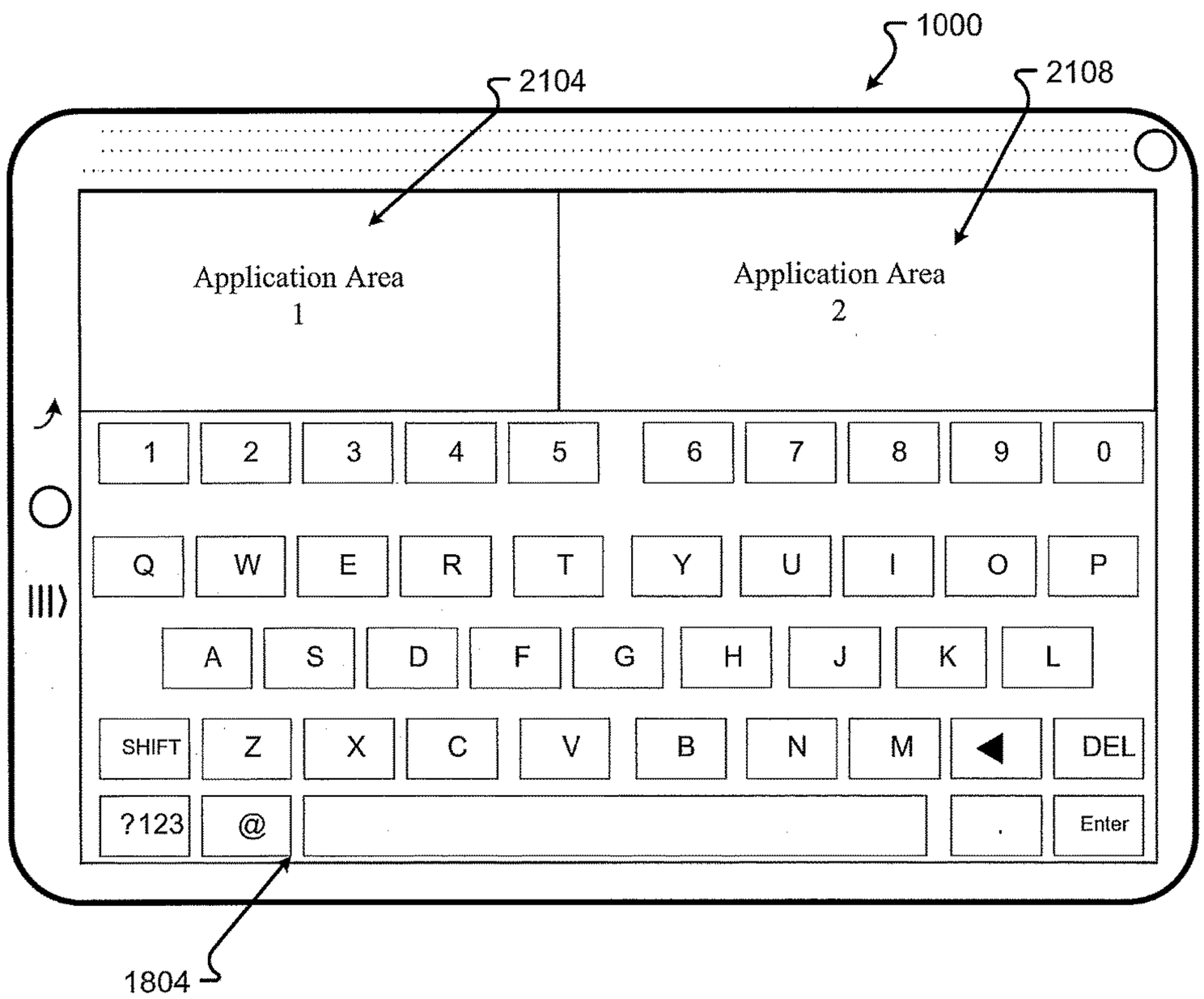

1000
2104
2108
Application Area
1
Application Area
2
1 2 3 4 5 6 7 8 9 0
Q W E R T Y U I O P
A S D F G H J K L
SHIFT Z X C V B N M ◀ DEL
?123 @ . Enter
1804

FIG. 21

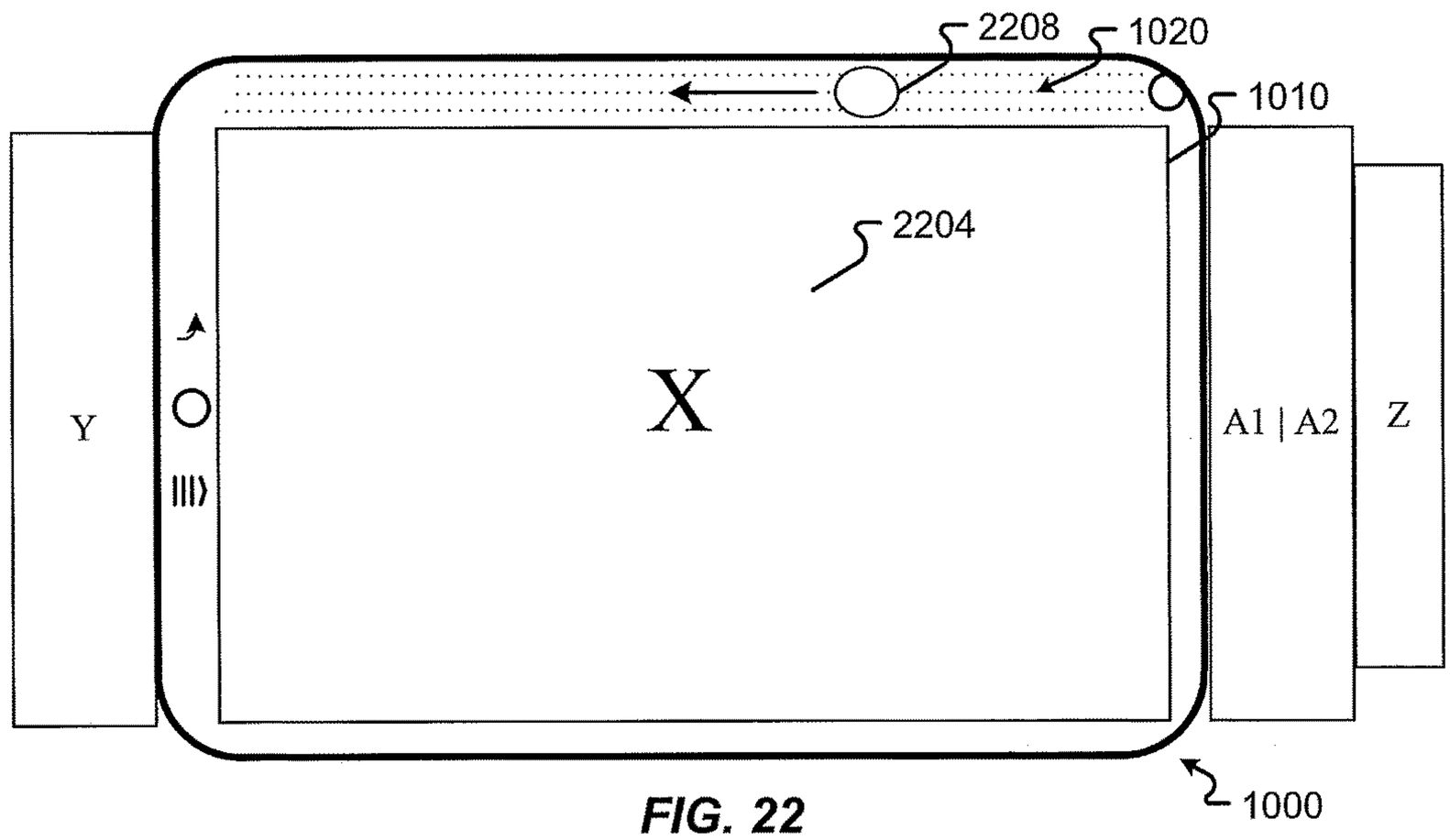



FIG. 22

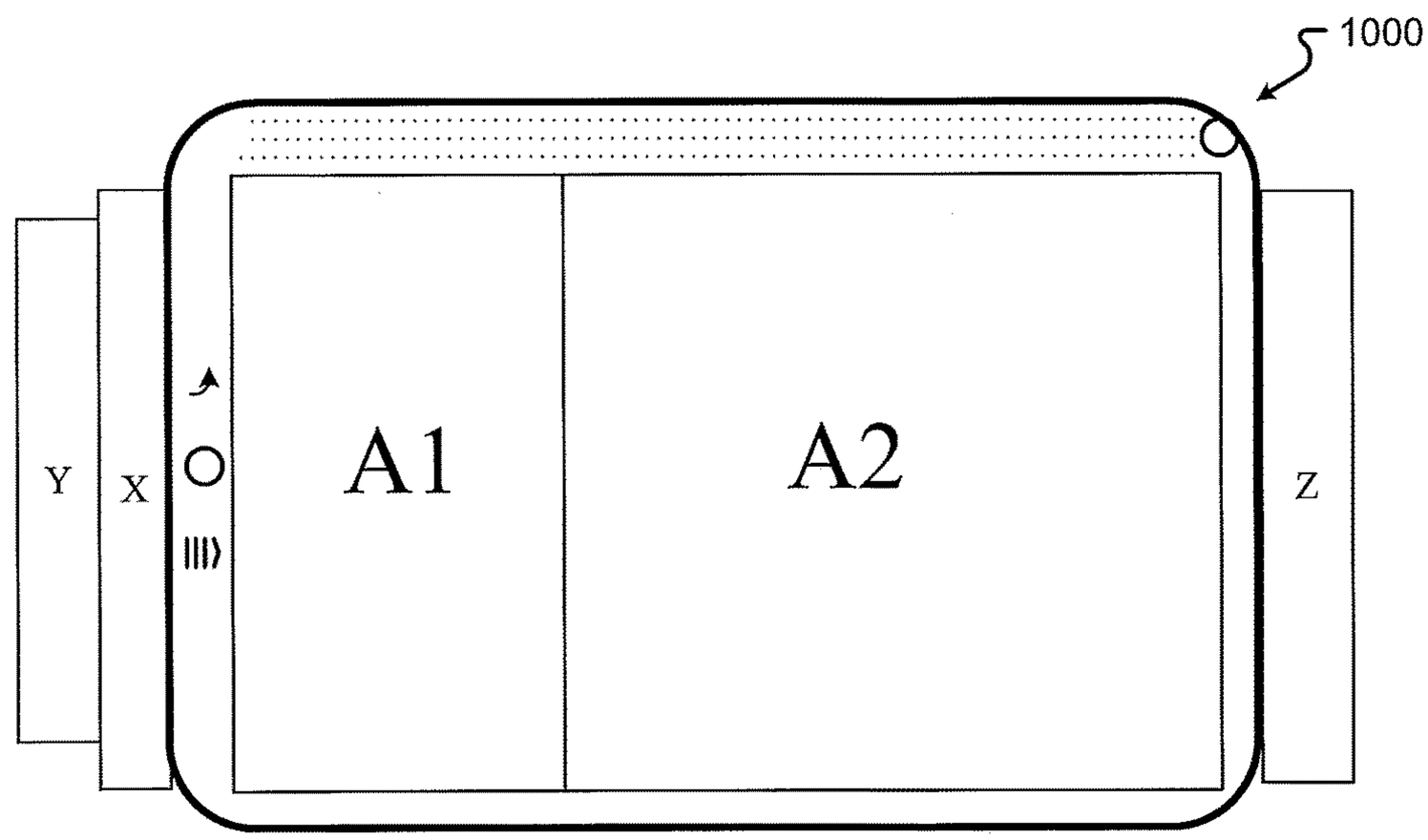



FIG. 23

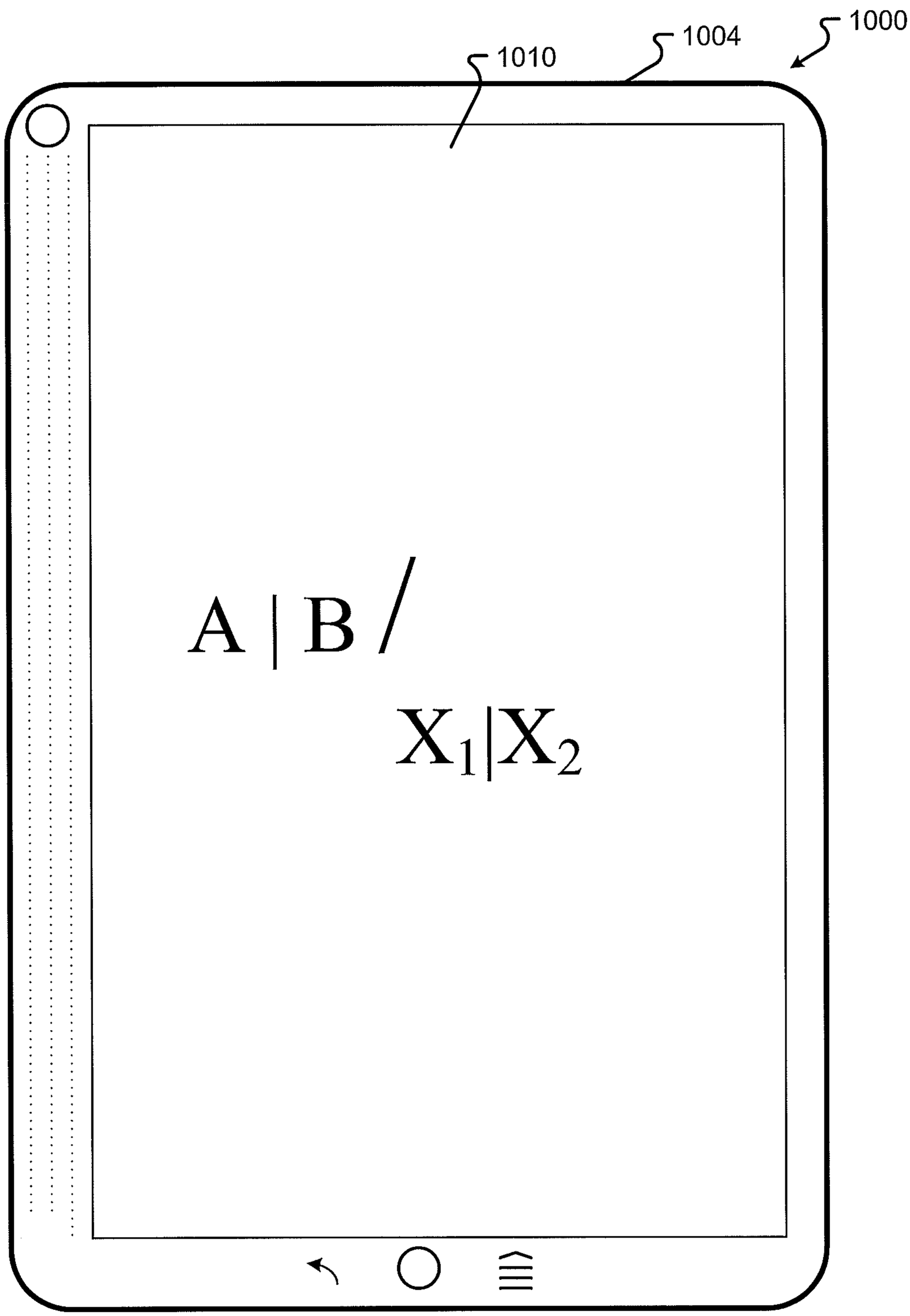



FIG. 24

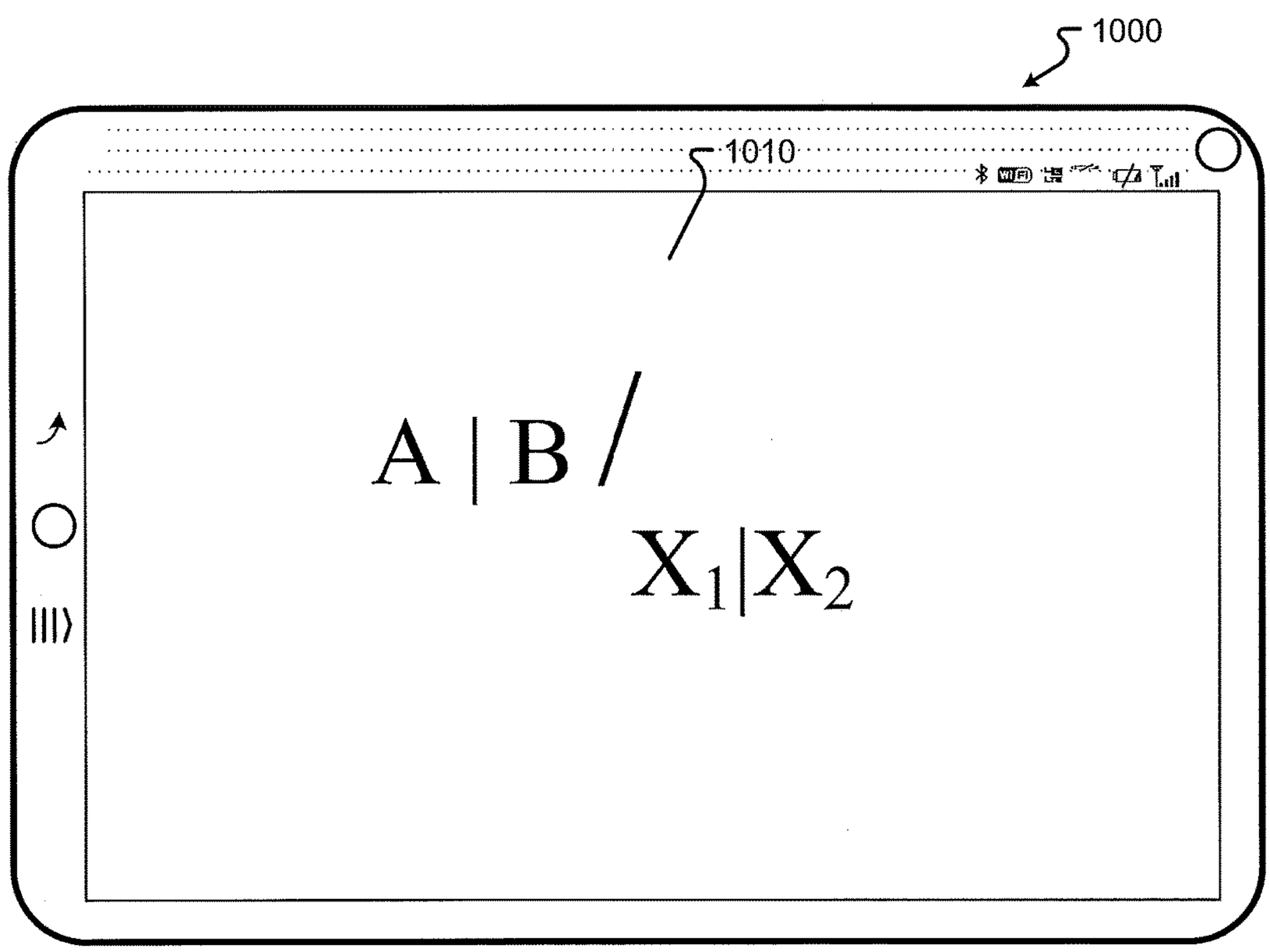



FIG. 25

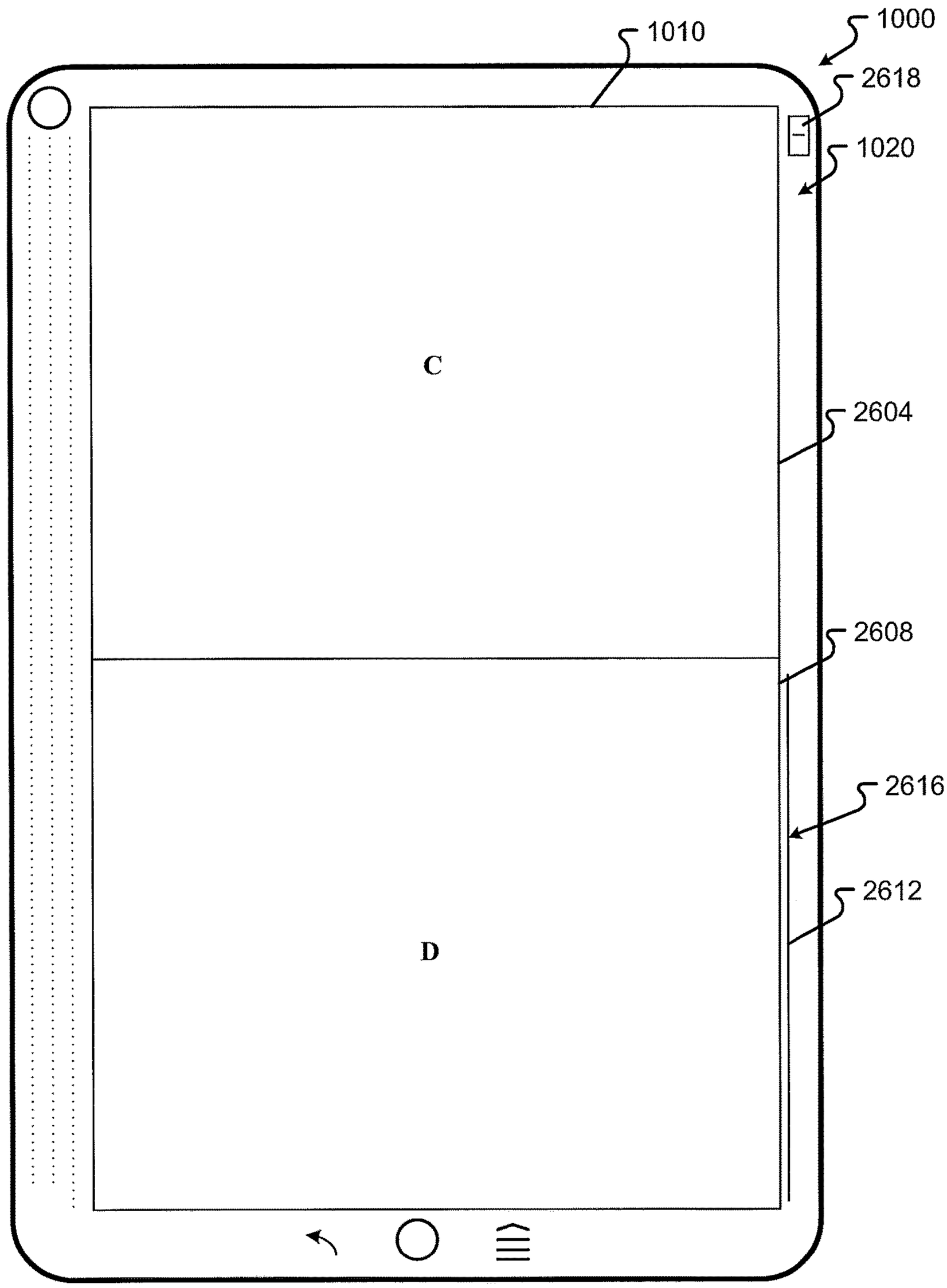



FIG. 26

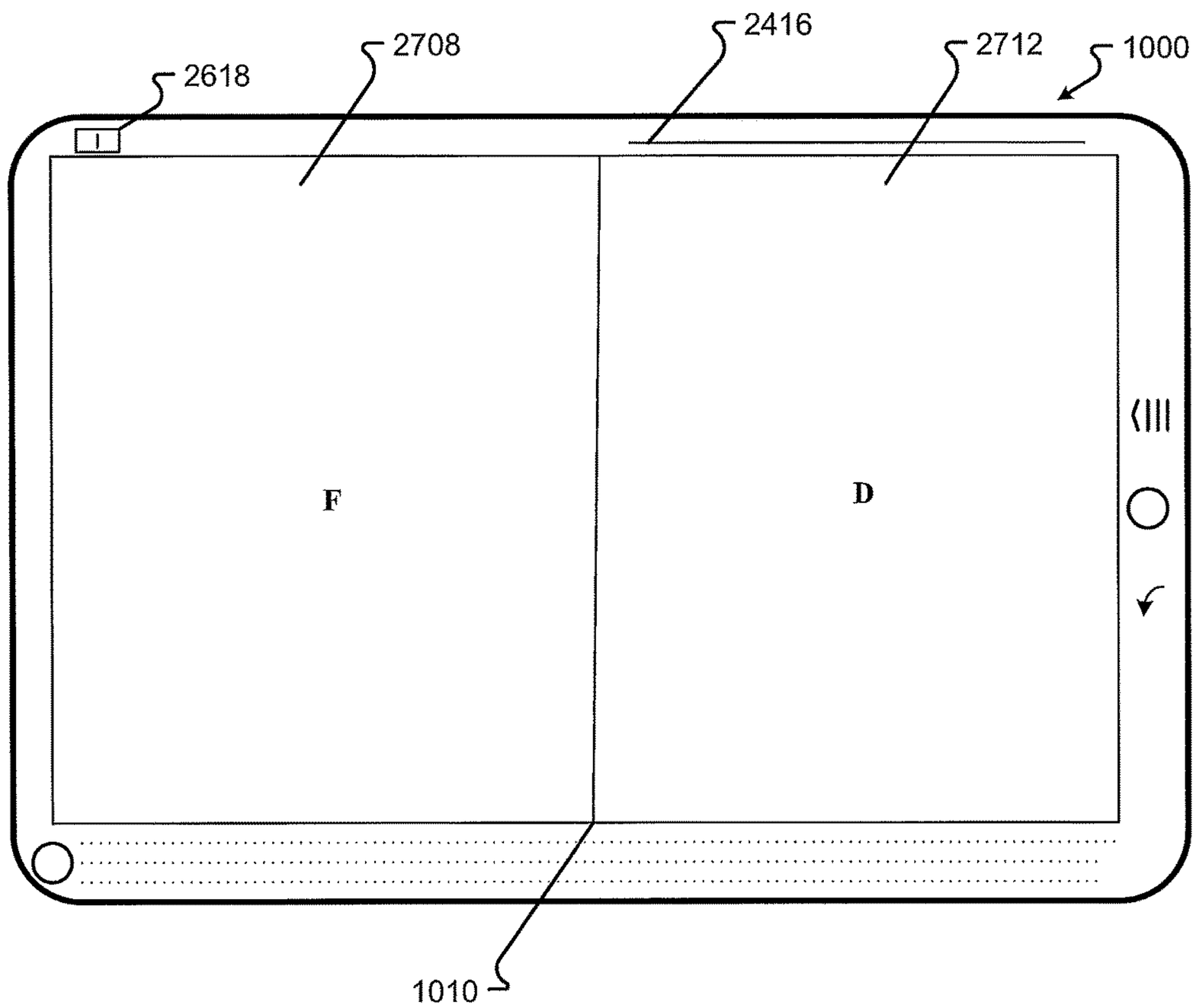



FIG. 27

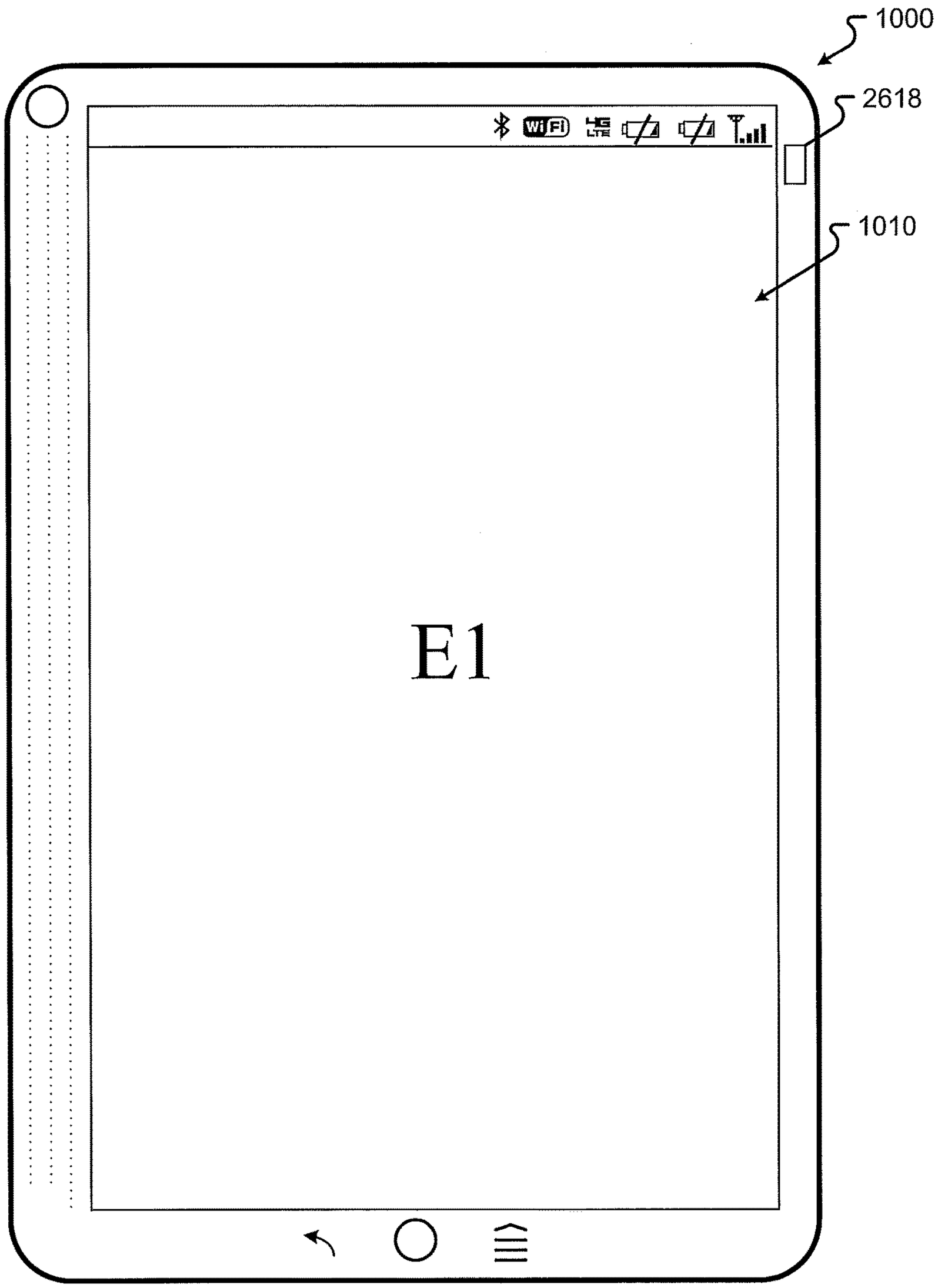



FIG. 28

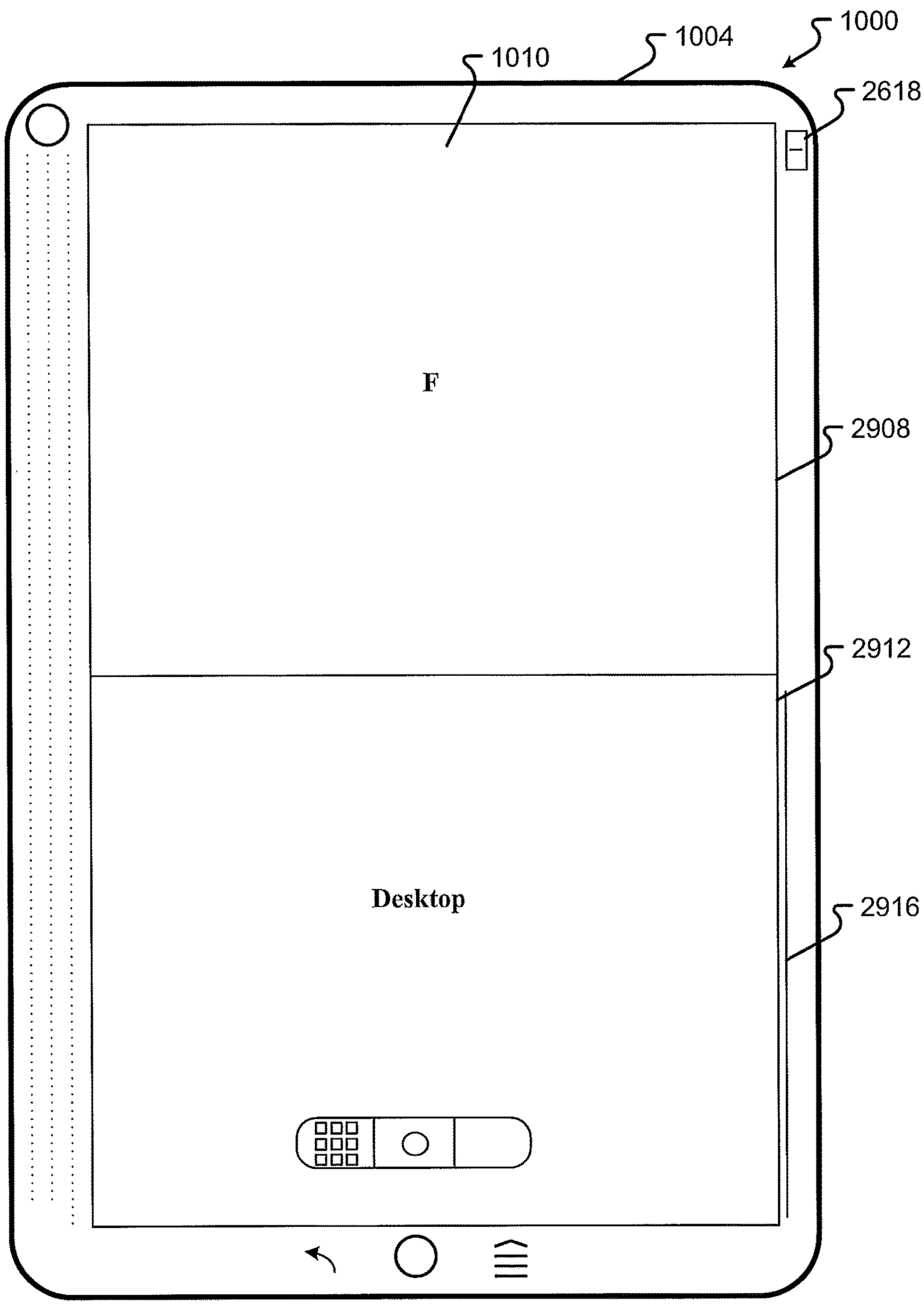



FIG. 29

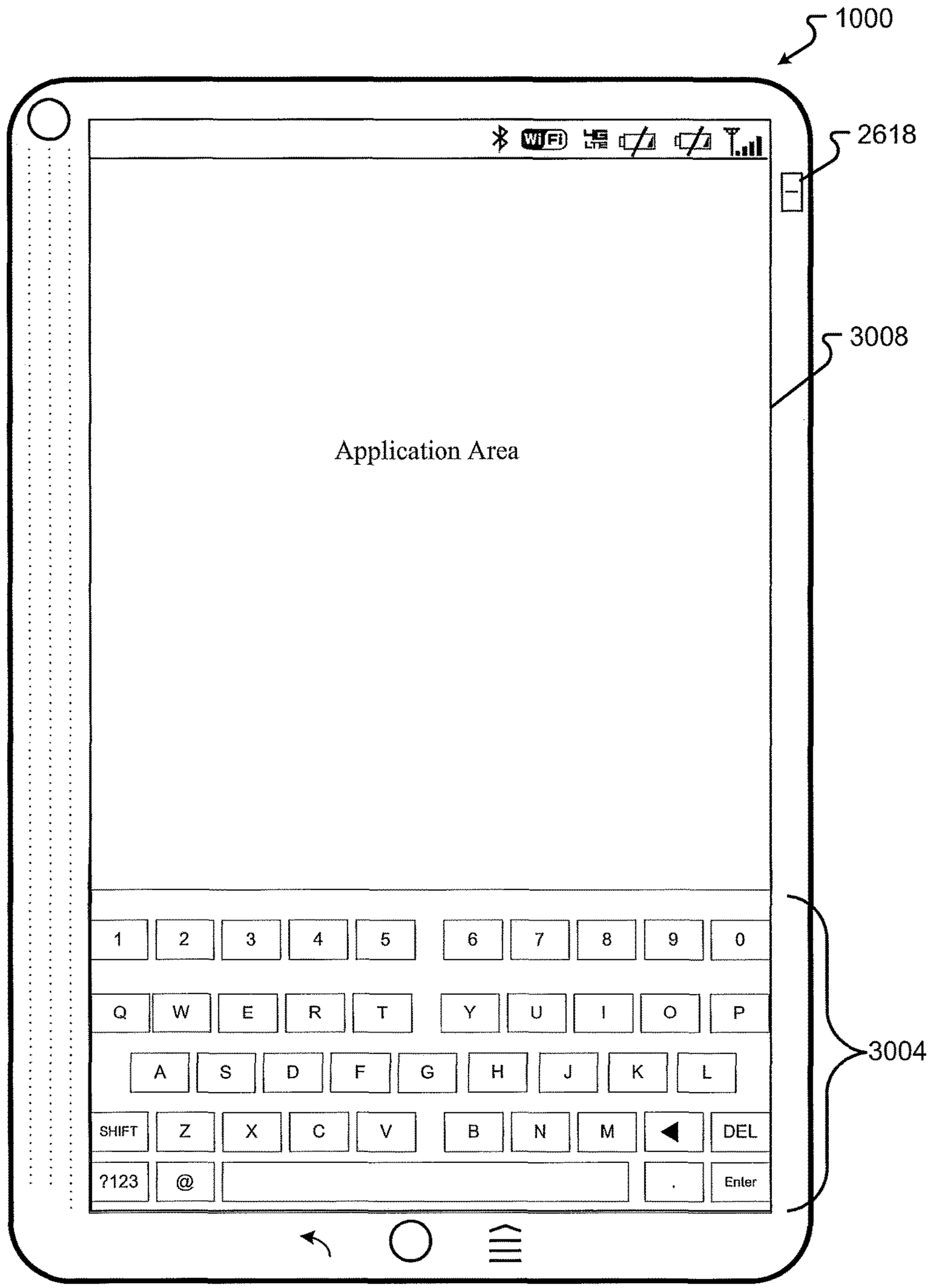

1000
2618
3008
Application Area
1 2 3 4 5 6 7 8 9 0
Q W E R T Y U I O P
A S D F G H J K L
SHIFT Z X C V B N M DEL
?123 @ . Enter
3004

