US 20150338940A1

(19) **United States**

(12) **Patent Application Publication**

(10) **Pub. No.: US 2015/0338940 A1**

(43) **Pub. Date: Nov. 26, 2015**

Vong

(54) **PEN INPUT MODES FOR DIGITAL INK**

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(21) Appl. No.: **14/665,462**

(22) Filed: **Mar. 23, 2015**

Related U.S. Application Data

(60) Provisional application No. 62/002,648, filed on May 23, 2014.

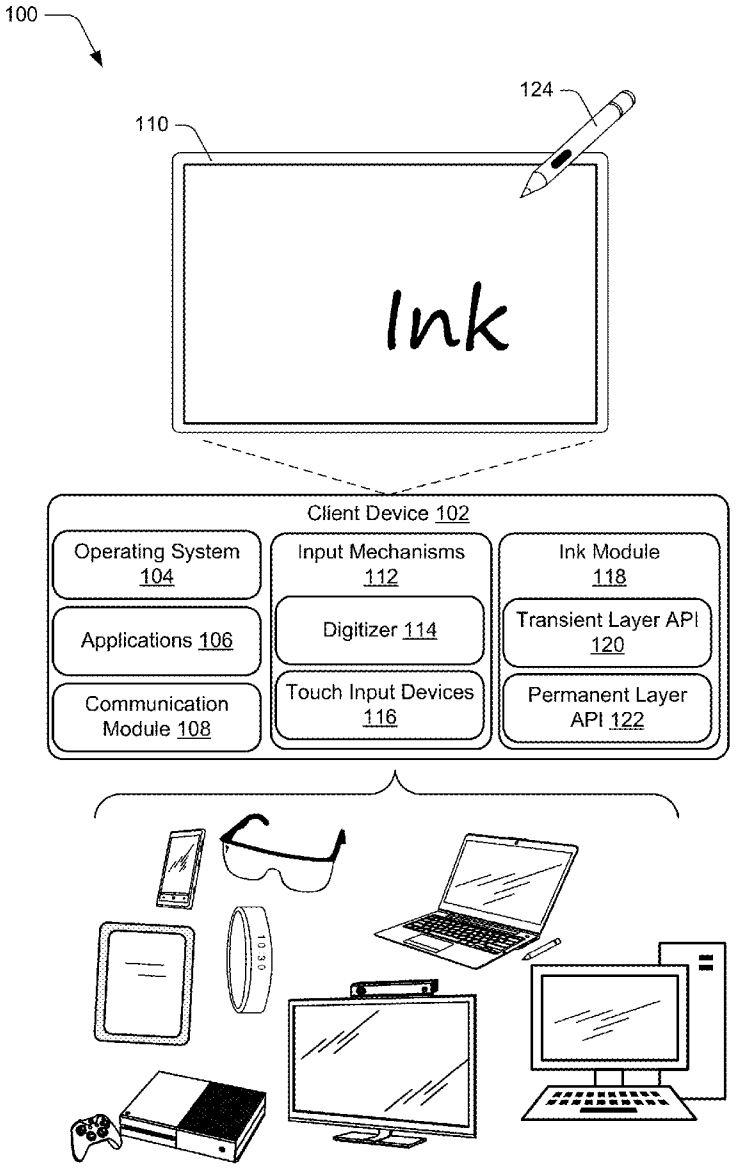
Publication Classification

(51) **Int. Cl.**
G06F 3/0354 (2006.01)
G06F 3/038 (2006.01)

(52) **U.S. Cl.**
CPC ***G06F 3/03545*** (2013.01); ***G06F 3/038*** (2013.01); *G06F 2203/0381* (2013.01)

(57) **ABSTRACT**

Techniques for pen input modes for digital ink are described. According to various embodiments, a pen apparatus is described that is switchable between providing digital ink input and non-digital-ink input. According to various embodiments, a pen apparatus is switchable between different ink input modes. For instance, the pen apparatus is switchable between a permanent ink mode in which ink is applied as permanent ink, and a transient ink mode in which ink is applied as transient ink.



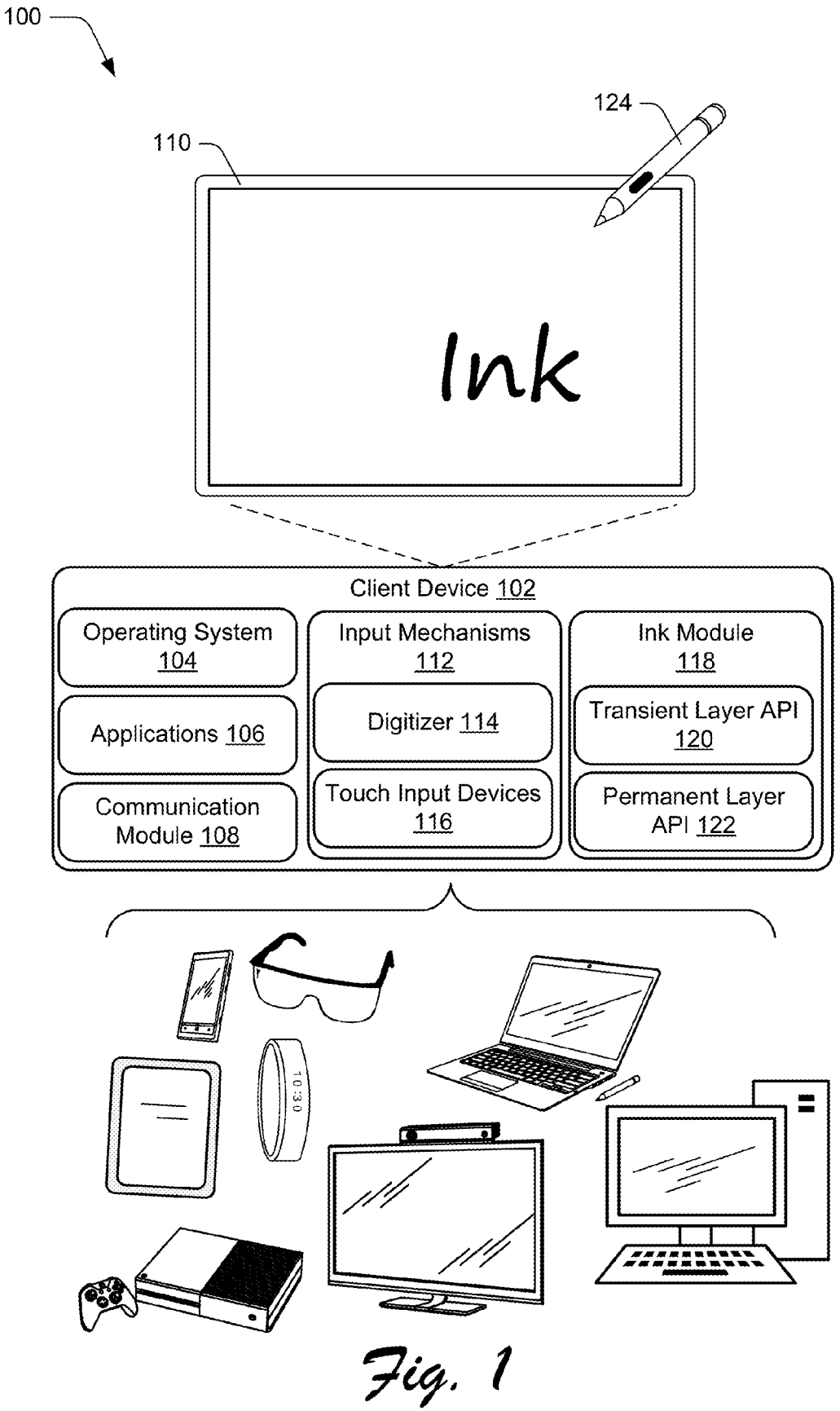
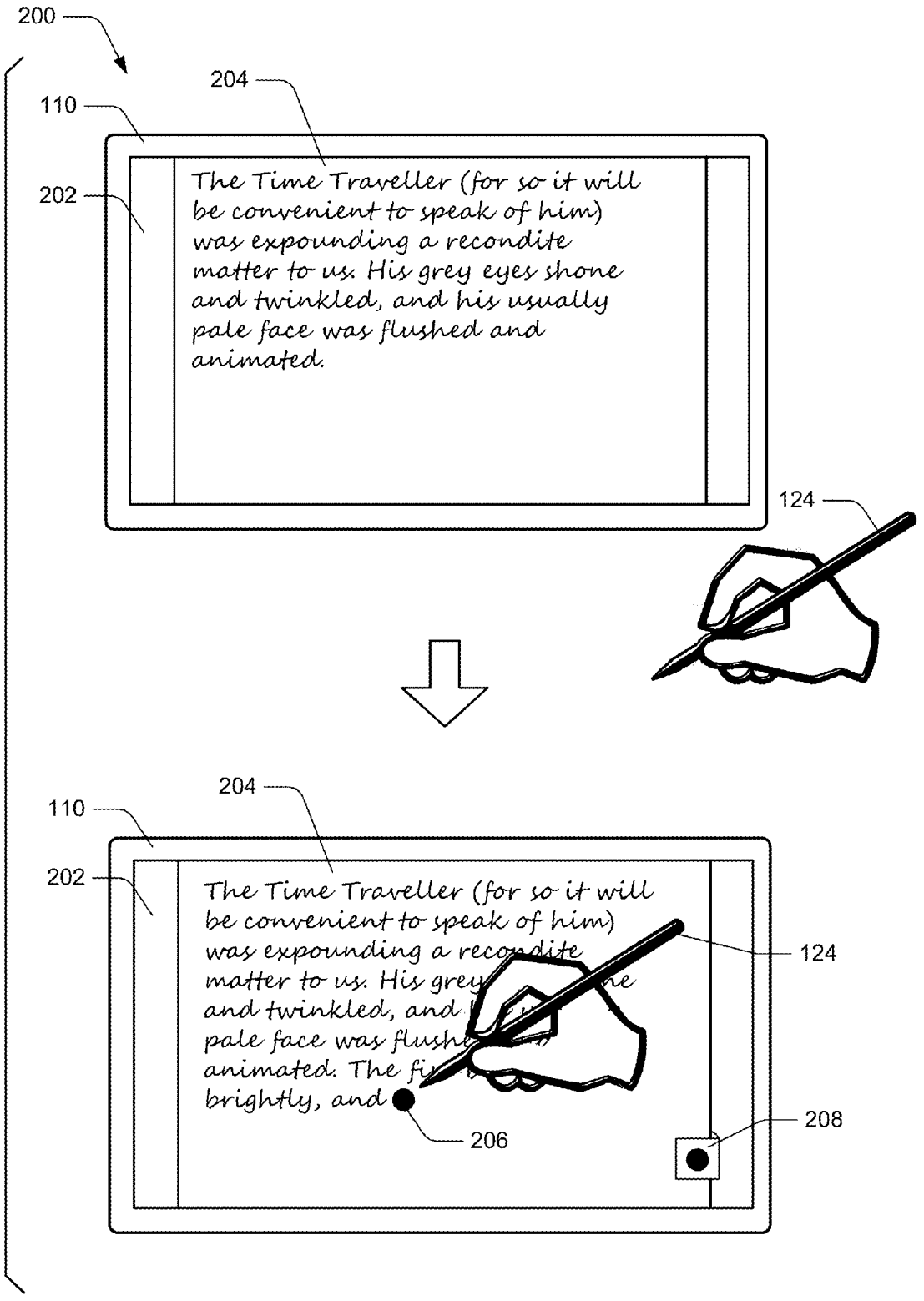