FIG. 30

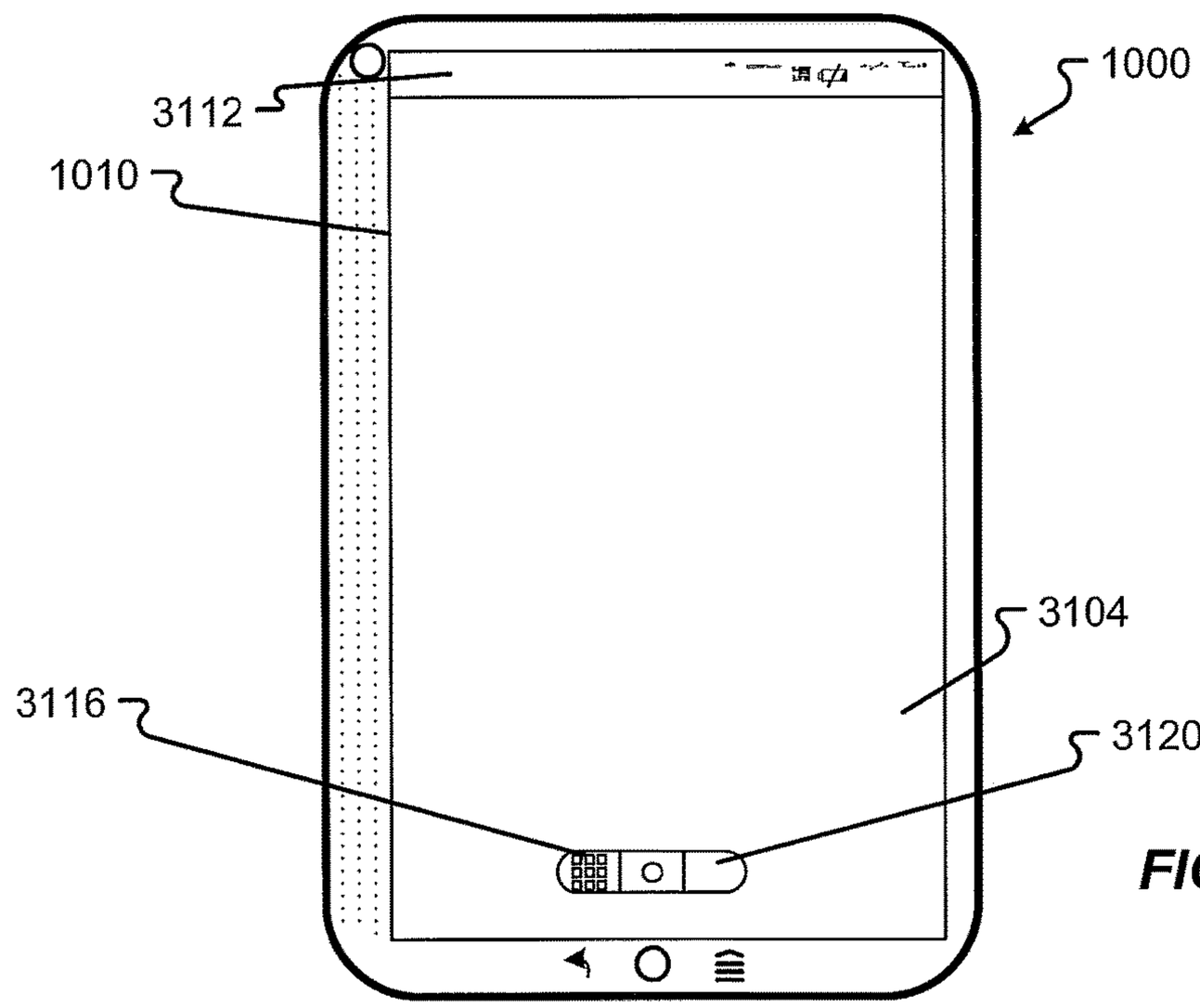



FIG. 31A

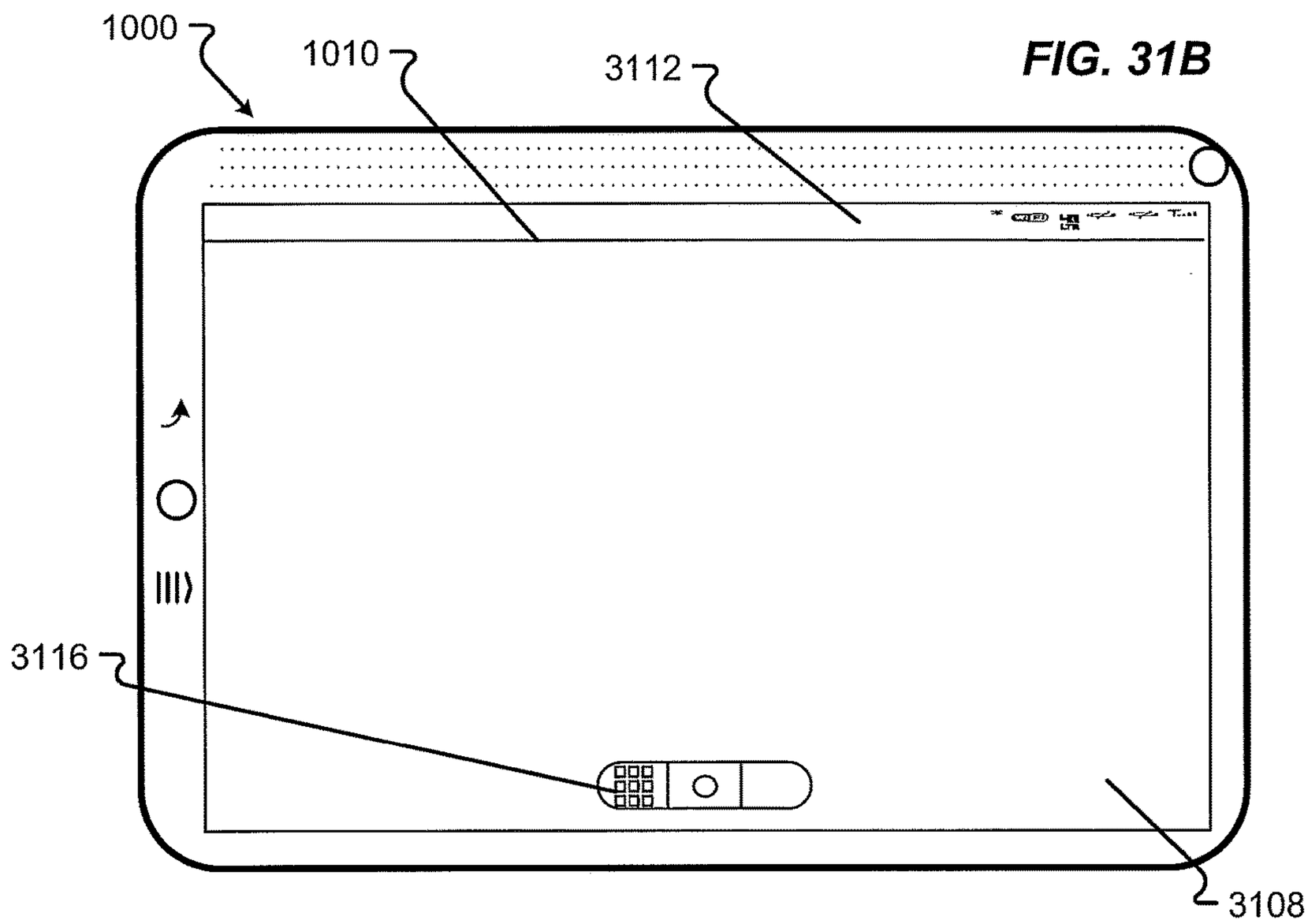



FIG. 31B

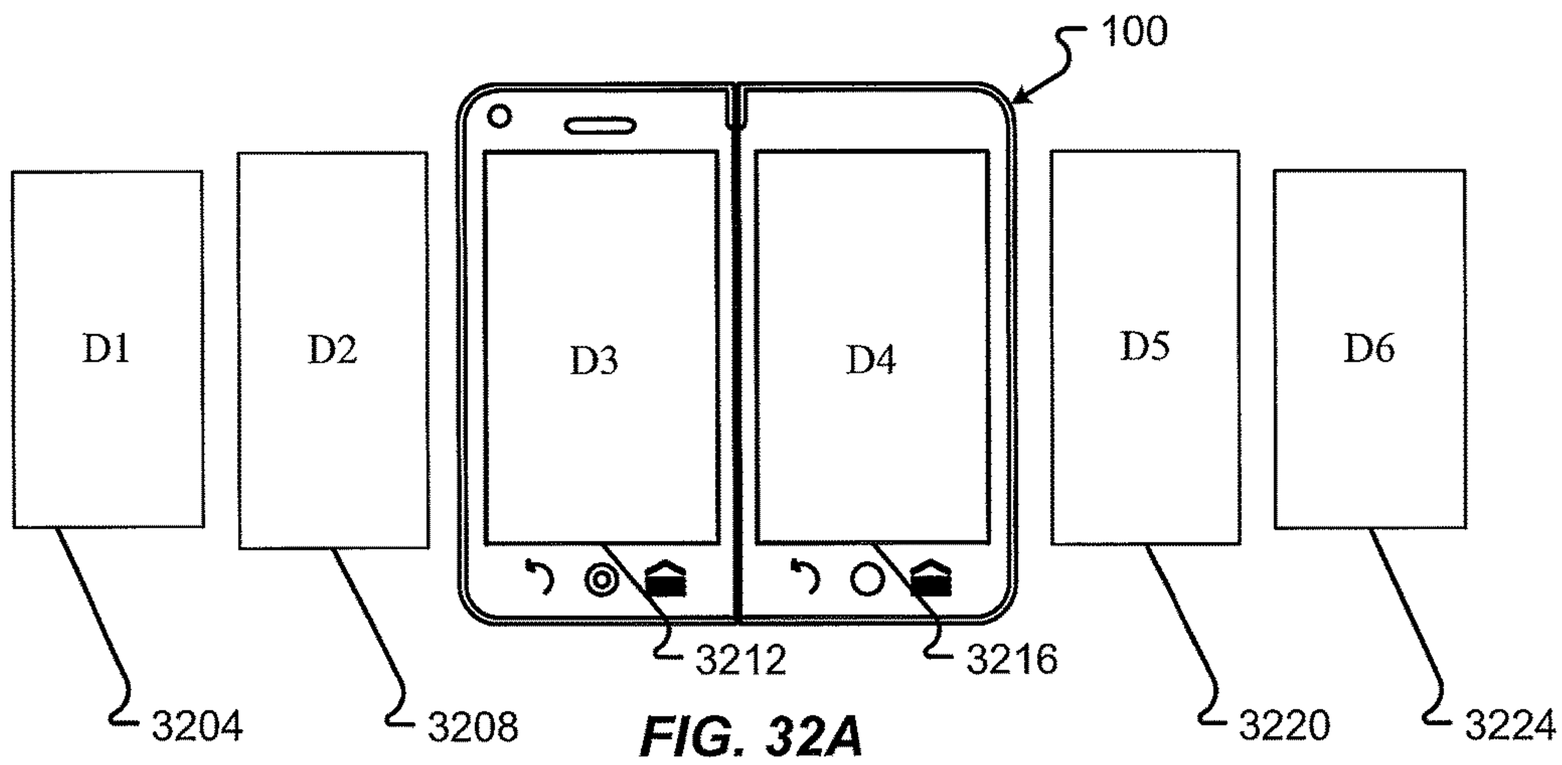
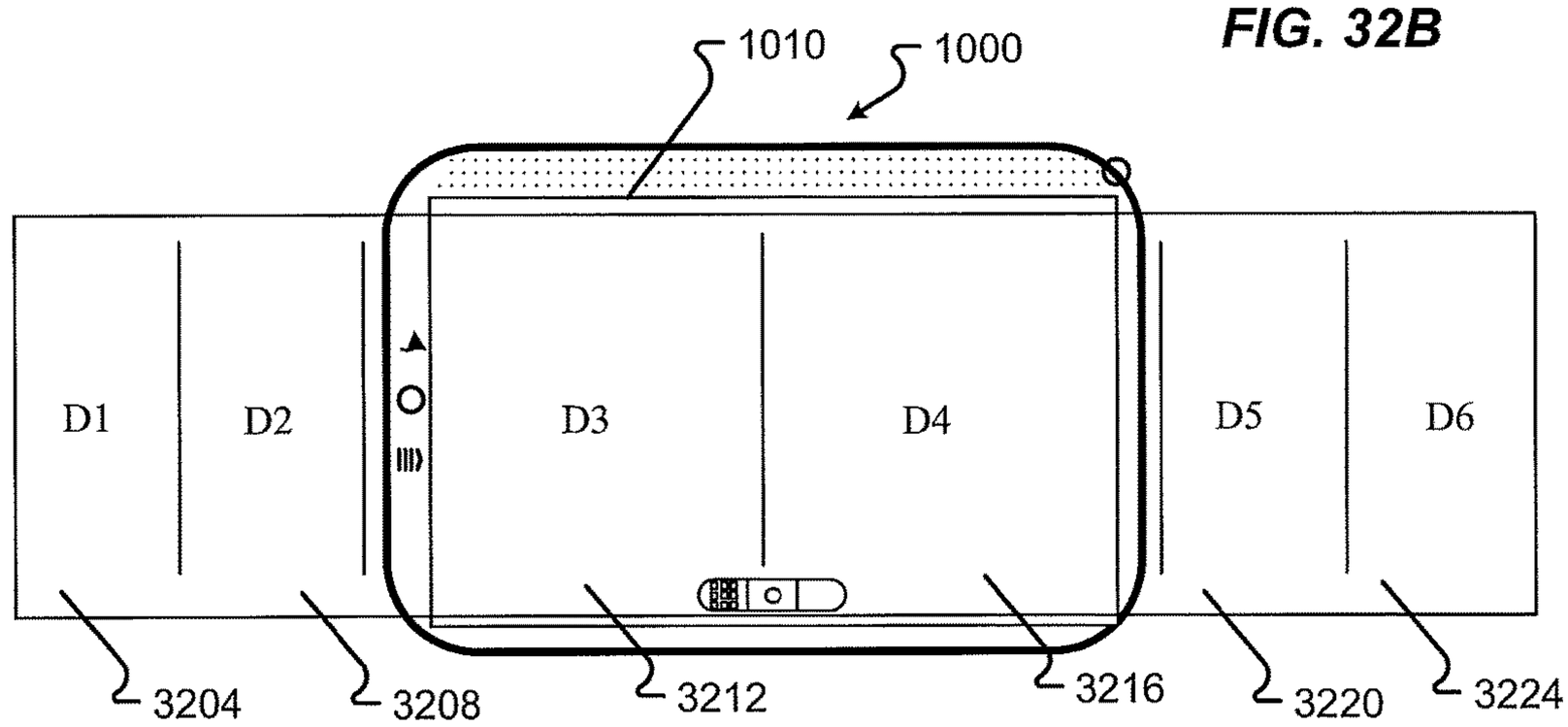



FIG. 32A

FIG. 32B



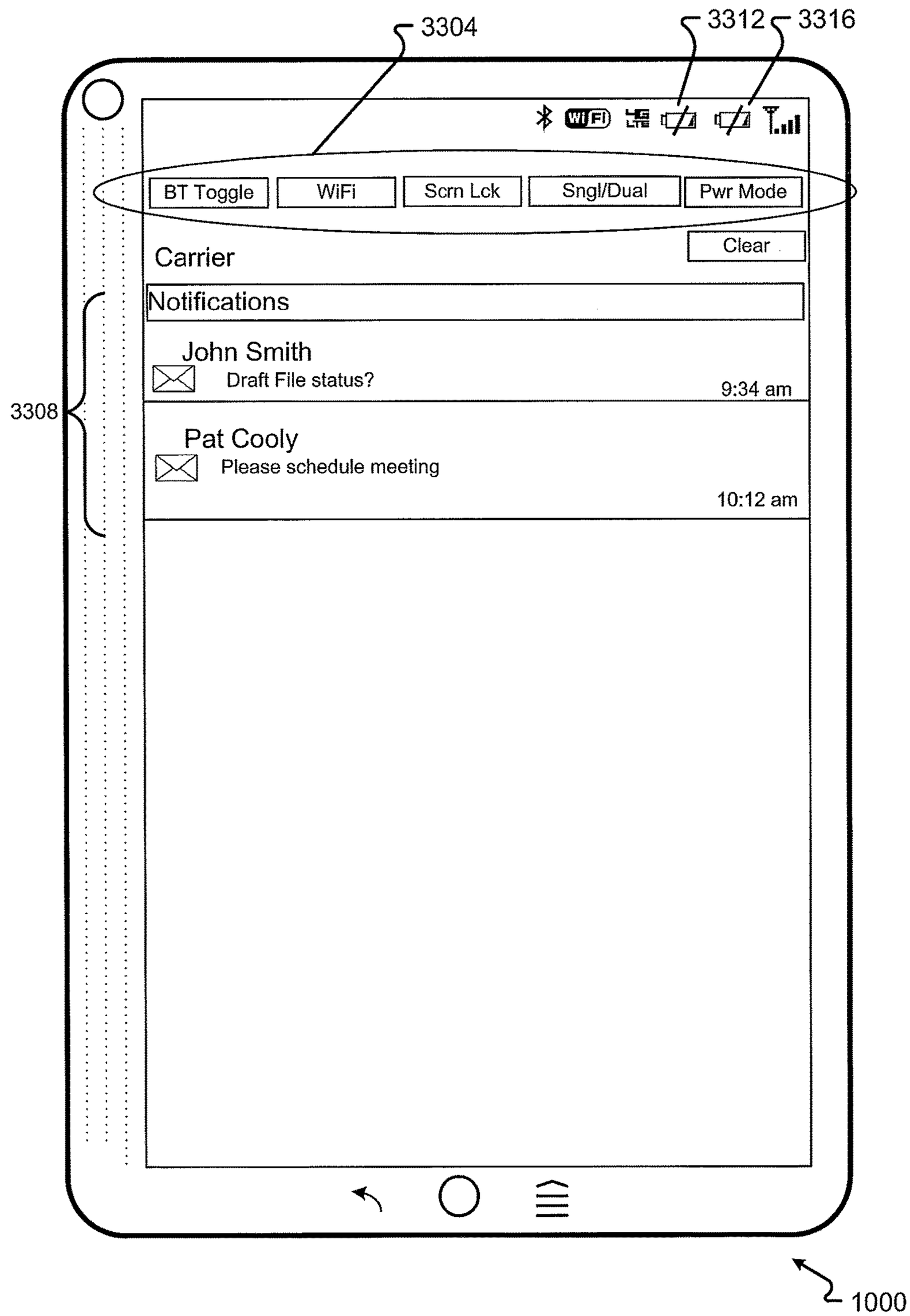

3304
3312
3316
BT Toggle
WiFi
Scrn Lck
Sngl/Dual
Pwr Mode
Clear
Carrier
Notifications
John Smith
Draft File status?
9:34 am
Pat Cooly
Please schedule meeting
10:12 am
3308
1000

FIG. 33

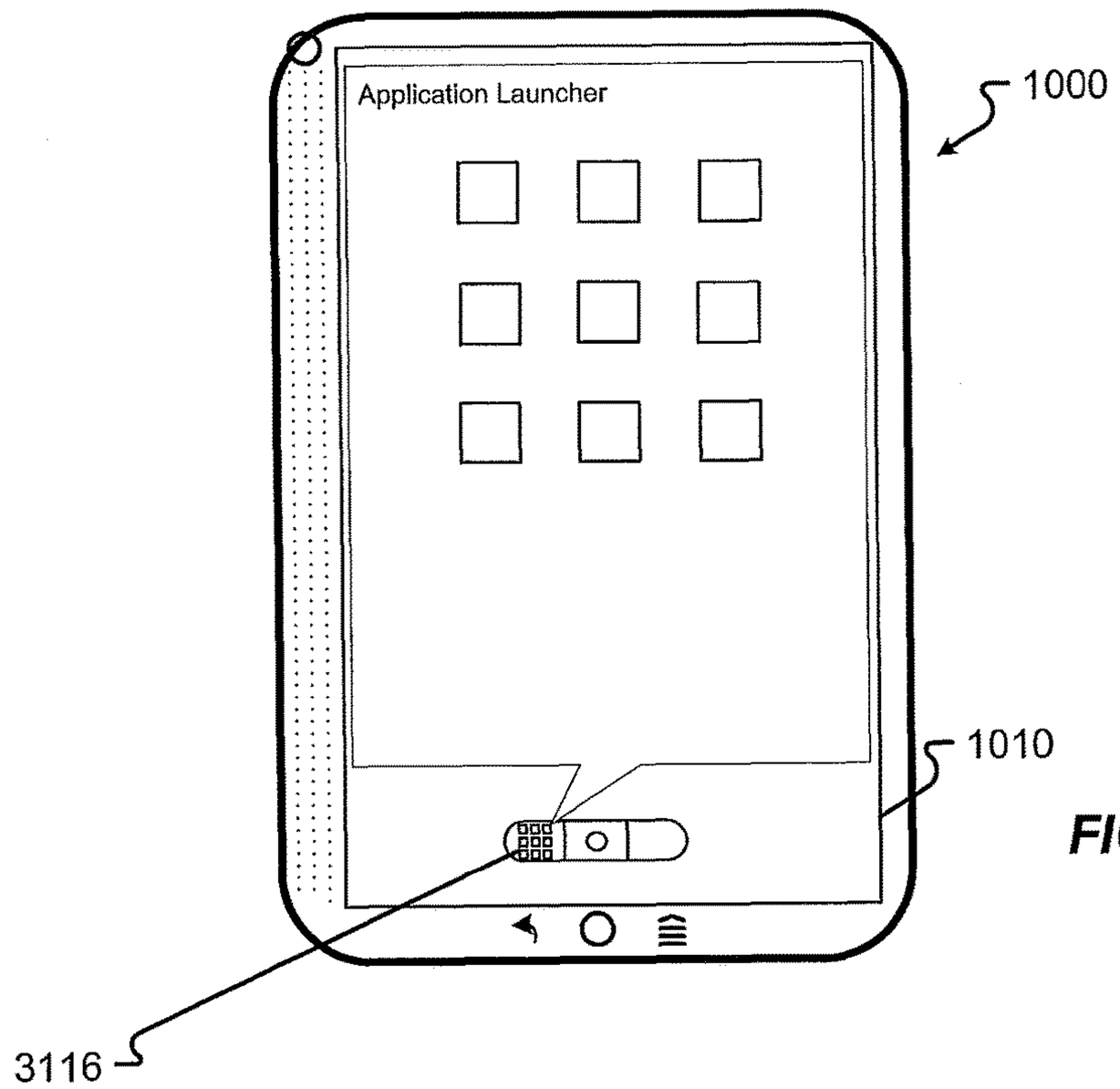



FIG. 34A

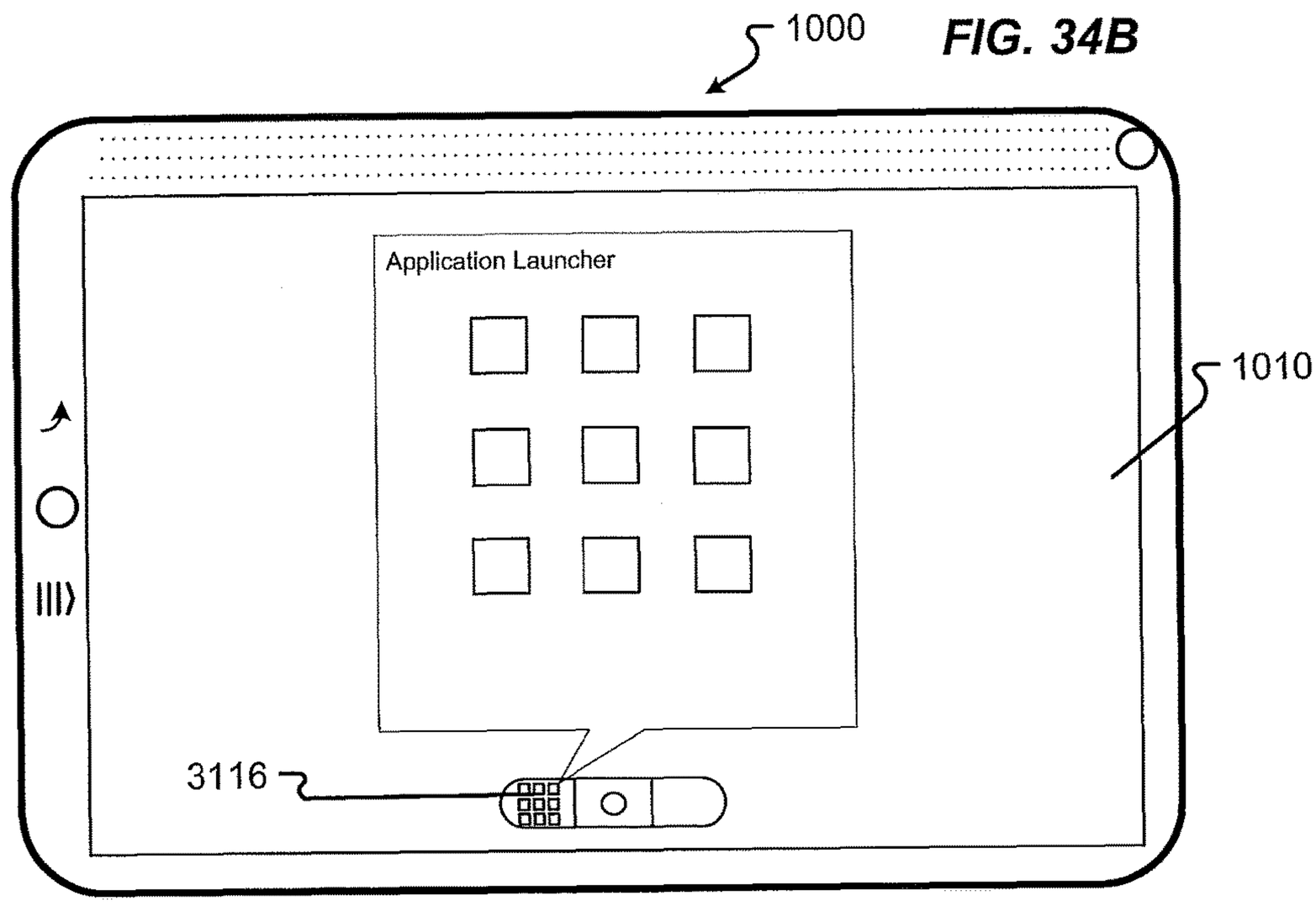



FIG. 34B

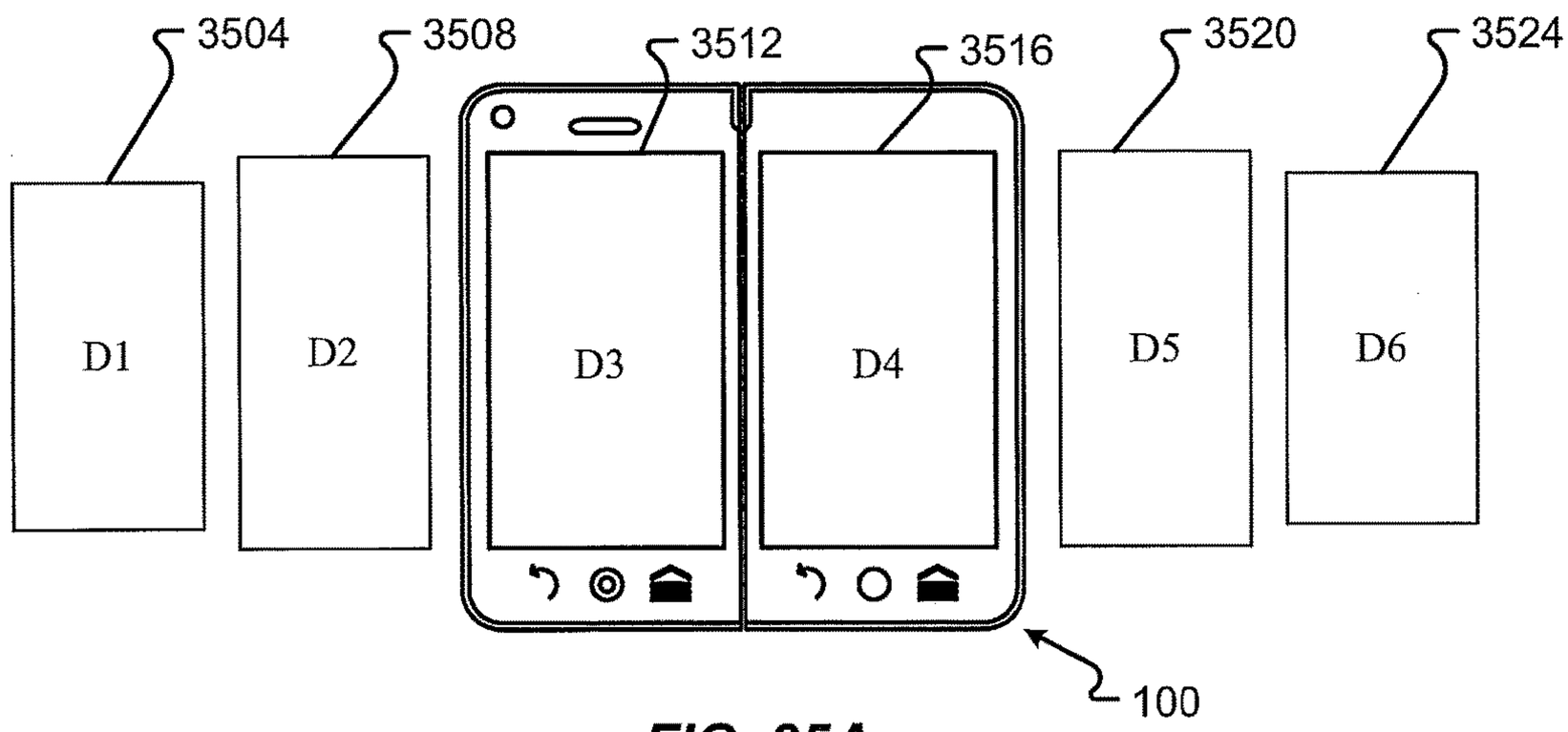



FIG. 35A

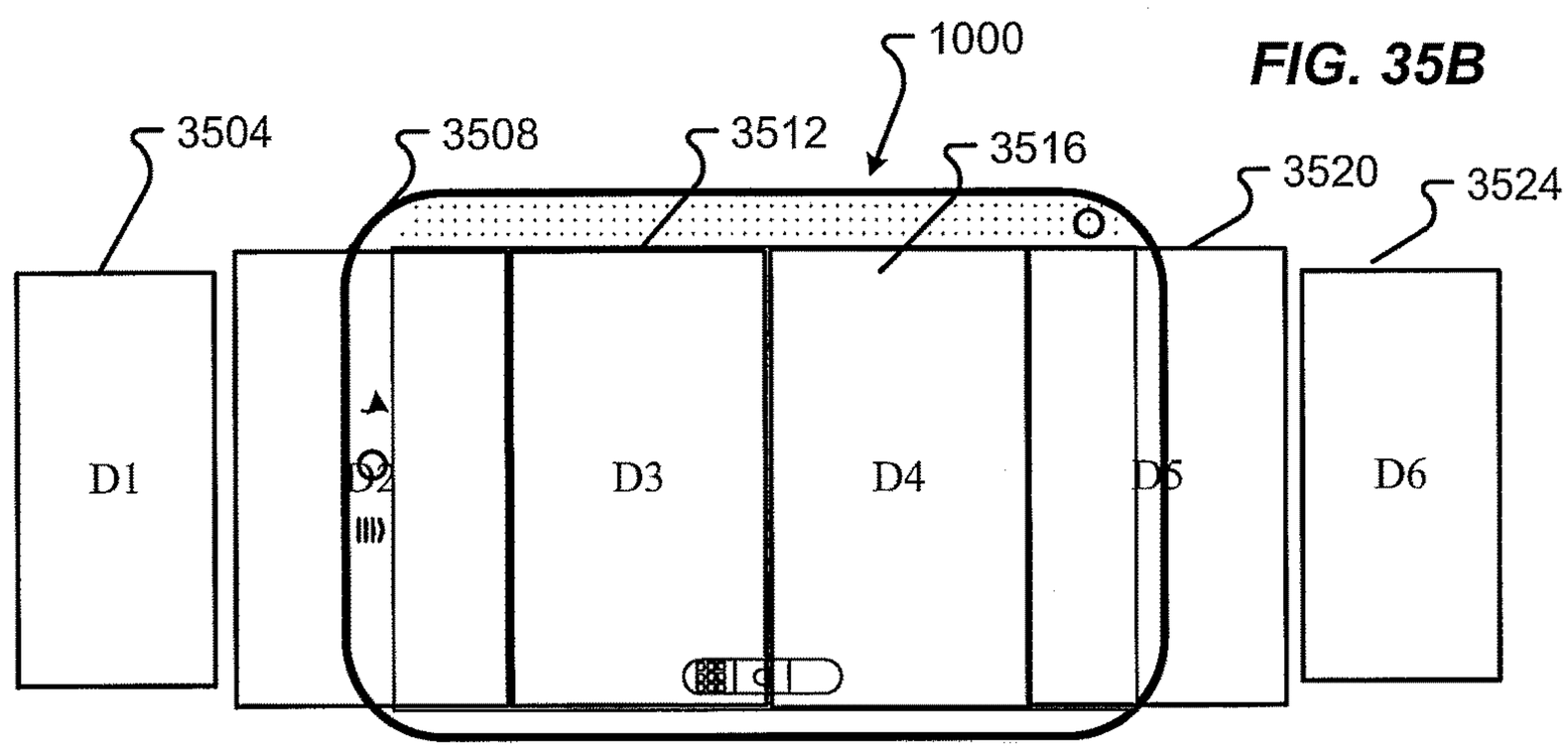



FIG. 35B

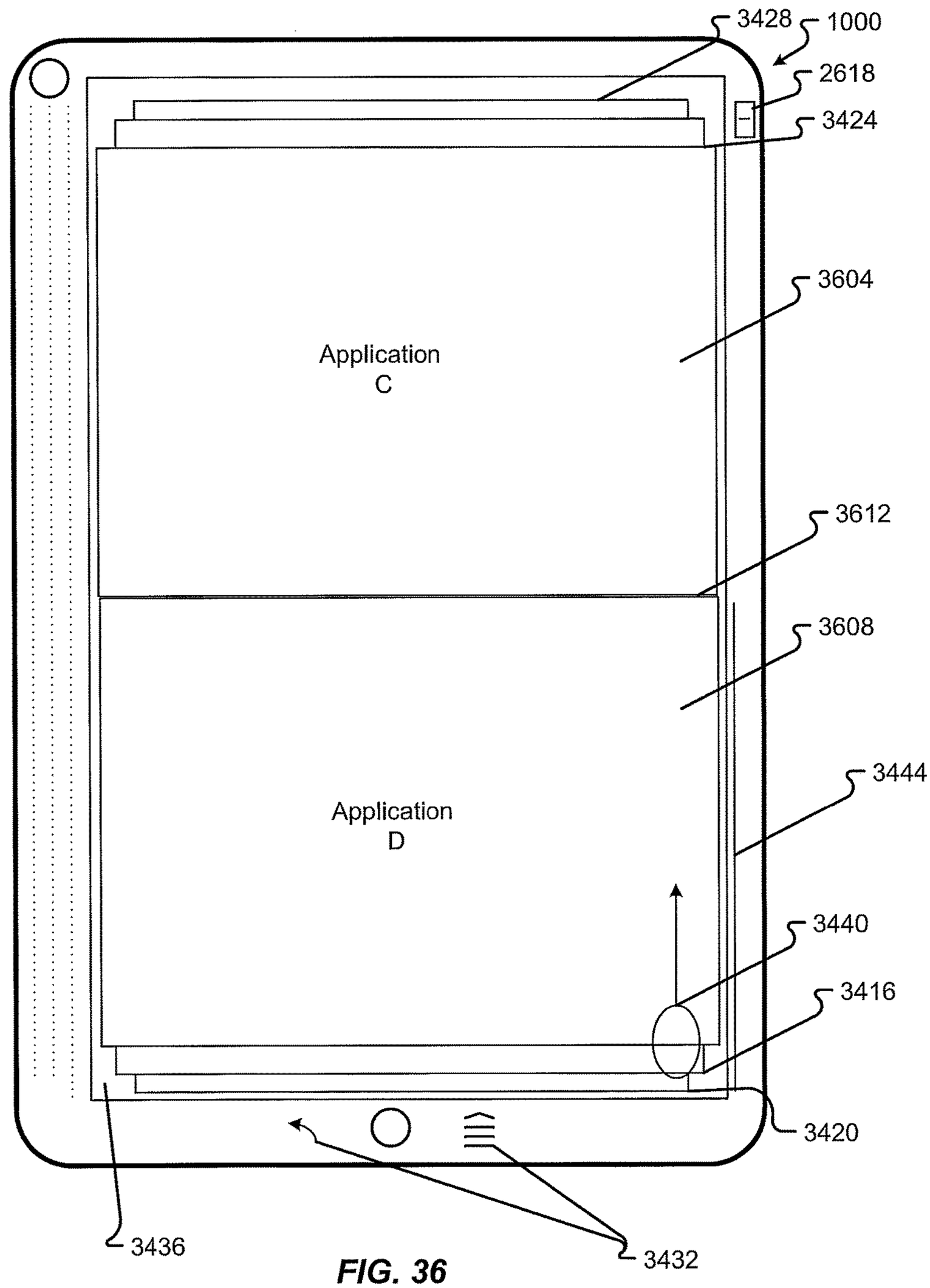

3428
1000
2618
3424
3604
Application
C
3612
3608
3444
Application
D
3440
3416
3420
3436
3432

FIG. 36

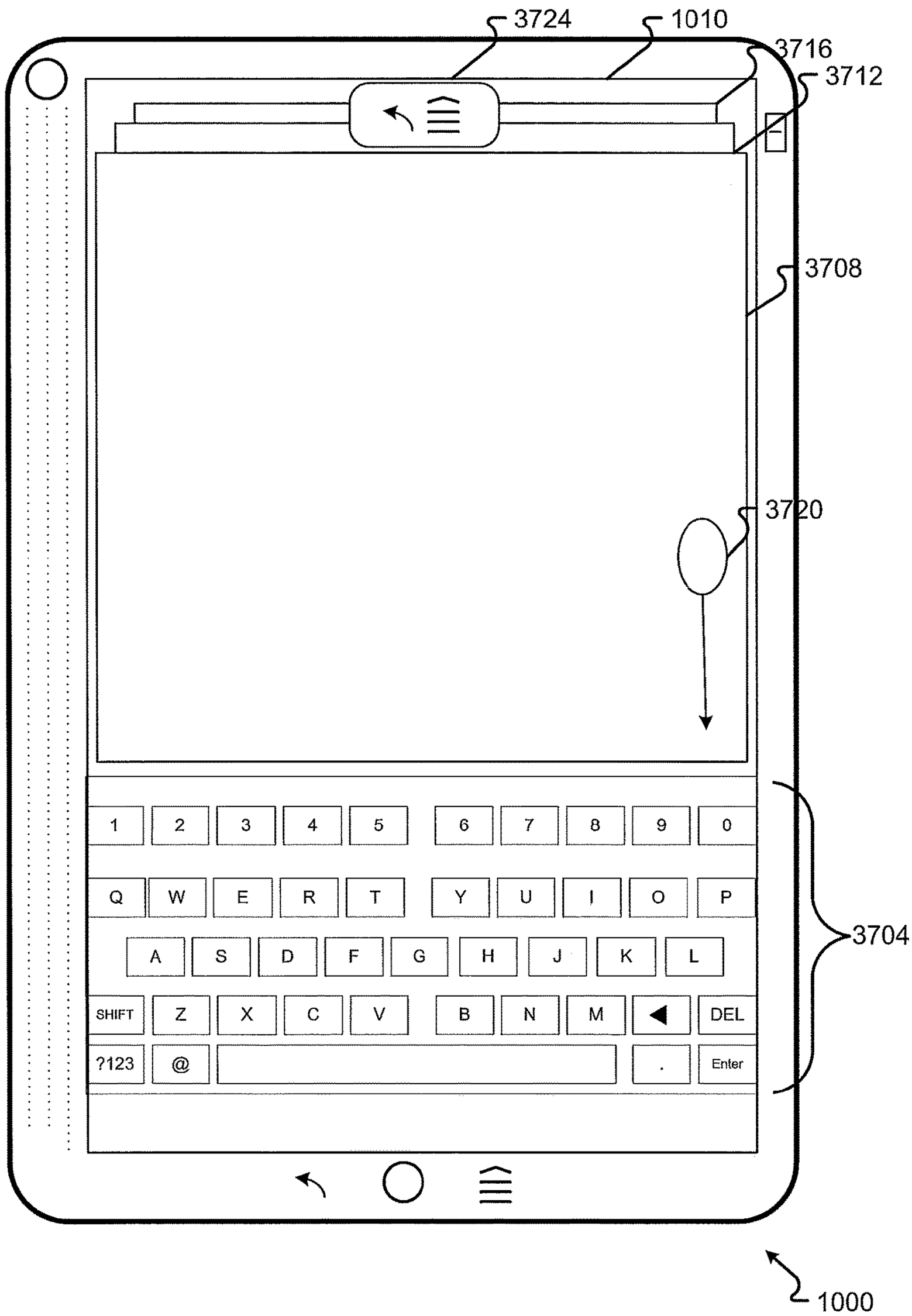

3724
1010
3716
3712
3708
3720
1 2 3 4 5 6 7 8 9 0
Q W E R T Y U I O P
A S D F G H J K L
SHIFT Z X C V B N M DEL
?123 @ . Enter
3704
1000

FIG. 37

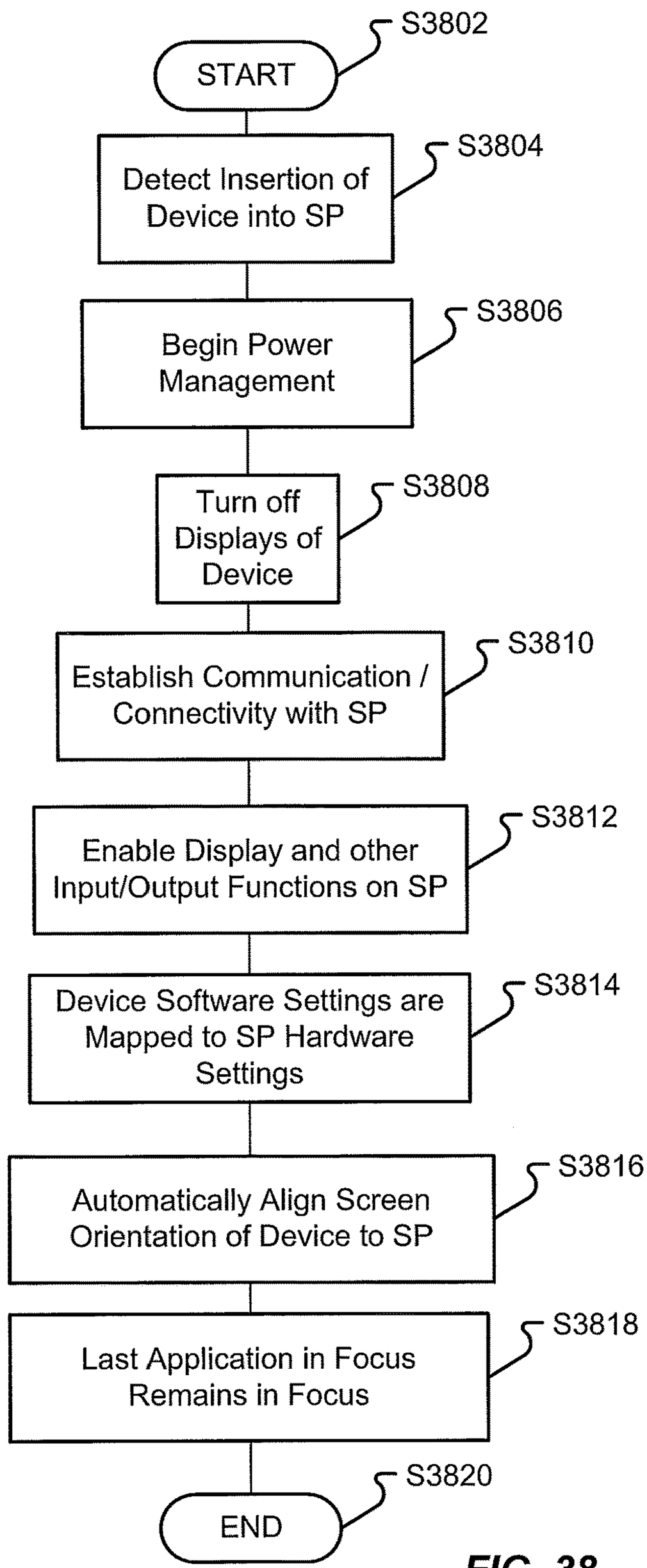

S3802
START
S3804
Detect Insertion of Device into SP
S3806
Begin Power Management
S3808
Turn off Displays of Device
S3810
Establish Communication / Connectivity with SP
S3812
Enable Display and other Input/Output Functions on SP
S3814
Device Software Settings are Mapped to SP Hardware Settings
S3816
Automatically Align Screen Orientation of Device to SP
S3818
Last Application in Focus Remains in Focus
S3820
END

FIG. 38

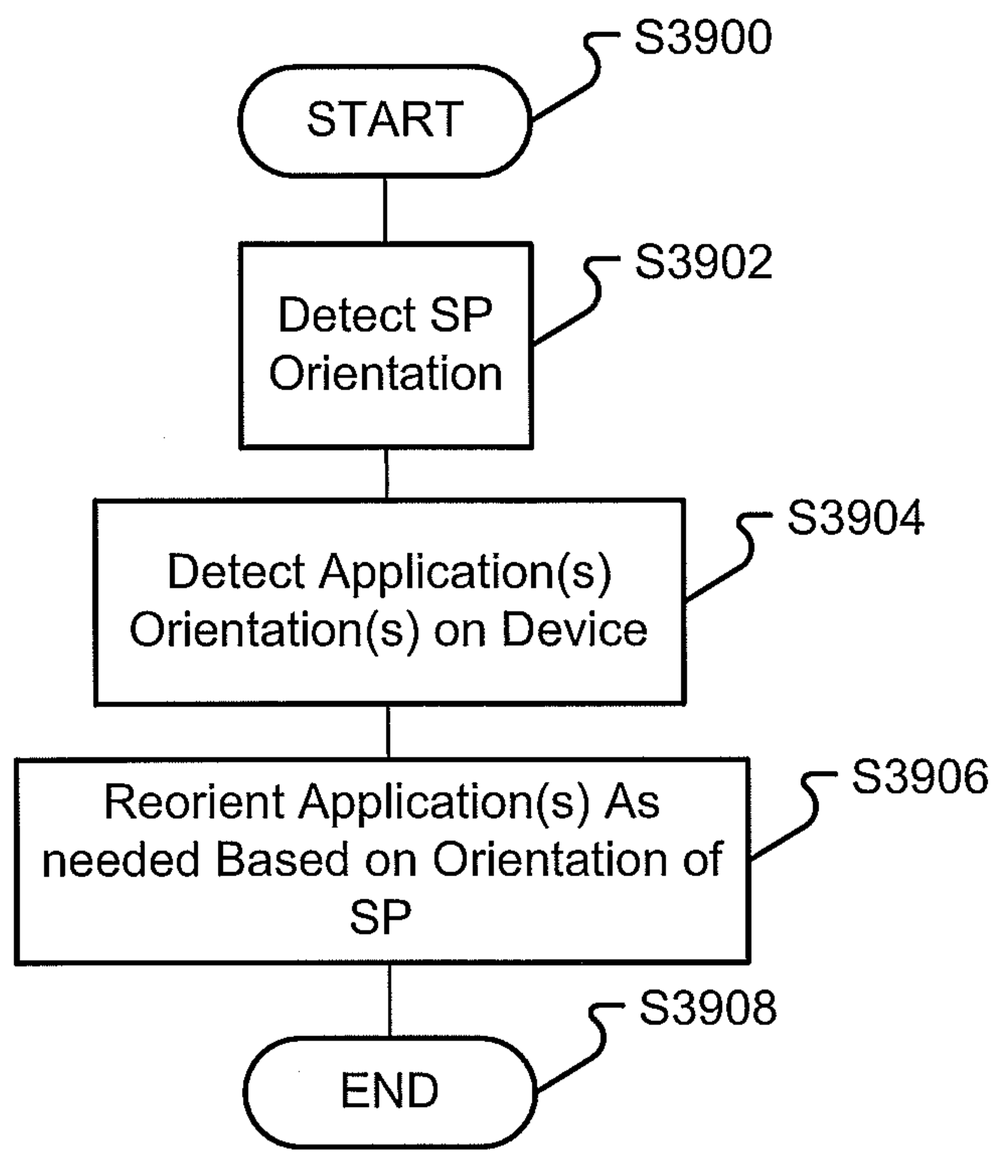

S3900
START
S3902
Detect SP Orientation
S3904
Detect Application(s) Orientation(s) on Device
S3906
Reorient Application(s) As needed Based on Orientation of SP
S3908
END

FIG. 39

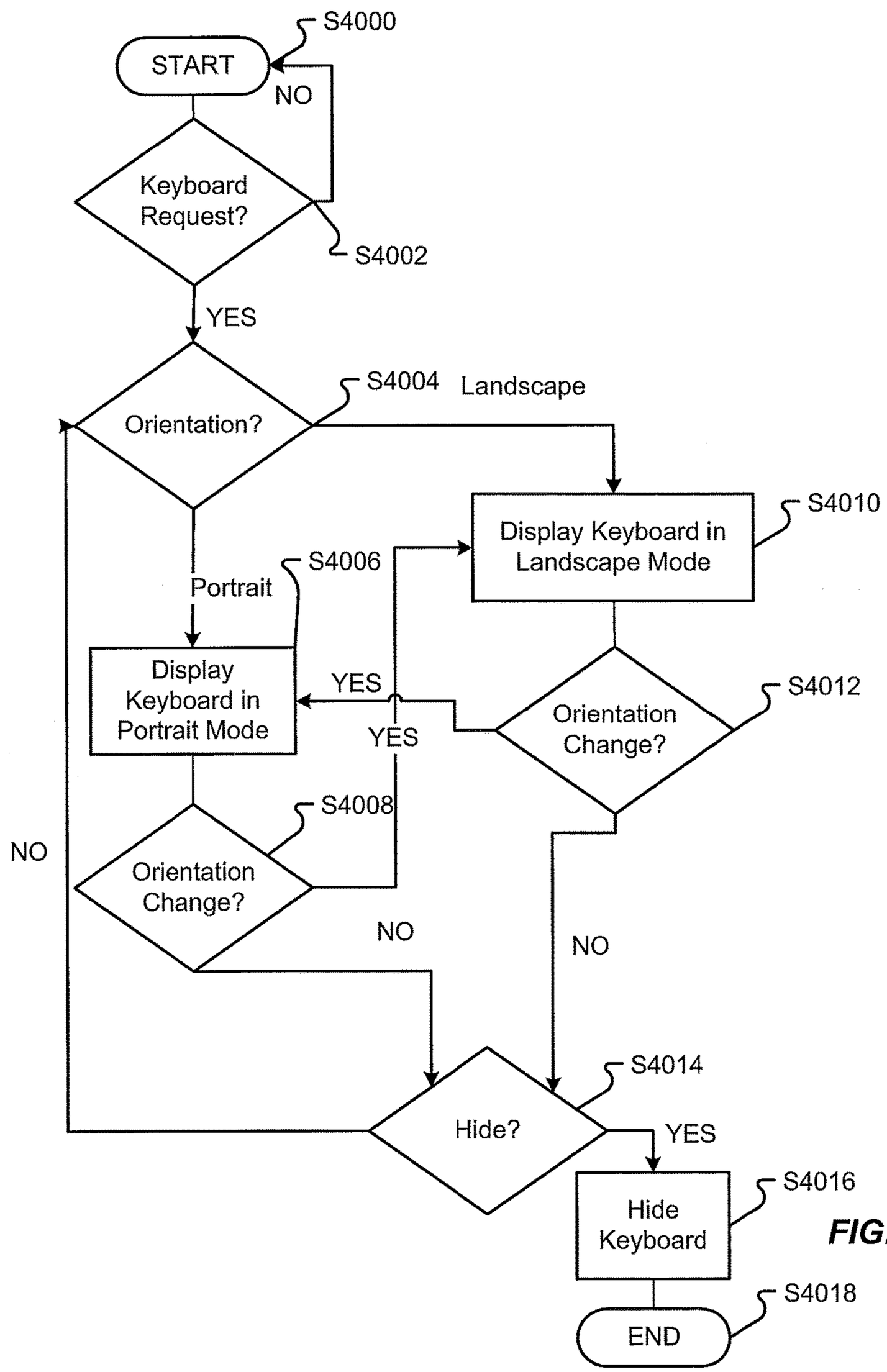

S4000
START
NO
Keyboard Request?
S4002
YES
Orientation?
S4004
Landscape
Display Keyboard in Landscape Mode
S4010
S4006
Portrait
Display Keyboard in Portrait Mode
YES
YES
Orientation Change?
S4012
S4008
NO
Orientation Change?
NO
NO
S4014
Hide?
YES
S4016
Hide Keyboard
S4018
END