100
124
110
Ink
Client Device 102
Operating System 104
Applications 106
Communication Module 108
Input Mechanisms 112
Digitizer 114
Touch Input Devices 116
Ink Module 118
Transient Layer API 120
Permanent Layer API 122

Fig. 1


200
204
110
202
The Time Traveller (for so it will be convenient to speak of him) was expounding a recondite matter to us. His grey eyes shone and twinkled, and his usually pale face was flushed and animated.
124
204
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The Time Traveller (for so it will be convenient to speak of him) was expounding a recondite matter to us. His grey
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animated. The fi
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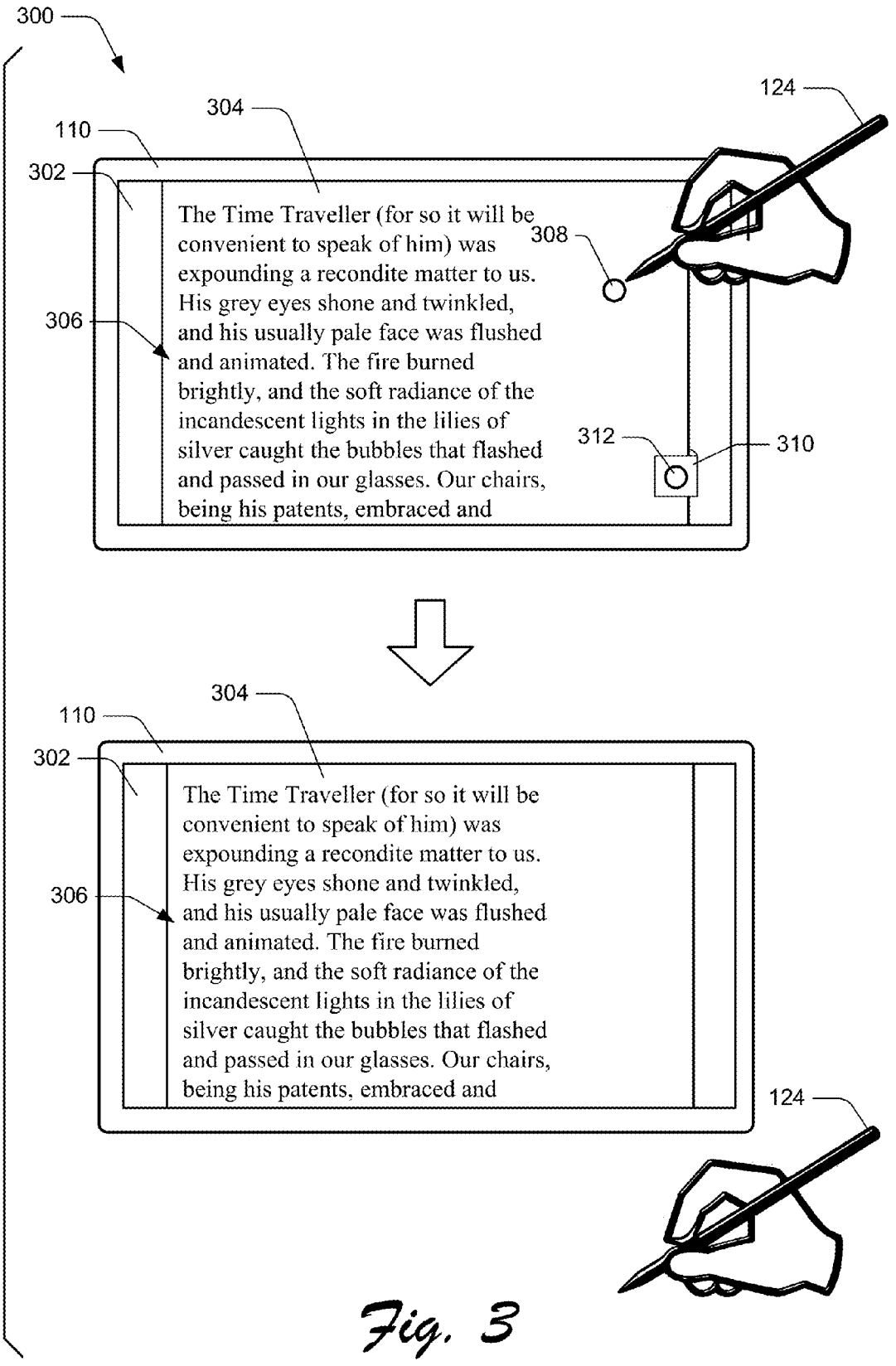
206
208

Fig. 2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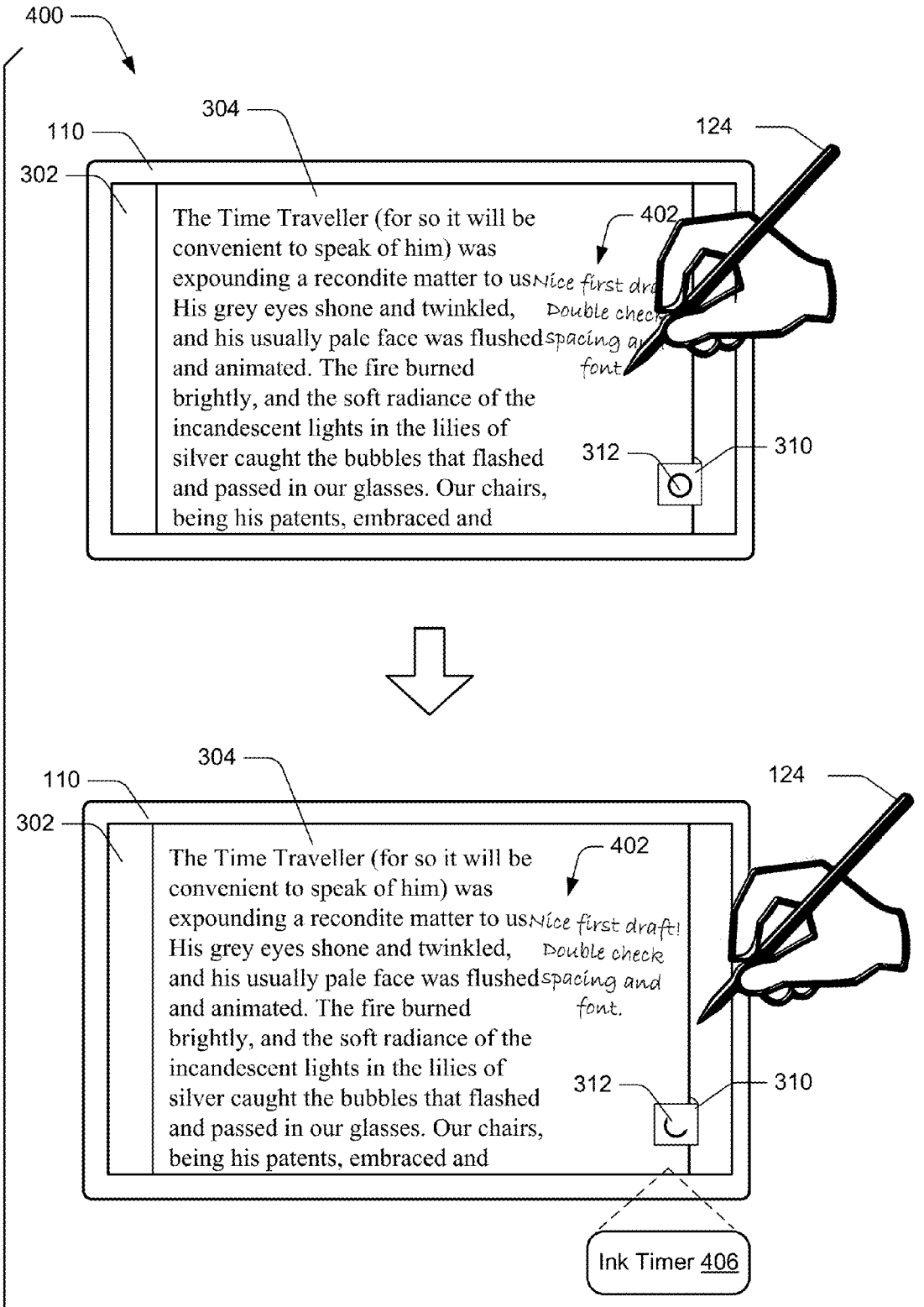
124