FIG. 40

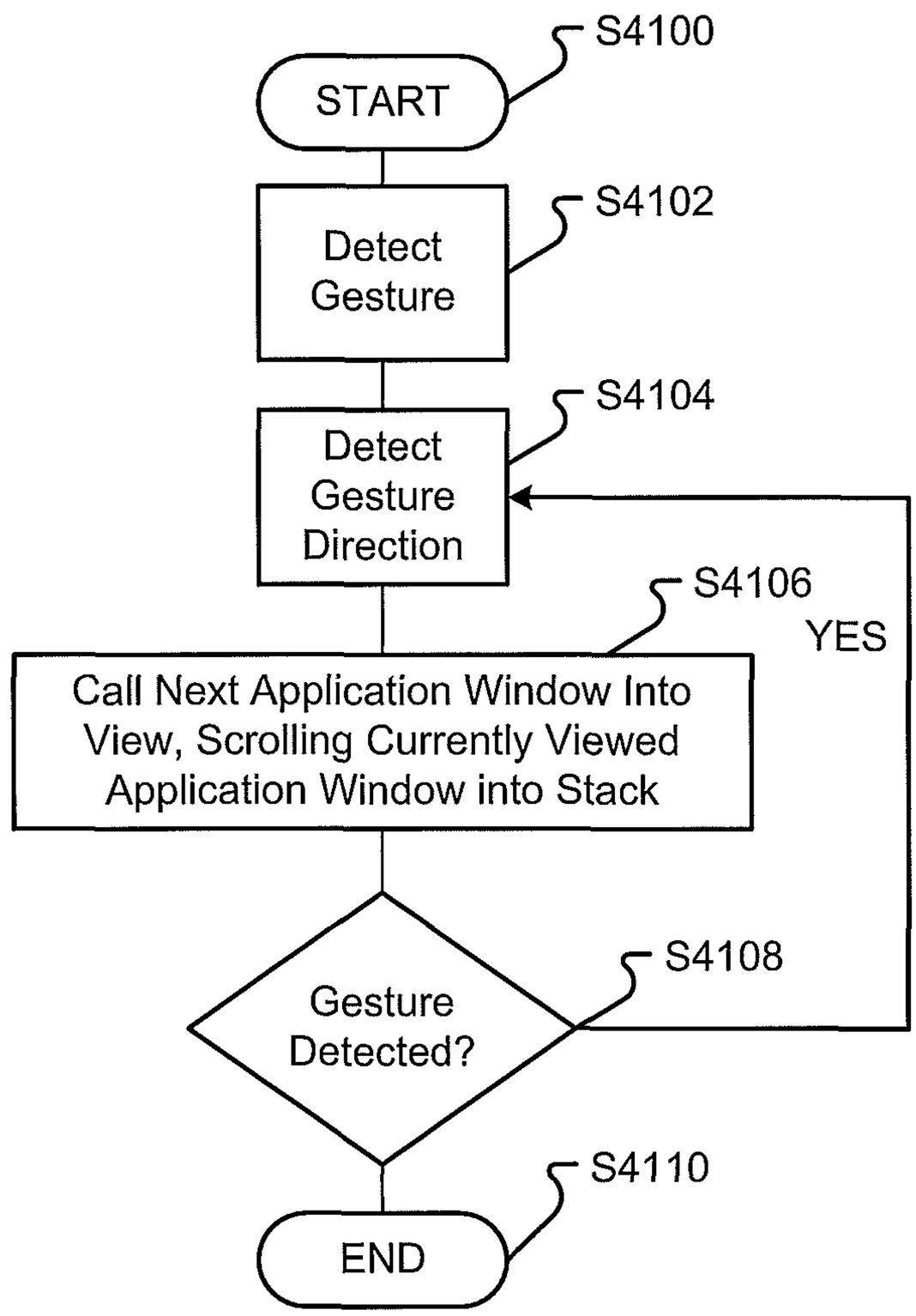

S4100
START
S4102
Detect Gesture
S4104
Detect Gesture Direction
S4106
YES
Call Next Application Window Into View, Scrolling Currently Viewed Application Window into Stack
S4108
Gesture Detected?
S4110
END

FIG. 41

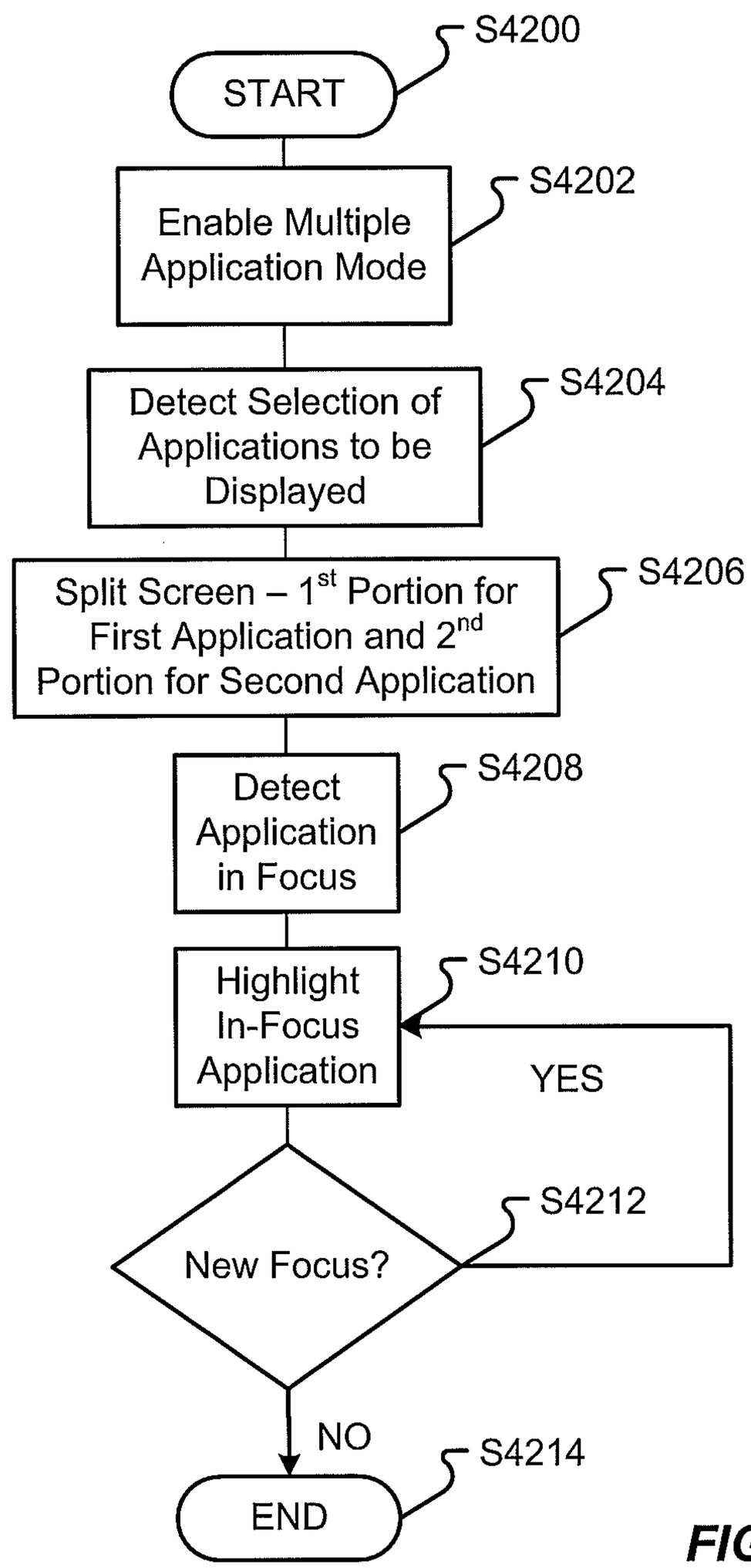

S4200
START
S4202
Enable Multiple Application Mode
S4204
Detect Selection of Applications to be Displayed
S4206
Split Screen – 1st Portion for First Application and 2nd Portion for Second Application
S4208
Detect Application in Focus
S4210
Highlight In-Focus Application
YES
S4212
New Focus?
NO
S4214
END

FIG. 42

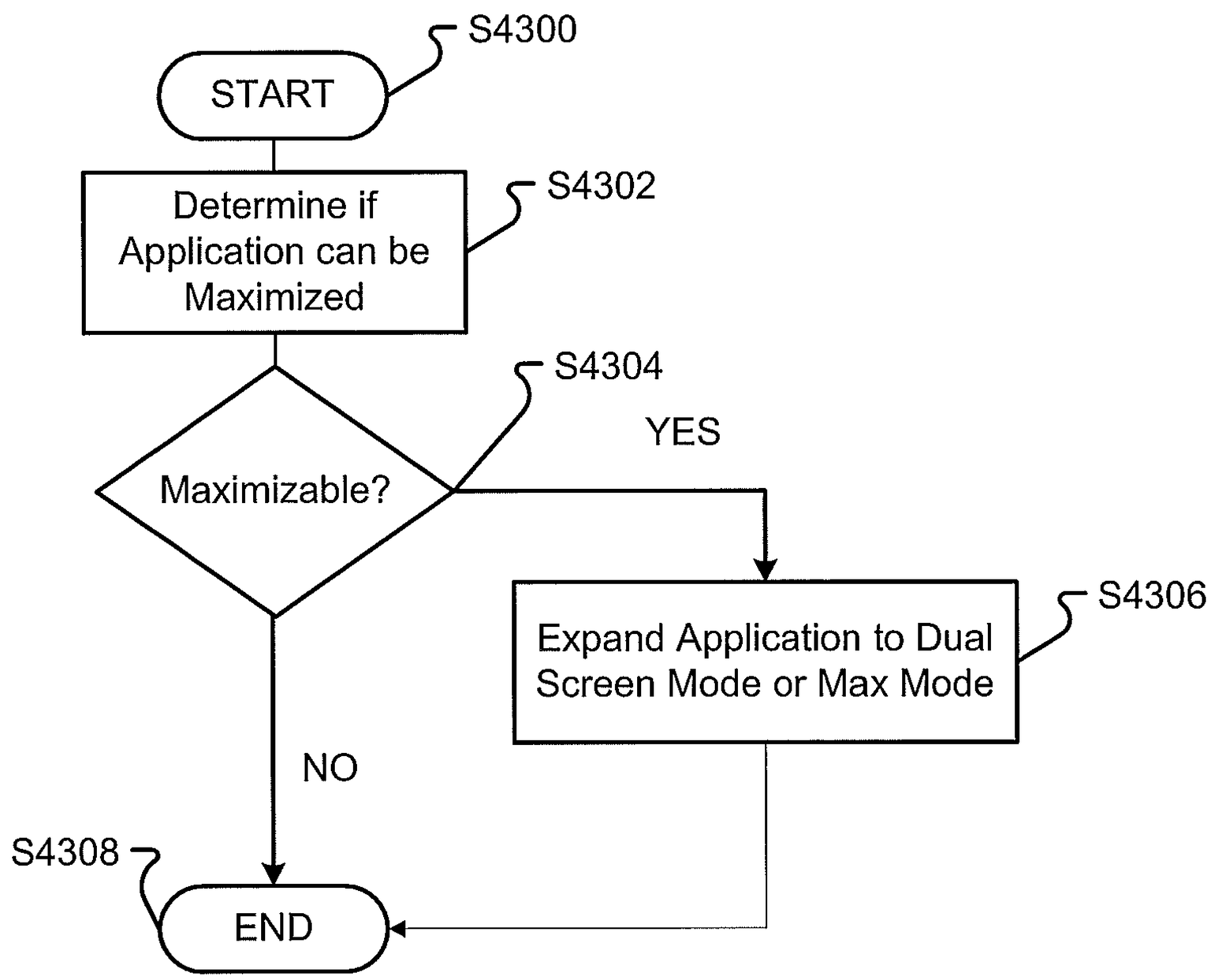

S4300
START
Determine if Application can be Maximized
S4302
S4304
Maximizable?
YES
Expand Application to Dual Screen Mode or Max Mode
S4306
NO
S4308
END

FIG. 43

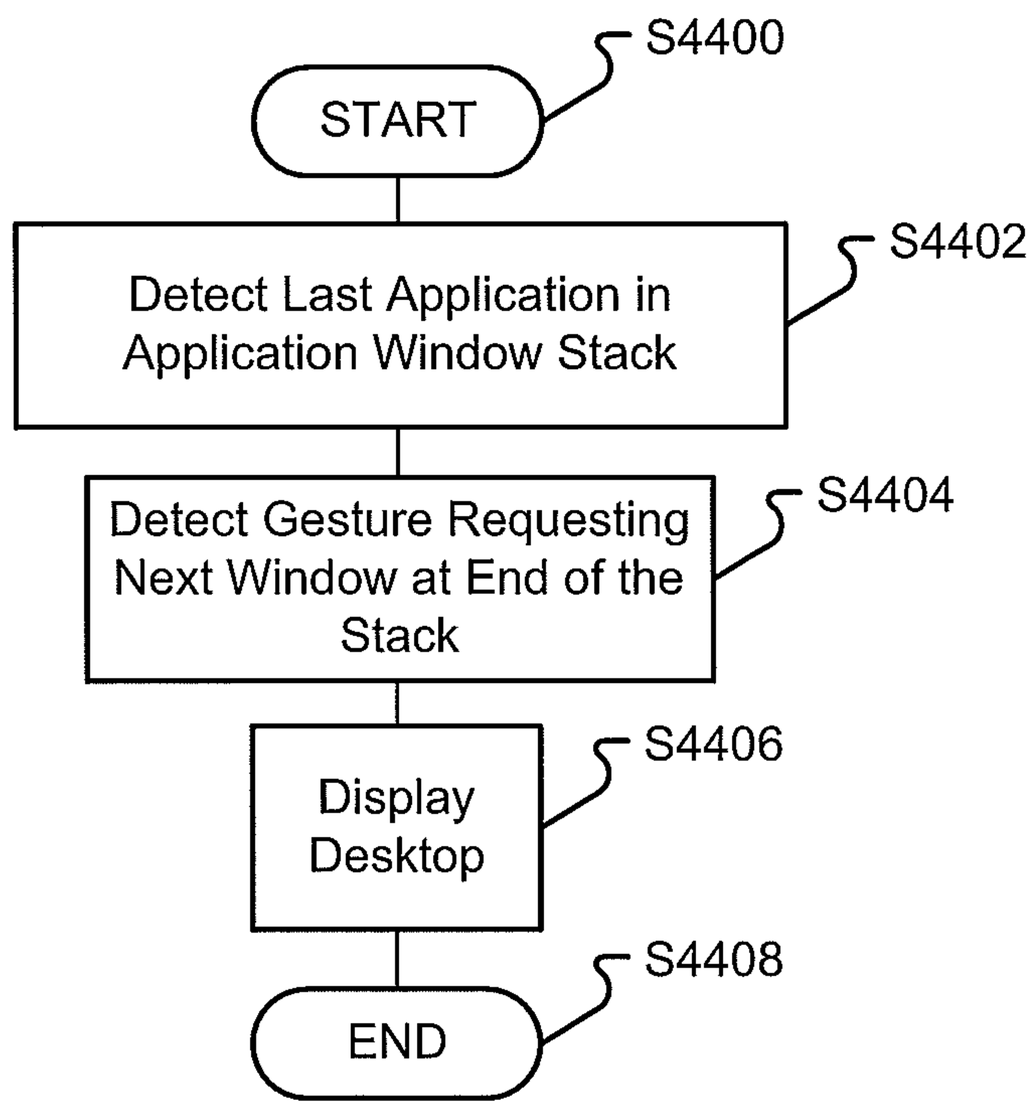

S4400
START
S4402
Detect Last Application in Application Window Stack
S4404
Detect Gesture Requesting Next Window at End of the Stack
S4406
Display Desktop
S4408
END

FIG. 44

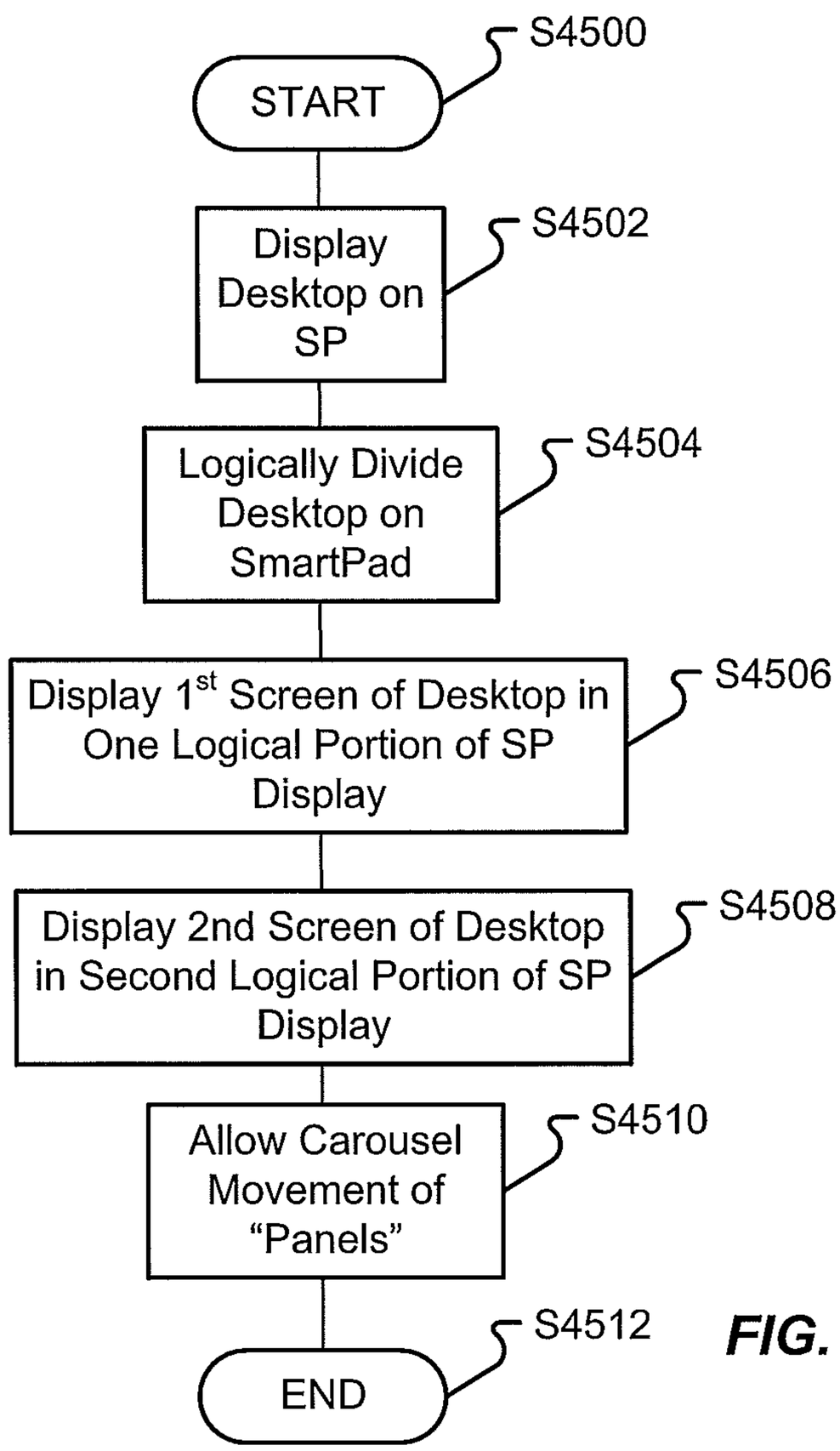

START
S4500
Display Desktop on SP
S4502
Logically Divide Desktop on SmartPad
S4504
Display 1st Screen of Desktop in One Logical Portion of SP Display
S4506
Display 2nd Screen of Desktop in Second Logical Portion of SP Display
S4508
Allow Carousel Movement of "Panels"
S4510
END
S4512

FIG. 45

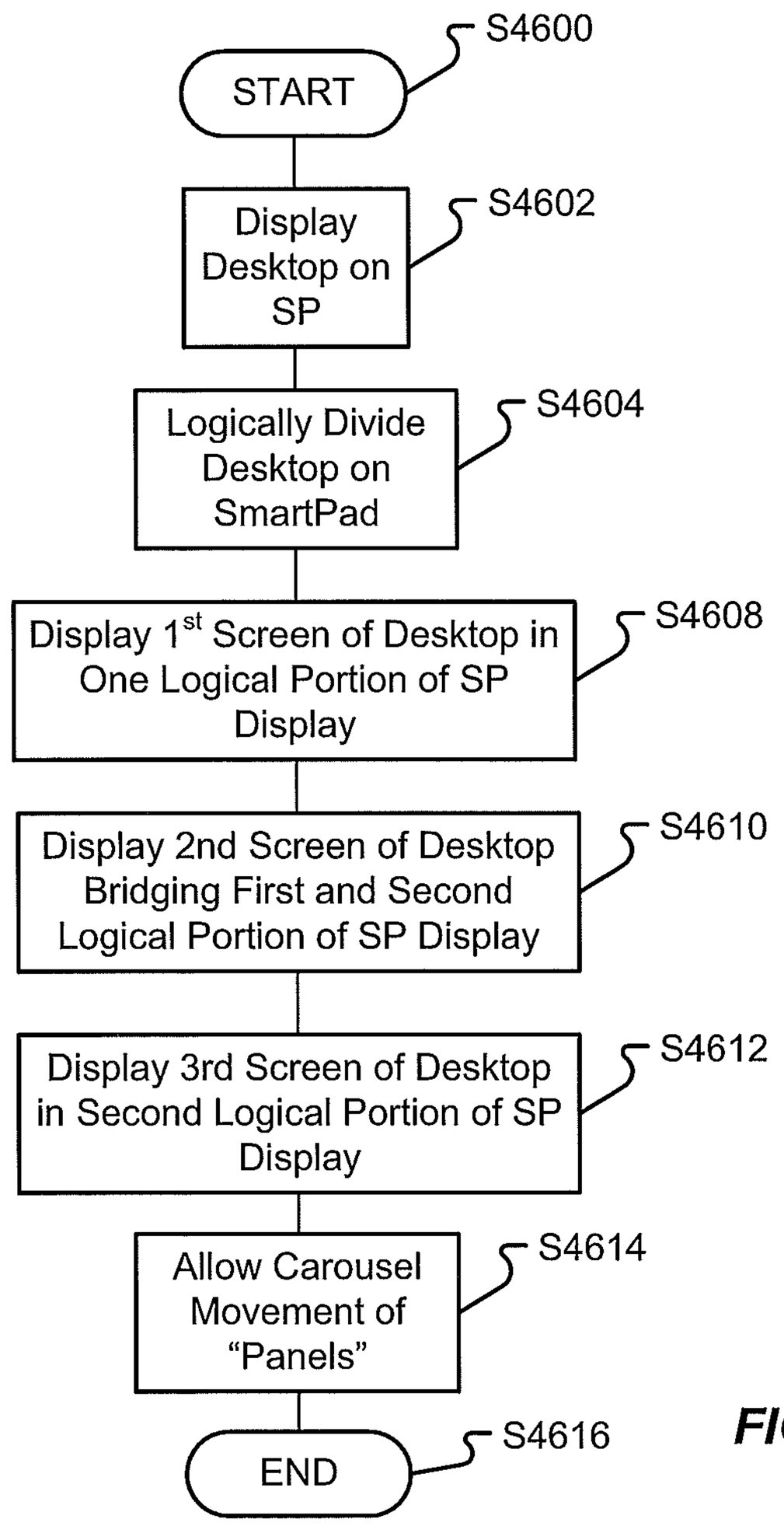

S4600
START
S4602
Display Desktop on SP
S4604
Logically Divide Desktop on SmartPad
S4608
Display 1st Screen of Desktop in One Logical Portion of SP Display
S4610
Display 2nd Screen of Desktop Bridging First and Second Logical Portion of SP Display
S4612
Display 3rd Screen of Desktop in Second Logical Portion of SP Display
S4614
Allow Carousel Movement of "Panels"
S4616
END

FIG. 46

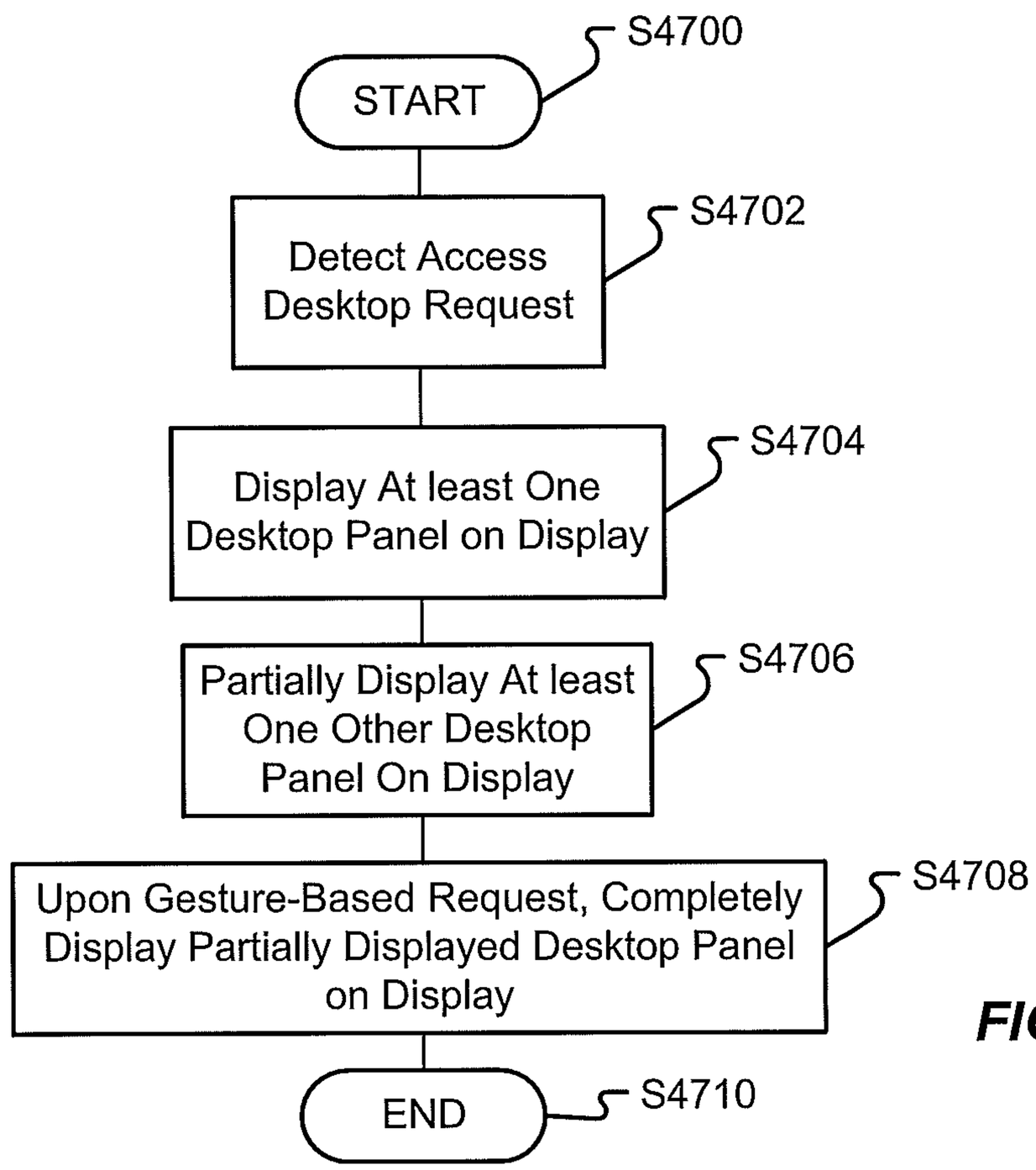

S4700
START
S4702
Detect Access Desktop Request
S4704
Display At least One Desktop Panel on Display
S4706
Partially Display At least One Other Desktop Panel On Display
S4708
Upon Gesture-Based Request, Completely Display Partially Displayed Desktop Panel on Display
END
S4710

FIG. 47

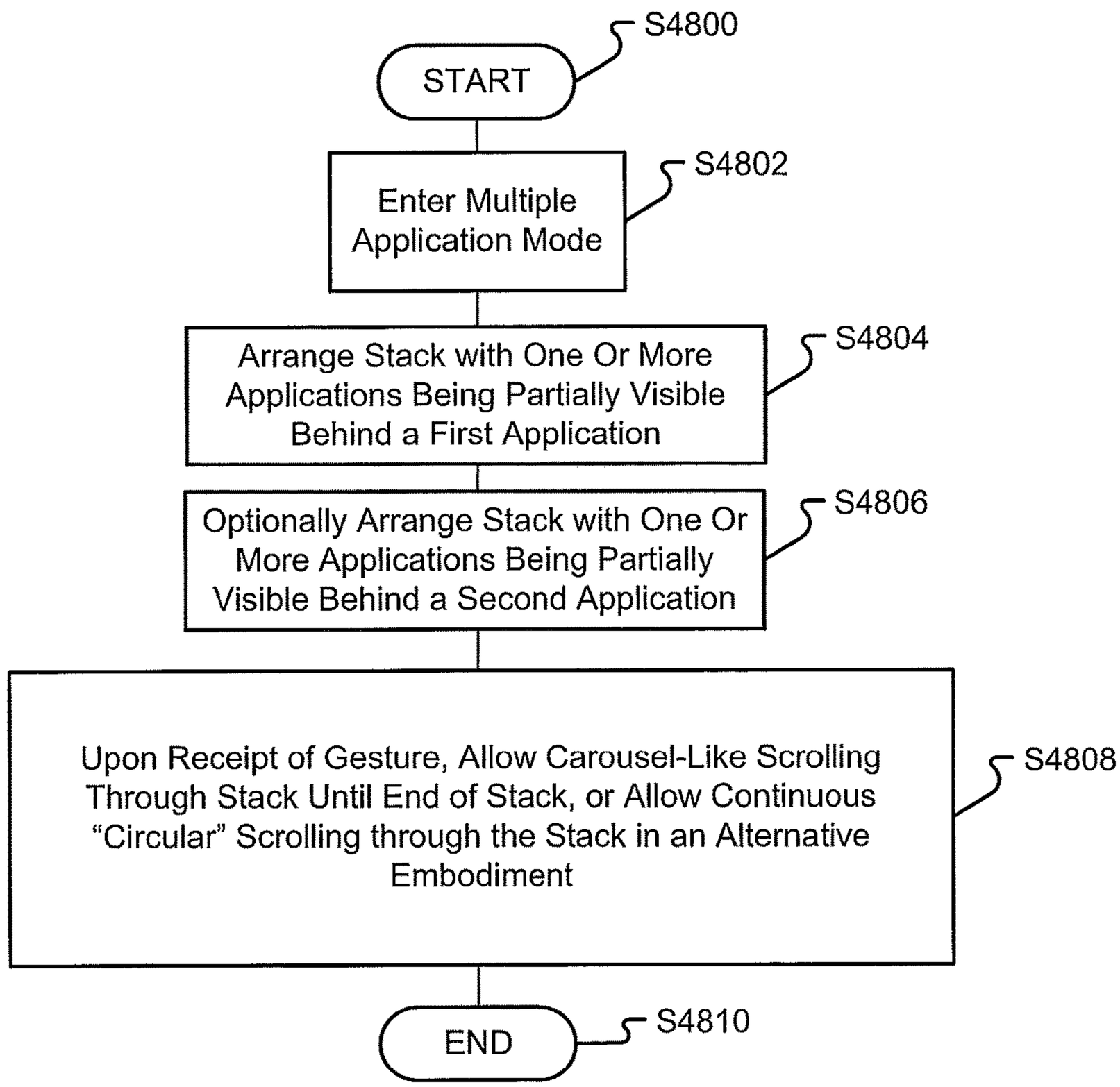

S4800
START
S4802
Enter Multiple Application Mode
S4804
Arrange Stack with One Or More Applications Being Partially Visible Behind a First Application
S4806
Optionally Arrange Stack with One Or More Applications Being Partially Visible Behind a Second Application
S4808
Upon Receipt of Gesture, Allow Carousel-Like Scrolling Through Stack Until End of Stack, or Allow Continuous "Circular" Scrolling through the Stack in an Alternative Embodiment
S4810
END

*FIG. 48*

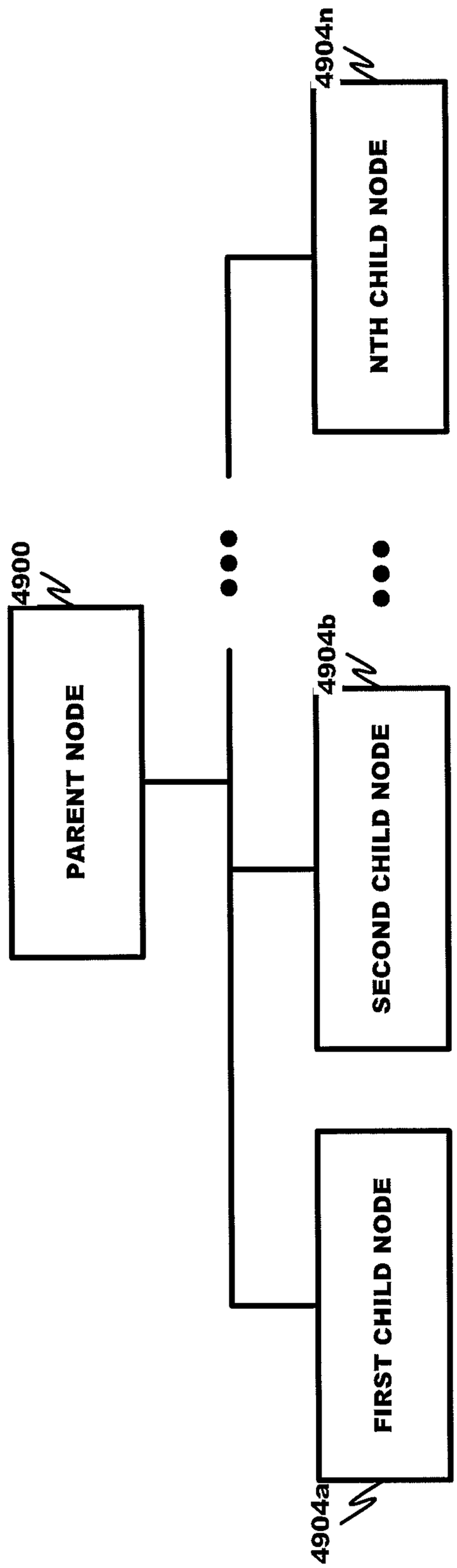

4900
PARENT NODE
4904a
FIRST CHILD NODE
4904b
SECOND CHILD NODE
4904n
NTH CHILD NODE

FIG. 49

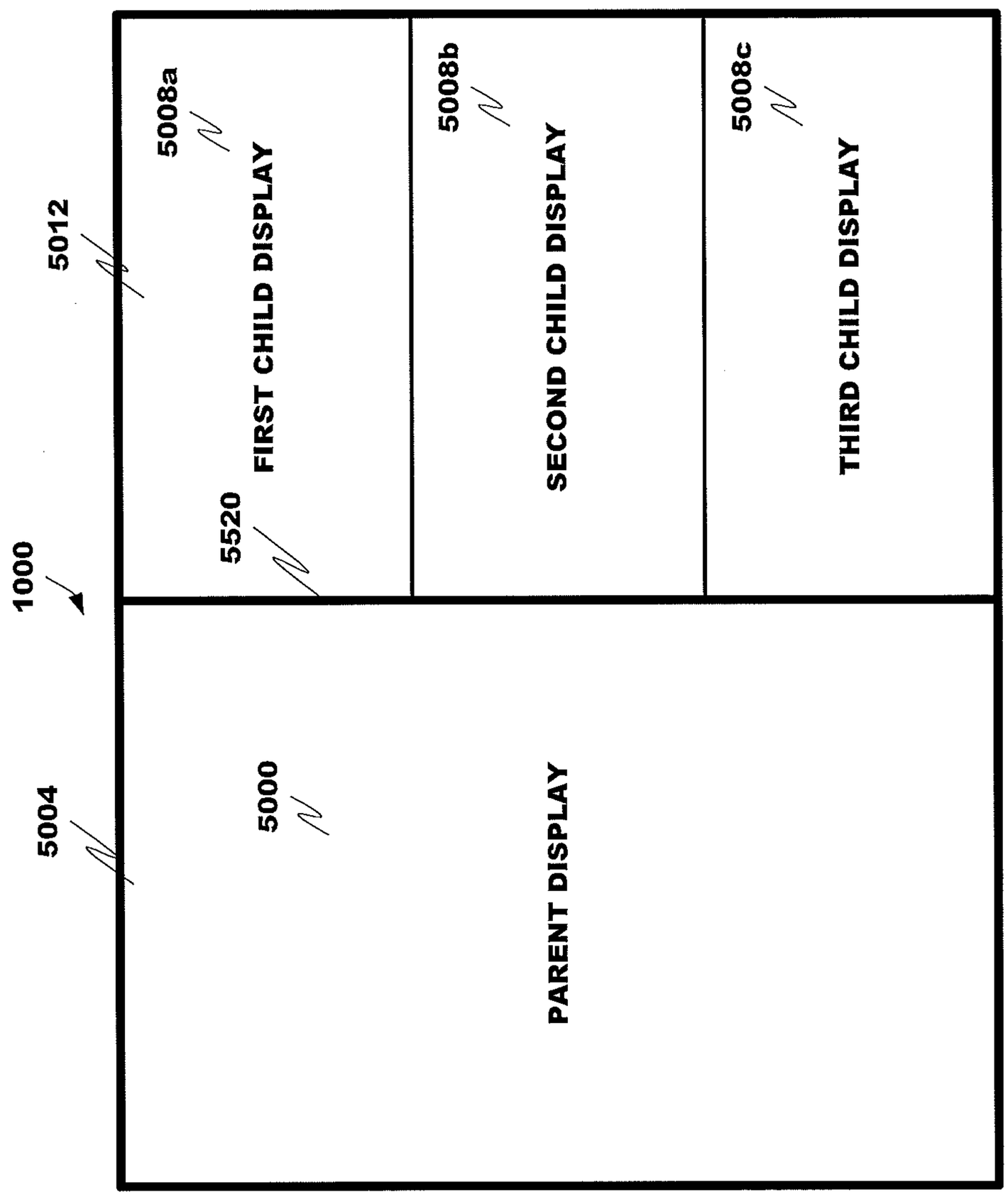

1000
5004
5012
5000
PARENT DISPLAY
5520
5008a
FIRST CHILD DISPLAY
5008b
SECOND CHILD DISPLAY
5008c
THIRD CHILD DISPLAY

FIG. 50

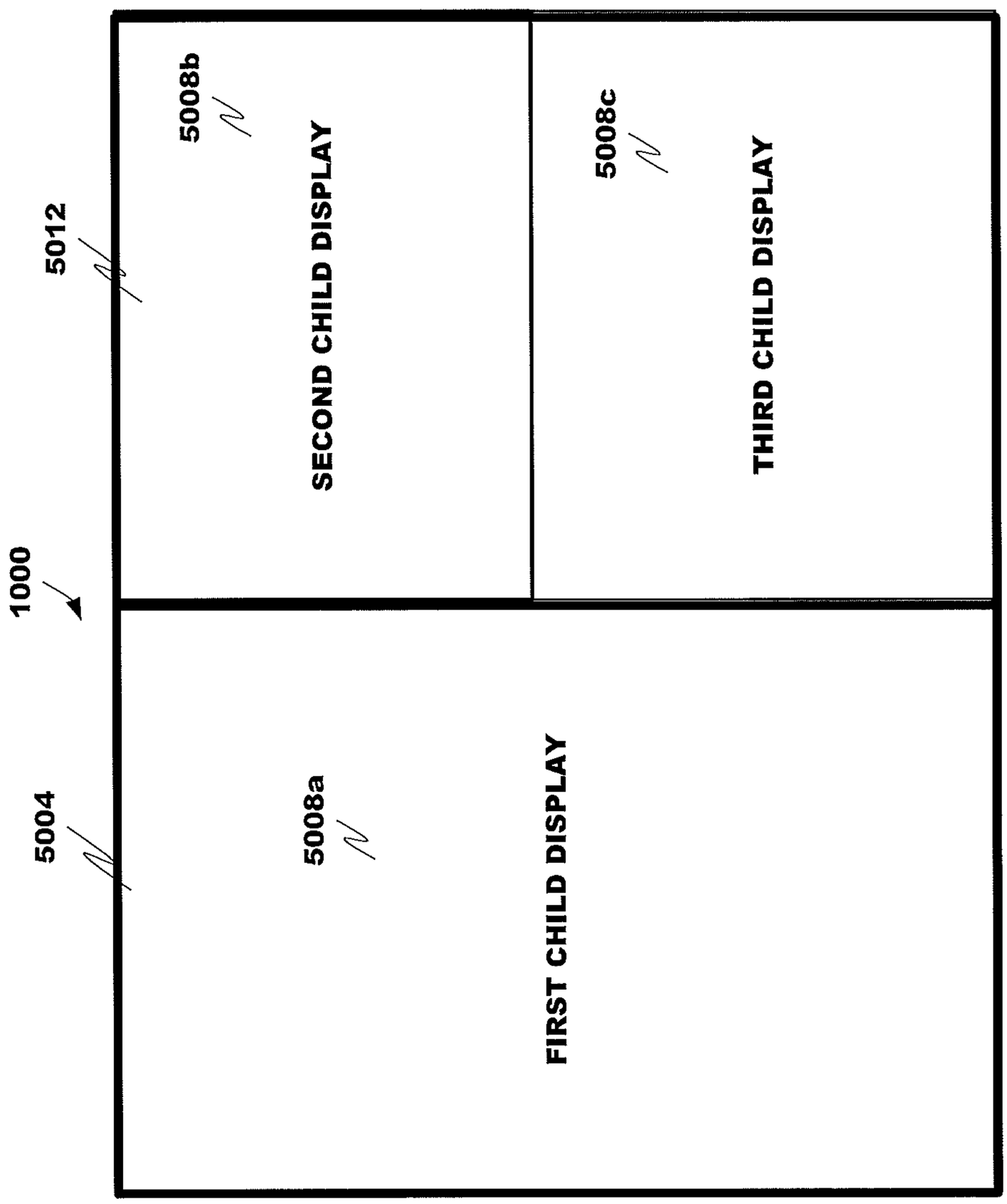

1000
5012
5004
5008b
SECOND CHILD DISPLAY
5008c
THIRD CHILD DISPLAY
5008a
FIRST CHILD DISPLAY

FIG. 51

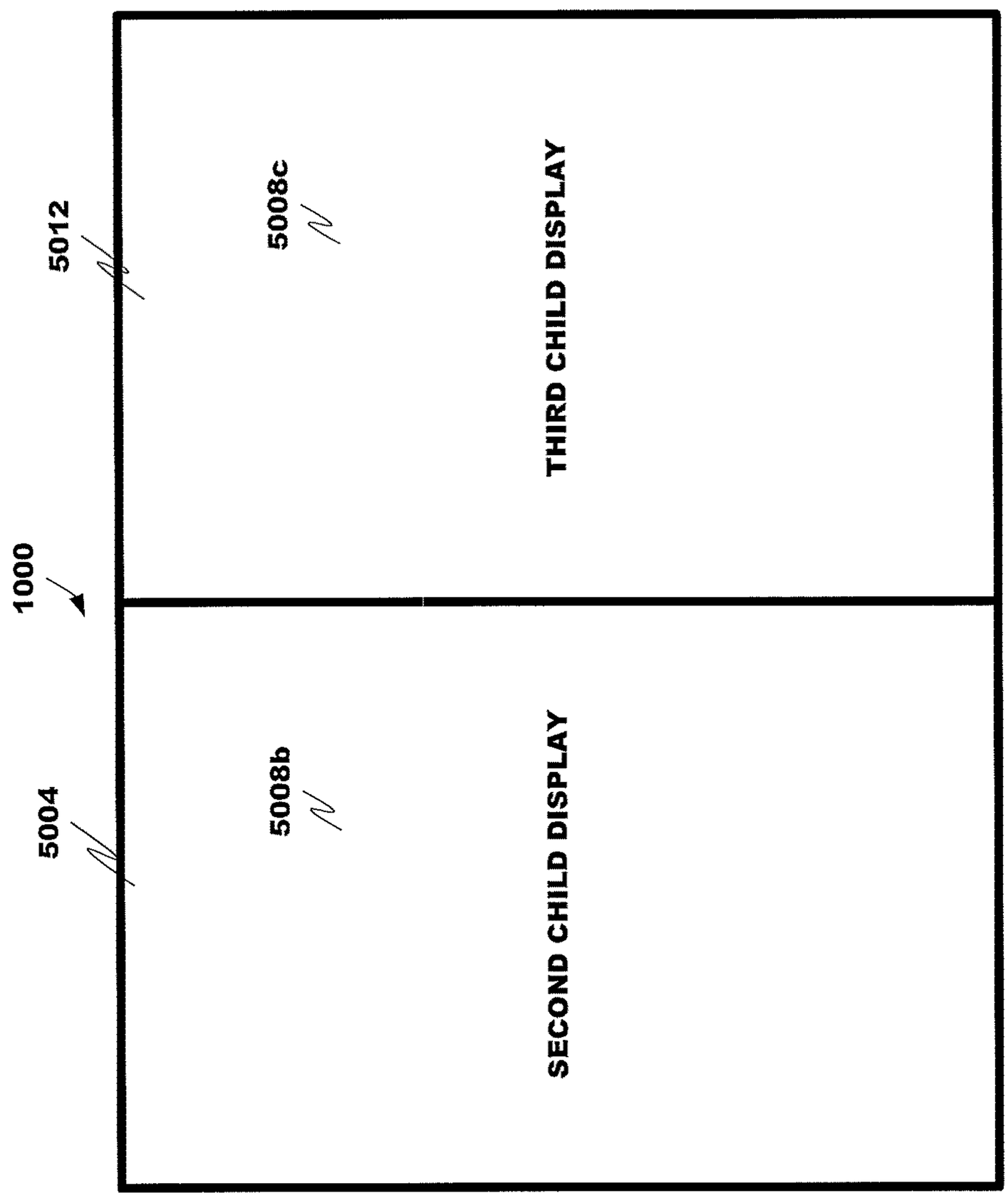

1000
5012
5008c
THIRD CHILD DISPLAY
5004
5008b
SECOND CHILD DISPLAY

FIG. 52

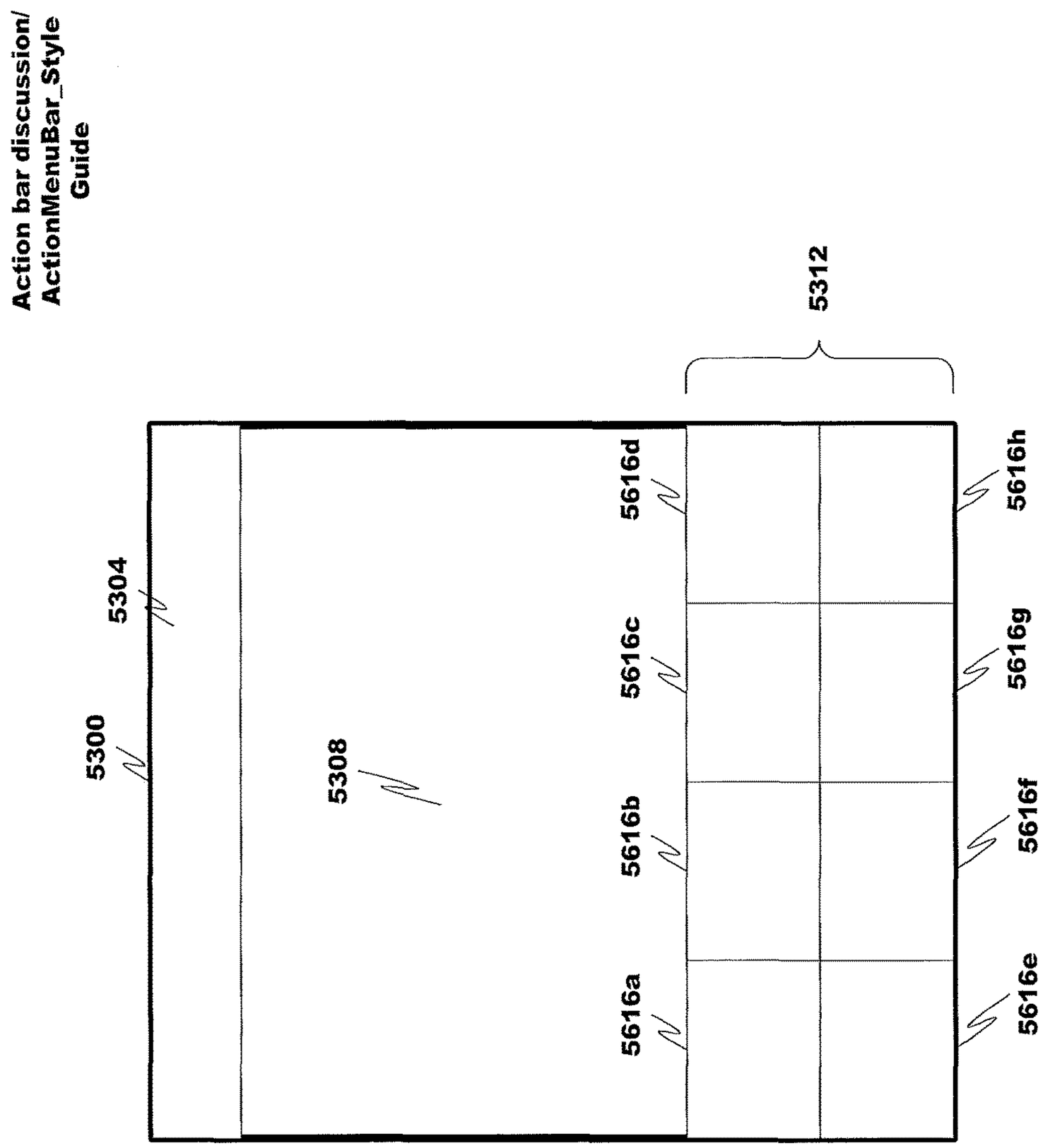

Action bar discussion/
Action MenuBar_Style
Guide
5312
5304
5300
5308
5616d
5616c
5616b
5616a
5616h
5616g
5616f
5616e