Fig. 3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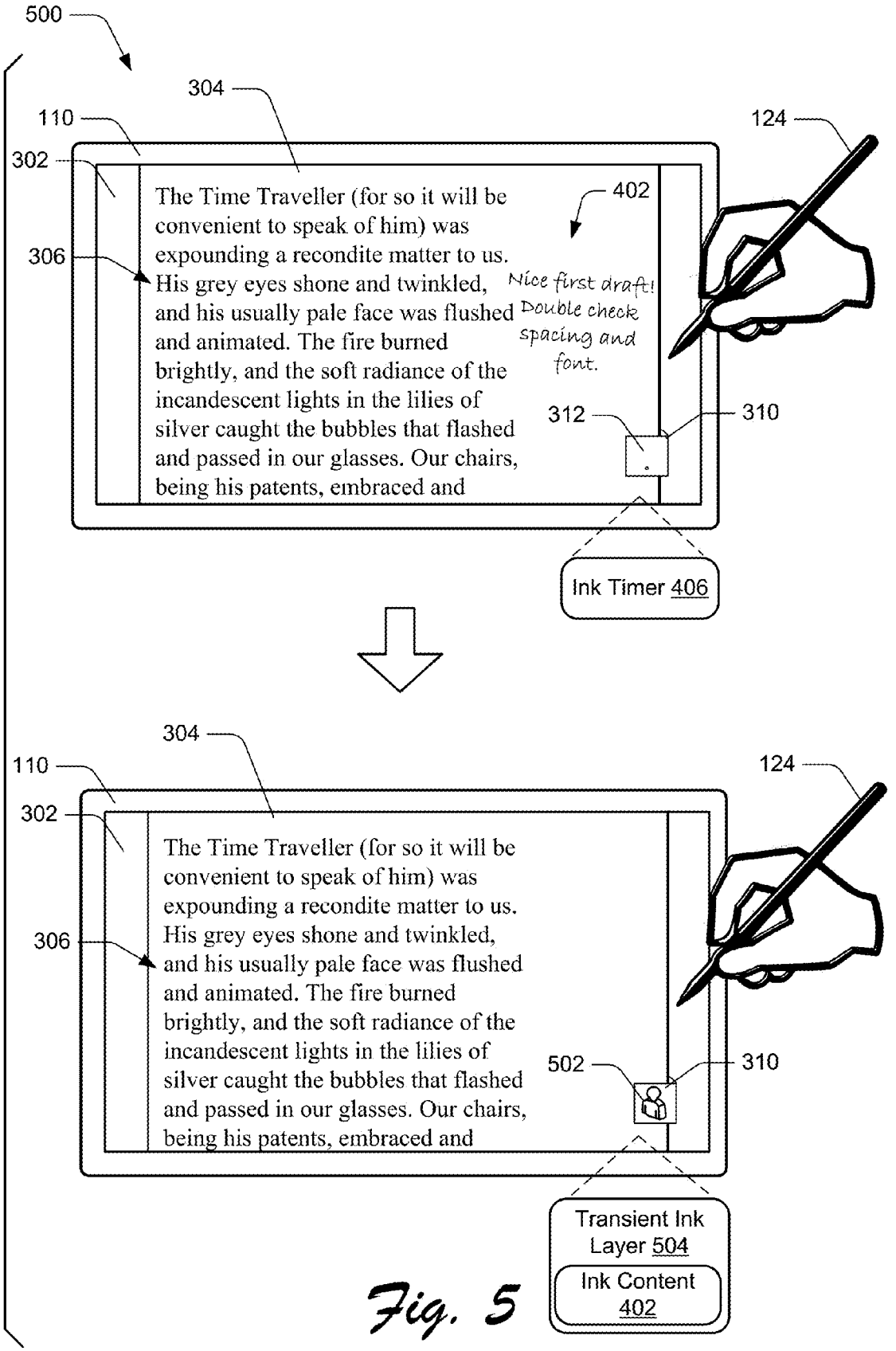
310
Ink Timer 406

Fig. 4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Ink Timer 406
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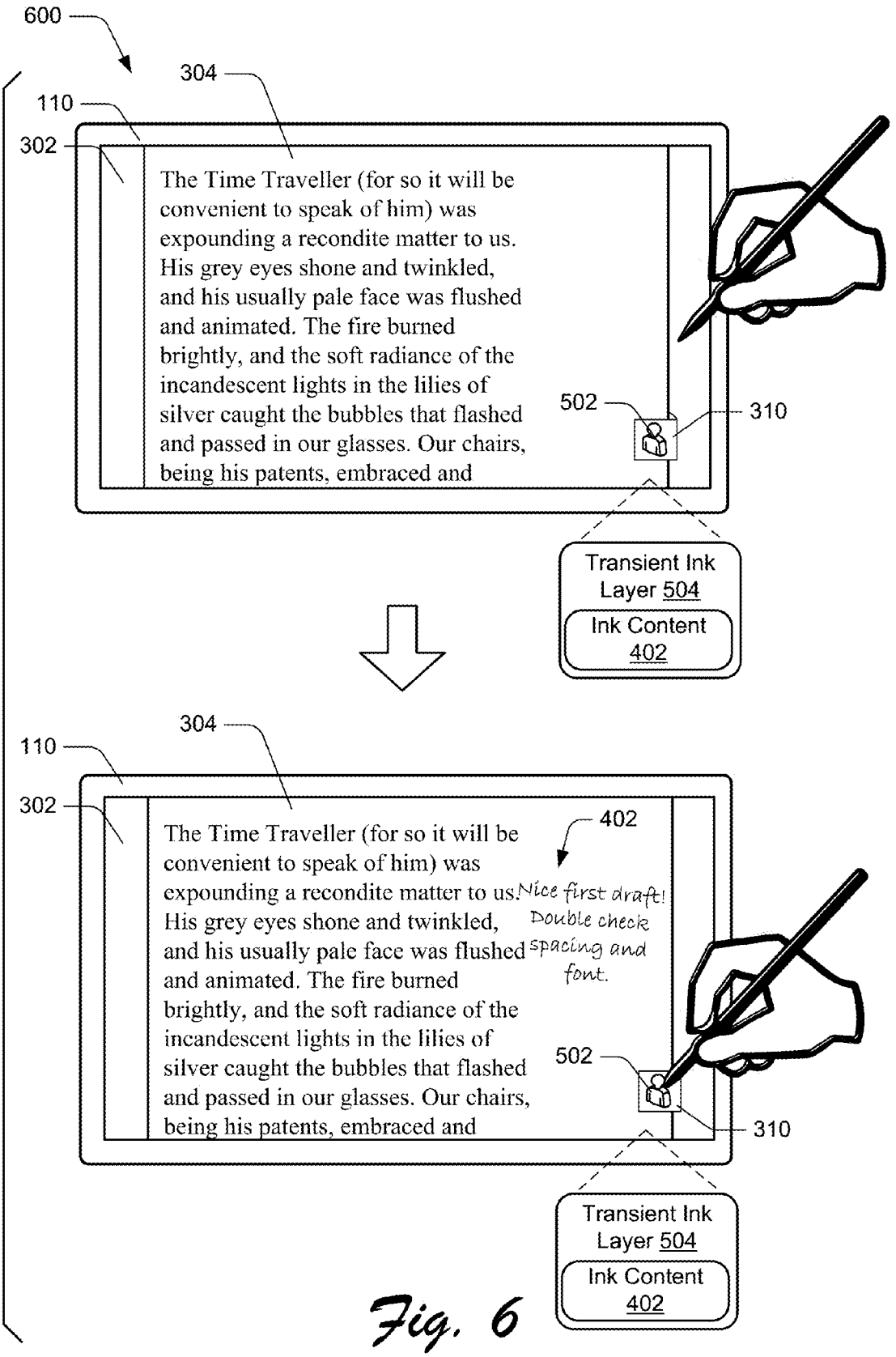
502
310
Transient Ink Layer 504
Ink Content 402

Fig. 5


600
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110
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The Time Traveller (for so it will be convenient to speak of him) was expounding a recondite matter to us. His grey eyes shone and twinkled, and his usually pale face was flushed and animated. The fire burned brightly, and the soft radiance of the incandescent lights in the lilies of silver caught the bubbles that flashed and passed in our glasses. Our chairs, being his patents, embraced and
502
310
Transient Ink Layer 504
Ink Content 402
304
110
302
402
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Nice first draft! Double check spacing and font.
502
310
Transient Ink Layer 504
Ink Content 402

Fig. 6

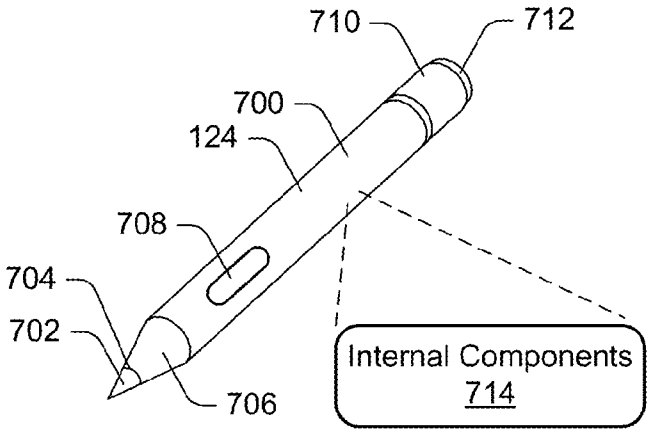
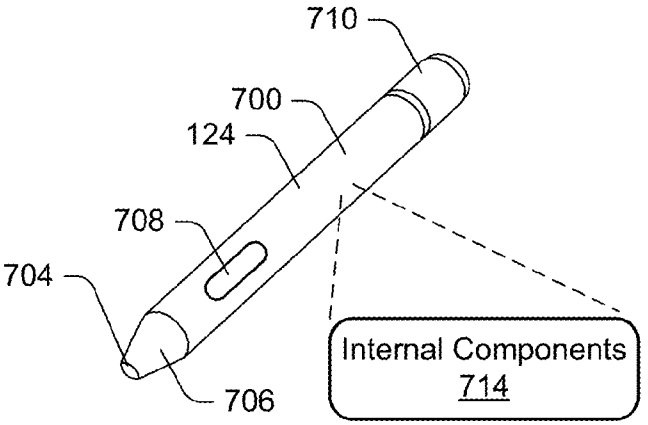