FIG. 53

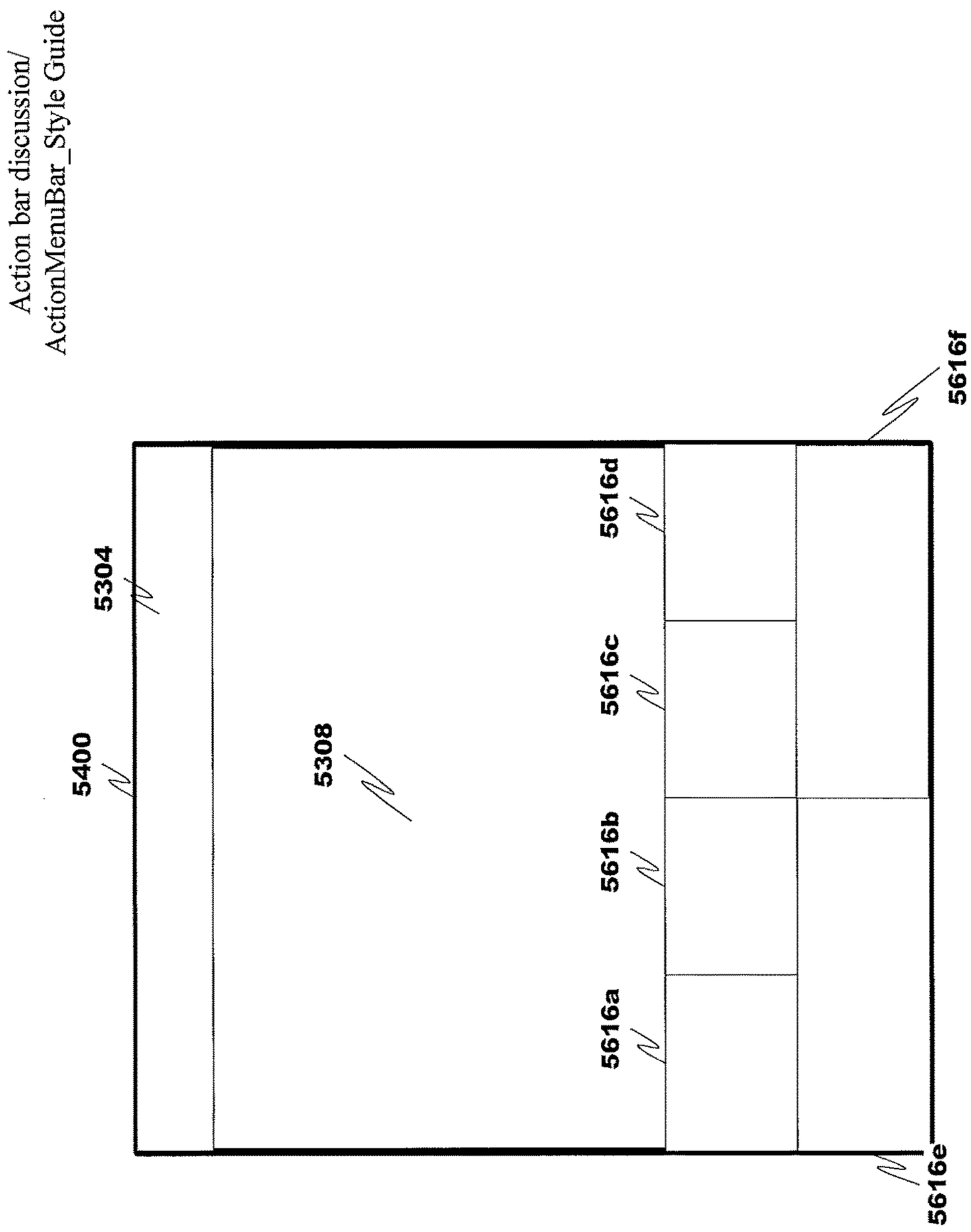

Action bar discussion/
ActionMenuBar_Style Guide
5400
5304
5308
5616a
5616b
5616c
5616d
5616e
5616f