710
712
700
124
708
704
702
706
Internal Components
714

Fig. 7


710
700
124
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704
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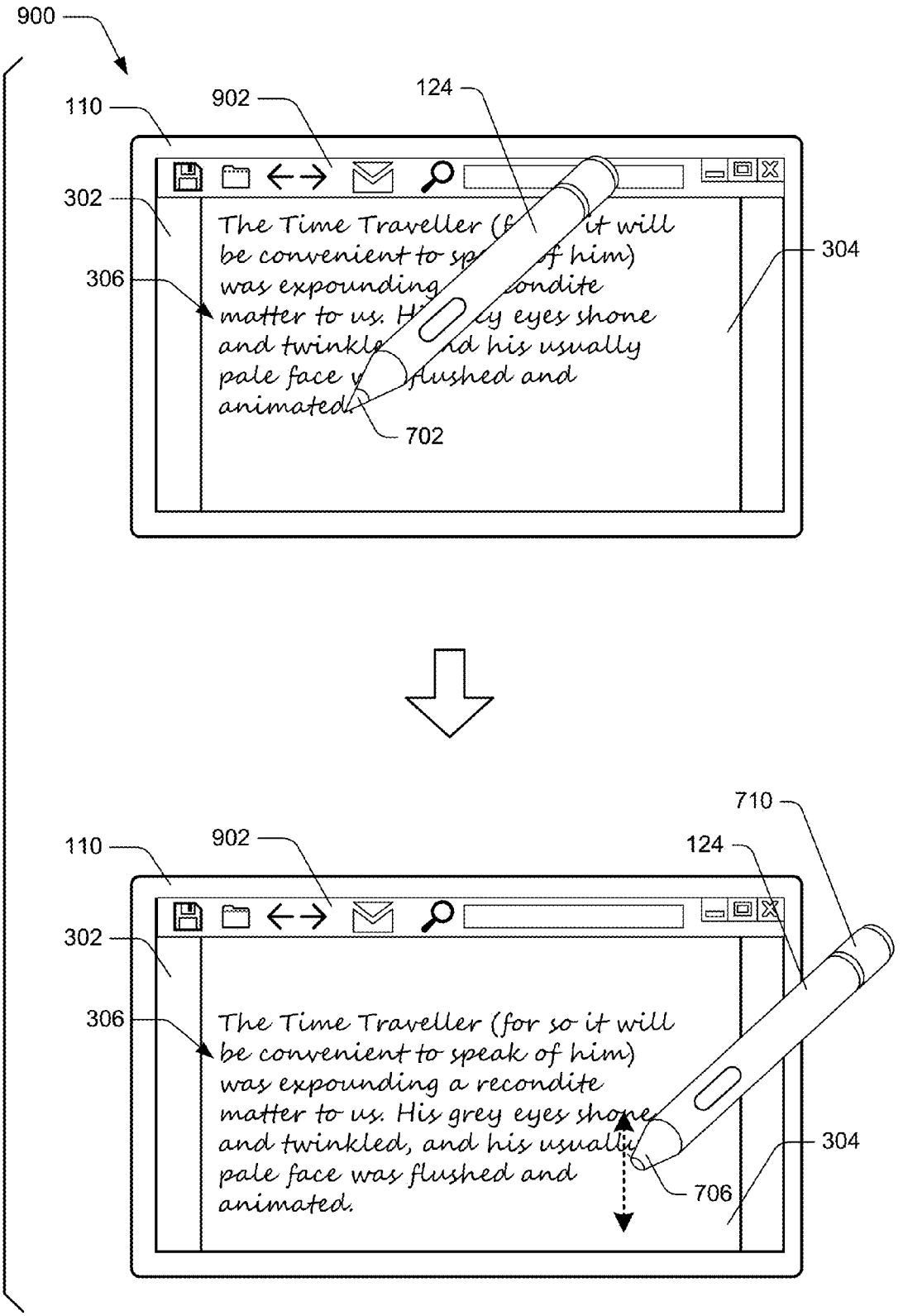
Internal Components
714

Fig. 8


900
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902
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302
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306
The Time Traveller (for so it will be convenient to speak of him) was expounding a recondite matter to us. His grey eyes shone and twinkled, and his usually pale face was flushed and animated.
702
710
706

Fig. 9

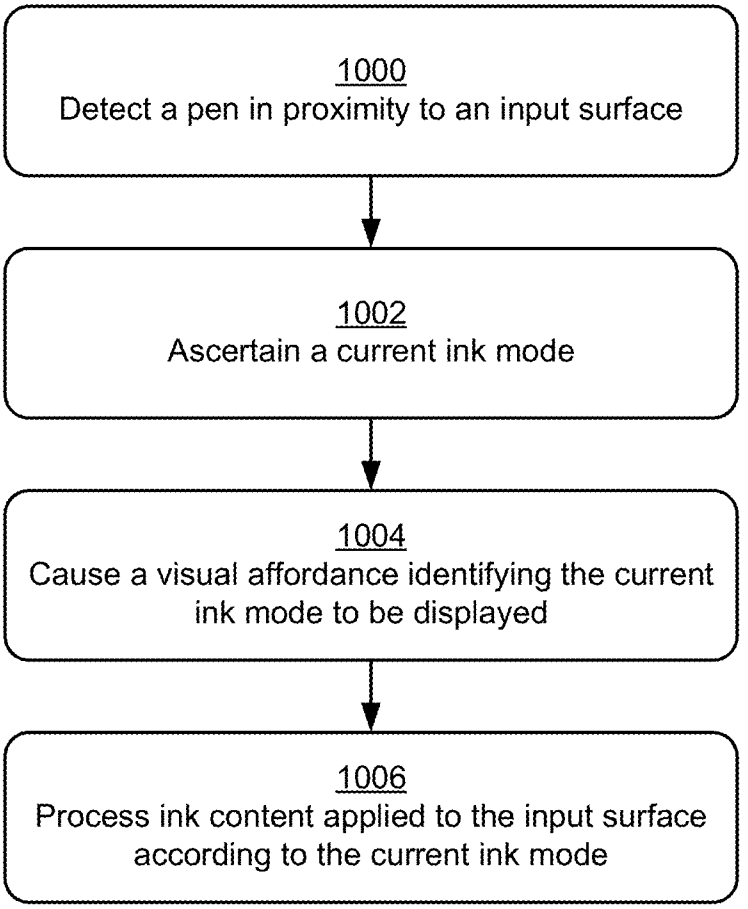
1000
Detect a pen in proximity to an input surface
1002
Ascertain a current ink mode
1004
Cause a visual affordance identifying the current ink mode to be displayed
1006
Process ink content applied to the input surface according to the current ink mode

Fig. 10

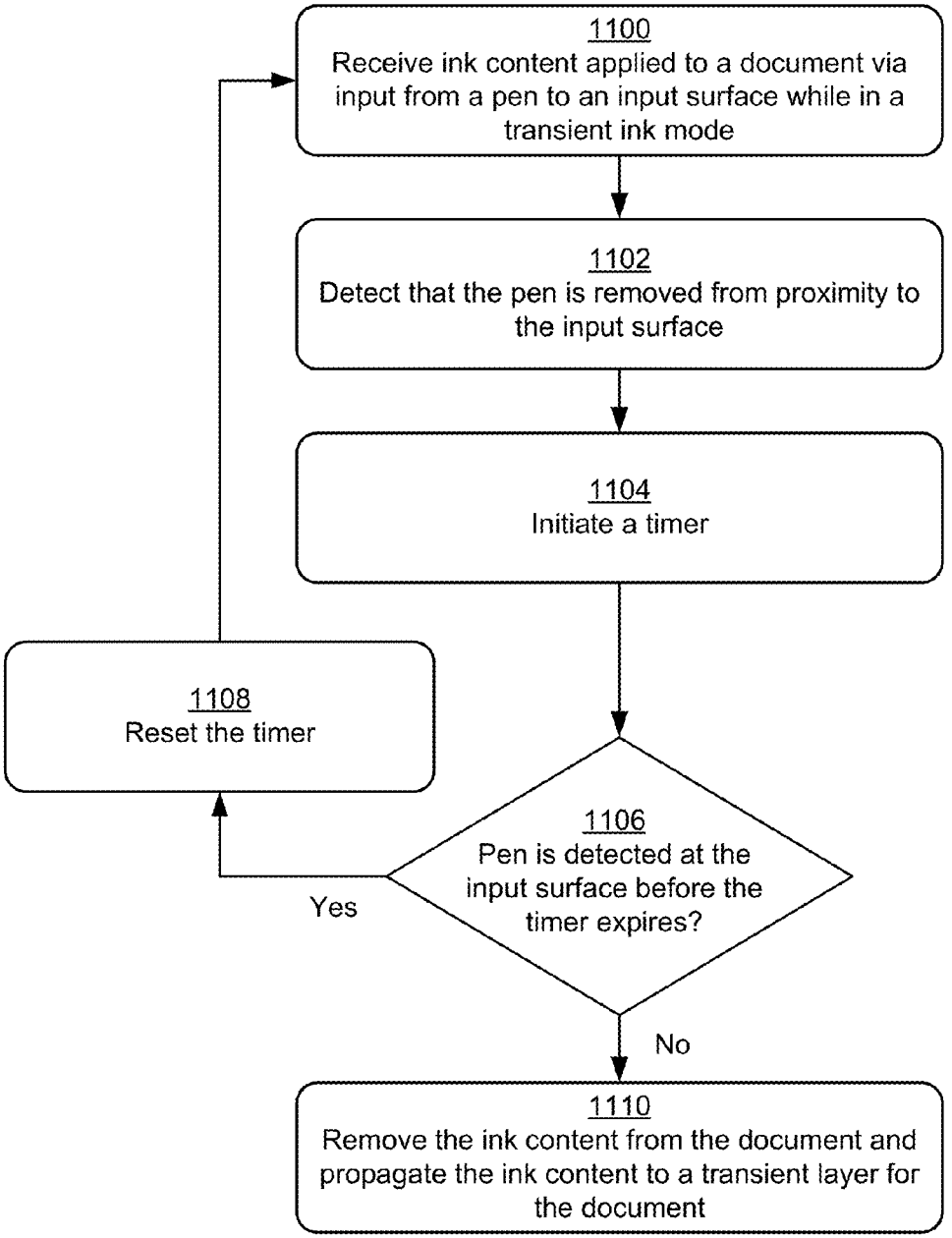
1100
Receive ink content applied to a document via input from a pen to an input surface while in a transient ink mode
1102
Detect that the pen is removed from proximity to the input surface
1104
Initiate a timer
1106
Pen is detected at the input surface before the timer expires?
Yes
No
1108
Reset the timer
1110
Remove the ink content from the document and propagate the ink content to a transient layer for the document

Fig. 11

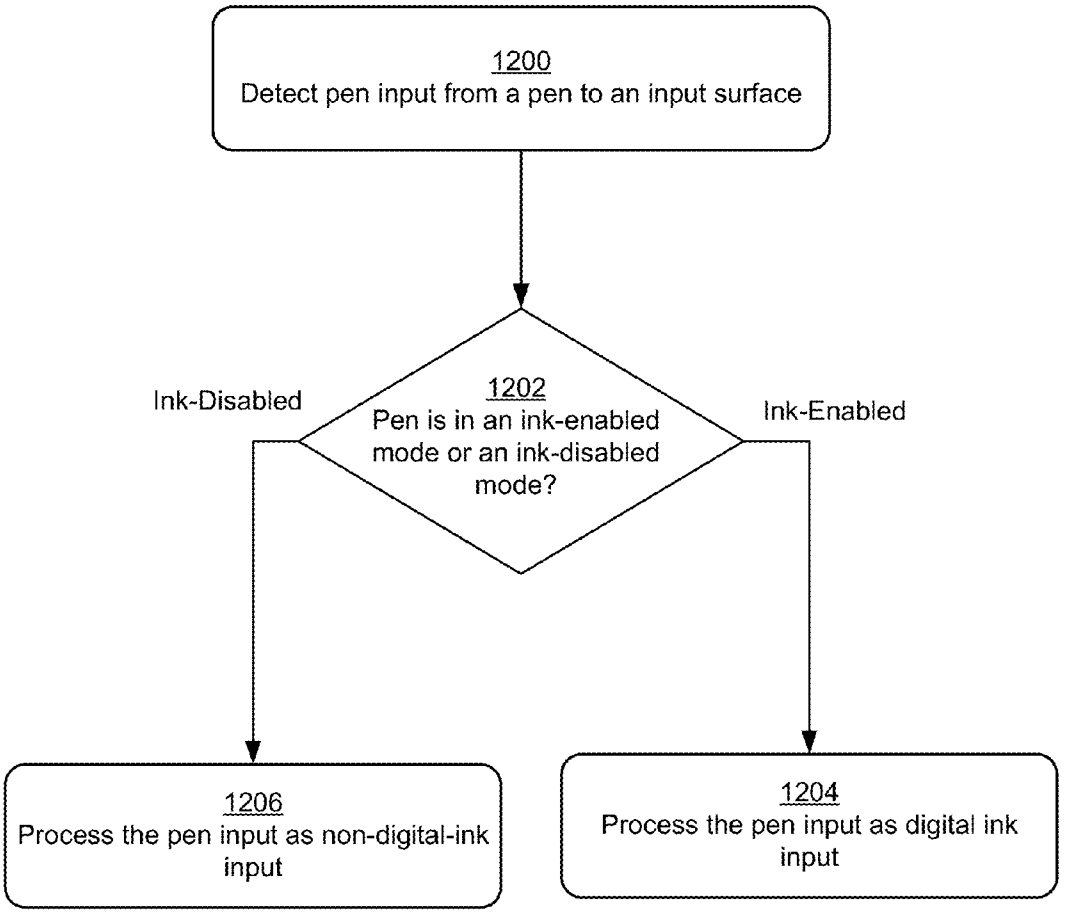
1200
Detect pen input from a pen to an input surface
1202
Pen is in an ink-enabled mode or an ink-disabled mode?
Ink-Disabled
Ink-Enabled
1206
Process the pen input as non-digital-ink input
1204
Process the pen input as digital ink input

Fig. 12

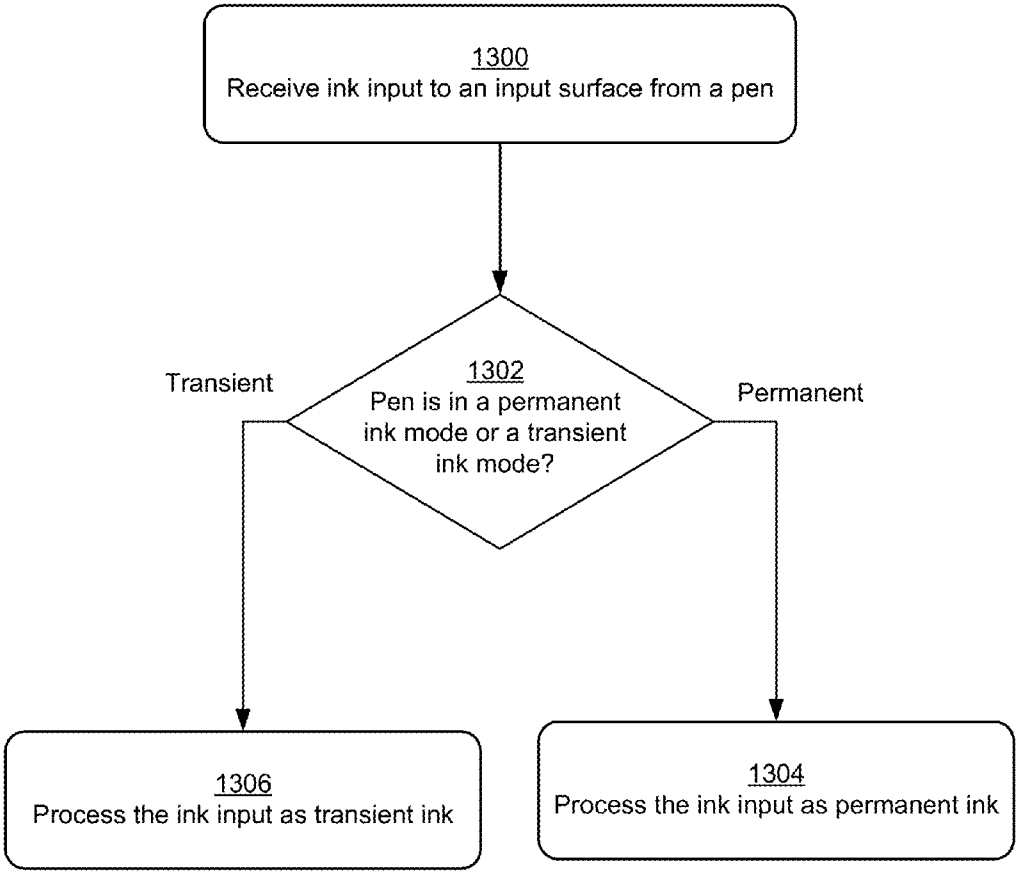
1300
Receive ink input to an input surface from a pen
1302
Pen is in a permanent ink mode or a transient ink mode?
Transient
Permanent
1306
Process the ink input as transient ink
1304
Process the ink input as permanent ink

Fig. 13

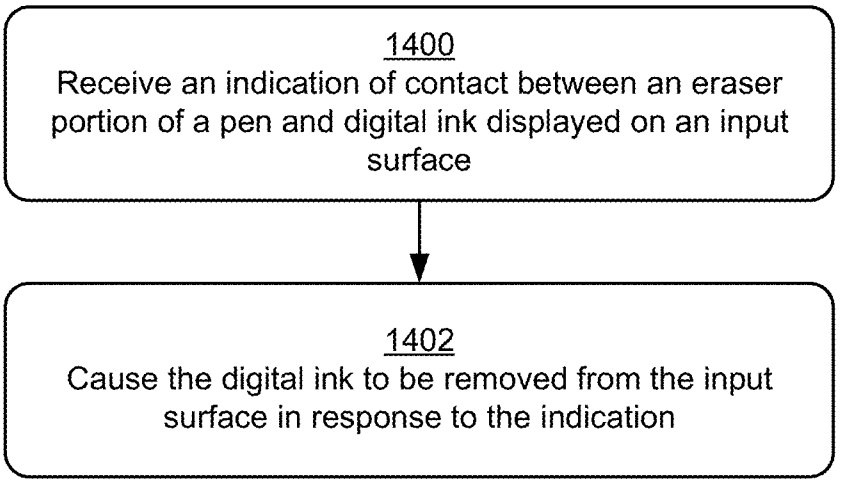
1400
Receive an indication of contact between an eraser portion of a pen and digital ink displayed on an input surface
1402
Cause the digital ink to be removed from the input surface in response to the indication

Fig. 14

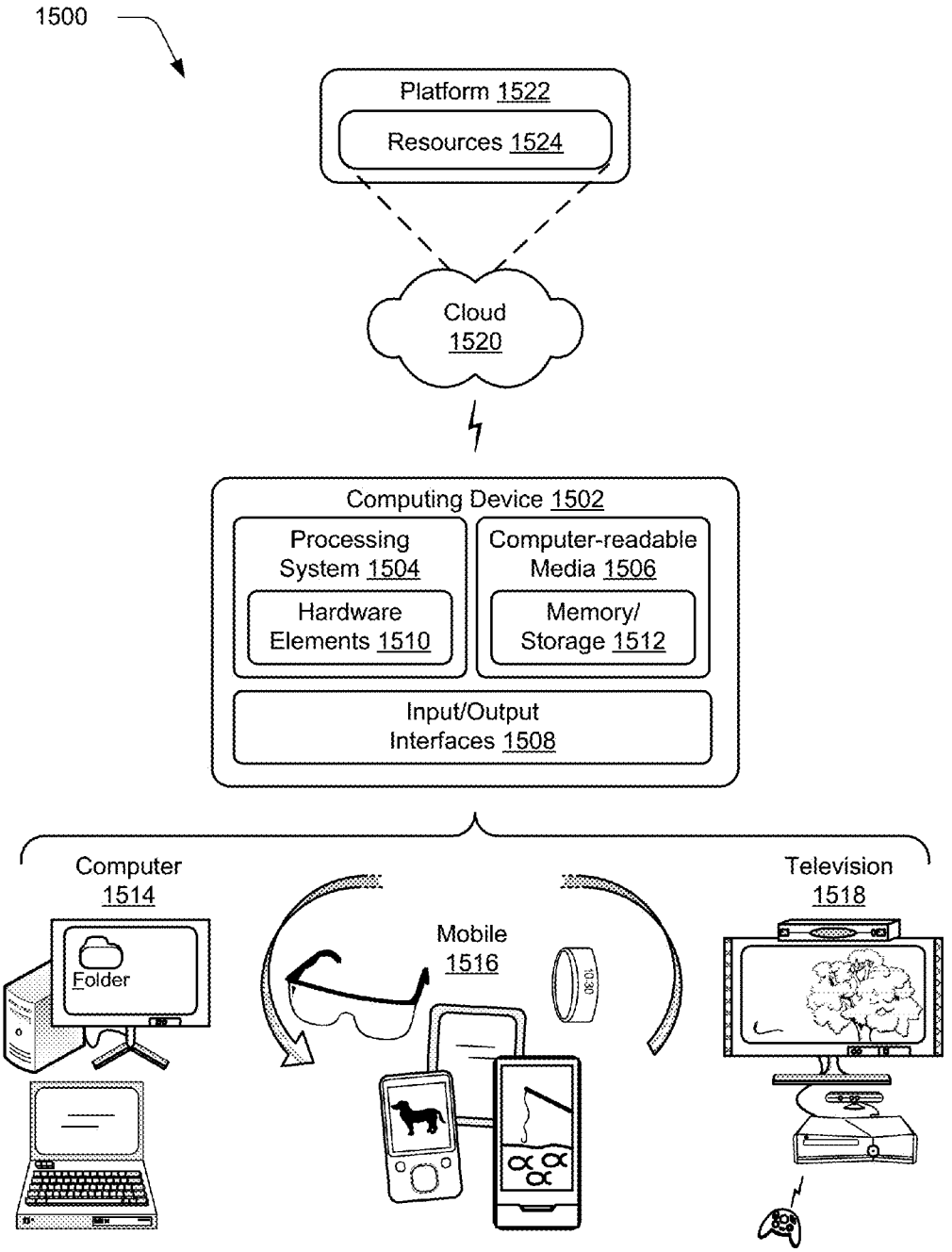
1500
Platform 1522
Resources 1524
Cloud
1520
Computing Device 1502
Processing System 1504
Hardware Elements 1510
Computer-readable Media 1506
Memory/ Storage 1512
Input/Output Interfaces 1508
Computer
1514
Folder
Mobile
1516
Television
1518

Fig. 15

PEN INPUT MODES FOR DIGITAL INK

RELATED APPLICATION

[0001] This application claims priority under 35 U.S.C. §119(e) to U.S. Provisional Patent Application No. 62/002,648, Attorney Docket Number 355121.01, filed May 23, 2014 and titled "Ink," the entire disclosure of which is incorporated by reference in its entirety.