FIG. 54

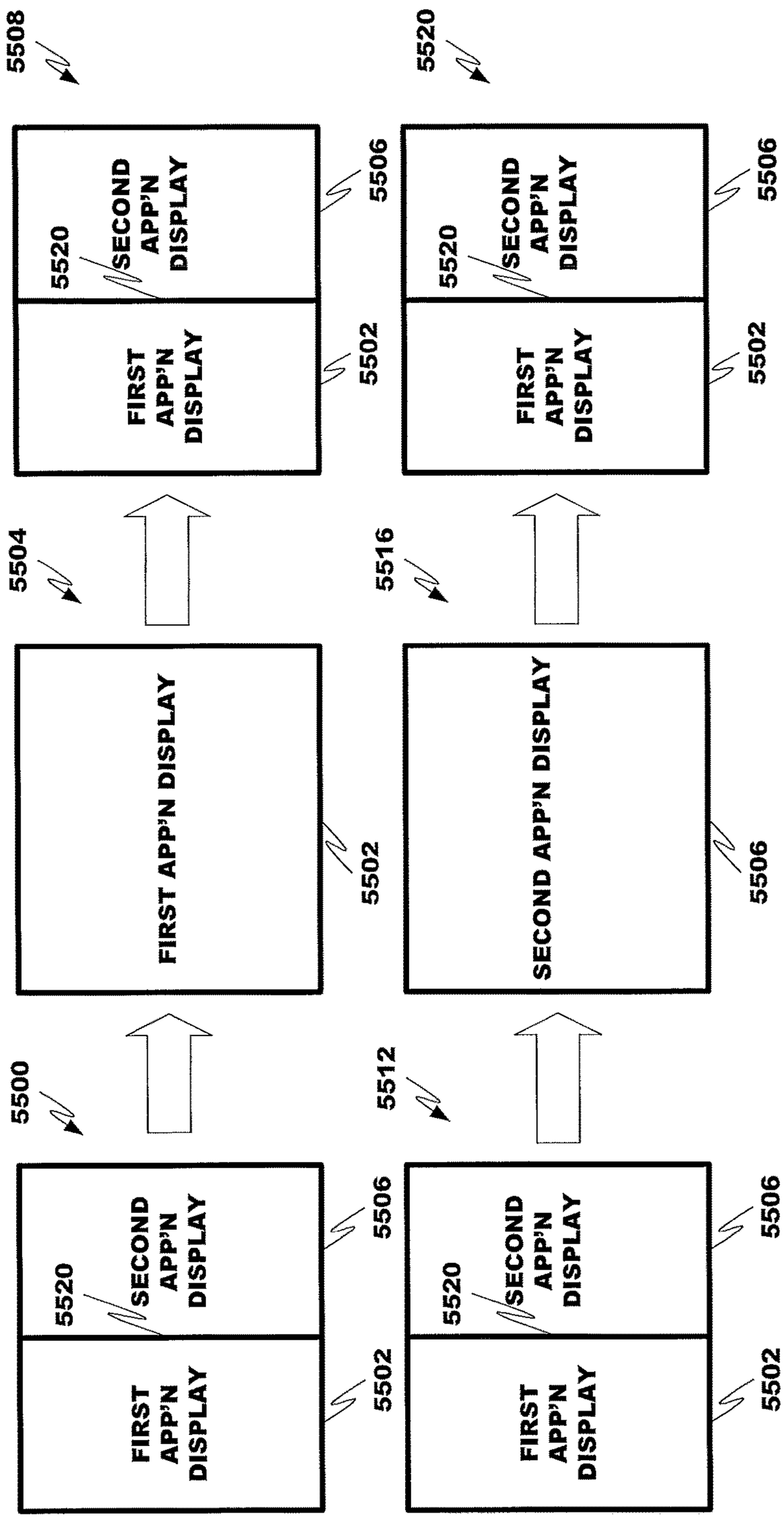



Fig. 55A

Fig. 55B

Fig. 55C

Fig. 55D

Fig. 55E

Fig. 55F

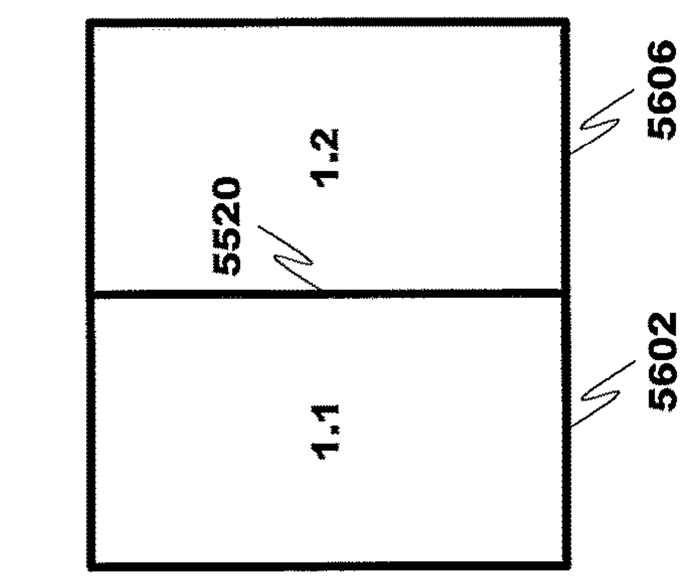



Fig. 56A




Fig. 56B

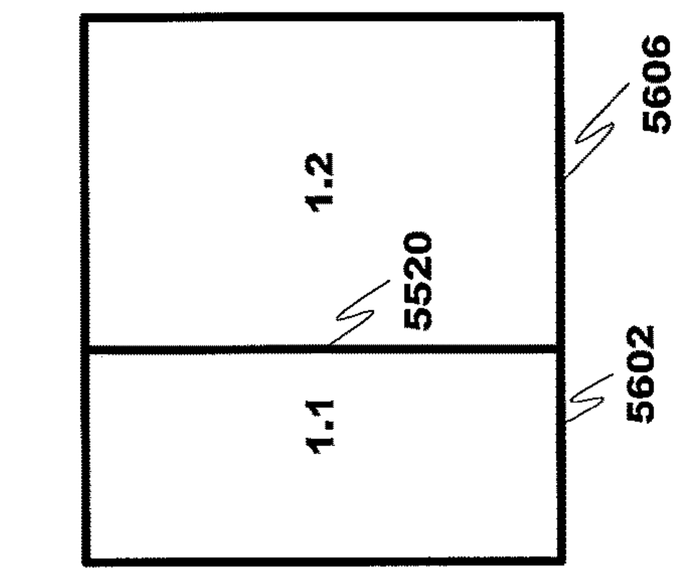



Fig. 56C

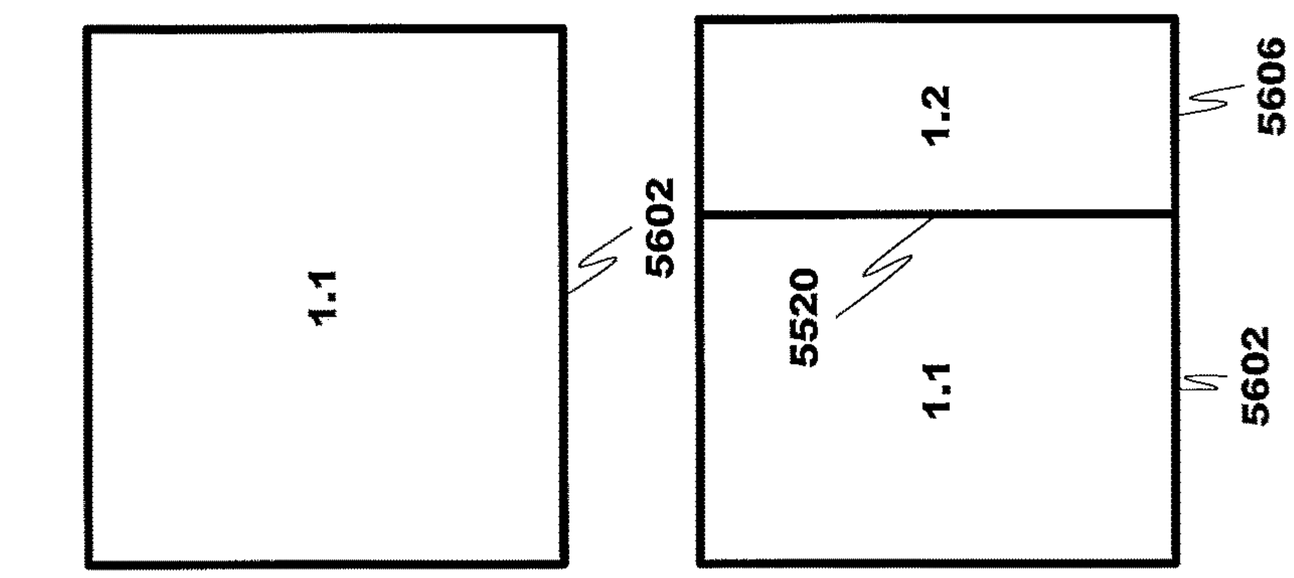



Fig. 56D

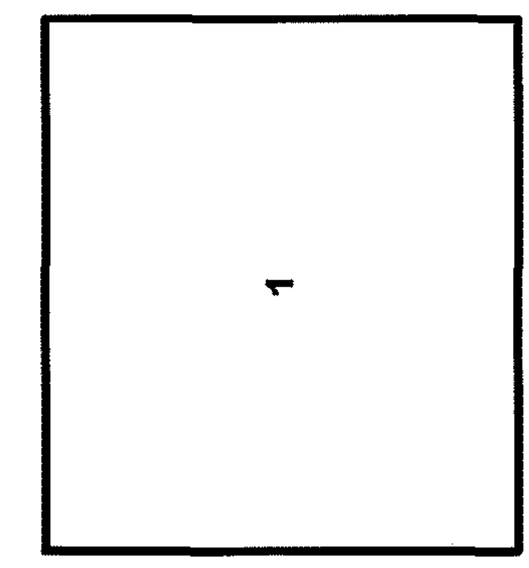



Fig. 56F

Fig. 56G

Fig. 56I




Fig. 56J

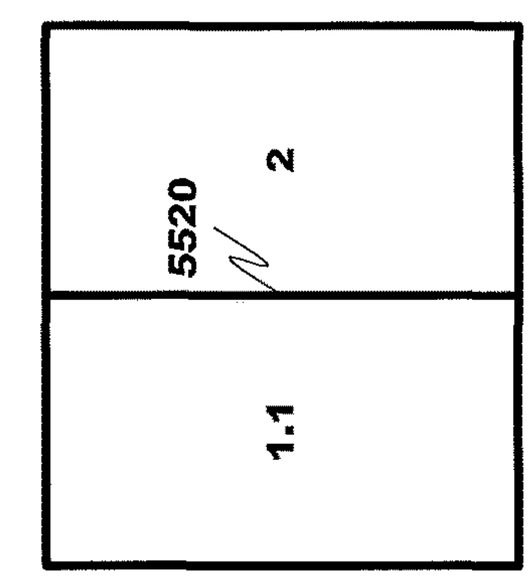



Fig. 56E




Fig. 56H

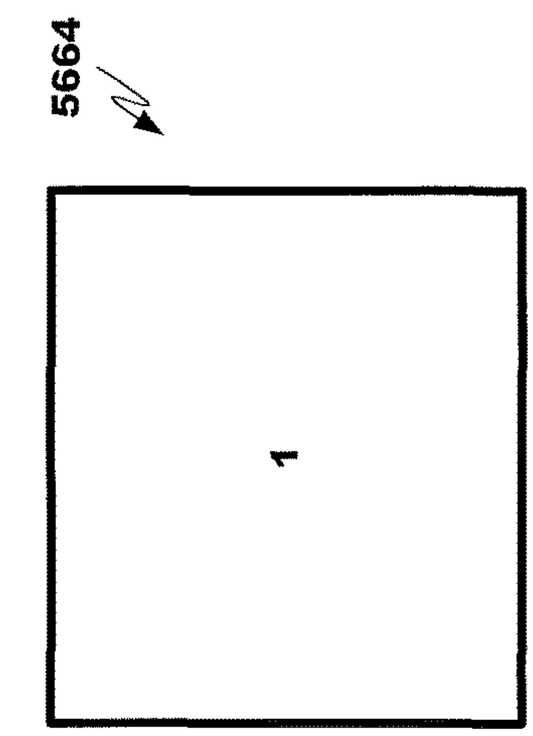



Fig. 56L

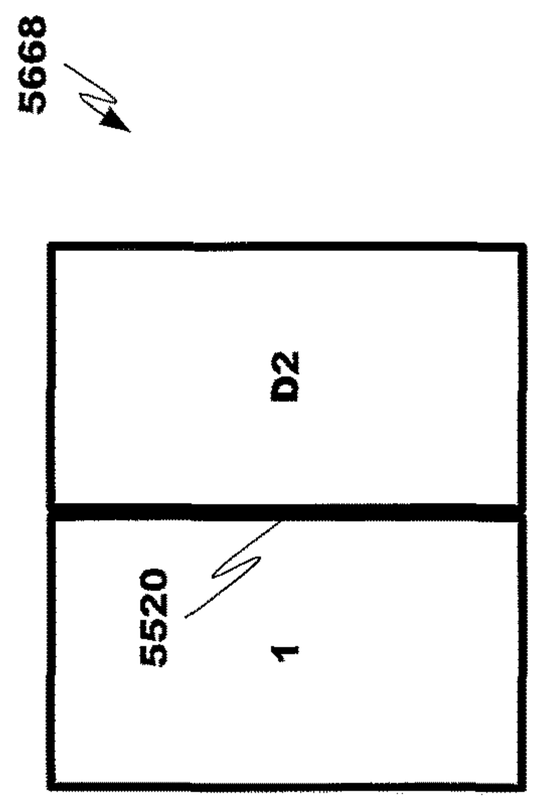



Fig. 56M

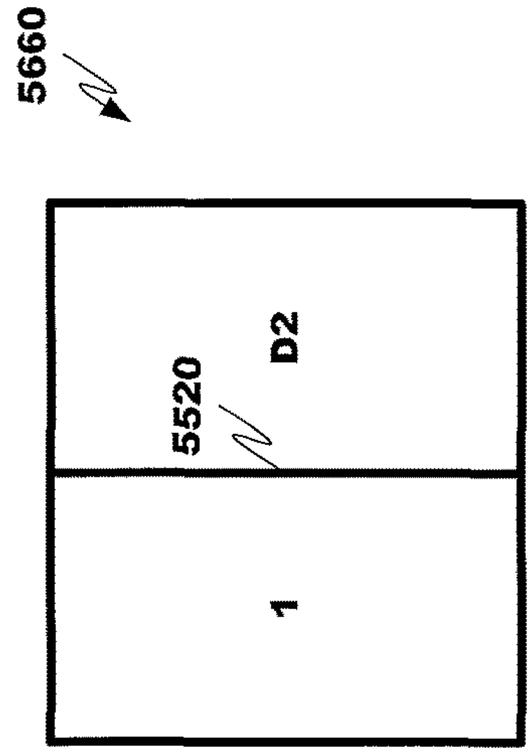



Fig. 56K

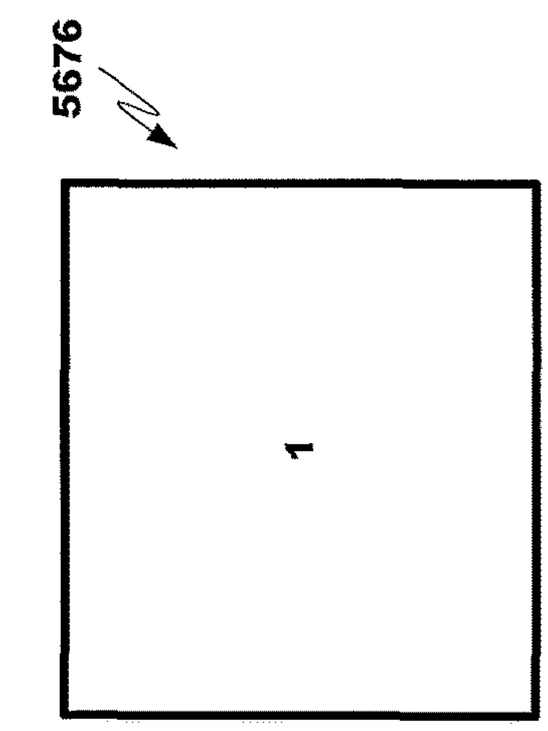



Fig. 56O

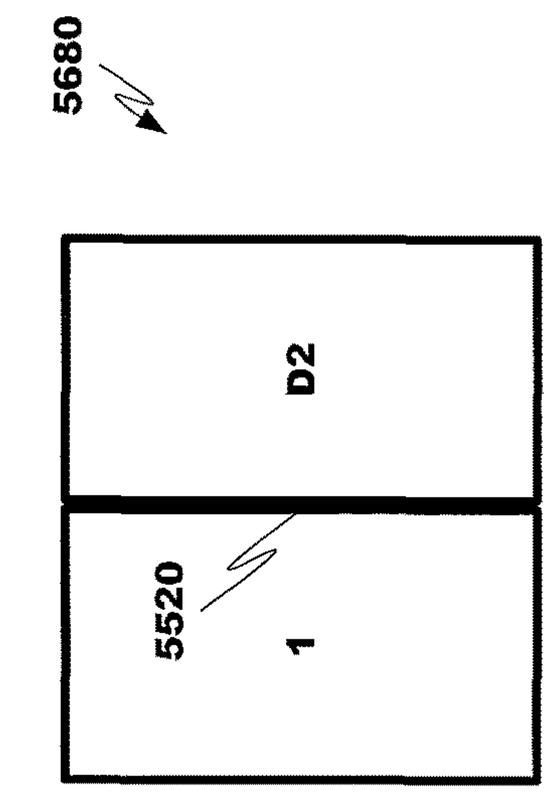



Fig. 56P

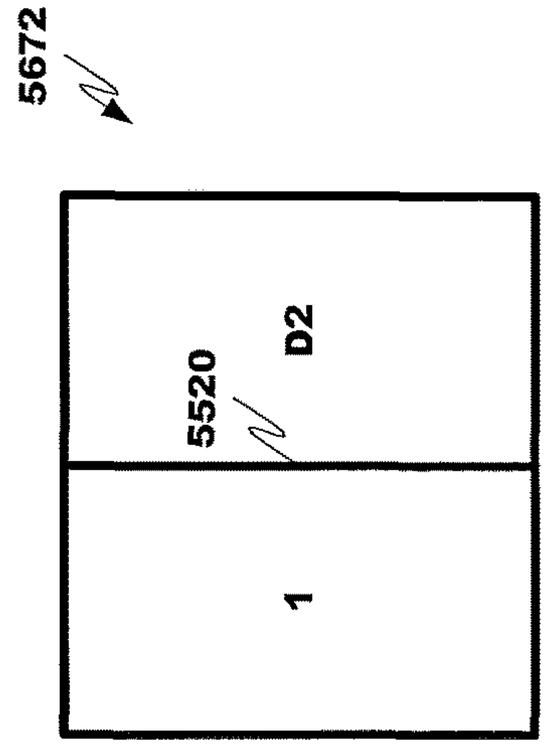



Fig. 56N

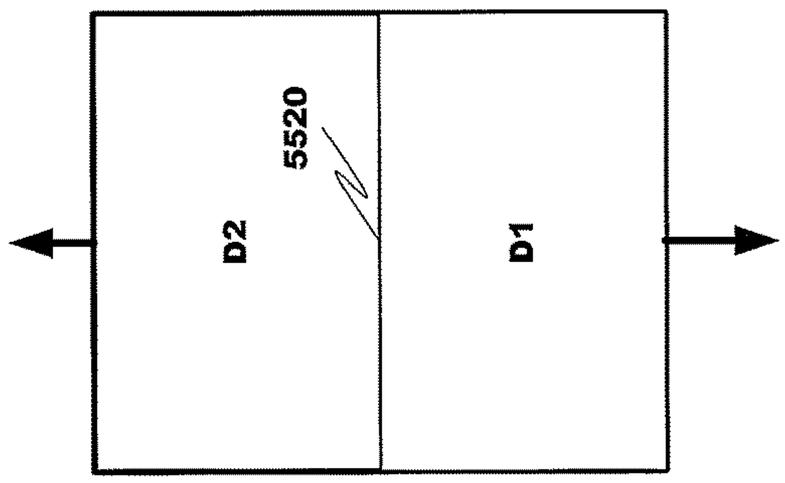



Fig. 56R

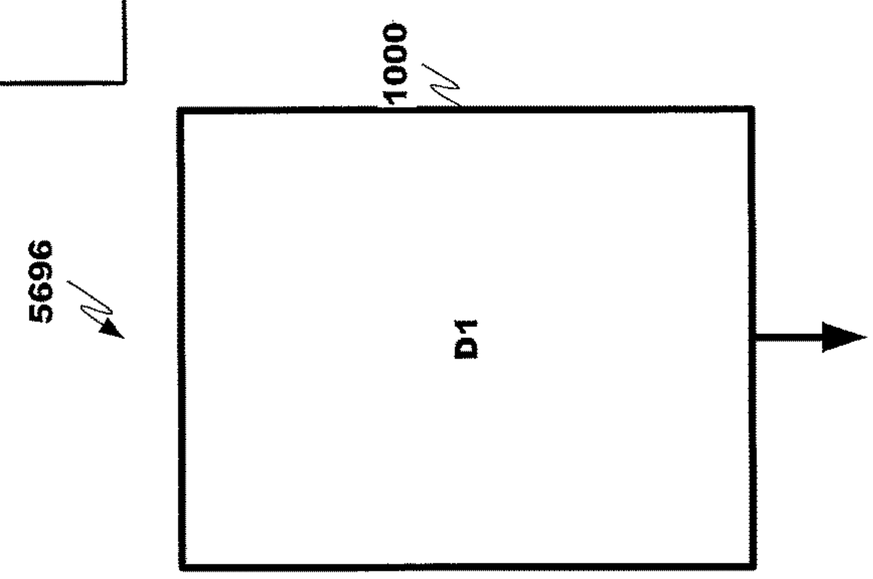



Fig. 56T

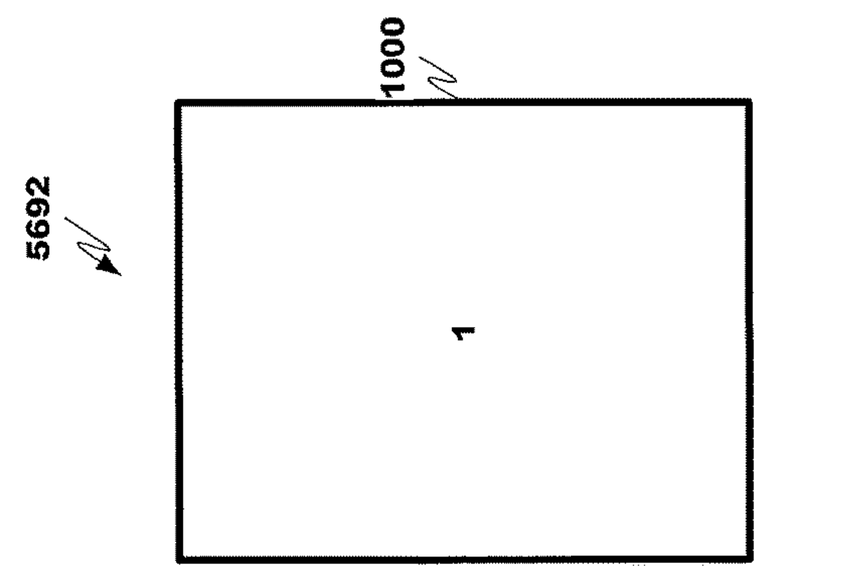



Fig. 56S

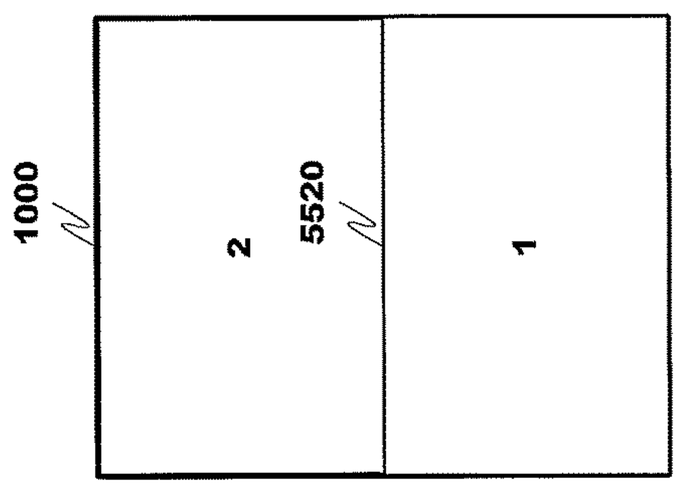



Fig. 56Q

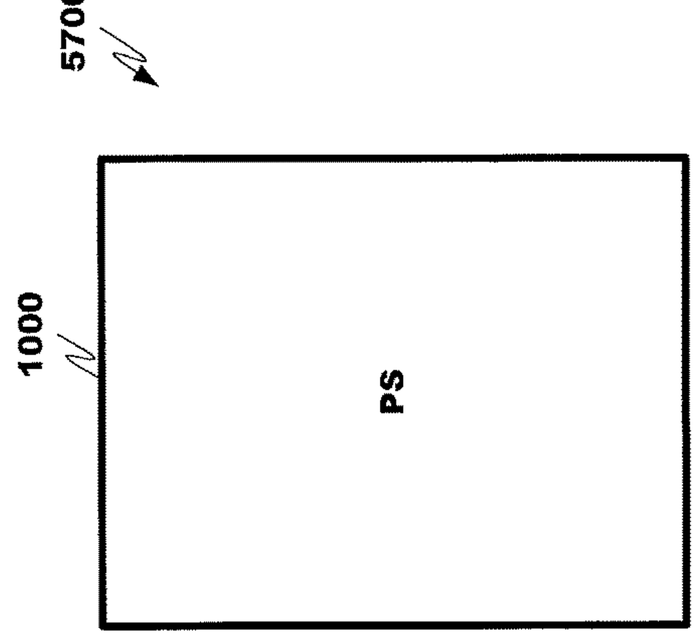



Fig. 57A

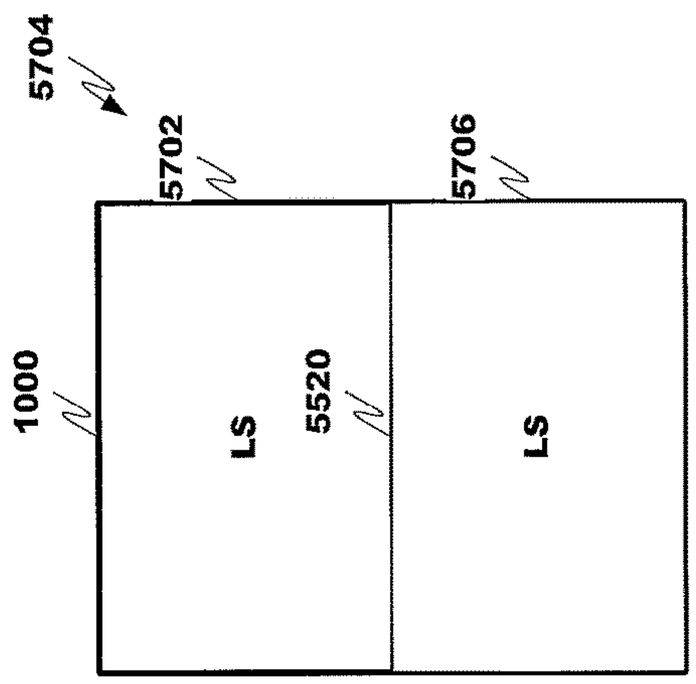



Fig. 57B

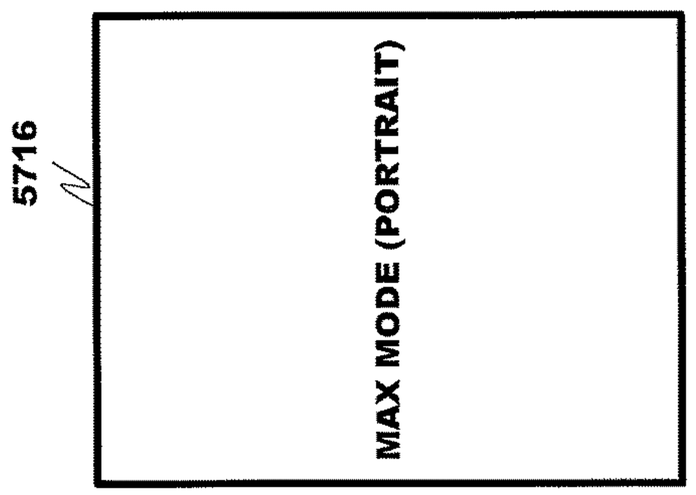



Fig. 57C

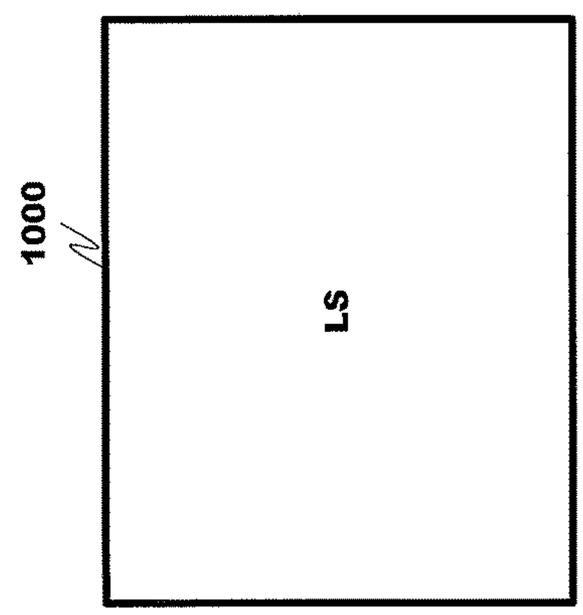



Fig. 57D

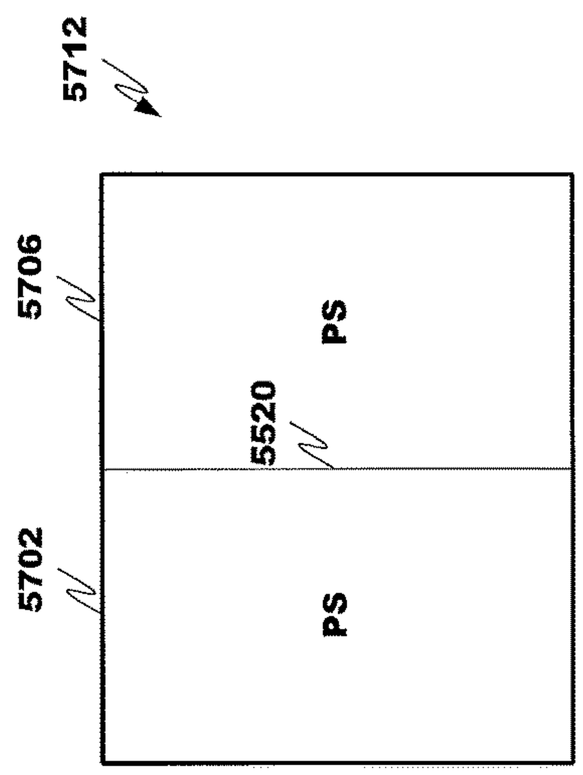



Fig. 57E

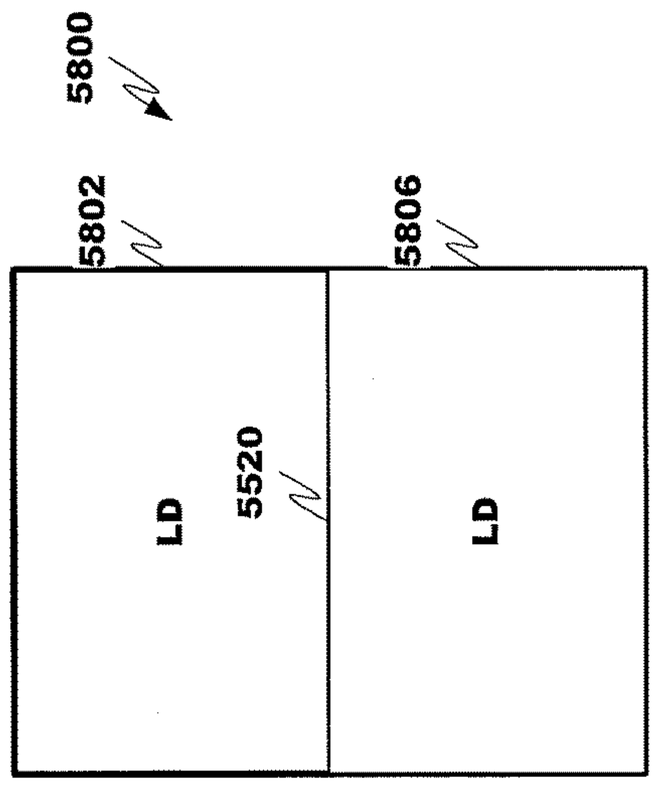



Fig. 58A

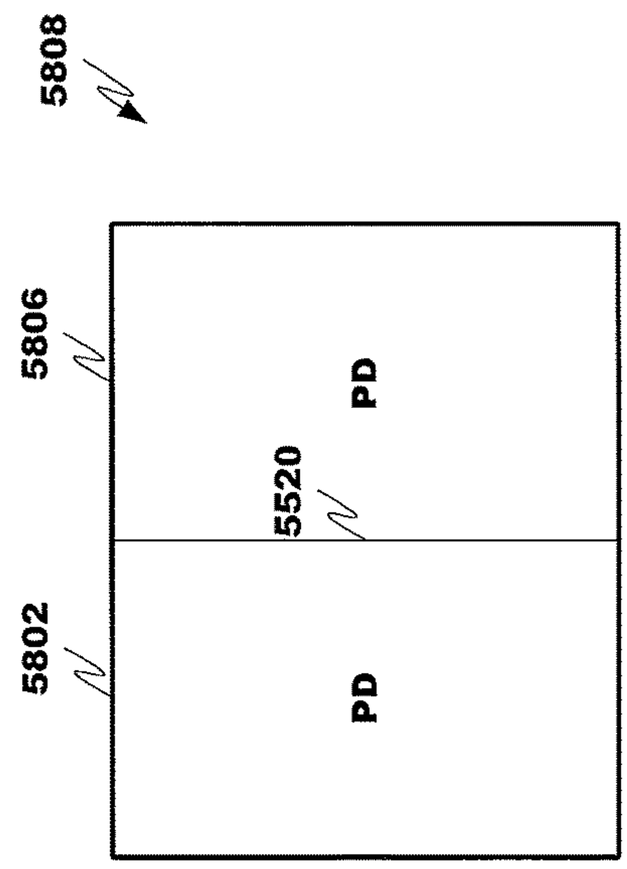



Fig. 58C

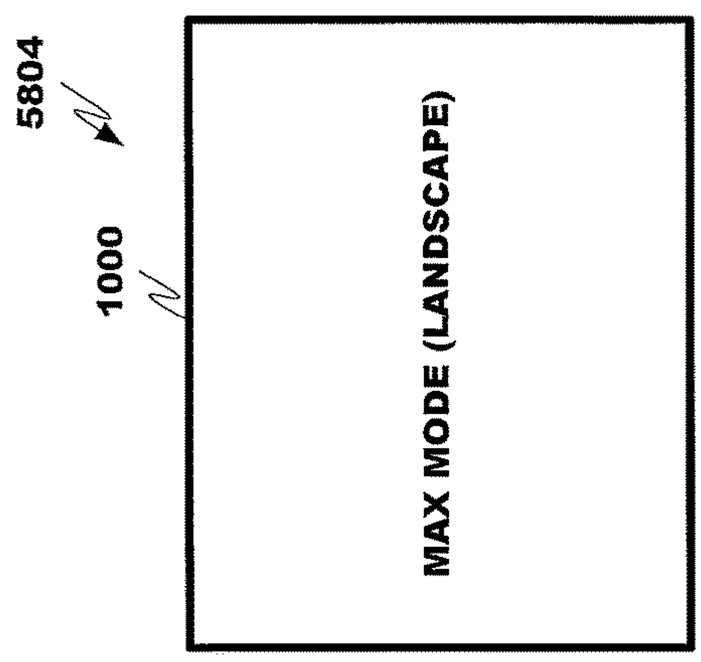



Fig. 58B

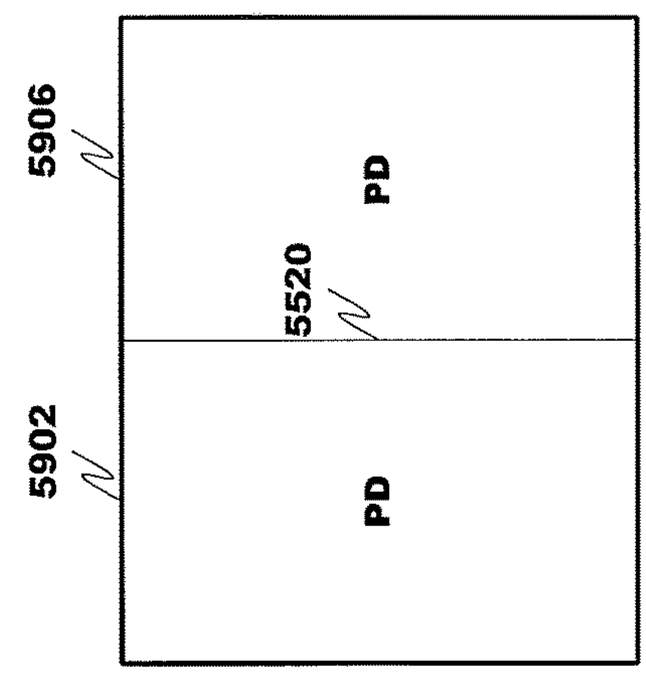



Fig. 59A

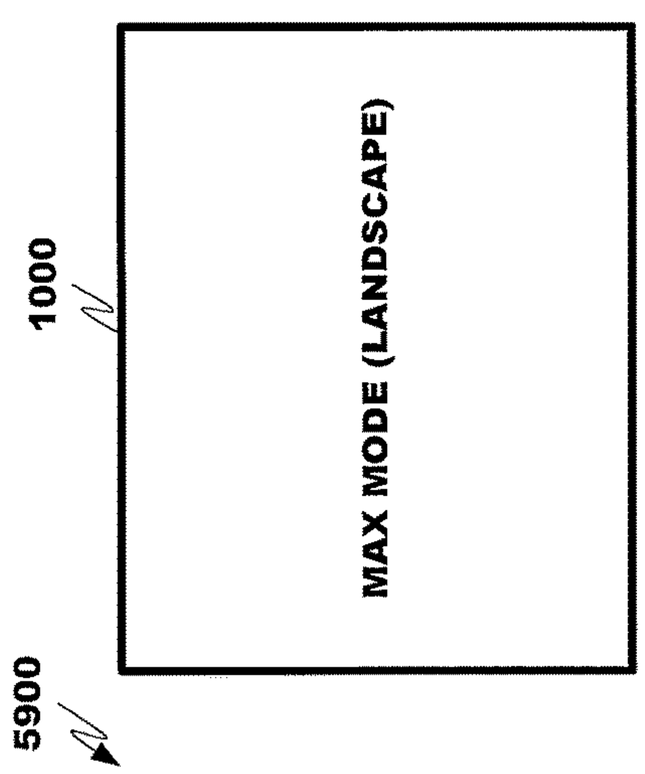



Fig. 59B

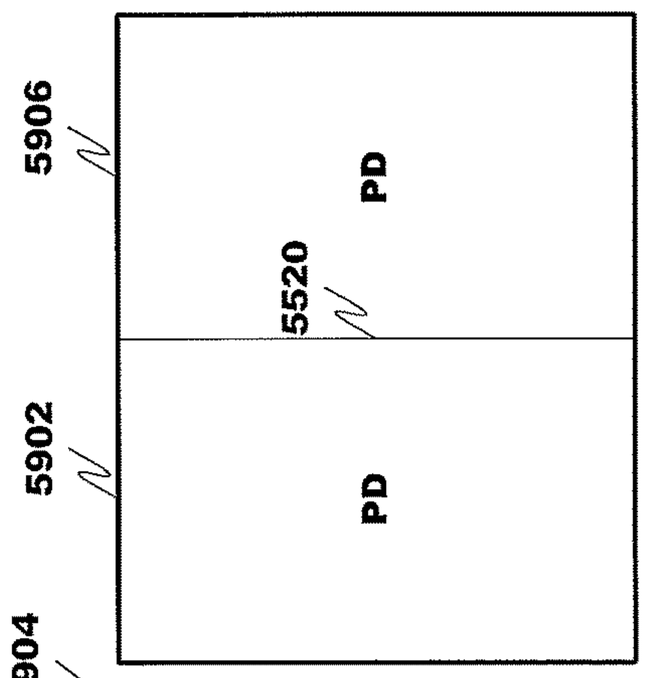



Fig. 59C

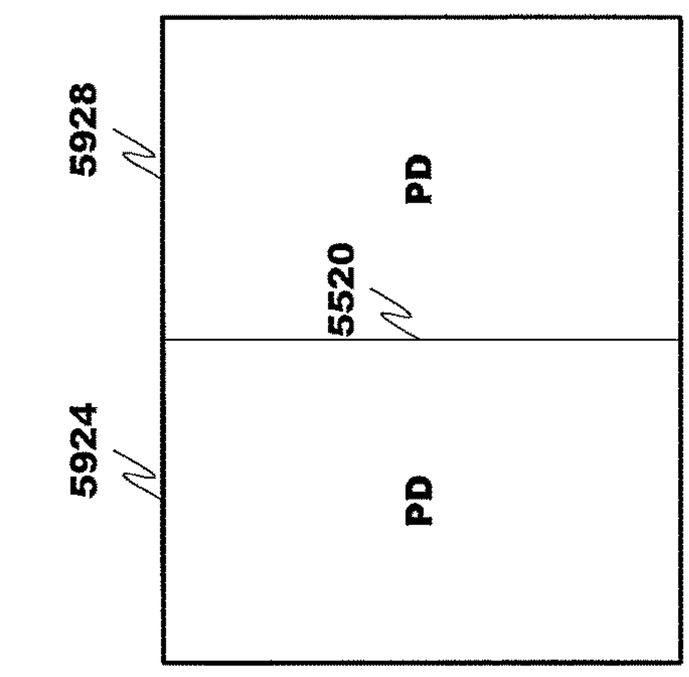



Fig. 59D

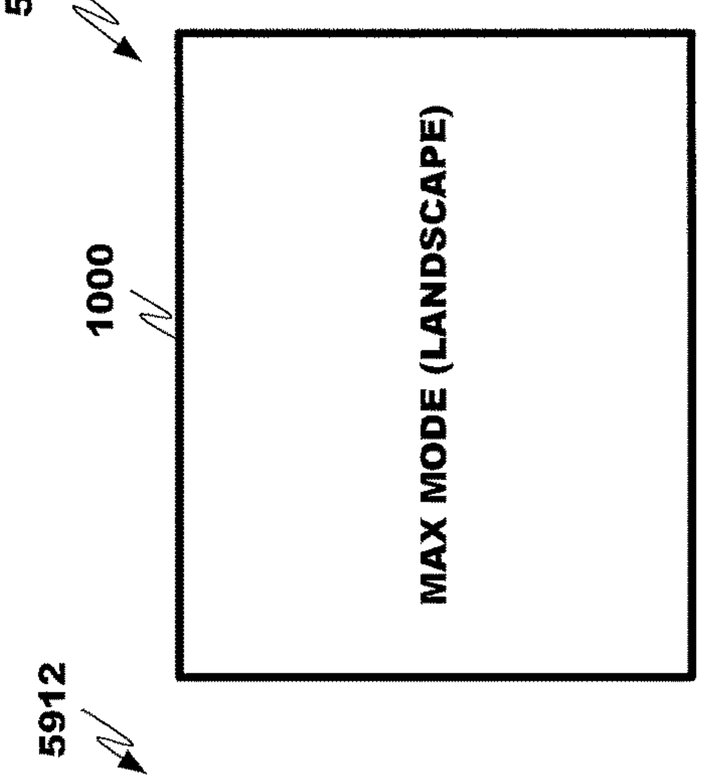



Fig. 59E

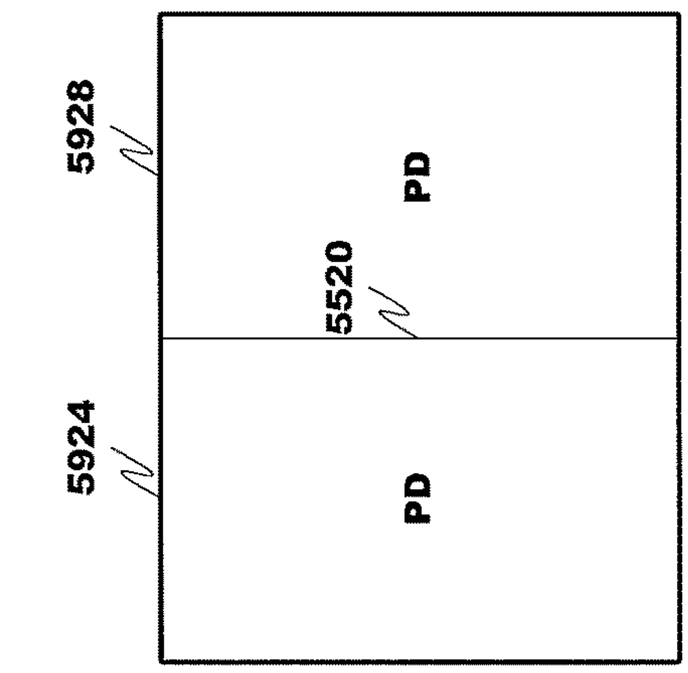



Fig. 59F

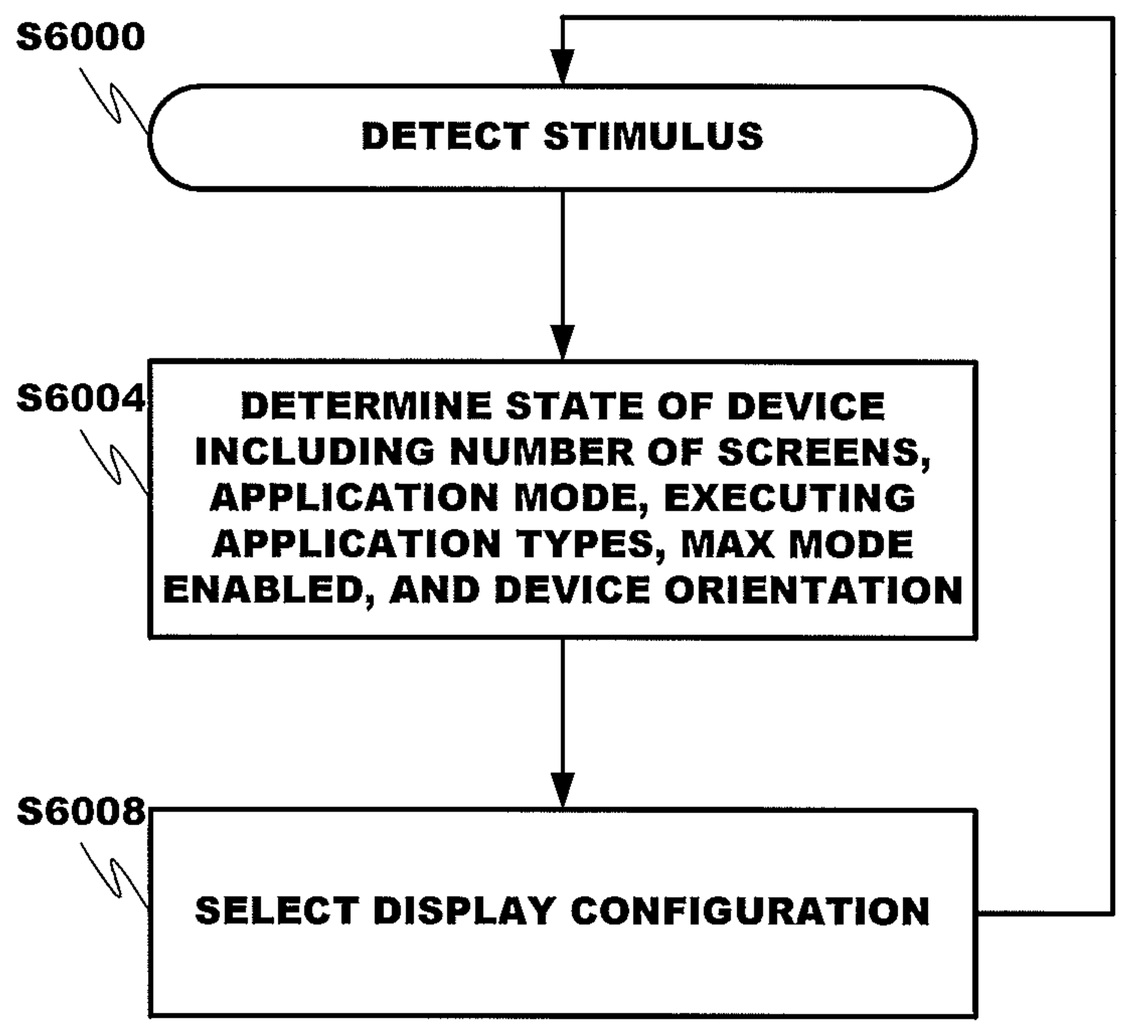

S6000
DETECT STIMULUS
S6004
DETERMINE STATE OF DEVICE INCLUDING NUMBER OF SCREENS, APPLICATION MODE, EXECUTING APPLICATION TYPES, MAX MODE ENABLED, AND DEVICE ORIENTATION
S6008
SELECT DISPLAY CONFIGURATION

*FIG. 60*

# MAX MODE

## CROSS REFERENCE TO RELATED APPLICATION

This application is a continuation and claims priority to U.S. patent application Ser. No. 14/679,746, filed on Apr. 6, 2015, which is a continuation and claims priority to U.S. patent application Ser. No. 13/627,577, filed on Sep. 26, 2012, now U.S. Pat. No. 9,001,149, issued on Apr. 7, 2015, which is a continuation-in-part and claims the benefits of and priority to U.S. patent application Ser. No. 13/247,581, filed on Sep. 28, 2011, now U.S. Pat. No. 8,659,565, issued on Feb. 25, 2014, which claims the benefits of and priority, under 35 U.S.C. § 119(e), to U.S. Provisional Application Ser. No. 61/389,000, filed on Oct. 1, 2010, entitled "DUAL DISPLAY WINDOWING SYSTEM;" 61/389,117, filed on Oct. 1, 2010, entitled "MULTI-OPERATING SYSTEM PORTABLE DOCKETING DEVICE;" 61/389,087, filed on Oct. 1, 2010, entitled "TABLET COMPUTING USER INTERFACE;"61/458,150, filed Nov. 17, 2010, entitled "DUAL SCREEN EMAIL CLIENT;" and 61/539,884, filed on Sep. 27, 2011, entitled "MOBILE DEVICE." Each of the aforementioned documents is incorporated herein by this reference in their entirety for all that they teach and for all purposes.

## BACKGROUND

A substantial number of handheld computing devices, such as cellular phones, tablets, and E-Readers, make use of a touch screen display not only to deliver display information to the user but also to receive inputs from user interface commands. While touch screen displays may increase the configurability of the handheld device and provide a wide variety of user interface options, this flexibility typically comes at a price. The dual use of the touch screen to provide content and receive user commands, while flexible for the user, may obfuscate the display and cause visual clutter, thereby leading to user frustration and loss of productivity.

The small form factor of handheld computing devices requires a careful balancing between the displayed graphics and the area provided for receiving inputs. On the one hand, the small display constrains the display space, which may increase the difficulty of interpreting actions or results. On the other hand, a virtual keypad or other user interface scheme is superimposed on or positioned adjacent to an executing application, requiring the application to be squeezed into an even smaller portion of the display.

This balancing act is particularly difficult for single display touch screen devices. Single display touch screen devices are crippled by their limited screen space. When users are entering information into the device, through the single display, the ability to interpret information in the display can be severely hampered, particularly when a complex interaction between display and interface is required.

## SUMMARY

There is a need for a dual multi-display handheld computing device that provides for enhanced power and/or versatility compared to conventional single display handheld computing devices. These and other needs are addressed by the various aspects, embodiments, and/or configurations of the present disclosure. Also, while the disclosure is presented in terms of exemplary embodiments,



it should be appreciated that individual aspects of the disclosure can be separately claimed.

In one embodiment, a communication device or smart pad is provided that includes:

a microprocessor;

a memory operable to store software; and

a screen comprising a display and a gesture capture area;

wherein the screen is configured to operate in at least the following modes:

a portrait single application mode, wherein the screen is in a portrait orientation and only one application is currently providing a maximized view, in portrait, for the display;

a portrait multi-application mode, wherein the screen is in a portrait orientation and a plurality of applications are currently providing a maximized view, in landscape, for the display;

a landscape single application mode, wherein the screen is in a landscape orientation and only one application is currently providing a maximized view, in landscape, for the display; and

a landscape multi-application mode, wherein the screen is in a portrait orientation and a plurality of applications are currently providing a maximized view, in portrait, for the display.

In portrait or landscape single application mode, a single-display or multi-display application can be capable of providing a max view. In max view, canvas-based content fills substantially the entire display, and non-canvas display elements are hidden. In portrait or landscape dual application mode, the single-display or multi-display application is generally not capable of providing a max view.

The following rules can be applied by the smartpad:

when the screen is in the portrait or landscape single application mode, a launched application launches in max mode;

when an application is in max mode, the application provides a max view to substantially the entire display regardless of whether the application was maximized or minimized immediately prior to entering the max mode; and

when an application exits the max mode, the view of the application is maximized.

When the screen is in portrait or landscape dual application mode, a system-wide seam extends across the display to separate the display into first and second logical displays, the first logical display being for a first view of a first application and the second logical display being for a second view of a second application. The first and second logical displays are logically independent of one another and, when the screen is in portrait or landscape single application mode, the display is free of a seam.

A selected application is in focus when a user switches from one of the portrait and landscape single application modes to the portrait and landscape multi-application modes. A view of the selected application is displayed both before and after the switch.

In one configuration, a parent view has first and second child views, the first and second child views being selected from links in the parent view, the display comprises first and second logical displays, the parent view is displayed in the first logical display, the first and second child views are displayed simultaneously in the second logical display, and, an order in which the first and second child views are opened is used to determine which of the first and second child views is moved to the first logical display when the parent view is closed or minimized.

In one configuration, a view displayed by the display comprises an action bar comprising plural action bar com-

mands, each command having a corresponding icon and label. The action bar comprises a primary and secondary row, the secondary row, but not the primary row, being hidden header when the primary row is collapsed and revealed when the primary row is expanded.

First and second action bars for first and second applications are generally revealed when the screen is in portrait or landscape dual application mode.

In one configuration, a settings screen launched from within an application is treated as a full-screen modal launched on top of the application.

The present disclosure can provide a number of advantages depending on the particular aspect, embodiment, and/or configuration.

For example, the smartpad could provide additional display area to assist a user with viewing content on the device.

Additionally, power sharing and management functions are available due to, for example, the larger size of the smartpad that could be used for power storage.

Furthermore, the smartpad allows functions of a communications device to be extended to a tablet-like platform and/or form factor.

Even further, the disclosure provides techniques directed toward translating or otherwise converting content for a multi-display device into content for a single screen device.

Moreover, the smartpad provides additional input areas adapted to receive input beyond that of the touchscreen.

Additional advantages are directed toward managing the display of one or more windows associated with one or more applications on a multi-display device on a single display device.

Further advantages are directed toward emulation of multi-display content on a single screen device.

These and other advantages will be apparent from the disclosure.

The phrases "at least one", "one or more", and "and/or" are open-ended expressions that are both conjunctive and disjunctive in operation. For example, each of the expressions "at least one of A, B and C", "at least one of A, B, or C", "one or more of A, B, and C", "one or more of A, B, or C" and "A, B, and/or C" means A alone, B alone, C alone, A and B together, A and C together, B and C together, or A, B and C together.

The term "a" or "an" entity refers to one or more of that entity. As such, the terms "a" (or "an"), "one or more" and "at least one" can be used interchangeably herein. It is also to be noted that the terms "comprising", "including", and "having" can be used interchangeably.

The term "automatic" and variations thereof, as used herein, refers to any process or operation done without material human input when the process or operation is performed. However, a process or operation can be automatic, even though performance of the process or operation uses material or immaterial human input, if the input is received before performance of the process or operation. Human input is deemed to be material if such input influences how the process or operation will be performed. Human input that consents to the performance of the process or operation is not deemed to be "material".

The term "composite display" refers to a logical structure that defines a display that can encompass one or more screens. A multi-screen composite display is a display that encompasses all the screens. A single-screen composite display has different displays on a common screen. The composite display can have different display characteristics based on the various orientations of the device.

The term "computer-readable medium" as used herein refers to any tangible storage and/or transmission medium that participate in providing instructions to a processor for execution. Such a medium may take many forms, including but not limited to, non-volatile media, volatile media, and transmission media. Non-volatile media includes, for example, NVRAM, or magnetic or optical disks. Volatile media includes dynamic memory, such as main memory. Common forms of computer-readable media include, for example, a floppy disk, a flexible disk, hard disk, magnetic tape, or any other magnetic medium, magneto-optical medium, a CD-ROM, any other optical medium, punch cards, paper tape, any other physical medium with patterns of holes, a RAM, a PROM, and EPROM, a FLASH-EPROM, a solid state medium like a memory card, any other memory chip or cartridge, a carrier wave as described hereinafter, or any other medium from which a computer can read. A digital file attachment to e-mail or other self-contained information archive or set of archives is considered a distribution medium equivalent to a tangible storage medium. When the computer-readable media is configured as a database, it is to be understood that the database may be any type of database, such as relational, hierarchical, object-oriented, and/or the like. Accordingly, the disclosure is considered to include a tangible storage medium or distribution medium and prior art-recognized equivalents and successor media, in which the software implementations of the present disclosure are stored.

The term "composite display" refers to a logical structure that defines a display that can encompass one or more screens. A multi-screen composite display is a display that encompasses all the screens. A single-screen composite display has different displays on a common screen. The composite display can have different display characteristics based on the various orientations of the device.

The term "desktop" refers to a metaphor used to portray systems. A desktop is generally considered a "surface" that typically includes pictures, called icons, widgets, folders, etc. that can activate show applications, windows, cabinets, files, folders, documents, and other graphical items. The icons are generally selectable to initiate a task through user interface interaction to allow a user to execute applications or conduct other operations.

The terms "determine", "calculate" and "compute," and variations thereof, as used herein, are used interchangeably and include any type of methodology, process, mathematical operation or technique.

The term "display" refers to one or more portions of one or more screens used to display the output of a computer to a user. A display may refer to all or part of a screen. In one configuration, the display is a single-display screen or a multi-display screen. A single physical screen can include multiple displays that are managed as separate logical displays. Thus, different content can be displayed on the separate displays although part of the same physical screen. In another configuration, the display occupies a single screen or spans multiple screens, referred to as a composite display. A composite display can encompass the touch sensitive displays of one or more screens.

The term "displayed image" refers to an image produced on the display. A typical displayed image is a window or desktop. The displayed image may occupy all or a portion of the display.

The term "display orientation" refers to the way in which a rectangular display is oriented by a user for viewing. The two most common types of display orientation are portrait and landscape. In landscape mode, the display is oriented

such that the width of the display is greater than the height of the display (such as a 4:3 ratio, which is 4 units wide and 3 units tall, or a 16:9 ratio, which is 16 units wide and 9 units tall). Stated differently, the longer dimension of the display is oriented substantially horizontal in landscape mode while the shorter dimension of the display is oriented substantially vertical. In the portrait mode, by contrast, the display is oriented such that the width of the display is less than the height of the display. Stated differently, the shorter dimension of the display is oriented substantially horizontal in the portrait mode while the longer dimension of the display is oriented substantially vertical.

The term "gesture" refers to a user action that expresses an intended idea, action, meaning, result, and/or outcome. The user action can include manipulating a device (e.g., opening or closing a device, changing a device orientation, moving a trackball or wheel, etc.), movement of a body part in relation to the device, movement of an implement or tool in relation to the device, audio inputs, etc. A gesture may be made on a device (such as on the screen) or with the device to interact with the device.

The term "gesture capture" refers to a sense or otherwise a detection of an instance and/or type of user gesture. The gesture capture can occur in one or more areas of the screen, A gesture region can be on the display, where it may be referred to as a touch sensitive display or off the display where it may be referred to as a gesture capture area. The term "means" shall be given its broadest possible interpretation in accordance with 35 U.S.C., Section 112, Paragraph 6. Accordingly, a claim incorporating the term "means" shall cover all structures, materials, or acts set forth herein, and all of the equivalents thereof. Further, the structures, materials or acts and the equivalents thereof shall include all those described in the summary of the disclosure, brief description of the drawings, detailed description, abstract, and claims themselves.

The term "module" as used herein refers to any known or later developed hardware, software, firmware, artificial intelligence, fuzzy logic, or combination of hardware and software that is capable of performing the functionality associated with that element.

A "multi-screen application" refers to an application that is capable of multiple modes. The multi-screen application mode can include, but is not limited to, a single screen mode (where the application is displayed on a single screen) or a composite display mode (where the application is displayed on two or more screens). A multi-screen application can have different layouts optimized for the mode. Thus, the multi-screen application can have different layouts for a single screen or for a composite display that can encompass two or more screens. The different layouts may have different screen/display dimensions and/or configurations on which the user interfaces of the multi-screen applications can be rendered. The different layouts allow the application to optimize the application's user interface for the type of display, e.g., single screen or multiple screens. In single screen mode, the multi-screen application may present one window pane of information. In a composite display mode, the multi-screen application may present multiple window panes of information or may provide a larger and a richer presentation because there is more space for the display contents. The multi-screen applications may be designed to adapt dynamically to changes in the device and the mode depending on which display (single or composite) the system assigns to the multi-screen application. In alternative embodiments, the user can use a gesture to request the application transition to a different mode, and, if a display is available for the requested mode, the device can allow the application to move to that display and transition modes.

A "multi-display application" refers to an application that is capable of multiple modes. The multi-display application mode can include, but is not limited to, a single display mode (where the application is displayed on a single display) or a composite display mode (where the application is displayed on two or more displays). A multi-display application can have different layouts optimized for the mode. Thus, the multi-display application can have different layouts for a single display or for a composite display that can encompass two or more displays. The different layouts may have different screen/display dimensions and/or configurations on which the user interfaces of the multi-display applications can be rendered. The different layouts allow the application to optimize the application's user interface for the type of display, e.g., single screen or multiple screens. In single display mode, the multi-display application may present one window pane of information. In a composite display mode, the multi-display application may present multiple window panes of information or may provide a larger and a richer presentation because there is more space for the display contents. The multi-display applications may be designed to adapt dynamically to changes in the device and the mode depending on which display (single or composite) the system assigns to the multi-display application. In alternative embodiments, the user can use a gesture to request the application transition to a different mode, and, if a display is available for the requested mode, the device can allow the application to move to that display and transition modes.

The term "screen," "touch screen," or "touchscreen" refers to a physical structure that includes one or more hardware components that provide the device with the ability to render a user interface and/or receive user input. A screen can encompass any combination of gesture capture region, a touch sensitive display, and/or a configurable area. The device can have one or more physical screens embedded in the hardware. However a screen may also include an external peripheral device that may be attached and detached from the device. In embodiments, multiple external devices may be attached to the device. Thus, in embodiments, the screen can enable the user to interact with the device by touching areas on the screen and provides information to a user through a display. The touch screen may sense user contact in a number of different ways, such as by a change in an electrical parameter (e.g., resistance or capacitance), acoustic wave variations, infrared radiation proximity detection, light variation detection, and the like. In a resistive touch screen, for example, normally separated conductive and resistive metallic layers in the screen pass an electrical current. When a user touches the screen, the two layers make contact in the contacted location, whereby a change in electrical field is noted and the coordinates of the contacted location calculated. In a capacitive touch screen, a capacitive layer stores electrical charge, which is discharged to the user upon contact with the touch screen, causing a decrease in the charge of the capacitive layer. The decrease is measured, and the contacted location coordinates determined. In a surface acoustic wave touch screen, an acoustic wave is transmitted through the screen, and the acoustic wave is disturbed by user contact. A receiving transducer detects the user contact instance and determines the contacted location coordinates.

A "single-screen application" refers to an application that is capable of single screen mode. Thus, the single-screen application can produce only one window and may not be capable of different modes or different display dimensions.

A single-screen application may not be capable of the several modes discussed with the multi-screen application.

A "single-display application" refers to an application that is capable of single display mode. Thus, the single-display application can produce only one window and may not be capable of different modes or different display dimensions. A single-display application may not be capable of the several modes discussed with the multi-display application.

The term "window" refers to a, typically rectangular, displayed image on at least part of a display that contains or provides content different from the rest of the screen. The window may obscure the desktop.

The preceding is a simplified summary of the disclosure to provide an understanding of some aspects of the disclosure. This summary is neither an extensive nor exhaustive overview of the disclosure and its various aspects, embodiments, and/or configurations. It is intended neither to identify key or critical elements of the disclosure nor to delineate the scope of the disclosure but to present selected concepts of the disclosure in a simplified form as an introduction to the more detailed description presented below. As will be appreciated, other aspects, embodiments, and/or configurations of the disclosure are possible utilizing, alone or in combination, one or more of the features set forth above or described in detail below.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1**A includes a first view of an embodiment of a multi-screen user device;

FIG. **1**B includes a second view of an embodiment of a multi-screen user device;

FIG. **1**C includes a third view of an embodiment of a multi-screen user device;

FIG. **1**D includes a fourth view of an embodiment of a multi-screen user device;

FIG. **1**E includes a fifth view of an embodiment of a multi-screen user device;

FIG. **1**F includes a sixth view of an embodiment of a multi-screen user device;

FIG. **1**G includes a seventh view of an embodiment of a multi-screen user device;

FIG. **1**H includes a eighth view of an embodiment of a multi-screen user device;

FIG. **1**I includes a ninth view of an embodiment of a multi-screen user device;

FIG. **1**J includes a tenth view of an embodiment of a multi-screen user device;

FIG. **2** is a block diagram of an embodiment of the hardware of the device;

FIG. **3**A is a block diagram of an embodiment of the state model for the device based on the device's orientation and/or configuration;

FIG. **3**B is a table of an embodiment of the state model for the device based on the device's orientation and/or configuration;

FIG. **4**A is a first representation of an embodiment of user gesture received at a device;

FIG. **4**B is a second representation of an embodiment of user gesture received at a device;

FIG. **4**C is a third representation of an embodiment of user gesture received at a device;

FIG. **4**D is a fourth representation of an embodiment of user gesture received at a device;

FIG. **4**E is a fifth representation of an embodiment of user gesture received at a device;

FIG. **4**F is a sixth representation of an embodiment of user gesture received at a device;

FIG. **4**G is a seventh representation of an embodiment of user gesture received at a device;

FIG. **4**H is a eighth representation of an embodiment of user gesture received at a device;

FIG. **5**A is a block diagram of an embodiment of the device software and/or firmware;

FIG. **5**B is a second block diagram of an embodiment of the device software and/or firmware;

FIG. **6**A is a first representation of an embodiment of a device configuration generated in response to the device state;

FIG. **6**B is a second representation of an embodiment of a device configuration generated in response to the device state;

FIG. **6**C is a third representation of an embodiment of a device configuration generated in response to the device state;

FIG. **6**D is a fourth representation of an embodiment of a device configuration generated in response to the device state;

FIG. **6**E is a fifth representation of an embodiment of a device configuration generated in response to the device state;

FIG. **6**F is a sixth representation of an embodiment of a device configuration generated in response to the device state;

FIG. **6**G is a seventh representation of an embodiment of a device configuration generated in response to the device state;

FIG. **6**H is a eighth representation of an embodiment of a device configuration generated in response to the device state;

FIG. **6**I is a ninth representation of an embodiment of a device configuration generated in response to the device state;

FIG. **6**J is a tenth representation of an embodiment of a device configuration generated in response to the device state;

FIG. **7**A is representation of a logical window stack;

FIG. **7**B is another representation of an embodiment of a logical window stack;

FIG. **7**C is another representation of an embodiment of a logical window stack;

FIG. **7**D is another representation of an embodiment of a logical window stack;

FIG. **7**E is another representation of an embodiment of a logical window stack;

FIG. **8** is block diagram of an embodiment of a logical data structure for a window stack;

FIG. **9** is a flow chart of an embodiment of a method for creating a window stack;

FIG. **10** illustrates an exemplary smartpad (SP).

FIG. **11** illustrates an exemplary method of associating the smartpad with the device.

FIG. **12** illustrates a docked device with the smartpad.

FIGS. **13**A-**13**B illustrate an exemplary method for screen orientation.

FIG. **14** illustrates a method for displaying an application when the SP is in a portrait mode.

FIG. **15** illustrates a method for displaying an application when the SP is in a landscape mode.

FIG. **16** illustrates an example of a dual screen application in portrait max mode.

FIG. **17** illustrates an example of a dual screen application in max mode landscape.

FIG. **18** illustrates an example of keyboard management on the SP.

FIG. **19** illustrates an example of keyboard management on the SP with an application area in max mode.

FIG. **20** illustrates another example of keyboard management for the SP in landscape mode.

FIG. **21** illustrates an example of a dual screen application running in a dual screen emulation mode on the SP with a virtual keyboard.

FIG. **22** illustrates an example of application window stack management on the SP.

FIG. **23** illustrates another example of application window stack management on the SP.

FIG. **24** illustrates an example of multi application mode of the SP, wherein in the multi application mode the SP emulates the device in its mini-tablet form.

FIG. **25** illustrates another example of multi application mode of the SP.

FIG. **26** illustrates another example of multi application mode of the SP.

FIG. **27** illustrates another example of multi application mode of the SP.

FIG. **28** illustrates a method for managing screen display.

FIG. **29** illustrates an exemplary method for managing screen display with the desktop.

FIG. **30** illustrates an exemplary method of managing screen display with a keyboard.

FIGS. **31**A and **31**B illustrate desktop management on the SP.

FIGS. **32**A and **32** B illustrate exemplary methods for desktop panel management.

FIG. **33** illustrates exemplary notification management on the SP.

FIGS. **34**A and **34**B illustrate exemplary techniques for application management.

FIGS. **35**A and **35**B illustrate an exemplary method for providing desktop previews or hints.

FIG. **36** illustrates an exemplary carousel application window stack.

FIG. **37** illustrates an exemplary carousel application window stack with a virtual keyboard.

FIG. **38** illustrates an exemplary method for associating the device and the SP.

FIG. **39** illustrates an exemplary method for application reorientation based on SP orientation.

FIG. **40** illustrates an exemplary method for managing the keyboard on the SP.

FIG. **41** illustrates an exemplary method for window manipulation based on one or more gestures.

FIG. **42** illustrates an exemplary method for application highlighting when an application is in focus in multi application mode.

FIG. **43** illustrates an exemplary method for application maximization.

FIG. **44** illustrates an exemplary method for transitioning from an application window to the desktop.

FIG. **45** illustrates an exemplary method for managing the display of the desktop and/or one or more panels on the SP.

FIG. **46** illustrates an exemplary method for merging panels for display on the SP.

FIG. **47** illustrates an exemplary method for previewing one or more panels on the SP.

FIG. **48** illustrates an exemplary method for stack management in multi application mode.

FIG. **49** depicts a hierarchical relationship according to embodiment.

FIG. **50** illustrates a display according to an embodiment.

FIG. **51** illustrates a display according to an embodiment.

FIG. **52** illustrates a display according to an embodiment.

FIG. **53** illustrates a display according to an embodiment.

FIG. **54** illustrates a display according to an embodiment.

FIGS. **55**A-F depict various displays according to an embodiment.

FIGS. **56**A-T depict various displays according to an embodiment.

FIGS. **57**A-E depict various displays according to an embodiment.

FIGS. **58**A-C depict various displays according to an embodiment.

FIGS. **59**A-F depict various displays according to an embodiment.

FIG. **60** illustrates an exemplary method for selecting a display configuration.

In the appended figures, similar components and/or features may have the same reference label. Further, various components of the same type may be distinguished by following the reference label by a letter that distinguishes among the similar components. If only the first reference label is used in the specification, the description is applicable to any one of the similar components having the same first reference label irrespective of the second reference label.

## DETAILED DESCRIPTION

Presented herein are embodiments of a device. The device can be a communications device, such as a cellular telephone, or other smart device. The device can include two screens that are oriented to provide several unique display configurations. Further, the device can receive user input in unique ways. The overall design and functionality of the device provides for an enhanced user experience making the device more useful and more efficient.

Mechanical Features:

FIGS. **1**A-**1**J illustrate a device **100** in accordance with embodiments of the present disclosure. As described in greater detail below, device **100** can be positioned in a number of different ways each of which provides different functionality to a user. The device **100** is a multi-screen device that includes a primary screen **104** and a secondary screen **108**, both of which are touch sensitive. In embodiments, the entire front surface of screens **104** and **108** may be touch sensitive and capable of receiving input by a user touching the front surface of the screens **104** and **108**. Primary screen **104** includes touch sensitive display **110**, which, in addition to being touch sensitive, also displays information to a user. Secondary screen **108** includes touch sensitive display **114**, which also displays information to a user. In other embodiments, screens **104** and **108** may include more than one display area.

Primary screen **104** also includes a configurable area **112** that has been configured for specific inputs when the user touches portions of the configurable area **112**. Secondary screen **108** also includes a configurable area **116** that has been configured for specific inputs. Areas **112***a* and **116***a* have been configured to receive a "back" input indicating that a user would like to view information previously displayed. Areas **112***b* and **116***b* have been configured to receive a "menu" input indicating that the user would like to view options from a menu. Areas **112***c* and **116***c* have been configured to receive a "home" input indicating that the user would like to view information associated with a "home" view. In other embodiments, areas **112***a-c* and **116***a-c* may be configured, in addition to the configurations described above, for other types of specific inputs including control-

ling features of device **100**, some non-limiting examples including adjusting overall system power, adjusting the volume, adjusting the brightness, adjusting the vibration, selecting of displayed items (on either of screen **104** or **108**), operating a camera, operating a microphone, and initiating/terminating of telephone calls. Also, in some embodiments, areas **112***a-c* and **116***a-c* may be configured for specific inputs depending upon the application running on device **100** and/or information displayed on touch sensitive displays **110** and/or **114**.

In addition to touch sensing, primary screen **104** and secondary screen **108** may also include areas that receive input from a user without requiring the user to touch the display area of the screen. For example, primary screen **104** includes gesture capture area **120**, and secondary screen **108** includes gesture capture area **124**. These areas are able to receive input by recognizing gestures made by a user without the need for the user to actually touch the surface of the display area. In comparison to touch sensitive displays **110** and **114**, the gesture capture areas **120** and **124** are commonly not capable of rendering a displayed image.

The two screens **104** and **108** are connected together with a hinge **128**, shown clearly in FIG. **1**C (illustrating a back view of device **100**). Hinge **128**, in the embodiment shown in FIGS. **1**A-**1**J, is a center hinge that connects screens **104** and **108** so that when the hinge is closed, screens **104** and **108** are juxtaposed (i.e., side-by-side) as shown in FIG. **1**B (illustrating a front view of device **100**). Hinge **128** can be opened to position the two screens **104** and **108** in different relative positions to each other. As described in greater detail below, the device **100** may have different functionalities depending on the relative positions of screens **104** and **108**.

FIG. **1**D illustrates the right side of device **100**. As shown in FIG. **1**D, secondary screen **108** also includes a card slot **132** and a port **136** on its side. Card slot **132** in embodiments, accommodates different types of cards including a subscriber identity module (SIM). Port **136** in embodiments is an input/output port (I/O port) that allows device **100** to be connected to other peripheral devices, such as a display, keyboard, or printing device. As can be appreciated, these are merely some examples and in other embodiments device **100** may include other slots and ports such as slots and ports for accommodating additional memory devices and/or for connecting other peripheral devices. Also shown in FIG. **1**D is an audio jack **140** that accommodates a tip, ring, sleeve (TRS) connector for example to allow a user to utilize headphones or a headset.

Device **100** also includes a number of buttons **158**. For example, FIG. **1**E illustrates the left side of device **100**. As shown in FIG. **1**E, the side of primary screen **104** includes three buttons **144**, **148**, and **152**, which can be configured for specific inputs. For example, buttons **144**, **148**, and **152** may be configured to, in combination or alone, control a number of aspects of device **100**. Some non-limiting examples include overall system power, volume, brightness, vibration, selection of displayed items (on either of screen **104** or **108**), a camera, a microphone, and initiation/termination of telephone calls. In some embodiments, instead of separate buttons two buttons may be combined into a rocker button. This arrangement is useful in situations where the buttons are configured to control features such as volume or brightness. In addition to buttons **144**, **148**, and **152**, device **100** also includes a button **156**, shown in FIG. **1**F, which illustrates the top of device **100**. In one embodiment, button **156** is configured as an on/off button used to control overall system power to device **100**. In other embodiments, button **156** is configured to, in addition to or in lieu of controlling system power, control other aspects of device **100**. In some embodiments, one or more of the buttons **144**, **148**, **152**, and **156** are capable of supporting different user commands. By way of example, a normal press has a duration commonly of less than about 1 second and resembles a quick tap. A medium press has a duration commonly of 1 second or more but less than about 12 seconds. A long press has a duration commonly of about 12 seconds or more. The function of the buttons is normally specific to the application that is currently in focus on the respective display **110** and **114**. In a telephone application for instance and depending on the particular button, a normal, medium, or long press can mean end call, increase in call volume, decrease in call volume, and toggle microphone mute. In a camera or video application for instance and depending on the particular button, a normal, medium, or long press can mean increase zoom, decrease zoom, and take photograph or record video.

There are also a number of hardware components within device **100**. As illustrated in FIG. **1**C, device **100** includes a speaker **160** and a microphone **164**. Device **100** also includes a camera **168** (FIG. **1**B). Additionally, device **100** includes two position sensors **172**A and **172**B, which are used to determine the relative positions of screens **104** and **108**. In one embodiment, position sensors **172**A and **172**B are Hall effect sensors. However, in other embodiments other sensors can be used in addition to or in lieu of the Hall effect sensors. An accelerometer **176** may also be included as part of device **100** to determine the orientation of the device **100** and/or the orientation of screens **104** and **108**. Additional internal hardware components that may be included in device **100** are described below with respect to FIG. **2**.

The overall design of device **100** allows it to provide additional functionality not available in other communication devices. Some of the functionality is based on the various positions and orientations that device **100** can have. As shown in FIGS. **1**B-**1**G, device **100** can be operated in an "open" position where screens **104** and **108** are juxtaposed. This position allows a large display area for displaying information to a user. When position sensors **172**A and **172**B determine that device **100** is in the open position, they can generate a signal that can be used to trigger different events such as displaying information on both screens **104** and **108**. Additional events may be triggered if accelerometer **176** determines that device **100** is in a portrait position (FIG. **1**B) as opposed to a landscape position (not shown).

In addition to the open position, device **100** may also have a "closed" position illustrated in FIG. **1**H. Again, position sensors **172**A and **172**B can generate a signal indicating that device **100** is in the "closed" position. This can trigger an event that results in a change of displayed information on screen **104** and/or **108**. For example, device **100** may be programmed to stop displaying information on one of the screens, e.g., screen **108**, since a user can only view one screen at a time when device **100** is in the "closed" position. In other embodiments, the signal generated by position sensors **172**A and **172**B, indicating that the device **100** is in the "closed" position, can trigger device **100** to answer an incoming telephone call. The "closed" position can also be a preferred position for utilizing the device **100** as a mobile phone.

Device **100** can also be used in an "easel" position which is illustrated in FIG. **1**I. In the "easel" position, screens **104** and **108** are angled with respect to each other and facing outward with the edges of screens **104** and **108** substantially horizontal. In this position, device **100** can be configured to display information on both screens **104** and **108** to allow

two users to simultaneously interact with device **100**. When device **100** is in the "easel" position, sensors **172**A and **172**B generate a signal indicating that the screens **104** and **108** are positioned at an angle to each other, and the accelerometer **176** can generate a signal indicating that device **100** has been placed so that the edge of screens **104** and **108** are substantially horizontal. The signals can then be used in combination to generate events that trigger changes in the display of information on screens **104** and **108**.

FIG. **1**J illustrates device **100** in a "modified easel" position. In the "modified easel" position, one of screens **104** or **108** is used as a stand and is faced down on the surface of an object such as a table. This position provides a convenient way for information to be displayed to a user in landscape orientation. Similar to the easel position, when device **100** is in the "modified easel" position, position sensors **172**A and **172**B generate a signal indicating that the screens **104** and **108** are positioned at an angle to each other. The accelerometer **176** would generate a signal indicating that device **100** has been positioned so that one of screens **104** and **108** is faced downwardly and is substantially horizontal. The signals can then be used to generate events that trigger changes in the display of information of screens **104** and **108**. For example, information may not be displayed on the screen that is face down since a user cannot see the screen.

Transitional states are also possible. When the position sensors **172**A and B and/or accelerometer indicate that the screens are being closed or folded (from open), a closing transitional state is recognized. Conversely when the position sensors **172**A and B indicate that the screens are being opened or folded (from closed), an opening transitional state is recognized. The closing and opening transitional states are typically time-based, or have a maximum time duration from a sensed starting point. Normally, no user input is possible when one of the closing and opening states is in effect. In this manner, incidental user contact with a screen during the closing or opening function is not misinterpreted as user input. In embodiments, another transitional state is possible when the device **100** is closed. This additional transitional state allows the display to switch from one screen **104** to the second screen **108** when the device **100** is closed based on some user input, e.g., a double tap on the screen **110**,**114**.

As can be appreciated, the description of device **100** is made for illustrative purposes only, and the embodiments are not limited to the specific mechanical features shown in FIGS. **1**A-**1**J and described above. In other embodiments, device **100** may include additional features, including one or more additional buttons, slots, display areas, hinges, and/or locking mechanisms. Additionally, in embodiments, the features described above may be located in different parts of device **100** and still provide similar functionality. Therefore, FIGS. **1**A-**1**J and the description provided above are non-limiting.

Hardware Features:

FIG. **2** illustrates components of a device **100** in accordance with embodiments of the present disclosure. In general, the device **100** includes a primary screen **104** and a secondary screen **108**. While the primary screen **104** and its components are normally enabled in both the opened and closed positions or states, the secondary screen **108** and its components are normally enabled in the opened state but disabled in the closed state. However, even when in the closed state a user or application triggered interrupt (such as in response to a phone application or camera application operation) can flip the active screen, or disable the primary screen **104** and enable the secondary screen **108**, by a suitable command. Each screen **104**, **108** can be touch sensitive and can include different operative areas. For example, a first operative area, within each touch sensitive screen **104** and **108**, may comprise a touch sensitive display **110**, **114**. In general, the touch sensitive display **110**, **114** may comprise a full color, touch sensitive display. A second area within each touch sensitive screen **104** and **108** may comprise a gesture capture region **120**, **124**. The gesture capture region **120**, **124** may comprise an area or region that is outside of the touch sensitive display **110**, **114** area, and that is capable of receiving input, for example in the form of gestures provided by a user. However, the gesture capture region **120**, **124** does not include pixels that can perform a display function or capability.

A third region of the touch sensitive screens **104** and **108** may comprise a configurable area **112**, **116**. The configurable area **112**, **116** is capable of receiving input and has display or limited display capabilities. In embodiments, the configurable area **112**, **116** may present different input options to the user. For example, the configurable area **112**, **116** may display buttons or other relatable items. Moreover, the identity of displayed buttons, or whether any buttons are displayed at all within the configurable area **112**, **116** of a touch sensitive screen **104** or **108**, may be determined from the context in which the device **100** is used and/or operated. In an exemplary embodiment, the touch sensitive screens **104** and **108** comprise liquid crystal display devices extending across at least those regions of the touch sensitive screens **104** and **108** that are capable of providing visual output to a user, and a capacitive input matrix over those regions of the touch sensitive screens **104** and **108** that are capable of receiving input from the user.

One or more display controllers **216***a*, **216***b* may be provided for controlling the operation of the touch sensitive screens **104** and **108**, including input (touch sensing) and output (display) functions. In the exemplary embodiment illustrated in FIG. **2**, a separate touch screen controller **216***a* or **216***b* is provided for each touch screen **104** and **108**. In accordance with alternate embodiments, a common or shared touch screen controller may be used to control each of the included touch sensitive screens **104** and **108**. In accordance with still other embodiments, the functions of a touch screen controller may be incorporated into other components, such as a processor **204**.

The processor **204** may comprise a general purpose programmable processor or controller for executing application programming or instructions. In accordance with at least some embodiments, the processor **204** may include multiple processor cores, and/or implement multiple virtual processors. In accordance with still other embodiments, the processor **204** may include multiple physical processors. As a particular example, the processor **204** may comprise a specially configured application specific integrated circuit (ASIC) or other integrated circuit, a digital signal processor, a controller, a hardwired electronic or logic circuit, a programmable logic device or gate array, a special purpose computer, or the like. The processor **204** generally functions to run programming code or instructions implementing various functions of the device **100**.

A communication device **100** may also include memory **208** for use in connection with the execution of application programming or instructions by the processor **204**, and for the temporary or long term storage of program instructions and/or data. As examples, the memory **208** may comprise RAM, DRAM, SDRAM, or other solid state memory. Alternatively or in addition, data storage **212** may be provided.

Like the memory **208**, the data storage **212** may comprise a solid state memory device or devices. Alternatively or in addition, the data storage **212** may comprise a hard disk drive or other random access memory.

In support of communications functions or capabilities, the device **100** can include a cellular telephony module **228**. As examples, the cellular telephony module **228** can comprise a GSM, CDMA, FDMA and/or analog cellular telephony transceiver capable of supporting voice, multimedia and/or data transfers over a cellular network. Alternatively or in addition, the device **100** can include an additional or other wireless communications module **232**. As examples, the other wireless communications module **232** can comprise a Wi-Fi, BLUETOOTH™, WiMax, infrared, or other wireless communications link. The cellular telephony module **228** and the other wireless communications module **232** can each be associated with a shared or a dedicated antenna **224**.

A port interface **252** may be included. The port interface **252** may include proprietary or universal ports to support the interconnection of the device **100** to other devices or components, such as a dock, which may or may not include additional or different capabilities from those integral to the device **100**. In addition to supporting an exchange of communication signals between the device **100** and another device or component, the docking port **136** and/or port interface **252** can support the supply of power to or from the device **100**. The port interface **252** also comprises an intelligent element that comprises a docking module for controlling communications or other interactions between the device **100** and a connected device or component.

An input/output module **248** and associated ports may be included to support communications over wired networks or links, for example with other communication devices, server devices, and/or peripheral devices. Examples of an input/output module **248** include an Ethernet port, a Universal Serial Bus (USB) port, Institute of Electrical and Electronics Engineers (IEEE) 1394, or other interface.

An audio input/output interface/device(s) **244** can be included to provide analog audio to an interconnected speaker or other device, and to receive analog audio input from a connected microphone or other device. As an example, the audio input/output interface/device(s) **244** may comprise an associated amplifier and analog to digital converter. Alternatively or in addition, the device **100** can include an integrated audio input/output device **256** and/or an audio jack for interconnecting an external speaker or microphone. For example, an integrated speaker and an integrated microphone can be provided, to support near talk or speaker phone operations.

Hardware buttons **158** can be included for example for use in connection with certain control operations. Examples include a master power switch, volume control, etc., as described in conjunction with FIGS. **1**A through **1**J. One or more image capture interfaces/devices **240**, such as a camera, can be included for capturing still and/or video images. Alternatively or in addition, an image capture interface/device **240** can include a scanner or code reader. An image capture interface/device **240** can include or be associated with additional elements, such as a flash or other light source.

The device **100** can also include a global positioning system (GPS) receiver **236**. In accordance with embodiments of the present disclosure, the GPS receiver **236** may further comprise a GPS module that is capable of providing absolute location information to other components of the device **100**. An accelerometer(s) **176** may also be included. For example, in connection with the display of information to a user and/or other functions, a signal from the accelerometer **176** can be used to determine an orientation and/or format in which to display that information to the user.

Embodiments of the present disclosure can also include one or more position sensor(s) **172**. The position sensor **172** can provide a signal indicating the position of the touch sensitive screens **104** and **108** relative to one another. This information can be provided as an input, for example to a user interface application, to determine an operating mode, characteristics of the touch sensitive displays **110**, **114**, and/or other device **100** operations. As examples, a screen position sensor **172** can comprise a series of Hall effect sensors, a multiple position switch, an optical switch, a Wheatstone bridge, a potentiometer, or other arrangement capable of providing a signal indicating of multiple relative positions the touch screens are in.

Communications between various components of the device **100** can be carried by one or more buses **222**. In addition, power can be supplied to the components of the device **100** from a power source and/or power control module **260**. The power control module **260** can, for example, include a battery, an AC to DC converter, power control logic, and/or ports for interconnecting the device **100** to an external source of power.

Device State:

FIGS. **3**A and **3**B represent illustrative states of device **100**. While a number of illustrative states are shown, and transitions from a first state to a second state, it is to be appreciated that the illustrative state diagram may not encompass all possible states and/or all possible transitions from a first state to a second state. As illustrated in FIG. **3**, the various arrows between the states (illustrated by the state represented in the circle) represent a physical change that occurs to the device **100**, that is detected by one or more of hardware and software, the detection triggering one or more of a hardware and/or software interrupt that is used to control and/or manage one or more functions of device **100**.

As illustrated in FIG. **3**A, there are twelve exemplary "physical" states: closed **304**, transition **308** (or opening transitional state), easel **312**, modified easel **316**, open **320**, inbound/outbound call or communication **324**, image/video capture **328**, transition **332** (or closing transitional state), landscape **340**, docked **336**, docked **344** and landscape **348**. Next to each illustrative state is a representation of the physical state of the device **100** with the exception of states **324** and **328**, where the state is generally symbolized by the international icon for a telephone and the icon for a camera, respectfully.

In state **304**, the device is in a closed state with the device **100** generally oriented in the portrait direction with the primary screen **104** and the secondary screen **108** back-to-back in different planes (see FIG. **1**H). From the closed state, the device **100** can enter, for example, docked state **336**, where the device **100** is coupled with a docking station, docking cable, or in general docked or associated with one or more other devices or peripherals, or the landscape state **340**, where the device **100** is generally oriented with the primary screen **104** facing the user, and the primary screen **104** and the secondary screen **108** being back-to-back.

In the closed state, the device can also move to a transitional state where the device remains closed but the display is moved from one screen **104** to another screen **108** based on a user input, e.g., a double tap on the screen **110**, **114**. Still another embodiment includes a bilateral state. In the bilateral state, the device remains closed, but a single application displays at least one window on both the first display **110**

and the second display **114**. The windows shown on the first and second display **110**, **114** may be the same or different based on the application and the state of that application. For example, while acquiring an image with a camera, the device may display the view finder on the first display **110** and displays a preview for the photo subjects (full screen and mirrored left-to-right) on the second display **114**.

In state **308**, a transition state from the closed state **304** to the semi-open state or easel state **312**, the device **100** is shown opening with the primary screen **104** and the secondary screen **108** being rotated around a point of axis coincidence with the hinge. Upon entering the easel state **312**, the primary screen **104** and the secondary screen **108** are separated from one another such that, for example, the device **100** can sit in an easel-like configuration on a surface.

In state **316**, known as the modified easel position, the device **100** has the primary screen **104** and the secondary screen **108** in a similar relative relationship to one another as in the easel state **312**, with the difference being one of the primary screen **104** or the secondary screen **108** are placed on a surface as shown.

State **320** is the open state where the primary screen **104** and the secondary screen **108** are generally on the same plane. From the open state, the device **100** can transition to the docked state **344** or the open landscape state **348**. In the open state **320**, the primary screen **104** and the secondary screen **108** are generally in the portrait-like orientation while in landscaped state **348** the primary screen **104** and the secondary screen **108** are generally in a landscape-like orientation.

State **324** is illustrative of a communication state, such as when an inbound or outbound call is being received or placed, respectively, by the device **100**. While not illustrated for clarity, it should be appreciated the device **100** can transition to the inbound/outbound call state **324** from any state illustrated in FIG. **3**. In a similar manner, the image/video capture state **328** can be entered into from any other state in FIG. **3**, with the image/video capture state **328** allowing the device **100** to take one or more images via a camera and/or videos with a video capture device **240**.

Transition state **332** illustratively shows primary screen **104** and the secondary screen **108** being closed upon one another for entry into, for example, the closed state **304**.

FIG. **3**B illustrates, with reference to the key, the inputs that are received to detect a transition from a first state to a second state. In FIG. **3**B, various combinations of states are shown with in general, a portion of the columns being directed toward a portrait state **352**, a landscape state **356**, and a portion of the rows being directed to portrait state **360** and landscape state **364**.

In FIG. **3**B, the Key indicates that "H" represents an input from one or more Hall Effect sensors, "A" represents an input from one or more accelerometers, "T" represents an input from a timer, "P" represents a communications trigger input and "I" represents an image and/or video capture request input. Thus, in the center portion **376** of the chart, an input, or combination of inputs, are shown that represent how the device **100** detects a transition from a first physical state to a second physical state.

As discussed, in the center portion of the chart **376**, the inputs that are received enable the detection of a transition from, for example, a portrait open state to a landscape easel state—shown in bold—"HAT." For this exemplary transition from the portrait open to the landscape easel state, a Hall Effect sensor ("H"), an accelerometer ("A") and a timer ("T") input may be needed. The timer input can be derived from, for example, a clock associated with the processor.

In addition to the portrait and landscape states, a docked state **368** is also shown that is triggered based on the receipt of a docking signal **372**. As discussed above and in relation to FIG. **3**, the docking signal can be triggered by the association of the device **100** with one or more other device **100***s*, accessories, peripherals, smart docks, or the like.

User Interaction:

FIGS. **4**A through **4**H depict various graphical representations of gesture inputs that may be recognized by the screens **104**, **108**. The gestures may be performed not only by a user's body part, such as a digit, but also by other devices, such as a stylus, that may be sensed by the contact sensing portion(s) of a screen **104**, **108**. In general, gestures are interpreted differently, based on where the gestures are performed (either directly on the display **110**, **114** or in the gesture capture region **120**, **124**). For example, gestures in the display **110**,**114** may be directed to a desktop or application, and gestures in the gesture capture region **120**, **124** may be interpreted as for the system.

With reference to FIGS. **4**A-**4**H, a first type of gesture, a touch gesture **420**, is substantially stationary on the screen **104**,**108** for a selected length of time. A circle **428** represents a touch or other contact type received at particular location of a contact sensing portion of the screen. The circle **428** may include a border **432**, the thickness of which indicates a length of time that the contact is held substantially stationary at the contact location. For instance, a tap **420** (or short press) has a thinner border **432***a* than the border **432***b* for a long press **424** (or for a normal press). The long press **424** may involve a contact that remains substantially stationary on the screen for longer time period than that of a tap **420**. As will be appreciated, differently defined gestures may be registered depending upon the length of time that the touch remains stationary prior to contact cessation or movement on the screen.

With reference to FIG. **4**C, a drag gesture **400** on the screen **104**,**108** is an initial contact (represented by circle **428**) with contact movement **436** in a selected direction. The initial contact **428** may remain stationary on the screen **104**,**108** for a certain amount of time represented by the border **432**. The drag gesture typically requires the user to contact an icon, window, or other displayed image at a first location followed by movement of the contact in a drag direction to a new second location desired for the selected displayed image. The contact movement need not be in a straight line but have any path of movement so long as the contact is substantially continuous from the first to the second locations.

With reference to FIG. **4**D, a flick gesture **404** on the screen **104**,**108** is an initial contact (represented by circle **428**) with truncated contact movement **436** (relative to a drag gesture) in a selected direction. In embodiments, a flick has a higher exit velocity for the last movement in the gesture compared to the drag gesture. The flick gesture can, for instance, be a finger snap following initial contact. Compared to a drag gesture, a flick gesture generally does not require continual contact with the screen **104**,**108** from the first location of a displayed image to a predetermined second location. The contacted displayed image is moved by the flick gesture in the direction of the flick gesture to the predetermined second location. Although both gestures commonly can move a displayed image from a first location to a second location, the temporal duration and distance of travel of the contact on the screen is generally less for a flick than for a drag gesture.

With reference to FIG. **4**E, a pinch gesture **408** on the screen **104**,**108** is depicted. The pinch gesture **408** may be

initiated by a first contact **428***a* to the screen **104**,**108** by, for example, a first digit and a second contact **428***b* to the screen **104**,**108** by, for example, a second digit. The first and second contacts **428***a,b* may be detected by a common contact sensing portion of a common screen **104**,**108**, by different contact sensing portions of a common screen **104** or **108**, or by different contact sensing portions of different screens. The first contact **428***a* is held for a first amount of time, as represented by the border **432***a*, and the second contact **428***b* is held for a second amount of time, as represented by the border **432***b*. The first and second amounts of time are generally substantially the same, and the first and second contacts **428** *a, b* generally occur substantially simultaneously. The first and second contacts **428** *a, b* generally also include corresponding first and second contact movements **436** *a, b*, respectively. The first and second contact movements **436** *a, b* are generally in opposing directions. Stated another way, the first contact movement **436***a* is towards the second contact **436***b*, and the second contact movement **436***b* is towards the first contact **436***a*. More simply stated, the pinch gesture **408** may be accomplished by a user's digits touching the screen **104**,**108** in a pinching motion.

With reference to FIG. **4**F, a spread gesture **410** on the screen **104**,**108** is depicted. The spread gesture **410** may be initiated by a first contact **428***a* to the screen **104**,**108** by, for example, a first digit and a second contact **428***b* to the screen **104**,**108** by, for example, a second digit. The first and second contacts **428***a,b* may be detected by a common contact sensing portion of a common screen **104**,**108**, by different contact sensing portions of a common screen **104**,**108**, or by different contact sensing portions of different screens. The first contact **428***a* is held for a first amount of time, as represented by the border **432***a*, and the second contact **428***b* is held for a second amount of time, as represented by the border **432***b*. The first and second amounts of time are generally substantially the same, and the first and second contacts **428** *a, b* generally occur substantially simultaneously. The first and second contacts **428** *a, b* generally also include corresponding first and second contact movements **436***a, b*, respectively. The first and second contact movements **436** *a, b* are generally in a common direction. Stated another way, the first and second contact movements **436** *a, b* are away from the first and second contacts **428***a, b*. More simply stated, the spread gesture **410** may be accomplished by a user's digits touching the screen **104**,**108** in a spreading motion.

The above gestures may be combined in any manner, such as those shown by FIGS. **4**G and **4**H, to produce a determined functional result. For example, in FIG. **4**G a tap gesture **420** is combined with a drag or flick gesture **412** in a direction away from the tap gesture **420**. In FIG. **4**H, a tap gesture **420** is combined with a drag or flick gesture **412** in a direction towards the tap gesture **420**.

The functional result of receiving a gesture can vary depending on a number of factors, including a state of the device **100**, display **110**, **114**, or screen **104**, **108**, a context associated with the gesture, or sensed location of the gesture. The state of the device commonly refers to one or more of a configuration of the device **100**, a display orientation, and user and other inputs received by the device **100**. Context commonly refers to one or more of the particular application(s) selected by the gesture and the portion(s) of the application currently executing, whether the application is a single- or multi-screen application, and whether the application is a multi-screen application displaying one or more windows in one or more screens or in one or more stacks. Sensed location of the gesture commonly refers to whether the sensed set(s) of gesture location coordinates are on a touch sensitive display **110**, **114** or a gesture capture region **120**, **124**, whether the sensed set(s) of gesture location coordinates are associated with a common or different display or screen **104**,**108**, and/or what portion of the gesture capture region contains the sensed set(s) of gesture location coordinates.

A tap, when received by an a touch sensitive display **110**, **114**, can be used, for instance, to select an icon to initiate or terminate execution of a corresponding application, to maximize or minimize a window, to reorder windows in a stack, and to provide user input such as by keyboard display or other displayed image. A drag, when received by a touch sensitive display **110**, **114**, can be used, for instance, to relocate an icon or window to a desired location within a display, to reorder a stack on a display, or to span both displays (such that the selected window occupies a portion of each display simultaneously). A flick, when received by a touch sensitive display **110**, **114** or a gesture capture region **120**, **124**, can be used to relocate a window from a first display to a second display or to span both displays (such that the selected window occupies a portion of each display simultaneously). Unlike the drag gesture, however, the flick gesture is generally not used to move the displayed image to a specific user-selected location but to a default location that is not configurable by the user.

The pinch gesture, when received by a touch sensitive display **110**, **114** or a gesture capture region **120**, **124**, can be used to minimize or otherwise increase the displayed area or size of a window (typically when received entirely by a common display), to switch windows displayed at the top of the stack on each display to the top of the stack of the other display (typically when received by different displays or screens), or to display an application manager (a "pop-up window" that displays the windows in the stack). The spread gesture, when received by a touch sensitive display **110**, **114** or a gesture capture region **120**, **124**, can be used to maximize or otherwise decrease the displayed area or size of a window, to switch windows displayed at the top of the stack on each display to the top of the stack of the other display (typically when received by different displays or screens), or to display an application manager (typically when received by an off-screen gesture capture region on the same or different screens).

The combined gestures of FIG. **4**G, when received by a common display capture region in a common display or screen **104**,**108**, can be used to hold a first window stack location in a first stack constant for a display receiving the gesture while reordering a second window stack location in a second window stack to include a window in the display receiving the gesture. The combined gestures of FIG. **4**H, when received by different display capture regions in a common display or screen **104**,**108** or in different displays or screens, can be used to hold a first window stack location in a first window stack constant for a display receiving the tap part of the gesture while reordering a second window stack location in a second window stack to include a window in the display receiving the flick or drag gesture. Although specific gestures and gesture capture regions in the preceding examples have been associated with corresponding sets of functional results, it is to be appreciated that these associations can be redefined in any manner to produce differing associations between gestures and/or gesture capture regions and/or functional results.

Firmware and Software:

The memory **508** may store and the processor **504** may execute one or more software components. These compo-

nents can include at least one operating system (OS) **516**, an application manager **562**, a desktop **566**, and/or one or more applications **564***a* and/or **564***b* from an application store **560**. The OS **516** can include a framework **520**, one or more frame buffers **548**, one or more drivers **512**, previously described in conjunction with FIG. **2**, and/or a kernel **518**. The OS **516** can be any software, consisting of programs and data, which manages computer hardware resources and provides common services for the execution of various applications **564**. The OS **516** can be any operating system and, at least in some embodiments, dedicated to mobile devices, including, but not limited to, Linux, ANDROID™, iPhone OS (IOS™), WINDOWS PHONE 7™, etc. The OS **516** is operable to provide functionality to the phone by executing one or more operations, as described herein.

The applications **564** can be any higher level software that executes particular functionality for the user. Applications **564** can include programs such as email clients, web browsers, texting applications, games, media players, office suites, etc. The applications **564** can be stored in an application store **560**, which may represent any memory or data storage, and the management software associated therewith, for storing the applications **564**. Once executed, the applications **564** may be run in a different area of memory **508**.

The framework **520** may be any software or data that allows the multiple tasks running on the device to interact. In embodiments, at least portions of the framework **520** and the discrete components described hereinafter may be considered part of the OS **516** or an application **564**. However, these portions will be described as part of the framework **520**, but those components are not so limited. The framework **520** can include, but is not limited to, a Multi-Display Management (MDM) module **524**, a Surface Cache module **528**, a Window Management module **532**, an Input Management module **536**, a Task Management module **540**, an Application Model Manager **542**, a Display Controller, one or more frame buffers **548**, a task stack **552**, one or more window stacks **550** (which is a logical arrangement of windows and/or desktops in a display area), and/or an event buffer **556**.

The MDM module **524** includes one or more modules that are operable to manage the display of applications or other data on the screens of the device. An embodiment of the MDM module **524** is described in conjunction with FIG. **5**B. In embodiments, the MDM module **524** receives inputs from the other OS **516** components, such as, the drivers **512**, and from the applications **564** to determine continually the state of the device **100**. The inputs assist the MDM module **524** in determining how to configure and allocate the displays according to the application's preferences and requirements, and the user's actions. Once a determination for display configurations is made, the MDM module **524** can bind the applications **564** to a display. The configuration may then be provided to one or more other components to generate a window with a display.

The Surface Cache module **528** includes any memory or storage and the software associated therewith to store or cache one or more images of windows. A series of active and/or non-active windows (or other display objects, such as, a desktop display) can be associated with each display. An active window (or other display object) is currently displayed. A non-active windows (or other display objects) were opened and, at some time, displayed but are now not displayed. To enhance the user experience, before a window transitions from an active state to an inactive state, a "screen shot" of a last generated image of the window (or other display object) can be stored. The Surface Cache module **528** may be operable to store a bitmap of the last active image of a window (or other display object) not currently displayed. Thus, the Surface Cache module **528** stores the images of non-active windows (or other display objects) in a data store.

In embodiments, the Window Management module **532** is operable to manage the windows (or other display objects) that are active or not active on each of the displays. The Window Management module **532**, based on information from the MDM module **524**, the OS **516**, or other components, determines when a window (or other display object) is visible or not active. The Window Management module **532** may then put a non-visible window (or other display object) in a "not active state" and, in conjunction with the Task Management module Task Management **540** suspends the application's operation. Further, the Window Management module **532** may assign, through collaborative interaction with the MDM module **524**, a display identifier to the window (or other display object) or manage one or more other items of data associated with the window (or other display object). The Window Management module **532** may also provide the stored information to the application **564**, the Task Management module **540**, or other components interacting with or associated with the window (or other display object). The Window Management module **532** can also associate an input task with a window based on window focus and display coordinates within the motion space.

The Input Management module **536** is operable to manage events that occur with the device. An event is any input into the window environment, for example, a user interface interactions with a user. The Input Management module **536** receives the events and logically stores the events in an event buffer **556**. Events can include such user interface interactions as a "down event," which occurs when a screen **104**, **108** receives a touch signal from a user, a "move event," which occurs when the screen **104**, **108** determines that a user's finger is moving across a screen(s), an "up event, which occurs when the screen **104**, **108** determines that the user has stopped touching the screen **104**, **108**, etc. These events are received, stored, and forwarded to other modules by the Input Management module **536**. The Input Management module **536** may also map screen inputs to a motion space which is the culmination of all physical and virtual display available on the device.

The motion space is a virtualized space that includes all touch sensitive displays **110**,**114** "tiled" together to mimic the physical dimensions of the device **100**. For example, when the device **100** is unfolded, the motion space size may be 960×800, which may be the number of pixels in the combined display area for both touch sensitive displays **110**, **114**. If a user touches on a first touch sensitive display **110** on location (40, 40), a full screen window can receive touch event with location (40, 40). If a user touches on a second touch sensitive display **114**, with location (40, 40), the full screen window can receive touch event with location (520, 40), because the second touch sensitive display **114** is on the right side of the first touch sensitive display **110**, so the device **100** can offset the touch by the first touch sensitive display's **110** width, which is 480 pixels. When a hardware event occurs with location info from a driver **512**, the framework **520** can up-scale the physical location to the motion space because the location of the event may be different based on the device orientation and state. The motion space may be as described in U.S. patent application Ser. No. 13/187,026, filed Jul. 20, 2011, entitled "Systems and Methods for Receiving Gesture Inputs Spanning Mul-

tiple Input Devices," which is hereby incorporated by reference in its entirety for all that it teaches and for all purposes.

A task can be an application and a sub-task can be an application component that provides a window with which users can interact to do something, such as dial the phone, take a photo, send an email, or view a map. Each task may be given a window in which to draw a user interface. The window typically fills a display (for example, touch sensitive display **110**,**114**), but may be smaller than the display **110**,**114** and float on top of other windows. An application usually consists of multiple sub-tasks that are loosely bound to each other. Typically, one task in an application is specified as the "main" task, which is presented to the user when launching the application for the first time. Each task can then start another task or sub-task to perform different actions.

The Task Management module **540** is operable to manage the operation of one or more applications **564** that may be executed by the device. Thus, the Task Management module **540** can receive signals to launch, suspend, terminate, etc. an application or application sub-tasks stored in the application store **560**. The Task Management module **540** may then instantiate one or more tasks or sub-tasks of the application **564** to begin operation of the application **564**. Further, the Task Management Module **540** may launch, suspend, or terminate a task or sub-task as a result of user input or as a result of a signal from a collaborating framework **520** component. The Task Management Module **540** is responsible for managing the lifecycle of applications (tasks and sub-task) from when the application is launched to when the application is terminated.

The processing of the Task Management Module **540** is facilitated by a task stack **552**, which is a logical structure associated with the Task Management Module **540**. The task stack **552** maintains the state of all tasks and sub-tasks on the device **100**. When some component of the operating system **516** requires a task or sub-task to transition in its lifecycle, the OS **516** component can notify the Task Management Module **540**. The Task Management Module **540** may then locate the task or sub-task, using identification information, in the task stack **552**, and send a signal to the task or sub-task indicating what kind of lifecycle transition the task needs to execute. Informing the task or sub-task of the transition allows the task or sub-task to prepare for the lifecycle state transition. The Task Management Module **540** can then execute the state transition for the task or sub-task. In embodiments, the state transition may entail triggering the OS kernel **518** to terminate the task when termination is required.

Further, the Task Management module **540** may suspend the application **564**, based on information from the Window Management Module **532**. Suspending the application **564** may maintain application data in memory but may limit or stop the application **564** from rendering a window or user interface. Once the application becomes active again, the Task Management module **540** can again trigger the application to render its user interface. In embodiments, if a task is suspended, the task may save the task's state in case the task is terminated. In the suspended state, the application task may not receive input because the application window is not visible to the user.

The frame buffer **548** is a logical structure(s) used to render the user interface. The frame buffer **548** can be created and destroyed by the OS kernel **518**. However, the Display Controller **544** can write the image data, for the visible windows, into the frame buffer **548**. A frame buffer **548** can be associated with one screen or multiple screens. The association of a frame buffer **548** with a screen can be controlled dynamically by interaction with the OS kernel **518**. A composite display may be created by associating multiple screens with a single frame buffer **548**. Graphical data used to render an application's window user interface may then be written to the single frame buffer **548**, for the composite display, which is output to the multiple screens **104**,**108**. The Display Controller **544** can direct an application's user interface to a portion of the frame buffer **548** that is mapped to a particular display **110**,**114**, thus, displaying the user interface on only one screen **104** or **108**. The Display Controller **544** can extend the control over user interfaces to multiple applications, controlling the user interfaces for as many displays as are associated with a frame buffer **548** or a portion thereof. This approach compensates for the multiple physical screens **104**,**108** that are in use by the software component above the Display Controller **544**.

The Application Manager **562** is an application that provides a presentation layer for the window environment. Thus, the Application Manager **562** provides the graphical model for rendering by the Task Management Module **540**. Likewise, the Desktop **566** provides the presentation layer for the Application Store **560**. Thus, the desktop provides a graphical model of a surface having selectable application icons for the Applications **564** in the Application Store **560** that can be provided to the Window Management Module **556** for rendering.

Further, the framework can include an Application Model Manager (AMM) **542**. The Application Manager **562** may interface with the AMM **542**. In embodiments, the AMM **542** receives state change information from the device **100** regarding the state of applications (which are running or suspended). The AMM **542** can associate bit map images from the Surface Cache Module **528** to the tasks that are alive (running or suspended). Further, the AMM **542** can convert the logical window stack maintained in the Task Manager Module **540** to a linear ("film strip" or "deck of cards") organization that the user perceives when the using the off gesture capture area **120** to sort through the windows. Further, the AMM **542** may provide a list of executing applications to the Application Manager **562**.

An embodiment of the MDM module **524** is shown in FIG. **5**B. The MDM module **524** is operable to determine the state of the environment for the device, including, but not limited to, the orientation of the device, whether the device **100** is opened or closed, what applications **564** are executing, how the applications **564** are to be displayed, what actions the user is conducting, the tasks being displayed, etc. To configure the display, the MDM module **524** interprets these environmental factors and determines a display configuration, as described in conjunction with FIGS. **6**A-**6**J. Then, the MDM module **524** can bind the applications **564** or other device components to the displays. The configuration may then be sent to the Display Controller **544** and/or the other components within the OS **516** to generate the display. The MDM module **524** can include one or more of, but is not limited to, a Display Configuration Module **568**, a Preferences Module **572**, a Device State Module **574**, a Gesture Module **576**, a Requirements Module **580**, an Event Module **584**, and/or a Binding Module **588**.

The Display Configuration Module **568** determines the layout for the display. In embodiments, the Display Configuration Module **568** can determine the environmental factors. The environmental factors may be received from one or more other MDM modules **524** or from other sources. The Display Configuration Module **568** can then determine

from the list of factors the best configuration for the display. Some embodiments of the possible configurations and the factors associated therewith are described in conjunction with FIGS. **6**A-**6**F.

The Preferences Module **572** is operable to determine display preferences for an application **564** or other component. For example, an application can have a preference for Single or Dual displays. The Preferences Module **572** can determine an application's display preference (e.g., by inspecting the application's preference settings) and may allow the application **564** to change to a mode (e.g., single screen, dual screen, max, etc.) if the device **100** is in a state that can accommodate the preferred mode. However, some user interface policies may disallow a mode even if the mode is available. As the configuration of the device changes, the preferences may be reviewed to determine if a better display configuration can be achieved for an application **564**.

The Device State Module **574** is operable to determine or receive the state of the device. The state of the device can be as described in conjunction with FIGS. **3**A and **3**B. The state of the device can be used by the Display Configuration Module **568** to determine the configuration for the display. As such, the Device State Module **574** may receive inputs and interpret the state of the device. The state information is then provided to the Display Configuration Module **568**.

The Gesture Module **576** is shown as part of the MDM module **524**, but, in embodiments, the Gesture module **576** may be a separate Framework **520** component that is separate from the MDM module **524**. In embodiments, the Gesture Module **576** is operable to determine if the user is conducting any actions on any part of the user interface. In alternative embodiments, the Gesture Module **576** receives user interface actions from the configurable area **112**,**116** only. The Gesture Module **576** can receive touch events that occur on the configurable area **112**,**116** (or possibly other user interface areas) by way of the Input Management Module **536** and may interpret the touch events (using direction, speed, distance, duration, and various other parameters) to determine what kind of gesture the user is performing. When a gesture is interpreted, the Gesture Module **576** can initiate the processing of the gesture and, by collaborating with other Framework **520** components, can manage the required window animation. The Gesture Module **576** collaborates with the Application Model Manager **542** to collect state information with respect to which applications are running (active or paused) and the order in which applications must appear when a user gesture is performed. The Gesture Module **576** may also receive references to bitmaps (from the Surface Cache Module **528**) and live windows so that when a gesture occurs it can instruct the Display Controller **544** how to move the window(s) across the display **110**,**114**. Thus, suspended applications may appear to be running when those windows are moved across the display **110**,**114**.

Further, the Gesture Module **576** can receive task information either from the Task Manage Module **540** or the Input Management module **536**. The gestures may be as defined in conjunction with FIGS. **4**A through **4**H. For example, moving a window causes the display to render a series of display frames that illustrate the window moving. The gesture associated with such user interface interaction can be received and interpreted by the Gesture Module **576**. The information about the user gesture is then sent to the Task Management Module **540** to modify the display binding of the task.

The Requirements Module **580**, similar to the Preferences Module **572**, is operable to determine display requirements for an application **564** or other component. An application can have a set display requirement that must be observed. Some applications require a particular display orientation. For example, the application "Angry Birds" can only be displayed in landscape orientation. This type of display requirement can be determined or received, by the Requirements Module **580**. As the orientation of the device changes, the Requirements Module **580** can reassert the display requirements for the application **564**. The Display Configuration Module **568** can generate a display configuration that is in accordance with the application display requirements, as provided by the Requirements Module **580**.

The Event Module **584**, similar to the Gesture Module **576**, is operable to determine one or more events occurring with an application or other component that can affect the user interface. Thus, the Event Module **584** can receive event information either from the event buffer **556** or the Task Management module **540**. These events can change how the tasks are bound to the displays. The Event Module **584** can collect state change information from other Framework **520** components and act upon that state change information. In an example, when the phone is opened or closed or when an orientation change has occurred, a new message may be rendered in a secondary screen. The state change based on the event can be received and interpreted by the Event Module **584**. The information about the events then may be sent to the Display Configuration Module **568** to modify the configuration of the display.

The Binding Module **588** is operable to bind the applications **564** or the other components to the configuration determined by the Display Configuration Module **568**. A binding associates, in memory, the display configuration for each application with the display and mode of the application. Thus, the Binding Module **588** can associate an application with a display configuration for the application (e.g. landscape, portrait, multi-screen, etc.). Then, the Binding Module **588** may assign a display identifier to the display. The display identifier associated the application with a particular display of the device **100**. This binding is then stored and provided to the Display Controller **544**, the other components of the OS **516**, or other components to properly render the display. The binding is dynamic and can change or be updated based on configuration changes associated with events, gestures, state changes, application preferences or requirements, etc.

User Interface Configurations:

With reference now to FIGS. **6**A-J, various types of output configurations made possible by the device **100** will be described hereinafter.

FIGS. **6**A and **6**B depict two different output configurations of the device **100** being in a first state. Specifically, FIG. **6**A depicts the device **100** being in a closed portrait state **304** where the data is displayed on the primary screen **104**. In this example, the device **100** displays data via the touch sensitive display **110** in a first portrait configuration **604**. As can be appreciated, the first portrait configuration **604** may only display a desktop or operating system home screen. Alternatively, one or more windows may be presented in a portrait orientation while the device **100** is displaying data in the first portrait configuration **604**.

FIG. **6**B depicts the device **100** still being in the closed portrait state **304**, but instead data is displayed on the secondary screen **108**. In this example, the device **100** displays data via the touch sensitive display **114** in a second portrait configuration **608**.

It may be possible to display similar or different data in either the first or second portrait configuration **604**, **608**. It

may also be possible to transition between the first portrait configuration **604** and second portrait configuration **608** by providing the device **100** a user gesture (e.g., a double tap gesture), a menu selection, or other means. Other suitable gestures may also be employed to transition between configurations. Furthermore, it may also be possible to transition the device **100** from the first or second portrait configuration **604**, **608** to any other configuration described herein depending upon which state the device **100** is moved.

An alternative output configuration may be accommodated by the device **100** being in a second state. Specifically, FIG. **6**C depicts a third portrait configuration where data is displayed simultaneously on both the primary screen **104** and the secondary screen **108**. The third portrait configuration may be referred to as a Dual-Portrait (PD) output configuration. In the PD output configuration, the touch sensitive display **110** of the primary screen **104** depicts data in the first portrait configuration **604** while the touch sensitive display **114** of the secondary screen **108** depicts data in the second portrait configuration **608**. The simultaneous presentation of the first portrait configuration **604** and the second portrait configuration **608** may occur when the device **100** is in an open portrait state **320**. In this configuration, the device **100** may display one application window in one display **110** or **114**, two application windows (one in each display **110** and **114**), one application window and one desktop, or one desktop. Other configurations may be possible. It should be appreciated that it may also be possible to transition the device **100** from the simultaneous display of configurations **604**, **608** to any other configuration described herein depending upon which state the device **100** is moved. Furthermore, while in this state, an application's display preference may place the device into bilateral mode, in which both displays are active to display different windows in the same application. For example, a Camera application may display a viewfinder and controls on one side, while the other side displays a mirrored preview that can be seen by the photo subjects. Games involving simultaneous play by two players may also take advantage of bilateral mode.

FIGS. **6**D and **6**E depicts two further output configurations of the device **100** being in a third state. Specifically, FIG. **6**D depicts the device **100** being in a closed landscape state **340** where the data is displayed on the primary screen **104**. In this example, the device **100** displays data via the touch sensitive display **110** in a first landscape configuration **612**. Much like the other configurations described herein, the first landscape configuration **612** may display a desktop, a home screen, one or more windows displaying application data, or the like.

FIG. **6**E depicts the device **100** still being in the closed landscape state **340**, but instead data is displayed on the secondary screen **108**. In this example, the device **100** displays data via the touch sensitive display **114** in a second landscape configuration **616**. It may be possible to display similar or different data in either the first or second portrait configuration **612**, **616**. It may also be possible to transition between the first landscape configuration **612** and second landscape configuration **616** by providing the device **100** with one or both of a twist and tap gesture or a flip and slide gesture. Other suitable gestures may also be employed to transition between configurations. Furthermore, it may also be possible to transition the device **100** from the first or second landscape configuration **612**, **616** to any other configuration described herein depending upon which state the device **100** is moved.

FIG. **6**F depicts a third landscape configuration where data is displayed simultaneously on both the primary screen **104** and the secondary screen **108**. The third landscape configuration may be referred to as a Dual-Landscape (LD) output configuration. In the LD output configuration, the touch sensitive display **110** of the primary screen **104** depicts data in the first landscape configuration **612** while the touch sensitive display **114** of the secondary screen **108** depicts data in the second landscape configuration **616**. The simultaneous presentation of the first landscape configuration **612** and the second landscape configuration **616** may occur when the device **100** is in an open landscape state **340**. It should be appreciated that it may also be possible to transition the device **100** from the simultaneous display of configurations **612**, **616** to any other configuration described herein depending upon which state the device **100** is moved.

FIGS. **6**G and **6**H depict two views of a device **100** being in yet another state. Specifically, the device **100** is depicted as being in an easel state **312**. FIG. **6**G shows that a first easel output configuration **618** may be displayed on the touch sensitive display **110**. FIG. **6**H shows that a second easel output configuration **620** may be displayed on the touch sensitive display **114**. The device **100** may be configured to depict either the first easel output configuration **618** or the second easel output configuration **620** individually. Alternatively, both the easel output configurations **618**, **620** may be presented simultaneously. In some embodiments, the easel output configurations **618**, **620** may be similar or identical to the landscape output configurations **612**, **616**. The device **100** may also be configured to display one or both of the easel output configurations **618**, **620** while in a modified easel state **316**. It should be appreciated that simultaneous utilization of the easel output configurations **618**, **620** may facilitate two-person games (e.g., Battleship®, chess, checkers, etc.), multi-user conferences where two or more users share the same device **100**, and other applications. As can be appreciated, it may also be possible to transition the device **100** from the display of one or both configurations **618**, **620** to any other configuration described herein depending upon which state the device **100** is moved.

FIG. **6**I depicts yet another output configuration that may be accommodated while the device **100** is in an open portrait state **320**. Specifically, the device **100** may be configured to present a single continuous image across both touch sensitive displays **110**, **114** in a portrait configuration referred to herein as a Portrait-Max (PMax) configuration **624**. In this configuration, data (e.g., a single image, application, window, icon, video, etc.) may be split and displayed partially on one of the touch sensitive displays while the other portion of the data is displayed on the other touch sensitive display. The Pmax configuration **624** may facilitate a larger display and/or better resolution for displaying a particular image on the device **100**. Similar to other output configurations, it may be possible to transition the device **100** from the Pmax configuration **624** to any other output configuration described herein depending upon which state the device **100** is moved.

FIG. **6**J depicts still another output configuration that may be accommodated while the device **100** is in an open landscape state **348**. Specifically, the device **100** may be configured to present a single continuous image across both touch sensitive displays **110**, **114** in a landscape configuration referred to herein as a Landscape-Max (LMax) configuration **628**. In this configuration, data (e.g., a single image, application, window, icon, video, etc.) may be split and displayed partially on one of the touch sensitive displays while the other portion of the data is displayed on the other touch sensitive display. The Lmax configuration **628** may facilitate a larger display and/or better resolution for dis-

playing a particular image on the device **100**. Similar to other output configurations, it may be possible to transition the device **100** from the Lmax configuration **628** to any other output configuration described herein depending upon which state the device **100** is moved.

The device **100** manages desktops and/or windows with at least one window stack **700**, **728**, as shown in FIGS. **7**A and **7**B. A window stack **700**, **728** is a logical arrangement of active and/or inactive windows for a multi-screen device. For example, the window stack **700**, **728** may be logically similar to a deck of cards, where one or more windows or desktops are arranged in order, as shown in FIGS. **7**A and **7**B. An active window is a window that is currently being displayed on at least one of the touch sensitive displays **110**, **114**. For example, windows **104** and **108** are active windows and are displayed on touch sensitive displays **110** and **114**. An inactive window is a window that was opened and displayed but is now "behind" an active window and not being displayed. In embodiments, an inactive window may be for an application that is suspended, and thus, the window is not displaying active content. For example, windows **712**, **716**, **720**, and **724** are inactive windows.

A window stack **700**, **728** may have various arrangements or organizational structures. In the embodiment shown in FIG. **7**A, the device **100** includes a first stack **760** associated with a first touch sensitive display **110** and a second stack associated with a second touch sensitive display **114**. Thus, each touch sensitive display **110**, **114** can have an associated window stack **760**, **764**. These two window stacks **760**, **764** may have different numbers of windows arranged in the respective stacks **760**, **764**. Further, the two window stacks **760**, **764** can also be identified differently and managed separately. Thus, the first window stack **760** can be arranged in order from a first window **704** to a next window **720** to a last window **724** and finally to a desktop **722**, which, in embodiments, is at the "bottom" of the window stack **760**. In embodiments, the desktop **722** is not always at the "bottom" as application windows can be arranged in the window stack below the desktop **722**, and the desktop **722** can be brought to the "top" of a stack over other windows during a desktop reveal. Likewise, the second stack **764** can be arranged from a first window **708** to a next window **712** to a last window **716**, and finally to a desktop **718**, which, in embodiments, is a single desktop area, with desktop **722**, under all the windows in both window stack **760** and window stack **764**. A logical data structure for managing the two window stacks **760**, **764** may be as described in conjunction with FIG. **8**.

Another arrangement for a window stack **728** is shown in FIG. **7**B. In this embodiment, there is a single window stack **728** for both touch sensitive displays **110**, **114**. Thus, the window stack **728** is arranged from a desktop **758** to a first window **744** to a last window **756**. A window can be arranged in a position among all windows without an association to a specific touch sensitive display **110**, **114**. In this embodiment, a window is in the order of windows. Further, at least one window is identified as being active. For example, a single window may be rendered in two portions **732** and **736** that are displayed on the first touch sensitive screen **110** and the second touch sensitive screen **114**. The single window may only occupy a single position in the window stack **728** although it is displayed on both displays **110**, **114**.

Yet another arrangement of a window stack **760** is shown in FIGS. **7**C through **7**E. The window stack **760** is shown in three "elevation" views. In FIG. **7**C, the top of the window stack **760** is shown. Two sides of the window stack **760** are shown in FIGS. **7**D and **7**E. In this embodiment, the window stack **760** resembles a stack of bricks. The windows are stacked on each other. Looking from the top of the window stack **760** in FIG. **7**C, only the top most windows in the window stack **760** are seen in different portions of the composite display **764**. The composite display **764** represents a logical model for the entire display area of the device **100**, which can include touch sensitive display **110** and touch sensitive display **114**. A desktop **786** or a window can occupy part or all of the composite display **764**.