BACKGROUND

[0002] Devices today (e.g., computing devices) typically support a variety of different input techniques. For instance, a particular device may receive input from a user via a keyboard, a mouse, voice input, touch input (e.g., to a touchscreen), and so forth. One particularly intuitive input technique enables a user to utilize a touch instrument (e.g., a pen, a stylus, a finger, and so forth) to provide freehand input to a touch-sensing functionality such as a touchscreen, which is interpreted as digital ink. The freehand input may be converted to a corresponding visual representation on a display, such as for taking notes, for creating and editing an electronic document, and so forth. Many current techniques for digital ink, however, typically provide limited ink functionality.

SUMMARY

[0003] This Summary is provided to introduce a selection of concepts in a simplified form that are further described below in the Detailed Description. This Summary is not intended to identify key features or essential features of the claimed subject matter, nor is it intended to be used as an aid in determining the scope of the claimed subject matter.

[0004] Techniques for pen input modes for digital ink are described. According to various embodiments, a pen apparatus is described that is switchable between providing digital ink input and non-digital-ink input. According to various embodiments, a pen apparatus is switchable between different ink input modes. For instance, the pen apparatus is switchable between a permanent ink mode in which ink is applied as permanent ink, and a transient ink mode in which ink is applied as transient ink.

BRIEF DESCRIPTION OF THE DRAWINGS

[0005] The detailed description is described with reference to the accompanying figures. In the figures, the left-most digit(s) of a reference number identifies the figure in which the reference number first appears. The use of the same reference numbers in different instances in the description and the figures may indicate similar or identical items.

[0006] FIG. **1** is an illustration of an environment in an example implementation that is operable to employ techniques discussed herein in accordance with one or more embodiments.

[0007] FIG. **2** depicts an example implementation scenario for a permanent ink mode in accordance with one or more embodiments.

[0008] FIG. **3** depicts an example implementation scenario for a transient ink mode in accordance with one or more embodiments.

[0009] FIG. **4** depicts an example implementation scenario for a transient ink mode in accordance with one or more embodiments.

[0010] FIG. **5** depicts an example implementation scenario for a transient ink mode in accordance with one or more embodiments.

[0011] FIG. **6** depicts an example implementation scenario for a transient ink mode in accordance with one or more embodiments.

[0012] FIG. **7** depicts an example implementation of a pen apparatus in accordance with one or more embodiments.

[0013] FIG. **8** depicts an example implementation of a pen apparatus in accordance with one or more embodiments.

[0014] FIG. **9** depicts an example implementation scenario for receiving digital ink input and non-digital-ink input in accordance with one or more embodiments.

[0015] FIG. **10** is a flow diagram that describes steps in a method for processing ink according to a current ink mode in accordance with one or more embodiments

[0016] FIG. **11** is a flow diagram that describes steps in a method for a transient ink timer in accordance with one or more embodiments.

[0017] FIG. **12** is a flow diagram that describes steps in a method for processing pen input based on a pen mode in accordance with one or more embodiments.

[0018] FIG. **13** is a flow diagram that describes steps in a method for processing pen input based on an ink mode in accordance with one or more embodiments.

[0019] FIG. **14** is a flow diagram that describes steps in a method for erasing digital ink in accordance with one or more embodiments

[0020] FIG. **15** illustrates an example system and computing device as described with reference to FIG. **1**, which are configured to implement embodiments of techniques described herein.

DETAILED DESCRIPTION

[0021] Overview

[0022] Techniques for pen input modes for digital ink are described. Generally, ink refers to freehand input to a pressure-sensing functionality such as a touchscreen and/or digitizer screen, which is interpreted as digital ink. Generally, digital ink is referred to herein as "ink" and "digital ink." Ink may be provided in various ways, such as using a pen (e.g., an active pen, a passive pen, and so forth), a stylus, a finger, and so forth.

[0023] According to various implementations, a pen apparatus is described that is switchable between providing digital ink input and non-digital-ink input. For instance, in an ink-enabled mode, the pen apparatus causes ink content to be applied to an input surface such as an active display. In an ink-disabled mode, the pen apparatus provides input modes other than ink content, such as touch input for object manipulation and selection, document navigation, and so forth. For instance, when the pen apparatus is in the ink-disabled mode, contact between the pen apparatus and an input surface does not cause ink to be applied to the input surface. Thus, a switchable pen apparatus enables user to provide different types of input from a single device.

[0024] According to various implementations, a pen apparatus is switchable to apply ink according to different ink modes. For instance, in an ink-enabled mode a pen will apply ink whenever input is provided to an input surface. However, the type of ink that is applied can be switched between different types, such as based on an application context, in response to a user selection of an ink mode, and so forth. For instance, the pen apparatus is switchable between a perma-

nent ink mode in which ink is applied as permanent ink, and a transient ink mode in which ink is applied as transient ink.

[0025] In the following discussion, an example environment is first described that is operable to employ techniques described herein. Next, a section entitled "Example Implementation Scenarios and Procedures" describes some example implementation scenarios and methods for pen input modes for digital ink in accordance with one or more embodiments. Finally, a section entitled "Example System and Device" describes an example system and device that are operable to employ techniques discussed herein in accordance with one or more embodiments.

[0026] Example Environment

[0027] FIG. **1** is an illustration of an environment **100** in an example implementation that is operable to employ techniques for pen input modes for digital ink discussed herein. Environment **100** includes a client device **102** which can be embodied as any suitable device such as, by way of example and not limitation, a smartphone, a tablet computer, a portable computer (e.g., a laptop), a desktop computer, a wearable device, and so forth. In at least some implementations, the client device **102** represents a smart appliance, such as an Internet of Things ("IoT") device. Thus, the client device **102** may range from a system with significant processing power, to a lightweight device with minimal processing power. One of a variety of different examples of a client device **102** is shown and described below in FIG. **15**.

[0028] The client device **102** includes a variety of different functionalities that enable various activities and tasks to be performed. For instance, the client device **102** includes an operating system **104**, applications **106**, and a communication module **108**. Generally, the operating system **104** is representative of functionality for abstracting various system components of the client device **102**, such as hardware, kernel-level modules and services, and so forth. The operating system **104**, for instance, can abstract various components (e.g., hardware, software, and firmware) of the client device **102** to the applications **106** to enable interaction between the components and the applications **106**.

[0029] The applications **106** represents functionalities for performing different tasks via the client device **102**. Examples of the applications **106** include a word processing application, a spreadsheet application, a web browser, a gaming application, and so forth. The applications **106** may be installed locally on the client device **102** to be executed via a local runtime environment, and/or may represent portals to remote functionality, such as cloud-based services, web apps, and so forth. Thus, the applications **106** may take a variety of forms, such as locally-executed code, portals to remotely hosted services, and so forth.

[0030] The communication module **108** is representative of functionality for enabling the client device **102** to communication over wired and/or wireless connections. For instance, the communication module **108** represents hardware and logic for communication via a variety of different wired and/or wireless technologies and protocols.

[0031] The client device **102** further includes a display device **110**, input mechanisms **112** including a digitizer **114** and touch input devices **116**, and an ink module **118**. The display device **110** generally represents functionality for visual output for the client device **102**. Additionally, the display device **110** represents functionality for receiving various types of input, such as touch input, pen input, and so forth. The input mechanisms **112** generally represent different functionalities for receiving input to the computing device **102**. Examples of the input mechanisms **112** include gesture-sensitive sensors and devices (e.g., such as touch-based sensors and movement-tracking sensors (e.g., camera-based)), a mouse, a keyboard, a stylus, a touch pad, accelerometers, a microphone with accompanying voice recognition software, and so forth. The input mechanisms **112** may be separate or integral with the displays **110**; integral examples include gesture-sensitive displays with integrated touch-sensitive or motion-sensitive sensors. The digitizer **114** represents functionality for converting various types of input to the display device **110** and the touch input devices **116** into digital data that can be used by the computing device **102** in various ways, such as for generating digital ink.

[0032] According to various implementations, the ink module **118** represents functionality for performing various aspects of techniques for pen input modes for digital ink discussed herein. Various functionalities of the ink module **118** are discussed below. The ink module **118** includes a transient layer application programming interface (API) **120** and a permanent layer API **122**. The transient layer API **120** represents functionality for enabling interaction with a transient ink layer, and the permanent layer API **122** represents functionality for enabling ink interaction with a permanent object (e.g., document) layer. In at least some implementations, the transient layer API **120** and the permanent layer API **122** may be utilized (e.g., by the applications **106**) to access transient ink functionality and permanent ink functionality, respectively.

[0033] The environment **100** further includes a pen **124**, which is representative of an input device for providing input to the display device **110**. Generally, the pen **124** is in a form factor of a traditional pen but includes functionality for interacting with the display device **110** and other functionality of the client device **102**. In at least some implementations, the pen **124** is an active pen that includes electronic components for interacting with the client device **102**. The pen **124**, for instance, includes a battery that can provide power to internal components of the pen **124**.

[0034] Alternatively or additionally, the pen **124** may include a magnet or other functionality that supports hover detection over the display device **110**. This is not intended to be limiting, however, and in at least some implementations the pen **124** may be passive, e.g., a stylus without internal electronics. Generally, the pen **124** is representative of an input device that can provide input that can be differentiated from other types of input by the client device **102**. For instance, the digitizer **114** is configured to differentiate between input provided via the pen **124**, and input provided by a different input mechanism such as a user's finger, a stylus, and so forth. Further details concerning the pen **124** are provided below.

[0035] Having described an example environment in which the techniques described herein may operate, consider now a discussion of an example implementation scenario in accordance with one or more embodiments.

[0036] Transient Ink and Permanent Ink

[0037] According to various implementations, ink can be applied in different ink modes including a transient ink mode and a permanent ink mode. Generally, transient ink refers to ink that is temporary and that can be used for various purposes, such as invoking particular actions, annotating a document, and so forth. For instance, in transient implementations, ink can be used for annotation layers for electronic

documents, temporary visual emphasis, text recognition, invoking various commands and functionalities, and so forth.

[0038] Permanent ink generally refers to implementations where ink becomes a part of the underlying object, such as for creating a document, writing on a document (e.g., for annotation and/or editing), applying ink to graphics, and so forth. Permanent ink, for example, can be considered as a graphics object, such as for note taking, for creating visual content, and so forth.