In the embodiment shown, the desktop **786** is the lowest display or "brick" in the window stack **760**. Thereupon, window **1 782**, window **2 782**, window **3 768**, and window **4 770** are layered. Window **1 782**, window **3 768**, window **2 782**, and window **4 770** only occupy a portion of the composite display **764**. Thus, another part of the stack **760** includes window **8 774** and windows **5** through **7** shown in section **790**. Only the top window in any portion of the composite display **764** is actually rendered and displayed. Thus, as shown in the top view in FIG. **7**C, window **4 770**, window **8 774**, and window **3 768** are displayed as being at the top of the display in different portions of the window stack **760**. A window can be dimensioned to occupy only a portion of the composite display **760** to "reveal" windows lower in the window stack **760**. For example, window **3 768** is lower in the stack than both window **4 770** and window **8 774** but is still displayed. A logical data structure to manage the window stack can be as described in conjunction with FIG. **8**.

When a new window is opened, the newly activated window is generally positioned at the top of the stack. However, where and how the window is positioned within the stack can be a function of the orientation of the device **100**, the context of what programs, functions, software, etc. are being executed on the device **100**, how the stack is positioned when the new window is opened, etc. To insert the window in the stack, the position in the stack for the window is determined and the touch sensitive display **110**, **114** to which the window is associated may also be determined. With this information, a logical data structure for the window can be created and stored. When user interface or other events or tasks change the arrangement of windows, the window stack(s) can be changed to reflect the change in arrangement. It should be noted that these same concepts described above can be used to manage the one or more desktops for the device **100**.

A logical data structure **800** for managing the arrangement of windows or desktops in a window stack is shown in FIG. **8**. The logical data structure **800** can be any data structure used to store data whether an object, record, file, etc. The logical data structure **800** can be stored in any type of database or data storage system, regardless of protocol or standard. In embodiments, the logical data structure **800** includes one or more portions, fields, attributes, etc. that store data in a logical arrangement that allows for easy storage and retrieval of the information. Hereinafter, these one or more portions, fields, attributes, etc. shall be described simply as fields. The fields can store data for a window identifier **804**, dimensions **808**, a stack position identifier **812**, a display identifier **816**, and/or an active indicator **820**. Each window in a window stack can have an associated logical data structure **800**. While only a single logical data structure **800** is shown in FIG. **8**, there may be more or fewer logical data structures **800** used with a window stack (based on the number of windows or desktops

in the stack), as represented by ellipses **824**. Further, there may be more or fewer fields than those shown in FIG. **8**, as represented by ellipses **828**.

A window identifier **804** can include any identifier (ID) that uniquely identifies the associated window in relation to other windows in the window stack. The window identifier **804** can be a globally unique identifier (GUID), a numeric ID, an alphanumeric ID, or other type of identifier. In embodiments, the window identifier **804** can be one, two, or any number of digits based on the number of windows that can be opened. In alternative embodiments, the size of the window identifier **804** may change based on the number of windows opened. While the window is open, the window identifier **804** may be static and remain unchanged.

Dimensions **808** can include dimensions for a window in the composite display **760**. For example, the dimensions **808** can include coordinates for two or more corners of the window or may include one coordinate and dimensions for the width and height of the window. These dimensions **808** can delineate what portion of the composite display **760** the window may occupy, which may the entire composite display **760** or only part of composite display **760**. For example, window **4 770** may have dimensions **880** that indicate that the window **770** will occupy only part of the display area for composite display **760**, as shown in FIGS. **7***c* through **7**E. As windows are moved or inserted in the window stack, the dimensions **808** may change.

A stack position identifier **812** can be any identifier that can identify the position in the stack for the window or may be inferred from the window's control record within a data structure, such as a list or a stack. The stack position identifier **812** can be a GUID, a numeric ID, an alphanumeric ID, or other type of identifier. Each window or desktop can include a stack position identifier **812**. For example, as shown in FIG. **7**A, window **1 704** in stack **1 760** can have a stack position identifier **812** of 1 identifying that window **704** is the first window in the stack **760** and the active window. Similarly, window **6 724** can have a stack position identifier **812** of 3 representing that window **724** is the third window in the stack **760**. Window **2 708** can also have a stack position identifier **812** of 1 representing that window **708** is the first window in the second stack **764**. As shown in FIG. **7**B, window **1 744** can have a stack position identifier **812** of 1, window **3**, rendered in portions **732** and **736**, can have a stack position identifier **812** of 3, and window **6 756** can have a stack position identifier **812** of 6. Thus, depending on the type of stack, the stack position identifier **812** can represent a window's location in the stack.

A display identifier **816** can identify that the window or desktop is associated with a particular display, such as the first display **110** or the second display **114**, or the composite display **760** composed of both displays. While this display identifier **816** may not be needed for a multi-stack system, as shown in FIG. **7**A, the display identifier **816** can indicate whether a window in the serial stack of FIG. **7**B is displayed on a particular display. Thus, window **3** may have two portions **732** and **736** in FIG. **7**B. The first portion **732** may have a display identifier **816** for the first display while the second portion **736** may have a display identifier **816** for the second display **114**. However, in alternative embodiments, the window may have two display identifier **816** that represent that the window is displayed on both of the displays **110**, **114**, or a display identifier **816** identifying the composite display. In another alternate embodiment, the window may have a single display identifier **816** to represent that the window is displayed on both of the displays **110**, **114**.

Similar to the display identifier **816**, an active indicator **820** may not be needed with the dual stack system of FIG. **7**A, as the window in stack position **1** is active and displayed. In the system of FIG. **7**B, the active indicator **820** can indicate which window(s) in the stack is being displayed. Thus, window **3** may have two portions **732** and **736** in FIG. **7**. The first portion **732** may have an active indicator **820** while the second portion **736** may also have an active indicator **820**. However, in alternative embodiments, window **3** may have a single active indicator **820**. The active indicator **820** can be a simple flag or bit that represents that the window is active or displayed.

An embodiment of a method **900** for creating a window stack is shown in FIG. **9**. While a general order for the steps of the method **900** is shown in FIG. **9**. Generally, the method **900** starts with a start operation **904** and ends with an end operation **928**. The method **900** can include more or fewer steps or can arrange the order of the steps differently than those shown in FIG. **9**. The method **900** can be executed as a set of computer-executable instructions executed by a computer system and encoded or stored on a computer readable medium. Hereinafter, the method **900** shall be explained with reference to the systems, components, modules, software, data structures, user interfaces, etc. described in conjunction with FIGS. **1**-**8**.

A multi-screen device **100** can receive activation of a window, in step **908**. In embodiments, the multi-screen device **100** can receive activation of a window by receiving an input from the touch sensitive display **110** or **114**, the configurable area **112** or **116**, a gesture capture region **120** or **124**, or some other hardware sensor operable to receive user interface inputs. The processor may execute the Task Management Module **540** may receive the input. The Task Management Module **540** can interpret the input as requesting an application task to be executed that will open a window in the window stack.

In embodiments, the Task Management Module **540** places the user interface interaction in the task stack **552** to be acted upon by the Display Configuration Module **568** of the Multi-Display Management Module **524**. Further, the Task Management Module **540** waits for information from the Multi-Display Management Module **524** to send instructions to the Window Management Module **532** to create the window in the window stack.

The Multi-Display Management Module **524**, upon receiving instruction from the Task Management Module **540**, determines to which touch portion of the composite display **760**, the newly activated window should be associated, in step **912**. For example, window **4 770** is associated with the a portion of the composite display **764** In embodiments, the device state module **574** of the Multi-Display Management Module **524** may determine how the device is oriented or in what state the device is in, e.g., open, closed, portrait, etc. Further, the preferences module **572** and/or requirements module **580** may determine how the window is to be displayed. The gesture module **576** may determine the user's intentions about how the window is to be opened based on the type of gesture and the location of where the gesture is made.

The Display Configuration Module **568** may use the input from these modules and evaluate the current window stack **760** to determine the best place and the best dimensions, based on a visibility algorithm, to open the window. Thus, the Display Configuration Module **568** determines the best place to put the window at the top of the window stack **760**, in step **916**. The visibility algorithm, in embodiments, determines for all portions of the composite display, which

windows are at the top of the stack. For example, the visibility algorithm determines that window **3 768**, window **4 770**, and window **8 774** are at the top of the stack **760** as viewed in FIGS. **7**C through **7**E. Upon determining where to open the window, the Display Configuration Module **568** can assign a display identifier **816** and possibly dimensions **808** to the window. The display identifier **816** and dimensions **808** can then be sent back to the Task Management Module **540**. The Task Management Module **540** may then assign the window a stack position identifier **812** indicating the windows position at the top of the window stack.

In embodiments, the Task Management Module **540** sends the window stack information and instructions to render the window to the Window Management Module **532**. The Window Management Module **532** and the Task Management Module **540** can create the logical data structure **800**, in step **924**. Both the Task Management Module **540** and the Window Management Module **532** may create and manage copies of the window stack. These copies of the window stack can be synchronized or kept similar through communications between the Window Management Module **532** and the Task Management Module **540**. Thus, the Window Management Module **532** and the Task Management Module **540**, based on the information determined by the Multi-Display Management Module **524**, can assign dimensions **808**, a stack position identifier **812** (e.g., window **1 782**, window **4 770**, etc.), a display identifier **816** (e.g., touch sensitive display **1 110**, touch sensitive display **2 114**, composite display identifier, etc,), and an active indicator **820**, which is generally always set when the window is at the "top" of the stack. The logical data structure **800** may then be stored by both the Window Management Module **532** and the Task Management Module **540**. Further, the Window Management Module **532** and the Task Management Module **540** may thereinafter manage the window stack and the logical data structure(s) **800**.

Demand for portable electronic devices with high levels of functionality continues to rise and personal electronic devices continue to become increasingly more portable. While computer power, battery life, screen size and overall functionality of portable phones and smart phones continue to increase, user reliance on these devices increases. Many users of such devices rely heavily on such devices for general communication, accessing the internet, cloud computing, and accessing various locally stored information such as contact information, files, music, pictures and the like. It is often desirable therefore to connect such heavily relied on devices to an additional computing device or display, such as a monitor or tablet device, such as a SmartPad (SP) **1000** (see FIG. **10**).

Accordingly, it is desirable for the device **100** to be able to interface with an additional device, such as the SmartPad **1000**, that enables functionality similar to, for example, both a tablet computer system and smart phone. Furthermore, a need exists for the above-described device to allow for various pre-existing features of both devices, such as sending and receiving phone calls and further allowing for the accessibility of applications running on the device **100**. A need also exists for the above device **100** to provide the benefits of both a tablet computer system and cellular phone in one integrative device by allowing for common operations and functionality without compromising the form factor of the device.

One exemplary embodiment is directed toward a selectively removable device and smartpad system. The smartpad system is discussed in greater detail hereinafter, and can have various features for complementing the communications device, such as a smart phone or device **100**. For example, the smartpad may supplement the device **100** by providing increased screen size, increased processor size, increased battery or power supply, or the like. Similarly, the device **100** may compliment the SP **1000** by providing connectivity through one or more wireless networks, access to various stored information, and the like. It will be expressly recognized therefore that two or more devices of the present disclosure may be provided in a connected or docked and generally symbiotic relationship. It will further be recognized that the devices provide various features, benefits and functionality in their independent state(s).

In accordance with one exemplary embodiment, the device **100** is capable of being received by the SP **1000** through a recessed feature of the SP **1000** having corresponding dimensions to the device **100**. In one exemplary embodiment, the SP **1000** is provided and preferably sized for receiving a predetermined device **100**. In alternative embodiments, however, it is contemplated that the SP **1000** is provided, the smartpad capable of receiving a plurality of communications devices of different sizes. In such embodiments, the SP **1000** may receive communications devices of various sizes by, for example, the inclusion of additional elements, such as spacers and various adjustable features.

In accordance with one exemplary embodiment, the device **100** and SP **1000** have a docking relationship that is established when the device **100** is connected to the SP **1000** during various modes of operation. For example, in one embodiment, a system is provided comprising the SP **1000** and the device **100**, the SP **1000** capable of physically receiving the device **100**, wherein the device **100** is operable as the primary computing device. In such an embodiment, the SP **1000** may, for example, simply provide enhanced audio and visual features for the device **100** that comprises its own CPU, memory, and the like. It is further contemplated that the system can be placed in a mode of operation wherein the device **100** docked to the SP **1000** provide it in a more passive mode where, for example, the device **100** draws power from the SP **1000** such as to recharge a battery of the device **100**.

In accordance with another exemplary embodiment, the device **100** and SP **1000** are provided wherein the device **100** is received or docked with the SP **1000** and wherein a substantial area of the device **100** is positioned within one or more compartments of the SP **1000**. For example, where as various known devices comprise docking features which require or result in the docked item to be generally exposed, thereby substantially altering the external dimensions of the host device and/or creating a potential for damaging one or both devices upon impact, an exemplary embodiment contemplates the SP **1000** which receives the device **100** in a manner such that the external dimensions of the SP **1000** are not substantially altered when the devices are connected. In such an arrangement, the device **100** and associated connection means are generally protected and the SP **1000** is allowed to substantially maintain its original shape. In accordance with one exemplary embodiment, the SP **1000** is capable of receiving and/or docking the device **100** wherein the device **100** is received in lockable association with the SP **1000**. As used herein, the term "lockable" is not intended to designate or limit it to any particular arrangement. Rather, lockable is intended to refer to various embodiments as described herein and will be recognized by one of ordinary skill in the art. In one embodiment, the device **100** is connectable to the SP **1000** wherein the SP **1000** comprises extension springs for first electively securing the device **100** in a docked manner and an ejection feature for releasing the

device **100** from the SP **1000**. Moreover, as will be described in greater detail below, it should be appreciated that the device **100** and SP **1000** can communicate using wired and/or wireless technology(ies) with equal success. Moreover, and in accordance with another exemplary embodiment, the hinged device **100** is selectively connectable to the SP **1000** wherein the device **100** is received by the SP **1000** in an open position and where in one or more preexisting ports of the SP **1000** correspond with internal receiving features of the SP **1000**, such that the device **100** and the SP **1000** may be operated simultaneously in various modes of use.

In accordance with some exemplary embodiments, the SP **1000** is provided with an eject or release button to facilitate the removal of a stored or docked device **100**.

FIG. **10** illustrates an exemplary SmartPad (SP) **1000** according to an exemplary embodiment. The exemplary SmartPad at least provides a larger touch sensitive display operatively coupleable to device **100**.

While the following description uses the term "smart" in conjunction with the display device **1000**, it is to be appreciated that this term does not necessarily connotate that there is intelligence in the SmartPad. Rather, it is to be appreciated that there can be "intelligence," including one or more of a processor(s), memory, storage, display drivers, etc., in the SmartPad, and/or one or more of these elements shared with the device **100** via, for example, one or more of a port, bus, connection, or the like. In general, any one or more of the functions of the device **100** is extendable to the SmartPad **1000** and vice versa.

The exemplary SmartPad **1000** includes a screen **1004**, a SP touch sensitive display **1010**, a SP configurable area **1008**, a SP gesture capture region(s) **1020** and a SP camera **1016**. The SP **1000** also includes a port (not visible in this orientation) adapted to receive the device **100** as illustrated at least in FIG. **11**.

The device **100** docks with the SmartPad **1000** via the port on the SP **1000** and the corresponding port **136** on device **100**. As discussed, port **136** in some embodiments is an input/output port (I/O port) that allows the device **100** to be connected to other peripheral devices, such as a display, keyboard, printing device and/or SP **1000**. In accordance with one exemplary embodiment, the docking is accomplished by the device **100** sliding into the left-hand side of the SP **1000**, with the device **100** being in an open state and the device **100** engaging a port in the SP **1000** corresponding to port **136**. In accordance with one exemplary embodiment, the device **100** engages a doored cassette-like slot in the SP **1000** into which the device **100** slides. (See, for example, FIGS. **13**A-B.) It should be appreciated however that there may be other configurations for physically and electrically engaging the two devices —in general, the manner of engagement is not important provided the device **100** and SP **1000** are in electrical communication with one another.

The SP **1000** includes a screen **1004**. In some embodiments, the entire front surface of the SP **1000** may be touch sensitive and capable of receiving input by a user touching the front surface of the screen **1004**. The screen **1004** includes touch sensitive display **1010**, which, in addition to being touch sensitive, is also capable of displaying information to a user.

The screen **1004** also includes a configurable area **1008** that has been configured for specific inputs when the user touches portions of the configurable area **1008**. Area **1012***a* is configured to receive a "back" input indicating that a user would like to view information previously displayed. Area **1012***b* is configured to receive a "menu" input indicating that the user would like to view options from a menu. Area **1012***c* is configured to receive a "home" input indicating that the user would like to view information associated with a "home" view.

In other embodiments, areas **1012***a-c* may be configured, in addition to the configurations described above, for other types of specific inputs including controlling features of device **100** and/or device **1000**, some non-limiting examples including adjusting overall system power, adjusting the volume, adjusting the brightness, adjusting the vibration, selecting of displayed items on screen **1004**, operating the SP camera **1016**, operating a microphone, and initiating/terminating of telephone calls. Also, in some embodiments, areas **1012***a-c* may be configured for specific inputs depending upon the application running on device **100**/SP **1000** and/or information displayed on the touch sensitive displays **1010**.

In addition to touch sensing, screen **1004** may also include areas that receive input from a user without requiring the user to touch the display area of the screen. For example, screen **1004** can include gesture capture area **1020**. These areas are able to receive input by recognizing gestures made by a user without the need for the user to actually touch the surface of the display area. In comparison to touch sensitive display **1010** and **1014**, the gesture capture area **1020** may not be capable of rendering a displayed image.

While not illustrated, there may also be a number of hardware components within SP **1000**. As illustrated in FIG. **10**, SP **1000** can include a speaker, a microphone and one or more cameras **1016**. Upon docking the device **100** in the SP **1000**, the corresponding device(s) (e.g., the speaker) in the device **100** could be disabled in favor of the speaker in the SP **1000**. Similarly, other components, such as the screen **1004**, microphone, speaker, etc, could be disabled on the device **100** in favor of the SP **1000**.

In general, the touch sensitive display **1010** may comprise a full color, touch sensitive display. A second area within each touch sensitive screen **1004** may comprise the SP gesture capture region **1020**. The SP gesture capture region **1020** may comprise an area or region that is outside of the SP touch sensitive display **1010** area that is capable of receiving input, for example in the form of gestures provided by a user. However, the SP gesture capture region **1020** does not necessarily include pixels that can perform a display function or capability.

A third region of the SP touch sensitive screen **1004** may comprise the configurable area **1008**. The configurable area **1008** is capable of receiving input and has display or limited display capabilities. In embodiments, the configurable area **1008** may present different input options to the user. For example, the configurable area **1008** may display buttons or other relatable items. Moreover, the identity of displayed buttons, or whether any buttons are displayed at all within the configurable area **1008** of the SP touch sensitive screen **1004** may be determined from the context in which the device **1000** is used and/or operated. In an exemplary embodiment, the touch sensitive screen **1004** comprise liquid crystal display devices extending across at least those regions of the touch sensitive screen **1004** that is capable of providing visual output to a user, and a capacitive input matrix over those regions of the touch sensitive screen **1004** that is capable of receiving input from the user.

As discussed above with reference to FIGS. **4**A through **4**H, the various graphical representations of gesture inputs that may be recognized by the screens **104**, **108** are also recognizable by screen **1004**. As discussed, the gestures may be performed not only by a user's body part, such as a digit,

but also by other devices, such as a stylus, that may be sensed by the contact sensing portion(s) of a screen **1004**. In general, gestures are interpreted differently, based on where the gestures are performed (either directly on the display **1004** or in the gesture capture region **1020**). For example, gestures in the display **1010** may be directed to a desktop or application, and gestures in the gesture capture region **1020** may be interpreted as for the system.

In addition to the above, the SP touch sensitive screen **1004** may also have an area that assists a user with identifying which portion of the screen is in focus. This could be a bar of light or in general an indicator that identifies which one or more portions of the SP touch sensitive screen **1004** are in focus. (See, for example, FIG. **29**.)

One or more display controllers (such as display controllers **216***a*, **216***b* and/or dedicated display controller(s) on the SP **1000**) may be provided for controlling the operation of the touch sensitive screen **1004** including input (touch sensing) and output (display) functions.

In accordance with one exemplary embodiment, a separate touch screen controller is provided for the SP **1000** in addition to each of the controllers for the touch screens **104** and **108**. In accordance with alternate embodiments, a common or shared touch screen controller may be used to control any one or more of the touch sensitive screens **104** and **108**, and/or **1004**. In accordance with still other embodiments, the functions of the touch screen controllers may be incorporated into other components, such as a processor and memory or dedicated graphics chip(s).

In a similar manner, the SP **1000** may include a processor complementary to the processor **204**, either of which may comprise a general purpose programmable processor or controller for executing application programming or instructions. In accordance with at least some embodiments, the processors may include multiple processor cores, and/or implement multiple virtual processors. In accordance with still other embodiments, the processors may include multiple physical processors. As a particular example, the processors may comprise a specially configured application specific integrated circuit (ASIC) or other integrated circuit, a digital signal processor, a controller, a hardwired electronic or logic circuit, a programmable logic device or gate array, a special purpose computer, or the like. The processors generally function to run programming code or instructions implementing various functions of the device **100** and/or SP **1000**.

The SP **1000** can also optionally be equipped with an audio input/output interface/device(s) (not shown) to provide analog audio to an interconnected speaker or other device, and to receive analog audio input from a connected microphone or other device. As an example, the audio input/output interface/device(s) **256** may comprise an associated amplifier and analog to digital converter usable with SP **1000**. Alternatively or in addition, the device **100** can include an integrated audio input/output device **256** and/or an audio jack for interconnecting an external speaker or microphone via SP **1000**. For example, an integrated speaker and an integrated microphone can be provided, to support near talk or speaker phone operations.

Hardware buttons (not shown) but similar to hardware buttons **158** can be included for example for use in connection with certain control operations. Examples include a master power switch, volume control, etc., as described in conjunction with FIGS. **1**A through **1**J. One or more image capture interfaces/devices **1016**, such as a camera, can be included for capturing still and/or video images. Alternatively or in addition, an image capture interface/device **1016** can include a scanner or code reader. An image capture interface/device **1016** can include or be associated with additional elements, such as a flash or other light sources.

Communications between various components of the device **100** and SP **1000** can be carried by one or more buses and/or communications channels. In addition, power can be supplied to one or more of the components of the device **100** and Sp **1000** from a power source and/or power control module **260**. The power control module **260** and/or device **100** and/or SP **1000** can, for example, include a battery, an AC to DC converter, power control logic, and/or ports for interconnecting the device **100**/**1000** to an external source of power.

The middleware **520** may also be any software or data that allows the multiple processes running on the devices to interact. In embodiments, at least portions of the middleware **520** and the discrete components described herein may be considered part of the OS **516** or an application **564**. However, these portions will be described as part of the middleware **520**, but those components are not so limited. The middleware **520** can include, but is not limited to, a Multi-Display Management (MDM) class **524**, a Surface Cache class **528**, a Window Management class **532**, an Activity Management class **536**, an Application Management class **540**, a display control block, one or more frame buffers **548**, an activity stack **552**, and/or an event buffer **556**—all of the functionality thereof extendable to the SP **1000**. A class can be any group of two or more modules that have related functionality or are associated in a software hierarchy.

The MDM class **524** also includes one or more modules that are operable to manage the display of applications or other data on the screen of the SP **1000**. An embodiment of the MDM class **524** is described in conjunction with FIG. **5**B. In embodiments, the MDM class **524** receives inputs from the OS **516**, the drivers **512** and the applications **564**. The inputs assist the MDM class **524** in determining how to display the information required by the user. Once a determination for display configurations is determined, the MDM class **524** can bind the applications **564** to a display configuration. The configuration may then be provided to one or more other components to generate the display on the SP **1000**.

FIG. **11** illustrates an exemplary embodiment showing the device **100** docking with the SP **1000**. More specifically, the device **100** is being inserted into a slot (not shown) on the SP **1000**. On completion of the inserting of device **100** into SP **1000** (See FIG. **12**), device **100** communicates with the SP **1000** via bus or other wired or wireless electrical means **1204**. The device **100** is also connected with, for example, the camera/video camera **1016**, microphone (Mic), and power port **1208**.

In conjunction with the docking of device **100** with SP **1000**, one or more of the devices can begin power management. For example, one or more of the device **100** and SP **1000** can include power supplies, such as batteries, solar, or in general any electrical supply, any one or more of which being usable to supply one or more of the device **100** and SP **1000**. Furthermore, through the use of, for example, an AC power adaptor connected to port **1208**, the SP **1000** can supply power to device **100**, such as to charge device **100**. It will be appreciated that the power management functionality described herein can be distributed between one or more of the device **100** and SP **1000**, with power being sharable between the two devices.

In addition to power management functions, upon the device **100** being docked with the SP **1000**, the displays on

device **100** can be turned off to, for example, save power. Furthermore, electrical connections are established between the device **100** and SP **1000** such that the speaker, microphone, display, input capture region(s), inputs, and the like, received by SP **1000** are transferrable to device **100**. Moreover, the display on device **1000** is enabled such that information that would have been displayed on one or more of the touch sensitive displays **110** and **114** is displayed on touch sensitive display **1010**. As will be discussed in greater detail herein, the SP **1000** can emulate the dual display configuration of the device **100** on the single display **1010**.

The SP **1000** can optionally be equipped with the headphone jack **1212** and power button **1216**. Moreover, any hardware buttons or user input buttons on the device **100** could be extended to and replicated on the SP **1000**.

This dock event between the device **100** and SP **1000** can be seen as states **336** or **344** in FIG. **3**A. As will be appreciated, and in accordance with one of the illustrative embodiments herein, the device **100** is docked with SP **1000** with the device being in the open state **210**. However, it is to be appreciated that the device **100** can be docked with the SP **1000** in the closed state **304**, or docked via, for example, a cable without the device **100** necessarily being inserted into the SP **1000**.

FIGS. **13**A-B illustrate application reorientation according to an exemplary embodiment of the disclosure. In particular, FIG. **13**A illustrates the device **100** being inserted into the SP **1000**. Before being associated with the SP **1000**, the device **100** has two applications, both in the landscape mode, represented by application "B" in landscape on a first screen and application "C" in landscape on a second screen (partially obscured by SP **1000**).

FIG. **13**B illustrates the re-orientation of the windows for the two applications based on the device **100** being associated with the SP **1000**, the SP **1000** being in the landscape orientation. In accordance with this exemplary embodiment, application "B" on the device **100** is re-oriented to be in the portrait orientation on the SP **1000**, and in a similar manner, application "C" on the device **100** is reoriented to the portrait orientation on the right-hand side the touch sensitive display **1010**. As will be appreciated, the reorientation of the application(s) from the device **100** to the SP **1000** can occur in a similar manner for a single application running on the device **100**. For example, if there is only one application running on device **100**, and the application is running in landscape mode, when the device **100** is docked with the SP **1000**, the orientation of the application is reoriented to be appropriate for the current orientation of the SP **1000**. For example, if the application on the device **100** is in portrait mode, and the SP **1000** is in landscape mode, the application is reoriented from portrait mode on the device **100** to landscape mode on the SP **1000**. In a similar manner, if the application on the device is in landscape mode, and upon being docked to the SP **1000** in portrait mode, the application is reoriented into portrait mode for appropriate viewing on the SP **1000**.

In accordance with one exemplary embodiment, the accelerometer **176** on device **100** is used to determine the orientation of both the device **100** and SP **1000**, and consequently the orientation of the touch screen display **1010**. Therefore, the accelerometer(s) **176** outputs a signal that is used in connection with the display of information to control the orientation and/or format in which information is to be displayed to the user on display **1010**. As is to be appreciated, reorientation can include one or more of a portrait to landscape conversion, a landscape to portrait conversion, a resizing, a re-proportioning and/or a redrawing of the window(s) associated with the application(s).

On reorienting of the running application(s), the application(s) is displayed on display **1010** on SP **1000**.

In accordance with an optional exemplary embodiment, priority can be given to the application that is in focus. For example, and using again applications "B" and "C" as illustrated in FIG. **13**B, if instead application C was in focus before docking, application C could be reoriented and displayed on the left-hand portion of display **1010**, and application B, which was not in focus before docking, displayed on the right-hand portion of display **1010** upon docking.

In accordance with another optional embodiment, the application in focus could be displayed in full-screen mode on display **1010** with the application(s) not in focus placed into a window stack that is, for example, in a carousel-type arrangement as discussed hereinafter.

FIG. **14** illustrates an exemplary embodiment of a single application mode for the SP **1000**. In the single application mode, all applications are launched and displayed in full screen. The single application mode can be indicated by a multi-tasking icon in the enunciator bar, or at some other location on screen **1004**.

Displaying of the application(s) are managed by one or more of the display controller **544**, framework **520**, window management module **532**, display configuration module **568**, as well as middleware **520** and associated classes. In single application mode, all dual screen capable applications can be launched in either a dual screen or max mode, where the application is displayed substantially filling the display **1010**. This is applicable to when the SP **1000** is either in the portrait mode, as illustrated in FIG. **14**, or in the landscape mode, as illustrated in FIG. **15**. In these figures, the "A" represents the single application with the X1, X2 being variables representing the coordinates and/or location of the window in which the application "A" is to be displaced. A similar notation is used hereinafter for the multi-application mode, with it being appreciated that, for example, X1 may contain the coordinate information for the displaying of the window for a first application, and X2 may contain the coordinate information for the displaying of a window corresponding to a second application, and so on.

In one configuration, max mode is a mode that maximizes the entire application workspace or area for viewing canvas-based content. Canvas-based content includes items such as Web Pages, E-mail, images, videos, photographs, documents, and other content that is not predefined by the application, such as commands, controls, settings, and the like. When an application supports max mode, it generally has a max mode button on or icon the action bar (discussed below). One location of the button is the last item of the first row in the action bar. When the max mode Screen button is selected, the content canvas is expanded to fill all available screens. If the application is currently minimized, max mode trigger an auto-maximization. Any non-canvas screen elements are hidden. This includes menus, tabs, action bar, notification bar, and other normally persistent controls. While in max mode, an overlay partially transparent icon can be fixed in the bottom right hand corner.

When SP **1000** is in single application mode, all applications are launched and displayed in max mode. Single application mode is indicated by a multi-tasking icon in an enunciator bar. Typical applications supported by this mode are single- and multi-display applications. All multi-display applications are launched in max mode.

When an application that supports max mode is set to max mode, it will automatically take over both screens or displays regardless of prior state (maximized or minimized) of the application. Upon exiting max mode, the application will

remain in a maximized (or full screen) state. In a full-screen state, the application view occupies the application area but non-canvas screen elements, particularly persistent controls, are not hidden but displayed in an appropriate display location, such as in a header or footer area (discussed below) and/or only one logical display (portion) of the screen or composite display is occupied by the view of the application. Thus, in full screen or maximized mode, the view includes menus, tabs, action bar, notification bar, and other normally persistent controls and the view occupies only a logical display portion of the screen or composite display.

Max mode is typically dismissed by one or more of selecting the max mode toggle button, selecting the menu button, closing the application, navigating to an application page that does not support max mode (including when using a hardware back button), performing a minimization action to perform the minimization and exit max mode, receiving an incoming phone call, and launching a second application from the max mode application.

Therefore, in one exemplary embodiment, when a single application is executed, a single application can launch in the full screen mode and can be correlated to the max mode as discussed in relation to FIG. **6**I where a single application spans both screens of the device **100**. This max mode is applicable to both the portrait and landscape orientations as illustrated in FIG. **14** and FIG. **15** with the display configuration module **568** appropriately (re)sizing the window for the application to fit on substantially all or all of the display **1010**.

This resizing can occur regardless of whether a native application on the device **100** actually supports the orientation of the SP **1000**. Therefore, even if the application does not support a particular orientation on device **100**, the display configuration module **568** can appropriately re-render and/or re-size the window for the application for appropriate display on the SP **1000**.

FIG. **16** and FIG. **17** illustrate an exemplary method of rendering a single application that is a dual screen application, in the portrait max mode and landscape max mode, respectively. More specifically, in FIG. **16**, the rendering of a dual screen application in portrait mode will display on display **1010** one of the two screens substantially or completely filling display **1010**. A user then, for example using a gesture, could scroll between the two screens of the single application. In the landscape mode, as illustrated in FIG. **17**, the screen **1010** is divided into a first portion **1704** and a second portion **1708**. In this exemplary embodiment, the first screen of the dual screen application is rendered in first portion **1704**, and the second screen of the dual screen application is rendered in the second portion **1708**. While a certain portion of the screen **1010** is illustratively logically divided for the first portion **1704** and the second portion **1708**, it should be appreciated that the screen real estate assigned to each portion can vary, for example, based on one or more of optimum display for the window(s), type of information being displayed in each portion, user preferences, rules associated with the application, and/or the like.

In accordance with a first example, the first portion is allocated one third of the screen **1010**'s resolution, while the second portion **1708** is allocated two thirds of the screen real estate. In accordance with another example, the screen **1010** is split **50**/**50**. In accordance with yet another example, the first portion could be allocated 70% of the screen **1010**'s real estate, while the second portion **1708** could be allocated 30%. The managing and resizing of these windows can again be done in cooperation with the display configuration module **568**, as well as the windows management module **532** and display controllers for successful rendering of the location of the window(s) on the SP **1000**.

As will be appreciated, and in a manner similar to the operation of device **1000**, should the SP **1000** change orientation (e.g., from landscape to portrait or vice versa) the window(s) for the application(s) can be redrawn in the appropriate orientation taking into account window prioritization based on whether a particular application and current focus is for a dual screen application or a single screen application.

Focus can also be taken into consideration when determining which window of the application should be displayed when the SP **1000** is in the portrait position. For example, if the application is an e-mail client, and the application natively is displayed on dual screens on device **1000** (a first screen being directed toward showing inbox content, and the second screen being a preview window for a specific item in the inbox) the system can evaluate which window is currently in focus, and ensure that window is displayed in the portrait max mode when the SP **1000** is in the portrait orientation.

In FIG. **17** the SP **1000** is configured to merge windows from the dual screen application on to a single display **1010**. In this landscape orientation, data (e.g., a single image, application, window, icon, video, etc.) from a first window is displayed in a first portion of the display **1010** while data (e.g., a single image, application, window, icon, video, etc.) is shown in a second portion of the display **1010**. Similar to other output configurations, it may be possible to transition the SP **1000** from the shown output configuration to any other output configuration described herein, depending on, for example, into which state the SP **1000** is moved.

Some other exemplary embodiments of windows management within the SP **1000** upon the device **100** docking with the SP **1000** are as follows: For example, a device **100** is docked to the SP **1000**, with the SP **1000** in a portrait orientation and there are two single-display applications running on the device **1000**, the application in focus is placed in a lower portion of the display **1010**, and the application not in focus is placed on an upper portion of the display **1010**. Another exemplary scenario, where the device **100** is docked to a portrait-oriented SP **1000** where one dual-screen application is running on the device **100** and the SP **1000** is in a dual application mode, applies gravity drop as discussed herein.

In another exemplary scenario, where the device **100** is running two single-screen applications, and the SP **1000** is in a landscape dual application mode, the first application is assigned to a first portion of the display **1010** and the second application is assigned to a second portion of the display **1010**.

In yet another exemplary scenario where the device **100** is running one dual-screen application and the SP **1000** is in dual application landscape mode, both screens of the dual screen application can be shown on the SP **1000**.

Stickiness can also apply to the SP **1000** such that, for example, when a first application is in focus, upon docking to a single application mode SP **1000**, the application remains visible after docking. As another example of stickiness, if a second application is in focus upon docking to a single application mode SP **1000**, application two remains visible after docking.

In accordance with another example, the device **100** is running one dual-screen application and is docked to a landscape-oriented SP **1000** in max mode, the windows are re-oriented to be side-by-side, opposed to one above the other.

FIG. **18** through FIG. **21** generally illustrate the management and display of a virtual keyboard **1804** on display **1010**. More specifically, in FIG. **18**, in portrait mode, the virtual keyboard **1804** is positioned below application area **1808**, where an application is displayed in, for example, max mode. In general, it is preferred that the keyboard can be glued to the lower-portion of the display **1010**, regardless of whether the SP is in the landscape or portrait mode. However, it is to be appreciated that, for example, based on user preferences, the screen can be glued to another portion of the screen, or can be moved to another location via, for example, a gesture. In FIG. **18**, the application area **1808** displays, for example, a standard application with the virtual keyboard **1804** being displayed in the lower portion of display **1010**. In FIG. **19**, for example, the application area **1908** is showing a dual-screen enabled application in max mode. The keyboard **1804** is again similarly displayed in the lower portion of the display **1010**.

In FIG. **20**, in SP landscape mode, the keyboard **1804** is displayed in the lower portion of display **1010** with the application area **2004** substantially or completely filling the displayable area above the keyboard **1804**. In FIG. **21**, the SP is again in landscape mode and displaying a dual-screen enabled application in max mode, the application area **1 2104** and application area **2 2108**, the keyboard **1804** is displayed below the two application areas.

In general, in the embodiments illustrated in FIG. **18** through FIG. **21**, a first determination is made as to whether a keyboard should be displayed. If the keyboard is to be displayed, the next determination is made as to the orientation of the SP. If the SP is in a portrait mode, the virtual keyboard is presented also in a portrait mode, preferable on the lower portion of the screen. If the SP is in a landscape mode, the keyboard is optionally re-sized to be substantially displayed on a lower portion of the display with, for example, one or more application windows being located above the virtual keyboard. With the orientation of the SP change, the keyboard is also reoriented to be coincident with the orientation of the SP. Similarly, when the keyboard is no longer required, the keyboard is hidden with the application area(s) being expanded to again substantially fill the display **1010**.

FIG. **22** and FIG. **23** illustrate exemplary methods of managing window positions on the SP **1000**. In particular, in FIG. **22**, application X **2204** is in view on display **1010**. On receiving user input, such as the swipe motion represented by **2208** in the gesture capture region **1020**, application X is "scrolled" to the left to be replaced with the dual-screen application A**1**|A**2**, as shown in FIG. **23**. If the same gesture **2208** were to be repeated again, application Z would come into view. Similarly, if in FIG. **22** gesture **2208** was in the opposite direction, to the right, application Y would come into view on display **1010**. Scrolling through available windows is of course applicable to both the landscape and portrait mode of the SP in a similar manner. For example, in portrait mode, instead of the gesture traversing from left to right or right to left, the gesture could traverse in a downward motion, or in an upward motion, with the virtual stacks of the windows being located "above" or "below" the device, similar to a rolodex. Thus, when the user initiates a downward type gesture, the next application "above" is displayed on display **1010**.

FIG. **24** illustrates the multi application mode of the SP **1000**, wherein in the multi application mode the SP **1000** emulates the device **100** in its mini-tablet form—with this mode optionally being invoked by selection of a multi application button (shown and described hereinafter). A simplified way of understanding this mode is to appreciate that the mode emulates the device **100** being opened. In this multi application mode, the SP **1000** can inherit the rules regarding the display of information on the device **100**—For example, that all applications are launched in single screen mode. One exception could be applications that support a max mode can be by default automatically expanded to this mode if provided the opportunity.

In this mode, each application has the ability to determine how the application appears in each orientation (e.g., portrait and landscape).

FIG. **26** illustrates an exemplary method of managing the multiple application mode of the SP **1000**. In the multiple application mode, multiple applications can be managed and displayed within the display **1010**. In multi application mode, the SP **1000** having the single screen emulates the dual screens of the device **100**. To initiate the multiple application mode, a button/toggle **2618** is selected, which allows the user to select multiple applications for display in the display **1010**. In this exemplary embodiment, a first application **2604** C, is shown in the upper-portion of the portrait mode SP **1000** and a second application **2608** D, is shown in a lower-portion of screen **1010**. In conjunction with the displaying of multiple applications in the multiple application mode, focus indicator **2616** can be provided to assist the user with identifying which application is in focus. As discussed, this focus indicator **2616** can be a light bar, or other indicator (such as an indicator in the screen **1010** or beside **2608**) drawing the user's attention to which application is in focus. In the exemplary embodiment in FIG. **26**, application D **2608** is in focus as represented by the focus indicator **2616**. In accordance with this exemplary embodiment, and while the focus indicator **2616** is shown in the gesture capture region **1020**, it should be appreciated that the focus indicator could be located in some other portion of the SP **1000**. For example, the window for the application in focus could be slightly re-sized to allow for the display of a bar of pixels adjacent to the window, which would similarly alert the user to the fact that that application is in focus. Similarly, the application in focus could appear at normal brightness while the application not in focus could be slightly dimmed. In general, any technique could be used to assist the user in readily determining which application is in focus.

To change focus, a user could use any of the gestures discussed herein or could, for example, simply touch the area where application C is displayed, thereby changing focus to application C, at which point a corresponding relocation of the focus indicator **2616** to adjacent to application C would occur.

FIG. **27** illustrates a similar scenario for a landscape mode SP **1000**. In particular, and upon selection of the multi application mode, the display **1010** is divided between, in this example, a first application D **2712**, and a second application F **2708**. Here, application D is displayed on the right-hand portion of display **1010** and application F displayed on the left-hand portion of display **1010**. While in this exemplary embodiment, the display real estate is split **50/50** between the two applications, it should be appreciated that one application could be displayed on a larger portion of the display **1010** than the other. In this particular exemplary embodiment, application D is in focus, as represented by focus indicator **2416**.

In the multiple application mode, in both portrait and landscape orientations, each application could have its own associated window stack as show in FIG. **22** and FIG. **23**, or there could be one stack shared between all of the displayed

applications. More specifically, if each application has its own stack, with a stack structure similar to that illustrated in FIG. **22**, a stack would be available for the first application, such as application X, and a similar stack would be available for application Y. Each of these stacks could be independently scrolled through using, for example, a gesture as discussed above.

FIG. **28** illustrates an exemplary method for managing screen display characteristics according to another embodiment of this disclosure. In accordance with this embodiment, a determination is made whether an application can be maximized, and if it can be maximized, it is expanded to the dual screen mode or max mode, as appropriate, to substantially fill the display **1010** as illustrated in the figure. Here, application E**1**, which is an application that can be maximized, has been expanded using the max mode to substantially or completely fill display **1010**.

In FIG. **28**, button **2618** allows a user to toggle between a single screen mode (as illustrated in FIG. **28**) and an emulated dual screen mode, for example, as illustrated in FIG. **26** and FIG. **27**. Here, button **2618** does not include the "|" therefore indicating to the user the SP **1000** is in single screen mode.

FIG. **29** illustrates an exemplary method of managing windows. In this exemplary embodiment, and similar to the operation of the device **100**, when the last application in the stack is moved to the side, the desktop is displayed. Even more specifically, as shown in FIG. **29**, application F **2908** is displayed in an upper portion of display **1010** and the desktop **2912** is displayed in the lower portion of display **1010**. Here the desktop is in focus, as illustrated by the focus indicator **2916**. This configuration is available since the user has selected the dual-screen emulation mode button **2618**.

FIG. **30** illustrates an exemplary method of displaying a keyboard according to one embodiment. In particular, when the SP is in portrait mode, the SP will have a keyboard area **3004** and an application area **3008**. Upon display of the keyboard **3004**, the application in application area **3008** is resized to substantially or completely fill the area of the screen not occupied by the keyboard **3004**.

FIG. **31**A and FIG. **31**B illustrate desktop availability in both the single application mode and dual application mode in both the SP landscape mode and SP portrait mode. In particular, and in accordance with an exemplary embodiment, the desktop **3104** will occupy the entirety of the screen **1010**. Additionally, and in accordance with this exemplary embodiment where the desktop is shown in a full-screen mode, the enunciator bar **1312** can be expanded across the entirety of the screen **1010**. This can occur in both the portrait mode as shown in FIG. **31**A as well as the landscape mode as illustrated in FIG. **31**B. From here, upon selection of the application launcher **3116**, the application launcher can optionally expand across the entirety of the screen **1010** in either the portrait or landscape mode. Similarly, the file explorer, which is launched by pressing the file explorer button **3120**, can be similarly expanded into substantially all or all of the screen **1010** space.

FIG. **32**A and FIG. **32**B illustrate screen redrawing that may be required to transition the desktop from the device **100** to the SP **1000**. In particular, in FIG. **32**A, six exemplary desktop panels are shown **3204-3224**. These desktop panels are moveable in a carousel-like fashion based on gesture input from a user. However, it may not be possible to directly translate these panels to display correctly on the SP **1000** without the panels being distorted or not occupying the entirety of the screen **1010**. Accordingly, in accordance with one exemplary embodiment, one or more of the panels **3204-3224** can be resized when displayed on the SP **1000** to accommodate all or substantially all of the screen **1010**. In accordance with another exemplary embodiment, more than two of the panels can be shown on the screen **1010**, such as a portion of panel D**2** **3208**, a portion of panel D**3** **3212** and a portion of panel D**4** **3216**. In this manner, the desktop illustrated on the SP **1000** will have a similar look-and-feel to the desktop panels shown on device **100**. The same carousel-like motion is available via a gesture input to the SP **1000** such that a user can scroll to the one or more panels of the desktop.

FIG. **33** illustrates an exemplary notifications display that behaves on the SP **1000** in a very similar manner to that of the device **100**. In particular, and whether in the portrait or landscape mode, notifications and status/toggle buttons are provided that allow the user to, for example, toggle on or off Bluetooth®, WiFi, screen lock, dual or single screen mode, power options, and the like. These, as well as other options are generally shown in area **3304**. Additional notifications can also be shown in area **3308** including one or more of carrier information, notification information, communication information, and the like as discussed above.

In more detail, area **3304** provides some buttons for standard widgets such as WiFi toggle on and off, Bluetooth® toggle on and off, and the like. The screen lock toggle can allow, for example, user to lock the screen thereby prohibiting it from rotating despite the orientation of the SP **1000**. The toggle can change color or display characteristics to indicate whether screen lock has been enabled. The single/dual application mode button toggles, for example, three different states including a dual application mode state, a single application mode state, and a single application lock state. The power mode toggle toggles between a handset optimized, SP optimized, hybrid power consumption, or of the like. These power modes can be associated with power levels, as indicated by the two battery status indicators **3312** and **3316** which correspond to the power levels in the device **100** and SP **1000**, respectively.

FIG. **34**A and FIG. **34**B show exemplary methods of launching and displaying the application launcher upon selection of the application launcher button **3116**. In both the portrait mode illustrated in FIG. **34**A and landscape mode illustrated in **34**B, and when the SP is in single application mode, the application launcher can appear in a bubble so as to not necessarily take up the entirety of the screen **1010**. However, for example, upon receiving an appropriate gesture or input by the user, the application launcher can be expanded to take up the entirety of the screen **1010**. This could further be classified in a preference such that the default is to always open the application launcher in a bubble so as to not take up the entirety of the screen **1010**, or to always open in full screen mode, taking up substantially all, or all of the screen **1010**.

FIG. **35**A and FIG. **35**B illustrate an optional embodiment whereby the system could provide "hints" as to the content of desktop panels that are not fully in view. More specifically, FIG. **35**A shows the first embodiment of the desktop panels D**1**-D**6**, **3504-3524** respectively. As discussed, a user is able to scroll through these panels in a carousel-type fashion, revealing any of the content in D**1**-D**6**. In accordance with the optional embodiment illustrated in FIG. **35**B, where the same panels D**1**-D**6** are available for viewing by user, the user is given a preview of one or more adjacent panels, here D**2** **3508** and D**5** **3520**. In this configuration, this user is able to "peek" at the content of the adjacent panel(s) without necessarily scrolling in a carousel like fashion to view the entirety of the panel. More specifically, the entirety

of panel D3 **3512** and D4 **3516** is shown on the display **1010**. In addition, approximately one third of panel D2 **3508** and one third of panel D5 **3520** are also shown on the display **1010**. As will be appreciated, more or less of panels D2 and D5 could be shown, with the greater of the panel being shown, the more visibility into that portion of the desktop the user would have.

FIG. **36** illustrates an optional embodiment for managing in a multiple application mode the stack of windows. This elegant method reinforces the conceptual model and assists the user with visualizing spatially the "carousel" type arrangement of the stack in the multi application mode. As is to be appreciated, while the exemplary embodiment shown in FIG. **36** is directed toward portrait mode of SP **1000**, it can work equally well in the landscape mode with the difference being instead of the carousel rotating from a top to bottom or bottom to top type arrangement, the "carousel" could be manipulated in a left to right or right to left type operation. However, the carousel could also work in a top to bottom or bottom to top mode in landscape mode as well.

In this exemplary embodiment, when multi-application mode is enabled via button **2618**, application C **3604** and application D **3608** can be displayed, separated by separator **3612**. In accordance with this optional exemplary embodiment, there are also one or more overflow applications behind application C **3604**, here the overflow applications being **3424** and **3428**. In a similar manner, there can be one or more overflow applications behind application D **3608**, here application **3416** and application **3420**. In this particular exemplary embodiment, the back and menu buttons **3432** can be enabled with a portion of the desktop **3436** being viewable behind the application stack. Upon receipt of one or more input gestures, such as gesture **3440**, a user can scroll through the "carousel" of applications, in this instance, relocating application D **3608** to application C **3604**'s position, and thereby revealing application **3416**. In addition, the focus indicator can be displayed near the application that is in focus. In this particular example, focus indicator **3444** is displayed beside application D. In accordance with an optional exemplary embodiment, instead of the stack "stopping" when the user reaches the last application, such as application **3420** or application **3428**, the applications can be stacked in a circular manner, and continuously rotate in response to one or more input gestures by a user.

These concepts can be extended to the situation where the keyboard is also displayed in the multiple application mode. For example, and as illustrated in FIG. **37**, the keyboard **3704** is displayed below the application stack **3708**. "Behind" the application stack **3708**, are additional applications **3712** and **3716** that the user can access via, for example, initiation of gesture **3720**. This exemplary embodiment has the applications scroll in a carousel-like fashion into and out of view, with the keyboard **3704** remaining visible, for example, at the bottom of display **1010**. As with the embodiment in FIG. **35**, the back and menu buttons can be enabled and, for example, virtually displayed on the display **1010** as illustrated by graphical button **3724**.

The capabilities of SP **1000** can provide flexibility and versatility in display management by one or more of the display controller **544**, framework **520**, window management module **532**, display configuration module **568**, as well as middleware **520** and associated classes.

With reference to FIGS. **57**A-E and **58**A-C, the various display modes and orientations of the SP **1000** are depicted. SP **1000** has two tablet orientations, namely portrait and landscape) and two application modes, namely single and dual. The differing combinations of orientations and display modes are discussed below.

FIG. **57**A (**5700**) depicts the portrait single application mode in which SP **1000** is in portrait orientation and single application mode. Single-display applications within SP **1000** are in portrait orientation and occupy substantially the entire application area.

FIG. **57**B (**5704**) depicts the portrait dual application mode in which SP **1000** is in portrait orientation and dual application mode. The separate views **5702** and **5706** of single-display applications within SP **1000** are each in landscape orientation while the composite display and SP **1000** are also in landscape orientation.

FIG. **57**C (**5708**) depicts the landscape single application mode in which SP **1000** is in landscape orientation and single application (or max) mode. The view of the single-display application within SP **1000** and the SP **1000** are each in landscape orientation.

FIG. **57**D (**5712**) depicts landscape dual application mode in which SP **1000** is in landscape orientation and dual application mode. The separate views **5702** and **5706** of single-display applications within SP **1000** are each in portrait orientation while the composite display and SP **1000** are in landscape orientation.

FIG. **57**E (**5716**) depicts a portrait multi-display application in which the application display of SP **1000** is presented in its portrait max mode.

FIG. **58**A (**5800**) depicts a multi-display application in which SP **1000** is in portrait orientation and the separate views **5802** and **5806** of multi-display applications within SP **1000** are each in landscape orientation (the view spanning across the entire screen) while the composite display and SP **1000** are in portrait orientation (when the windows or other displayed objects are maximized). When minimized, the windows or other displayed objects of the multi-display applications are presented in landscape orientation (the view not spanning across the entire screen).

FIG. **58**B (**5804**) depicts a landscape multi-display applications in which application display of SP **1000** is presented in its landscape max mode.

Finally, FIG. **58**C (**5808**) depicts a multi-display applications in which SP **1000** is in landscape orientation and the separate views **5802** and **5806** of multi-display applications within SP **1000** are each in portrait orientation (the view spanning across the entire screen) while the composite display and SP **1000** are in landscape orientation (when the windows or other displayed objects are maximized). When minimized, the windows or other displayed objects of the multi-display applications are presented in portrait orientation (the view not spanning across the entire screen).

The rules for seam **5520** use depend on a number of factors. When SP **1000** is in dual-application mode with windows or displayed objects from two separate applications in view, the seam **5520** is displayed in a central portion of the composite display and spans the entire height of the screen and/or composite display. The seam **5520** is also used to as a main indication of focus. The seam **5520** is also displayed when a window or displayed object from only one application is displayed along with a desktop. When the SP **1000** is in single-application mode, and a non-max mode-capable multi-display application is displayed, no seam **5520** is shown. Instead, one view is laid out across the entire display. When the SP **1000** is in single-application mode, and a max mode-capable application is displayed, the seam **5520** separates the views of the composite display. The seam generally can be placed anywhere between 25% and 75% of

the composite display's width (relative to its portrait or landscape orientation), extends the entire height of the composite display (relative to its portrait or landscape orientation), and may even be omitted completely. When the desktop is revealed or no applications are executing, the seam **5520** is not displayed.

SP **1000** can allow switching between single and dual application modes. FIG. **59**A (**5900**) depicts SP **1000** in dual-application mode, with two single-display applications visible as views **5902** and **5906**. Upon switching to single-application mode, the application in focus remains visible in full screen view (FIG. **59**B (**5904**)). Upon switching back to dual-application mode, the visible application returns to its original view and optionally is placed on the left/bottom part of the SP screen (FIG. **59**C (**5908**)). As shown in FIGS. **59**D-F (**5912**, **5916**, and **5920**) the separately displayed views **5924** and **5928** of a multi-display application behave in a similar manner except that the selected window **5924** enters the max mode. SP provides the user with a clear indication of the current application mode (dual or single) through an icon in the enunciator bar. Switching SP **1000** between single and dual modes is similar in nature to the opening and closing of the communication device **100**; however in contrast to the behavior on the communication device **100**, the application in focus remains on screen before and after the mode is switched. For example, when the keyboard is present when switching modes, the keyboard will remain visible when the transition is over.

With reference to FIGS. **55**A-F, toggling a first application view **5502** into max mode is depicted. With reference to FIG. **55**A (**5500**), first and second application views **5502** and **5506** in dual application portrait orientation are depicted. The first and second application views **5502** and **5506** in a composite display are divided by seam **5520**. As noted, a seam **5520**, or application display divider, visually separates the different application views in the composite display, such as when the SP **1000** is in dual-application mode and a multi-display application is maximized across the display.

When an application, such as the first application, supports max mode, it typically has a max mode button on the action bar (discussed below). When the max mode button is selected, the first application view **5502** (e.g., application area) expands to fill both the entire display area of the SP **1000** (FIG. **55**B (**5504**)) regardless of prior first or second application state, and the seam **5520** disappears. When the first application view **5502** is currently minimized, max mode will trigger an auto-maximization. Any non-application area elements are hidden. Hidden elements include menus, tabs, action bar, notification bar, and other normally persistent controls.

When max mode is dismissed, the first and second application views **5502** and **5506** are restored (FIG. **55**C (**5508**)). The application state is remembered when the max mode is toggled on and off, whereby a minimized application will return to its minimized state when the max mode is exited. As shown by FIGS. **55**D-F (**5512**, **5516**, and **5520** respectively), the same rules apply when the second application view **5506** is selected and when the second application view is max-mode capable.

FIGS. **49**-**52** depict the parent-child node structure used in various configurations of the communication device and SP. With reference to FIG. **49**, a parent node **4900** has multiple first, second, . . . nth child nodes **4904***a-n*. In one application, the nodes correspond to documents or other displayed information. For example, a user selects a first link contained in a web page. The web page is designated as the parent node **4900** and parent web page, and the first web page corresponding to the first link is the first child node **4904***a* or first child view. This association is associated by a suitable mechanism, such as a link, an embedded identifier of one node in the other node's identification string, and other mechanisms known to one of ordinary skill in the art. The user then selects a second link contained in the parent web page. The second web page corresponding to the second link is the second child node **4904***b* or the second child view. This association is tracked as noted. If the user then selects a third link in the first web page corresponding to the first child node **4904***a*, the first web page becomes a parent node and parent view to a third web page (not shown) corresponding to the third link, and the third web page the third child node or child view to the first web page. This association is tracked as noted.

The same principles generally apply to lower tiers. Thus, if the user were to select a fourth link in the first child view, a fourth web page corresponding to the fourth link is a child node or view of the first child view. In other words relative to the fourth child view, the first child view is the parent and the parent view is the grandparent. If the user were to select a fifth link in the fourth child view, a fifth web page corresponding to the fifth link is a child node or view of the fourth child view. In other words relative to the fifth child view, the fourth child view is the parent, the first child view is the grandparent and the parent view is the great grandparent. These association is tracked as noted and used for state tracking to enable user navigation through the various views.

When the SP **1000** is in dual display orientation (with the seam being displayed to form a composite display), the separate views corresponding to child nodes are displayed in separate windows of the composite display. As shown in FIG. **50**, the parent view corresponding to the parent node is displayed in a first view of the composite display, and the first and second child views corresponding to the first and second child nodes are displayed simultaneously in the other view of the composite display. FIG. **50** depicts a parent view **5000** in a first view **5004** of the composite display and first, second, and third child views **5008***a-c* to the parent view **5000** (meaning that the child views were selected from differing links in the common parent view **5000**) are displayed simultaneously in the second view **5012** of the composite display.

Now turning to FIG. **51**, the user closes or minimizes the parent view **5000**, and the first child view **5008***a* moves to the first view **5004** while the second and third child views **5008***b-c* are displayed simultaneously in separate windows in the second view **5012** of the composite display.

No turning to FIG. **52**, the user closes or minimizes the first child view **5008***a*, and the second child view **5008***b* moves to the first view **5004** while the third child view **5008***c* is displayed in the second view **5012** of the composite display.

A user can use an on-focus feature to move between displays or screens while in dual display mode for a single multi-display application. When the user reaches the split region, or seam, between the views, the on-focus position will move to the first selectable user interface element closest to the top left position of that screen or display. Selectable user interface elements include tabs and sub tabs, buttons and split buttons, header elements and avatars, drop down menus, list items such as contact lists, email lists, and bookmarks, action menus, form elements such as text fields, search fields, radio buttons and check boxes, etc., modals, the triad, and application icons. The on-focus feature will not

allow users to switch between applications (i.e., two running apps in single mode), navigate other applications not in view, or switch between an application and a desktop.

With reference to FIGS. **56**A-D, a multi-display application has first and second child windows **5602** and **5606**. In FIG. **56**A (**5600**), the SP **1000** is in dual-display mode, each view of a composite display having a respective one of the first and second child views **5602** and **5606**. The user has selected the first child view **5602** which expands to occupy the entire screen or displayable area (FIG. **56**B (**5604**)). The user again selects the second child view **5606**, which is restored to the original display portion, which has been enlarged by movement of the seam **5520** to the left, thereby decreasing the size of the first child view **5602** (FIG. **56**C (**5608**)). The converse is possible. The user can select the second child view **5606**, which is restored to the original display portion, which has been decreased by movement of the seam **5520** to the right, thereby increasing the size of the first child view **5602** (FIG. **56**D (**5612**)).

The behavior of multi-display applications will now be discussed with reference to FIGS. **56**E-J. Multi-display applications that are not maximized in dual-application mode go to the max mode when SP **1000** switches to the single application mode (if supported). When SP **1000** switches to single application mode (if supported), the view associated with the multi-display application expands to max mode across the entire SP screen. When switching back, the multi-display application returns to its non-maximized state (e.g., minimized state). FIG. **56**E (**5640**) depicts SP **1000** as having two views (**1.1** and **2.2**) for different applications, with view **1.1** being from a multi-display application. SP **1000** then switches to single application mode, and the view **1.1** associated with the multi-display application expands across the SP screen in max mode (FIG. **56**F (**5644**)). When switching back, the multi-display application view **1.1** returns to a non-maximized state (FIG. **56**G (**5648**)).

Multi-display applications that do not support a max mode will have one of their views treated as being in single application mode when the tablet is switched to single application mode. FIG. **56**E (**5640**) depicts SP **1000** as having two views (**2.1** and **2.2**) for a common multi-display application. SP **1000** then switches to single application mode, and the view **2.1** associated with the multi-display application expands across the SP screen (FIG. **56**F (**5644**)). The view **2.1**, however, is not in max mode. When switching back, the multi-display application views return to a non-maximized state (FIG. **56**G (**5648**)).

A multi-display application that is maximized in dual-application mode will go to its max mode when SP switches to single application mode. FIG. **56**H (**5652**) depicts SP **1000** as having two views (**2.1** and **2.2**) for a common multi-display application. SP **1000** then switches to single application mode, and the view **2.1** associated with the multi-display application expands across the SP screen (FIG. **56**I (**5656**)). The view **2.1**, however, is not in max mode. When switching back, the multi-display application views return to a non-maximized state (FIG. **56**J (**5648**)).

A multi-display application that is maximized in dual-application mode will go to its max mode when SP **1000** switches to single application mode. When switching back to dual-application mode, the multi-display application returns to its maximized state, which is typically a full screen state.

Variations of the above can occur when a desktop is visible in dual-application mode. FIG. **56**K (**5660**) depicts a view **1** from a single- or multi-display application and a second view D**2** from a desktop. Upon switching to single-application mode, the application in focus, or view **1**, remains visible (FIG. **56**L (**5664**)). Upon switching back to multi-application mode, the view **1** is placed on the left/bottom part of SP screen or composite display (FIG. **56**M (**5668**)).

When the desktop view D**2** happens to have focus, as in FIG. **56**N (**5672**), switching to single-application mode will make the visible application (view **1**) take over the screen or composite display in single mode (FIG. **56**O (**5676**)). Upon switching back to multi-application mode, the view **1** is placed on the left/bottom part of SP screen or composite display (FIG. **56**P (**5680**)) (even if the desktop had focus before).

In dual application mode, the views **1** and **2** (FIG. **56**Q (**5684**) from first and second applications on the primary and secondary displays of the screen or composite display are pushed in the direction of their respective stacks (primary display downwards and secondary display upwards) to reveal underlying desktop views D**1** and D**2**, as shown in FIG. **56**R (**5688**). In single application mode, the single mode application view **1** (FIG. **56**S (**5692**)) slides off screen in a single motion in the direction of the physical buttons to review desktop view D**1** (FIG. **56**T (**5696**).

The configuration of a view of SP **1000** will now be discussed with reference to FIGS. **53** and **54**. SP display **5300** typically includes header area **5304**, application area **5308**, and footer area **5312**, which is depicted as including user selectable action bar commands **5616***a-h*. Header area **5304** and footer area **5312** can include tool bars, enunciator bars, dashboard, notification bar, action region (e.g., tab bar, search bar, etc.), single-/dual-application mode transition button, and full screen and/or max mode action bar and/or overlay button.

In one configuration, header bar command icons are dedicated to in-application navigation. At times, other fundamental actions may be placed into the header bar, for example when an action bar cannot be used. The header bar is not scrolled off the view. For pannable list- or canvas-based views the header bar can be tapped in order to scroll the view back to the top. Headers or action bars can include tabs. Tabs are used for creating subviews or to allow for filtering of content. The interaction for tabs is simple, a tap will select the tab and change the view accordingly.

Action bar commands **5616***a-h* provide a user with frequently used commands and, of course, are defined by and therefore depend on the selected application. Examples of action bar commands **5616***a-h* include, for an email application, user account access, move, compose, delete, print, refresh, rename, reply, folder management, toggle text, move, exit, edit, forward, reply all, settings, deselect all, select all, marked as read, marked as unread, and add folder; for a telecommunications application, conference, add pause, wait, add contact, account access, search contacts, contact details, import to contacts, export from contacts, instant message text, call, voice mail, access, edit contact, delete contact, share contact, and display option; for a browser, back in search string, forward in search string, mobile web, full screen, find, print, share, full web, book mark, delete, view list, cancel download, and exit; for gallery, delete, share, slide show, new album, move, settings, rename, edit image, image details, crop image, rotate view left, rotate view right, and exit; for messaging, compose, delete, settings, compose options, and menu search; for electronic calendar, add event, edit event, settings, and today; and for music, search, play all songs, search other, delete, new play list, start play list, other sources, edit play

list, play all artists, edit, save as playlist, shuffle, cancel, clear track list, and play all albums. Each action bar command **5616***a-h* has a corresponding icon and label.

Action bars commands **5616***a-h* are scalable in width to accommodate SP layouts, such as portrait and landscape views. The action bar **5312** is typically made up of two or more rows of action bar commands **5616***a-h*, with one row being the primary row and the other rows being the secondary row(s). Within the primary and secondary bars are rows that contain the action icons and the icon labels. Although any number may be used, the number of icons and labels per row generally range from 1 to 5 with 4 being preferred. The horizontal dimension of the button and label equals the width of the view divided by the number of buttons and labels required. Icons and labels are vertically and horizontally centered within their respective regions using the indicated dimensions, sp size and padding. The action bar is consistent across portrait and landscape SP orientations.

When the action bar **5312** contains two or more rows of commands **5616***a-h*, the bar can be expanded and collapsed to reveal and hide the secondary bar(s), respectively. When more than a threshold number of commands are needed, the overflow mode is entered and an overflow modal or "more" action bar command is accessible from the bar. In other words, the overflow modal is linked to the hidden action bar commands, such as in a secondary row. Activating the more command can present a modeless list for accessing the overflow action bar commands. The action bar is hidden in the process

When an application that contains an action bar is launched, the bar is revealed as part of the launching animation. The bar may contain only one row of commands. Upon expansion, the labels for the commands are shown. In one configuration, an extended action bar can be collapsed by pressing the menu hardware key again. Initiating an action on the bar collapses the bar afterwards. In addition, any action that is not directly related to interacting with the bar also collapses the bar. Examples include view changes, or interaction with elements on the current view. Pressing the hardware back-button collapses the bar.

As shown in FIG. **54**, differing numbers of action bar commands and primary and secondary action bar configurations are possible. In the depicted configuration, SP display **5400** includes first, second, third and fourth action bar commands **5616***a-d* in the primary bar and only fifth and sixth action bar commands in the secondary bar. The action bar command icons in the primary bar are formatted differently, or differently sized, than those in the secondary bar. The opposite can also be true.

Once an edit mode has been entered by selection of an "edit" action bar command **5616**, the action bar transforms into an edit bar, which can have one or more rows of command icons like the action bar. Despite the difference in naming, the edit bar behaves very similarly to the action bar. Like the action bar, the edit bar expands by default and is not collapsed automatically but only by pressing the hardware menu button. The edit mode is exited via an exit-button, generally placed as the right-most action bar command **5616** in the bar, or by pressing the hardware back-button. When the edit mode is exited, the edit bar is hidden automatically. When a number of edit commands exceeds a selected threshold or an overflow mode is entered, a command in the list of edit commands becomes a "more" command that opens up a modal containing all the extra commands. Activating the more command presents a modeless list for accessing the overflow edit commands. The action bar is hidden in the process.

A number of rules apply to action bar configurations in differing SP display configurations. Two single-display applications in dual screen portrait orientation contain their individual action bars. Upon activating the hardware menu button, the application that has focus expands its action bar. The action bar of the other application is unaffected. An application in max mode (utilizing both screens or displays) can contain action bars for individual views. When the action bar is maximized and minimized using the menu hardware button, both action bars are affected. In some cases, commands are duplicated when an application is maximized (a command that appears on both the parent and child action bars is duplicated when the views are displayed simultaneously). In these cases, the action bar commands need to be revised for the affected dual-screen views. For two single-display action bars from the same application (but from different views within that application), the two commands are repeated across the bars. When maximized into a dual-screen application, the combined action bar omits the duplicate commands; the layout of the combined bar is determined on a view-by-view basis. When primary action bar is in "normal mode", it generally only shows a portion, typically about 70%, of the top part of the primary bar. When the secondary action bar is expanded in "full mode", it generally shows fully both the primary and secondary bars. The action bar command icon width is commonly the number of action bar command icons to be displayed in the row divided by the actual width of the screen.

In another embodiment, setting screens are employed. In the system, there are two ways to call up setting-screens, namely from within an application and via the settings-application provided by the system. Depending on where a setting-screen was launched from, the visual look-and-feel and the interaction model for the view changes. Settings-screens launched from within applications are usually treated as full-screen modals launched on top of the parent application. When the application is maximized, setting-views are generally presented on one side of the application. Setting views can contain several levels of views, similar to multi-node parent-child structured applications. In these cases, a header bar contains a return-arrow for going back up in the view structure and the action bar contains a command to dismiss the modal.

FIG. **38** outlines an exemplary method for docking the device **100** with the smartpad **1000**. In particular, control begins in step S**3802** and continues to step S**3804**. In step S**3804** the insertion of the device into the SP is detected. Next, in step S**3806**, power management can optionally begin. For example, and as discussed, the SP can be used as a power source for the device, the device can be used as a power source for the SP, power can be shared between the two devices and/or the SP can be plugged in, via for example, an AC adaptor, which is capable of charging one or more of the SP and the device **100**. Then, in step S**3808**, the display of the device **100** is optionally turned off to, for example, conserve power. Control then continues to step S**3810**. In step S**3810**, communication and/or connectivity are established between the device **100** and the SP. Next, in step S**3812**, display and other input/output functions on the SP are enabled. Then, in step S**3814**, the device software settings are mapped to the smartpad hardware settings. Control then continues to step S**3816**.

In step S**3816**, the screen orientation of the device is automatically aligned to the orientation of the SP. Next, in step S**3818**, the last application in focus on the device remains in focus and is displayed on the SP. Normal opera-

tion and interaction with the SP then continues utilizing, for example, the same gestures as are usable with the device **100**. Control then continues to step S**3820** where the control sequence ends.

FIG. **39** illustrates an exemplary method of application/display orientation/reorientation. In particular, control begins in step S**3900** and continues to step S**3902**. In step S**3902**, the orientation of the SP is detected. Next, in step S**3904**, the application orientation on the device is detected. Then, in step S**3906**, one or more displayed applications are reoriented to be in the same orientation as the SP. In addition, and based on the need for reorientation, a re-drawing or re-sizing of the application can also occur with the application(s) being displayed on the SP. Control then continues to step S**3908** where the control sequence ends.

FIG. **40** outlines an exemplary method for managing the keyboard. In particular, control begins in step S**4000** and continues to step S**4002**. In step S**4002**, determination is made as to whether a keyboard request has been detected. If a keyboard request has not been detected, control jumps back to step S**4000** with control otherwise continuing to step S**4004**. In step S**4004**, a determination is made as to the orientation of the SP. If the SP is in the landscape orientation, control jumps to step S**4010** with control otherwise continuing to step S**4006** with the SP being in the portrait orientation. In step S**4006**, the keyboard is displayed in the portrait mode.

Next, in step S**4008**, a determination is made as to whether there has been an orientation change. If there has been an orientation change, control jumps to step S**4010** with control otherwise continuing to step S**4014**.

In step S**4010**, the keyboard is displayed in the landscape mode. Next, in step S**4012**, a determination is made as to whether there has been a change in orientation of the SP. If there has been a change in the orientation, control jumps to step S**4006** with control otherwise continuing to S**4014**.

In step S**4014**, a determination is made as to whether the keyboard should be hidden. If the keyboard should be hidden, control continues to step S**4016** with control otherwise continuing back to step S**4004**.

In step S**4016**, the keyboard is hidden with control continuing to step S**4018** where the control sequence ends.

FIG. **41** illustrates an exemplary method for window management. In particular, control begins in step S**4100** and continues to step S**4102**. In step S**4102** a gesture is detected. As will be appreciated, and similar to the device **100**, this gesture can be on the touch-sensitive display, in a configurable area, and/or in the gesture capture region(s). In step S**4104**, gesture direction can also optionally be detected. Then, in step S**4106**, the next application window can be brought into view, enabling, for example, a user to scroll through application window stack. A determination is then made as to whether another gesture has been detected. If another gesture has been detected, control jumps back to step S**4104** with control otherwise continuing to step S**4110**.

FIG. **42** outlines an exemplary method for screen management. In particular, control begins in step S**4200** and continues to step S**4202**. In step S**4202**, multiple application mode is enabled via, for example, selection of a button or toggle. Next, in step S**4204**, a user is optionally prompted to select which applications will be displayed. In an alternative embodiment, two adjacent applications in the stack are displayed, with one of the applications being the application that is currently in focus. Then, in step S**4206**, the screen is split with the first portion of the screen displaying a first application and a second portion of the screen displaying a second application. Next, in **54208**, the application that was detected to be in focus is then highlighted on the SP in step S**4210**. Control then continues to step S**4212**.

In step S**4212**, a determination is made as to whether a new application has been brought into focus. If a new application has been brought into focus, control jumps back to step S**4210** where that application is highlighted with an "in-focus" indicator. Otherwise, control continues to step S**4214** where the control sequence ends.

FIG. **43** outlines an exemplary method for windows management. In particular, control begins in step S**4300** and continues to step S**4302**. In step S**4302**, a determination is made as to whether the application can be maximized. Next, in step S**4304**, if the application is maximizable, control jumps to step S**4306** where the application is expanded to either the dual screen mode or the max mode. Control then continues to step S**4308** where the control sequence ends.

FIG. **44** outlines an exemplary method for transitioning from an application window to the desktop. In particular, control begins in step S**4400** and continues to step S**4402**. In step S**4402**, the last application in the application window stack is detected. Next, in step S**4404**, a gesture is detected, the gesture requesting a "next" window, however the current window is the last application in the window stack. In this scenario, in step S**4406**, the desktop is displayed in that there are no further windows to display in the application window stack. Control then continues to step S**4408** where the control sequence ends.

FIG. **45** illustrates an exemplary method of emulating the multi-screen display of the device **100** on the SP **1000**. As will be appreciated, a multi-screen application on the device **100** transforms to a multi-display application on the SP **1000**; that is, output of a multi-screen application that occupies the primary and secondary screens of the device **100** is converted or transformed to output that occupies the virtual and/or logical primary and secondary displays of the SP **1000** separated by a virtual and/or logical seam **5520**.

Control beings in step S**4500** and continues to step S**4502**. In step S**4502**, the desktop is displayed on the SP. Next, in step S**4504**, the desktop is logically divided on the SP into, for example, two sections. Then in step S**4506**, a first screen of the desktop is displayed in a first logical portion of the SP display. Then, in step S**4508**, a second screen of the desktop is displayed in a second logical portion of the SP display. Control then continues to step S**4510**.

In step S**4510**, carousel movement of the "panels" shown in the display can be initiated through user input, such as a gesture. Control then continues to step S**4512** where the control sequence ends.

FIG. **46** outlines an exemplary method of displaying multiple "panels" of the desktop on the SP. In particular, control begins in step S**4600** and continues to step S**4602**. In step S**4602**, a portion of the desktop is displayed on the SP. Next, in step S**4604**, the desktop is logically divided on the smartpad to accommodate multiple desktop "panels." Then, in step S**4608**, the first screen or panel of the desktop is displayed in one logical portion of the SP display. Then, in step S**4610**, a second screen or panel of the desktop is displayed bridging a first and a second logical portion of the SP display. Then, a third screen or panel of the desktop is displayed in the second logical portion of the SP display. Control then continues to step S**4614**.

In step S**4614** carousel movement of the panels can be affected by, for example, an input of a gesture by the user. Control then continues to step S**4616** where the control sequence ends.

FIG. **47** outlines an exemplary method of displaying one or more portions of the desktop. In particular, control begins

in step S**4700** and continues to step S**4702**. In step S**4702**, an access request to the desktop is detected. Next, in step S**4704**, at least one desktop panel is displayed. Then, in step S**4706**, at least one additional desktop panel is partially displayed on the desktop. Control then continues to step S**4708**.

In step S**4708**, and upon detection of a gesture, the partially displayed panel can be completely displayed on the display of the SP. Control then continues to step S**4710** where the control sequence ends.

FIG. **48** outlines an exemplary method of windows management in multiple application mode. In particular, control begins in step S**4800** and continues to step S**4802**. In step S**4802**, multiple application mode is entered. Next, in step S**4804**, the windows stack is arranged with one or more applications being partially visible behind a first application. Next, in step S**4806**, the stack can be arranged with one or more applications also partially being visible behind a second application. Then, in step S**4808**, and upon receiving an input gesture from a user, carousel-like scrolling can be enabled through the stack until the end of the stack is reached, or in a second embodiment, the stack can have a "circular" arrangement where continuous scrolling through the stack is possible. Control then continues to step S**4810** where the control sequence ends.

FIG. **60** depicts an exemplary method of selecting a particular display configuration. In particular, control begins in step S**6000** and, when a stimulus is detected, continues to step S**6004**. Stimuli include user command, change in currently executing application requirements and capabilities, change in currently executing number of applications, change in device orientation, and max mode enabled or disabled. In step S**6004**, the microprocessor determines a current (or post-stimulus) state of the device, including a number of screens (e.g., whether one or multiple screens), an application mode (e.g., single- or multi-screen application, and single- or multi-display application), currently executing application types, requirements, and capabilities, max mode currently enabled or disabled, and current device orientation (e.g., portrait or landscape). Using the device state, the microprocessor, in step S**6008**, selects a display configuration. The display configurations and rules used for display configuration selection are set forth above. Display configurations, for example, include minimized or maximized view, max mode view, multi- or single-screen composite display, and the like.

The exemplary systems and methods of this disclosure have been described in relation to a smartpad and interaction with the device. However, to avoid unnecessarily obscuring the present disclosure, the preceding description omits a number of known structures and devices. This omission is not to be construed as a limitation of the scopes of the claims. Specific details are set forth to provide an understanding of the present disclosure. It should however be appreciated that the present disclosure may be practiced in a variety of ways beyond the specific detail set forth herein.

For example, the smartpad could have multiple physical and/or logical screens/displays. Additionally, the smartpad could be used with one or more input devices such as a stylus, mouse, or the like. Moreover, the smartpad could be populated with a processor, memory, communications means and the like that would allow for stand-alone operation. Even further, the smartpad could be associated or docked with other types of communications devices such as a smartphone such that the smartpad could be used as a display and/or I/O interface therefore.

Furthermore, while the exemplary aspects, embodiments, and/or configurations illustrated herein show the various components of the system collocated, certain components of the system can be located remotely, at distant portions of a distributed network, such as a LAN and/or the Internet, or within a dedicated system. Thus, it should be appreciated, that the components of the system can be combined in to one or more devices, such as a tablet-like device, or collocated on a particular node of a distributed network, such as an analog and/or digital telecommunications network, a packet-switch network, or a circuit-switched network. It will be appreciated from the preceding description, and for reasons of computational efficiency, that the components of the system can be arranged at any location within a distributed network of components without affecting the operation of the system. For example, the various components can be located in a switch such as a PBX and media server, gateway, in one or more communications devices, at one or more users' premises, or some combination thereof. Similarly, one or more functional portions of the system could be distributed between a telecommunications device(s) and an associated computing device.

Furthermore, it should be appreciated that the various links connecting the elements can be wired or wireless links, or any combination thereof, or any other known or later developed element(s) that is capable of supplying and/or communicating data to and from the connected elements. These wired or wireless links can also be secure links and may be capable of communicating encrypted information. Transmission media used as links, for example, can be any suitable carrier for electrical signals, including coaxial cables, copper wire and fiber optics, and may take the form of acoustic or light waves, such as those generated during radio-wave and infrared data communications.

Also, while the flowcharts have been discussed and illustrated in relation to a particular sequence of events, it should be appreciated that changes, additions, and omissions to this sequence can occur without materially affecting the operation of the disclosed embodiments, configuration, and aspects.

In yet another embodiment, the systems and methods of this disclosure can be implemented in conjunction with a special purpose computer, a programmed microprocessor or microcontroller and peripheral integrated circuit element(s), an ASIC or other integrated circuit, a digital signal processor, a hard-wired electronic or logic circuit such as discrete element circuit, a programmable logic device or gate array such as PLD, PLA, FPGA, PAL, special purpose computer, any comparable means, or the like. In general, any device(s) or means capable of implementing the methodology illustrated herein can be used to implement the various aspects of this disclosure. Exemplary hardware that can be used for the disclosed embodiments, configurations and aspects includes computers, handheld devices, telephones (e.g., cellular, Internet enabled, digital, analog, hybrids, and others), and other hardware known in the art. Some of these devices include processors (e.g., a single or multiple microprocessors), memory, nonvolatile storage, input devices, and output devices. Furthermore, alternative software implementations including, but not limited to, distributed processing or component/object distributed processing, parallel processing, or virtual machine processing can also be constructed to implement the methods described herein.

In yet another embodiment, the disclosed methods may be readily implemented in conjunction with software using object or object-oriented software development environments that provide portable source code that can be used on

a variety of computer or workstation platforms. Alternatively, the disclosed system may be implemented partially or fully in hardware using standard logic circuits or VLSI design. Whether software or hardware is used to implement the systems in accordance with this disclosure is dependent on the speed and/or efficiency requirements of the system, the particular function, and the particular software or hardware systems or microprocessor or microcomputer systems being utilized.

In yet another embodiment, the disclosed methods may be partially implemented in software that can be stored on a storage medium, executed on programmed general-purpose computer with the cooperation of a controller and memory, a special purpose computer, a microprocessor, or the like. In these instances, the systems and methods of this disclosure can be implemented as program embedded on personal computer such as an applet, JAVA® or CGI script, as a resource residing on a server or computer workstation, as a routine embedded in a dedicated measurement system, system component, or the like. The system can also be implemented by physically incorporating the system and/or method into a software and/or hardware system.

Although the present disclosure describes components and functions implemented in the aspects, embodiments, and/or configurations with reference to particular standards and protocols, the aspects, embodiments, and/or configurations are not limited to such standards and protocols. Other similar standards and protocols not mentioned herein are in existence and are considered to be included in the present disclosure. Moreover, the standards and protocols mentioned herein and other similar standards and protocols not mentioned herein are periodically superseded by faster or more effective equivalents having essentially the same functions. Such replacement standards and protocols having the same functions are considered equivalents included in the present disclosure.

The present disclosure, in various aspects, embodiments, and/or configurations, includes components, methods, processes, systems and/or apparatus substantially as depicted and described herein, including various aspects, embodiments, configurations embodiments, subcombinations, and/or subsets thereof. Those of skill in the art will understand how to make and use the disclosed aspects, embodiments, and/or configurations after understanding the present disclosure. The present disclosure, in various aspects, embodiments, and/or configurations, includes providing devices and processes in the absence of items not depicted and/or described herein or in various aspects, embodiments, and/or configurations hereof, including in the absence of such items as may have been used in previous devices or processes, e.g., for improving performance, achieving ease and\or reducing cost of implementation.

The foregoing discussion has been presented for purposes of illustration and description. The foregoing is not intended to limit the disclosure to the form or forms disclosed herein. In the foregoing Detailed Description for example, various features of the disclosure are grouped together in one or more aspects, embodiments, and/or configurations for the purpose of streamlining the disclosure. The features of the aspects, embodiments, and/or configurations of the disclosure may be combined in alternate aspects, embodiments, and/or configurations other than those discussed above. This method of disclosure is not to be interpreted as reflecting an intention that the claims require more features than are expressly recited in each claim. Rather, as the following claims reflect, inventive aspects lie in less than all features of a single foregoing disclosed aspect, embodiment, and/or configuration. Thus, the following claims are hereby incorporated into this Detailed Description, with each claim standing on its own as a separate preferred embodiment of the disclosure.

Moreover, though the description has included description of one or more aspects, embodiments, and/or configurations and certain variations and modifications, other variations, combinations, and modifications are within the scope of the disclosure, e.g., as may be within the skill and knowledge of those in the art, after understanding the present disclosure. It is intended to obtain rights which include alternative aspects, embodiments, and/or configurations to the extent permitted, including alternate, interchangeable and/or equivalent structures, functions, ranges or steps to those claimed, whether or not such alternate, interchangeable and/or equivalent structures, functions, ranges or steps are disclosed herein, and without intending to publicly dedicate any patentable subject matter.

What is claimed is:

**1**. A smartpad, comprising:

a microprocessor;

a memory operable to store software; and

a screen comprising:

a display; and

a gesture capture area;

wherein the screen operates in at least the following modes:

a portrait single application mode, wherein the screen is in a portrait orientation and only one application is currently providing a maximized view, in portrait, for the display;

a portrait multi-application mode, wherein the screen is in a portrait orientation and a plurality of applications are currently providing a maximized view, in landscape, for the display;

a landscape single application mode, wherein the screen is in a landscape orientation and only one application is currently providing a maximized view, in landscape, for the display; and

a landscape multi-application mode, wherein the screen is in a portrait orientation and a plurality of applications are currently providing a maximized view, in portrait, for the display, wherein, in portrait or landscape single application mode, a single-display or multi-display application is capable of providing a max view, wherein canvas-based content fills substantially the entire display and wherein non-canvas display elements are hidden, and wherein, in portrait or landscape multi-application mode, the single-display or multi-display application is not capable of providing a max view.

**2**. The smartpad of claim **1**, wherein the following rules are applied:

when the screen is in the portrait or landscape single application mode, a launched application launches in a max mode;

when an application is in the max mode, the application provides a max view to substantially the entire display regardless of whether the application was maximized or minimized immediately prior to entering the max mode;

when an application exits the max mode, the view of the application is maximized.

**3**. The smartpad of claim **1**, wherein, when the screen is in portrait or landscape multi-application mode, a seam extends across the display to separate the display into first and second logical displays, the first logical display being for a first view of a first application and the second logical

display being for a second view of a second application and wherein the first and second logical displays are logically independent of one another and wherein, when the screen is in portrait or landscape single application mode, the display is free of a seam.

**4**. The smartpad of claim **1**, wherein a selected application is in focus when a user switches from one of the portrait and landscape single application modes to the portrait and landscape multi-application modes and wherein a view of the selected application is displayed both before and after the switch.

**5**. The smartpad of claim **1**, wherein a parent view has first and second child views, the first and second child views being selected from links in the parent view, wherein the display comprises first and second logical displays, wherein the parent view is displayed in the first logical display, wherein the first and second child views are displayed simultaneously in the second logical display, and wherein, an order in which the first and second child views are opened is used to determine which of the first and second child views is moved to the first logical display when the parent view is closed or minimized.

**6**. The smartpad of claim **1**, wherein a view displayed by the display comprises an action bar comprising plural action bar commands, each command having a corresponding icon and label, wherein the action bar comprises a primary and secondary row, the secondary row, but not the primary row, being hidden header when the primary row is collapsed and revealed when the primary row is expanded.

**7**. The smartpad of claim **6**, wherein the following rule is applied for action bars:

first and second action bars for first and second applications are revealed when the screen is in portrait or landscape multi-application mode.

**8**. The smartpad of claim **1**, wherein a settings screen launched from within an application is treated as a full-screen modal launched on top of the application.

**9**. A method comprising:

providing a communication device comprising a microprocessor, a memory operable to store software, and a screen comprising a display and gesture capture area;

operating, by the microprocessor, the communication device in at least the following modes:

a portrait single application mode, wherein the screen is in a portrait orientation and only one application is currently providing a maximized view, in portrait, for the display;

a portrait multi-application mode, wherein the screen is in a portrait orientation and a plurality of applications are currently providing a maximized view, in landscape, for the display;

a landscape single application mode, wherein the screen is in a landscape orientation and only one application is currently providing a maximized view, in landscape, for the display; and

a landscape multi-application mode, wherein the screen is in a portrait orientation and a plurality of applications are currently providing a maximized view, in portrait, for the display, wherein, in portrait or landscape single application mode, a single-display or multi-display application is capable of providing a max view, wherein canvas-based content fills substantially the entire display and wherein non-canvas display elements are hidden, and wherein, in portrait or landscape multi-application mode, the single-display or multi-display application is not capable of providing a max view.

**10**. The method of claim **9**, wherein the following rules are applied:

when the screen is in the portrait or landscape single application mode, a launched application launches in a max mode;

when an application is in the max mode, the application provides a max view to substantially the entire display regardless of whether the application was maximized or minimized immediately prior to entering the max mode;

when an application exits the max mode, the view of the application is maximized.

**11**. The method of claim **9**, wherein, when the screen is in portrait or landscape multi-application mode, a seam extends across the display to separate the display into first and second logical displays, the first logical display being for a first view of a first application and the second logical display being for a second view of a second application and wherein the first and second logical displays are logically independent of one another and wherein, when the screen is in portrait or landscape single application mode, the display is free of a seam.

**12**. The method of claim **9**, wherein a selected application is in focus when a user switches from one of the portrait and landscape single application modes to the portrait and landscape multi-application modes and wherein a view of the selected application is displayed both before and after the switch.

**13**. The method of claim **9**, wherein a parent view has first and second child views, the first and second child views being selected from links in the parent view, wherein the display comprises first and second logical displays, wherein the parent view is displayed in the first logical display, wherein the first and second child views are displayed simultaneously in the second logical display, and wherein, an order in which the first and second child views are opened is used to determine which of the first and second child views is moved to the first logical display when the parent view is closed or minimized.

**14**. The method of claim **9**, wherein a view displayed by the display comprises an action bar comprising plural action bar commands, each command having a corresponding icon and label, wherein the action bar comprises a primary and secondary row, the secondary row, but not the primary row, being hidden header when the primary row is collapsed and revealed when the primary row is expanded.

**15**. The method of claim **14**, wherein the following rule is applied for action bars:

first and second action bars for first and second applications are revealed when the screen is in portrait or landscape multi-application mode.

**16**. The method of claim **9**, wherein a settings screen launched from within an application is treated as a full-screen modal launched on top of the application.

**17**. A non-transitory, computer-readable medium comprising a set of instructions stored therein which, when executed by a processor, causes the processor to:

operate a communication device comprising a screen, a display, and gesture capture area in at least the following modes:

a portrait single application mode, wherein the screen is in a portrait orientation and only one application is currently providing a maximized view, in portrait, for the display;

a portrait multi-application mode, wherein the screen is in a portrait orientation and a plurality of applica-

tions are currently providing a maximized view, in landscape, for the display;

a landscape single application mode, wherein the screen is in a landscape orientation and only one application is currently providing a maximized view, in landscape, for the display; and

a landscape multi-application mode, wherein the screen is in a portrait orientation and a plurality of applications are currently providing a maximized view, in portrait, for the display, wherein, in portrait or landscape single application mode, a single-display or multi-display application is capable of providing a max view, wherein canvas-based content fills substantially the entire display and wherein non-canvas display elements are hidden, and wherein, in portrait or landscape multi-application mode, the single-display or multi-display application is not capable of providing a max view.

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