[0039] In at least some implementations, a pen (e.g., the pen **124**) applies ink whenever the pen is in an ink-enabled mode and is in contact with an input surface, such as the display device **104** and/or other input surface. Further, a pen can apply ink across many different applications, platforms, and services. In one or more implementations, an application and/or service can specify how ink is used in relation to an underlying object, such as a word processing document, a spreadsheet and so forth. For instance, in some scenarios ink is applied as transient ink, and other scenarios ink is applied as permanent ink. Examples of different implementations and attributes of transient ink and permanent ink are detailed below.

[0040] Example Implementation Scenarios and Procedures

[0041] This section describes some example implementation scenarios and example procedures for ink modes in accordance with one or more implementations. The implementation scenarios and procedures may be implemented in the environment **100** described above, the system **1500** of FIG. **15**, and/or any other suitable environment. The implementation scenarios and procedures, for example, describe example operations of the client device **102** and the ink module **118**. While the implementation scenarios and procedures are discussed with reference to a particular application, it is to be appreciated that techniques for pen input modes for digital ink discussed herein are applicable across a variety of different applications, services, and environments. In at least some embodiments, steps described for the various procedures are implemented automatically and independent of user interaction.

[0042] FIG. **2** depicts an example implementation scenario **200** for a permanent ink mode in accordance with one or more implementations. The upper portion of the scenario **200** includes a graphical user interface (GUI) **202** displayed on the display device **110**. Generally, the GUI **202** represents a GUI for a particular functionality, such as an instance of the applications **106**. Also depicted is a user holding the pen **124**. Displayed within the GUI **202** is a document **204**, e.g., an electronic document generated via one of the applications **106**.

[0043] Proceeding to the lower portion of the scenario **200**, the user brings the pen **124** in proximity to the surface of the display device **110** and within the GUI **202**. The pen **124**, for instance, is placed within a particular distance of the display device **110** (e.g., less than 2 centimeters) but not in contact with the display device **110**. This behavior is generally referred to herein as "hovering" the pen **124**. In response to detecting proximity of the pen **124**, a hover target **206** is displayed within the GUI **202** and at a point within the GUI **202** that is directly beneath the tip of the pen **124**. Generally, the hover target **206** represents a visual affordance that indicates that ink functionality is active such that a user may apply ink to the document **204**.

[0044] According to various implementations, the visual appearance (e.g., shape, color, shading, and so forth) of the hover target **206** provides a visual cue indicating a current ink mode that is active. In the scenario **200**, the hover target is presented as a solid circle, which indicates that a permanent ink mode is active. For instance, if the user proceeds to put the pen **124** in contact with the display device **110** to apply ink to the document **204** in a permanent ink mode, the ink will become part of the document **204**, e.g., will be added to a primary content layer of the document **204**. Consider, for example, that the text (e.g., primary content) displayed in the document **204** was created via ink input in a permanent ink mode. Thus, ink applied in a permanent ink mode represents a permanent ink layer that is added to a primary content layer of the document **204**.

[0045] In further response to detecting hovering of the pen **124**, an ink flag **208** is visually presented adjacent to and/or at least partially overlaying a portion of the document **204**. Generally, the ink flag **208** represents a visual affordance that indicates that ink functionality is active such that a user may apply ink to the document **204**. In at least some implementations, the ink flag **208** may be presented additionally or alternatively to the hover target **206**. In this particular example, the ink flag **208** includes a visual cue indicating a current ink mode that is active. In the scenario **200**, the ink flag **208** includes a solid circle, which indicates that a permanent ink mode is active. As further detailed below, the ink flag **208** is selectable to cause an ink menu to be displayed that includes various ink-related functionalities, options, and settings that can be applied.

[0046] FIG. **3** depicts an example implementation scenario **300** for a transient ink mode in accordance with one or more implementations. The upper portion of the scenario **300** includes a graphical user interface (GUI) **302** displayed on the display device **110**. Generally, the GUI **302** represents a GUI for a particular functionality, such as an instance of the applications **106**. Displayed within the GUI **302** is a document **304**, e.g., an electronic document generating via one of the applications **106**. The document **304** includes primary content **306**, which represents content generated as part of a primary content layer for the document **304**. For instance, in this particular example the document **304** is a text-based document, and thus the primary content **306** includes text that is populated to the document. Various other types of documents and primary content may be employed, such as for graphics, multimedia, web content, and so forth.

[0047] As further illustrated, a user is hovering the pen **124** within a certain proximity of the surface of the display device **110**, such as discussed above with reference to the scenario **200**. In response, a hover target **308** is displayed within the document **304** and beneath the tip of the pen. In this particular example, the hover target **308** is presented as a hollow circle, thus indicating that a transient ink mode is active. For instance, if the user proceeds to apply ink to the document **304**, the ink will behave according to a transient ink mode. Examples of different transient ink behaviors are detailed elsewhere herein.

[0048] Further in response to the user hovering the pen **124** over the display device **110**, an ink flag **310** is presented. In this particular example, the ink flag **310** includes a hollow circle **312**, thus providing a visual cue that a transient ink mode is active.

[0049] Proceeding to the lower portion of the scenario **300**, the user removes the pen **124** from proximity to the display device **110**. In response, the hover target **308** and the ink flag **310** are removed from the display device **110**. For instance, in

at least some implementations, a hover target and/or an ink flag are presented when the pen **124** is detected as being hovered over the display device **110**, and are removed from the display device **110** when the pen **124** is removed such that the pen **124** is no longer detected as being hovered over the display device **110**. This is not intended to be limiting, however, and in at least some implementations, an ink flag may be persistently displayed to indicate that inking functionality is active and/or available.

[0050] FIG. **4** depicts an example implementation scenario **400** for a transient ink mode in accordance with one or more implementations. The upper portion of the scenario **300** includes the GUI **302** with the document **304** (introduced above) displayed on the display device **110**. In at least some implementations, the scenario **400** represents an extension of the scenario **300**, above.

[0051] In the upper portion of the scenario **400**, a user applies ink content **402** to the document **304** using the pen **124**. In this particular scenario, the ink content **402** corresponds to an annotation of the document **402**. It is to be appreciated, however, that a variety of different types of transient ink other than annotations may be employed. Notice that as the user is applying the ink content **402**, a hover target is not displayed. For instance, in at least some implementations when the pen **124** transitions from a hover position to contact with the display device **110**, a hover target is removed. Notice also that the ink flag **310** includes a hollow circle **312**, indicating that the ink content **402** is applied according to a transient ink mode.

[0052] Proceeding to the lower portion of the scenario **400**, the user lifts the pen **124** from the display device **110** such that the pen **124** is not detected, e.g., the pen **124** is not in contact with the display device **110** and is not in close enough proximity to the display device **110** to be detected as hovering. In response to the pen **124** no longer being detected in contact with or in proximity to the display device **110**, an ink timer **406** begins running. For instance, the ink timer **406** begins counting down from a specific time value, such as 30 seconds, 60 seconds, and so forth. Generally, the ink timer is representative of functionality to implement a countdown function, such as for tracking time between user interactions with the display device **110** via the pen **124**. The ink timer **406**, for example, represents a functionality of the ink module **118**.

[0053] As a visual cue that the ink counter **406** is elapsing, the hollow circle **312** begins to unwind, e.g., begins to disappear from the ink flag **310**. In at least some implementations, the hollow circle **312** unwinds at a rate that corresponds to the countdown of the ink timer **406**. For instance, when the ink timer **406** is elapsed by 50%, then 50% of the hollow circle **312** is removed from the ink flag **310**. Thus, unwinding of the hollow circle **312** provides a visual cue that the ink timer **406** is elapsing, and how much of the ink timer has elapsed and/or remains to be elapsed.

[0054] In at least some implementations, if the ink timer **406** is elapsing as in the lower portion of the scenario **400** and the user proceeds to place the pen **124** in proximity to the display device **110** (e.g., hovered or in contact with the display device **110**), the ink timer **406** will reset and will not begin elapsing again until the user removes the pen **124** from the display device **110** such that the pen **124** is not detected. In such implementations, the hollow circle **312** will be restored within the ink flag **310** as in the upper portion of the scenario **400**.

[0055] FIG. **5** depicts an example implementation scenario **500** for a transient ink mode in accordance with one or more implementations. The upper portion of the scenario **300** includes the GUI **302** with the document **304** (introduced above) displayed on the display device **110**. In at least some implementations, the scenario **500** represents an extension of the scenario **400**, above.

[0056] In the upper portion of the scenario **500**, the ink timer **406** has elapsed. For instance, notice that the hollow circle **312** has completely unwound within the ink flag **310**, e.g., is visually removed from the ink flag **310**. According to various implementations, this provides a visual cue that the ink timer **406** has completely elapsed.

[0057] Proceeding to the lower portion of the scenario **500**, and in response to expiry of the ink timer **406**, the ink content **402** is removed from the GUI **302** and saved as part of a transient ink layer **504** for the document **304**. Further, the ink flag **310** is populated with a user icon **502**. The user icon **502**, for example, represents a user that is currently logged in to the computing device **102**, and/or a user that interacts with the document **304** to apply the ink content **402**. Alternatively or additionally, the pen **124** includes user identification data that is detected by the computing device **102** and thus is leveraged to track which user is interacting with the document **304**. For example, the pen **124** includes a tagging mechanism (e.g., a radio-frequency identifier (RFID) chip) embedded with a user identity for a particular user. Thus, when the pen **124** is placed in proximity to the display device **110**, the tagging mechanism is detected by the computing device **102** and utilized to attribute ink input and/or other types of input to a particular user. As used herein, the term "user" may be used to refer to an identity for an individual person, and/or an identity for a discrete group of users that are grouped under a single user identity.

[0058] According to various implementations, population of the user icon **502** to the ink flag **310** represents a visual indication that the transient ink layer **504** exists for the document **304**, and that the transient ink layer **504** is associated with (e.g., was generated by) a particular user. Generally, the transient ink layer **504** represents a data layer that is not part of the primary content layer of the document **304**, but that is persisted and can be referenced for various purposes. Further attributes of transient ink layers are described elsewhere herein.

[0059] FIG. **6** depicts an example implementation scenario **600** for a transient ink mode in accordance with one or more implementations. The upper portion of the scenario **600** includes the GUI **302** with the document **304** (introduced above) displayed on the display device **110**. In at least some implementations, the scenario **600** represents an extension of the scenario **500**, above.

[0060] In the upper portion of the scenario **600**, the ink flag **310** is displayed indicating that a transient ink layer (e.g., the transient ink layer **504**) exists for the document **304**, and that the transient ink layer is linked to a particular user represented by the user icon **502** in the ink flag **310**.

[0061] Proceeding to the lower portion of the scenario **600**, a user selects the ink flag **310** with the pen **124**, which causes the ink content **402** to be returned to display as part of the document **304**. The ink content **402**, for example, is bound to the transient ink layer **504**, along with other transient ink content generated for the transient ink layer **504**. Thus, in at

least some implementations, the transient ink layer **504** is accessible by various techniques, such as by selection of the ink flag **310**.

[0062] Additionally or alternatively to selection of the ink flag **310**, if the user proceeds to apply further ink content to the document **304** while in the transient ink mode, the transient ink layer **504** is retrieved and transient ink content included as part of the transient ink layer **504** is displayed as part of the document **504**. In at least some implementations, transient ink content of the transient ink layer **504** is bound (e.g., anchored) to particular portions (e.g., pages, lines, text, and so forth) of the document **304**. For instance, the user generated the ink content **402** adjacent to a particular section of text. Thus, when the transient ink layer **504** is recalled as depicted in the scenario **600**, the ink content **402** is displayed adjacent to the particular section of text.

[0063] According to various implementations, the transient ink layer **504** is cumulative such that a user may add ink content to and remove ink content from the transient ink layer **504** over a span of time and during multiple different interactivity sessions. Thus, the transient ink layer **504** generally represents a record of multiple user interactions with the document **304**, such as for annotations, proofreading, commenting, and so forth. Alternatively or additionally, multiple transient layers may be created for the document **304**, such as when significant changes are made to the primary content **306**, when other users apply transient ink to the document **304**, and so forth.

[0064] In at least some implementations, when the user pauses interaction with the document **304**, the ink timer **406** begins elapsing such as discussed above with reference to the scenarios **400**, **500**. Accordingly, the scenario **600** may return to the scenario **400**.

[0065] FIG. **7** depicts an example implementation of the pen **124** in accordance with one or more implementations. The pen **124** includes a shaft **700**, which represents a main body and/or chassis of the pen **124**. For instance, various components of the pen **124** are attached to and/or contained within the shaft **700**. The pen **124** further includes a tip **702** that extends through a tip portal **704** in a nose **706** of the shaft **700**. The tip **702** represents a portion of the pen **124** that can be leveraged to provide input and/or other types of interactions to an input surface, such as the display device **110** and/or others of the touch input devices **116**. For instance, contact between the tip **702** and an input surface causes digital ink input to be applied to the input surface. As further detailed below, the tip **702** can be retracted and extended relative to the shaft **700** to provide for different input scenarios.

[0066] The pen **124** further includes a pen mode button **708**, which represents a selectable control (e.g., a switch) for switching the pen **124** between different pen input modes. Generally, different pen input modes enable input from the pen **124** to be utilized and/or interpreted by the ink module **118** in different ways. For instance, selecting the pen mode button **708** causes the pen **124** to transition between a permanent ink mode and a transient ink mode.

[0067] A tip button **710** is attached to the shaft **700** and as further detailed below is selectable to retract and extend the tip **702**. In at least some implementations, the pen **124** is configured to provide digital ink input with the tip **702** extended as illustrated in FIG. **7**. Further, the pen **124** is configured to provide non-digital-ink input with the tip **702** retracted, as further detailed below.

[0068] An eraser portion **712** is attached to the pen **124** adjacent to the tip button **710**. The eraser portion **712** is representative of functionality to enable ink content to be erased, such as permanent and/or transient ink.

[0069] The pen **124** further includes internal components **714**, which are representative of components that enable various functionalities of the pen **124**. For instance, the internal components **714** include active electronics such as logic and processing components for controlling different operating modes of the pen **124**. In at least some implementations, the internal components **714** are configured to transmit and receive wireless signals using any suitable wireless protocol, such as Bluetooth, radio-frequency identifier (RFID), and so forth. For instance, the pen **124** can leverage the internal components **124** to transmit a signal that indicates a current ink mode of the pen **124**, such as whether the pen **124** is in a permanent or transient ink mode. Further, the pen **124** can leverage the internal components **124** to transmit a signal that indicates whether ink functionality of the pen **124** is enabled or disabled.

[0070] FIG. **8** depicts an example implementation of the pen **124** in accordance with one or more implementations. In FIG. **8**, the tip **702** is retracted into the shaft **700**. For instance, a user selects (e.g., presses) the tip button **710**, which causes the tip **702** to at least partially retract through the tip portal **704** into the nose **706** of the shaft **700**. The tip portal **704** represents an opening in the nose **706** through which the tip **702** may extend and retract. According to various implementations, with the tip **702** retracted as in FIG. **8**, the pen **124** provides non-digital-ink input to an input surface. For instance, contact between the nose **706** and an input surface provides non-digital-ink input, such as for selection input, object manipulation, and so forth.

[0071] According to various implementations, selecting the tip button **710** while the tip **702** is retracted causes the tip **702** to extend from the nose **706**, such as depicted in FIG. **7**.

[0072] FIG. **9** depicts an example implementation scenario **900** for receiving digital ink input and non-digital-ink input in accordance with one or more implementations. The upper portion of the scenario **900** includes the GUI **302** with the document **304** (introduced above) displayed on the display device **110**. In this particular implementation, the GUI **302** includes a menu region **902** that includes different selectable controls for performing various actions, such as on the document **304**. In at least some implementations, the scenario **900** represents an extension of one or more of the scenarios described above.

[0073] In the upper portion of the scenario **900**, a user manipulates the pen **124** to apply ink content (e.g., digital-ink) to the document **304**. For instance, contact between the tip **702** and the display device **110** causes ink content to be added to the document **304**. As referenced above, with the tip **702** extended the pen **124** is in an ink-enabled mode such that ink is always application when the pen **124** is placed in contact with the display device **110**. In at least some implementations, the ink content is added as permanent ink that becomes part of the primary content **306** of the document **304**. Alternatively, the ink content is added as transient ink of the document **304**. Examples of different transient ink behaviors are discussed throughout.

[0074] Proceeding to the lower portion of the scenario **900**, the user selects the tip button **710**, which causes the tip **702** to retract into the nose **706**. With the tip **702** retracted, the pen **124** is used to provide non-digital-ink input, such as touch

input to the display device **110**. Retracting the tip **702** enables the pen **124** to be used for touch input such as a user would provide via a finger. For instance, with the tip **702** retracted, placing the pen **124** (e.g., the nose **706**) in contact with the display device **110** within the document **304** does not cause ink content to be applied to the document **304**. Non-digital-ink input can be leveraged for various purposes, such as for manipulating the document **304** within the GUI **302**, selecting selectable controls from the menu region **902**, selecting primary content within the document **304**, and so forth. In this particular example, the user places the nose **706** of the pen **124** in contact with the display device **110** and drags (e.g., scrolls) the document **304** within the GUI **302**. Notice that as the user manipulates the document **304** with the tip **702** retracted, ink content is not applied to the document **304**.

[0075] FIG. **10** is a flow diagram that describes steps in a method in accordance with one or more embodiments. The method, for instance, describes an example procedure for processing ink according to a current ink mode in accordance with one or more embodiments.

[0076] Step **1000** detects a pen in proximity to an input surface. The touch input device **116**, for instance, detects that the pen **124** is hovered and/or in contact with the touch input device **116** with the tip **702** extended. As referenced above, a hover operation can be associated with a particular threshold proximity to an input surface such that hovering the pen **124** at or within the threshold proximity to the input surface is interpreted as a hover operation, but placing the pen **124** farther than the threshold proximity from the input surface is not interpreted as a hover operation.

[0077] Step **1002** ascertains a current ink mode. The ink module **118**, for example, ascertains an ink mode that is currently active on the computing device **102**. Examples of different ink modes are detailed elsewhere herein, and include a permanent ink mode and a transient ink mode.

[0078] In at least some implementations, a current ink mode may be automatically selected by the ink module **118**, such as based on an application and/or document context that is currently in focus. For instance, an application **106** may specify a default ink mode that is to be active for the application. Further, some applications may specify ink mode permissions that indicate allowed and disallowed ink modes. A particular application **106**, for example, may specify that a permanent ink mode is not allowed for documents presented by the application, such as to protect documents from being edited.

[0079] Alternatively or additionally, a current ink mode is user-selectable, such as in response to user input selecting an ink mode from the ink menu **802**. For instance, a user may cause a switch from a default ink mode for an application to a different ink mode. The user, for example, can select the pen mode button **708** to cause the pen **124** and/or the ink module **118** to switch between different ink modes.

[0080] In at least some implementations, ascertaining a current ink mode includes ascertaining whether the pen is in an ink-enabled mode or an ink-disabled mode, such as ascertaining whether the tip **702** of the pen **124** is extended or retracted.

[0081] Step **1004** causes a visual affordance identifying the current ink mode to be displayed. Examples of such an affordance include a hover target, a visual included as part of an ink flag, and so forth. Examples of different visual affordances are detailed throughout this description and the accompanying drawings.

[0082] Step **1006** processes ink content applied to the input surface according to the current ink mode. The ink content, for instance, is processed as permanent ink, transient ink, and so forth. For example, if a permanent ink mode is active, the ink content is saved as permanent ink, such as part of a primary content layer of a document. If the transient ink mode is active, the ink content is propagated to a transient ink layer of a document. Examples of different mode-specific ink behaviors and actions are detailed elsewhere herein.

[0083] FIG. **11** is a flow diagram that describes steps in a method in accordance with one or more embodiments. The method, for instance, describes an example procedure for a transient ink timer in accordance with one or more implementations. In at least some implementations, the method represents an extension of the method described above with reference to FIG. **10**.

[0084] Step **1100** receives ink content applied to a document via input from a pen to an input surface while in a transient ink mode. The ink module **118**, for example, processes ink content received from the pen **124** to the display device **110** as transient ink.

[0085] Step **1102** detects that the pen is removed from proximity to the input surface. For instance, the touch input device **116** detects that the pen **124** is not in contact with and is not hovering over a surface of the touch input device **116**, e.g., the display device **110**.

[0086] Step **1104** initiates a timer. The timer, for example, is initiated in response to detecting that the pen is removed from proximity to the input surface. In at least some implementations, a visual representation of the timer is presented. For instance, the visual representation provides a visual cue that the timer is elapsing, and indicates a relative amount (e.g., percentage) of the timer that has elapsed. The visual representation, for example, is animated to visually convey that the timer is elapsing. One example of a visual representation of a timer is discussed above with reference to FIGS. **4** and **5**.

[0087] Step **1106** ascertains whether the pen is detected at the input surface before the timer expires. For instance, the ink module **118** ascertains whether the pen **124** is detected is contact with and/or hovering over the touch input device **116** prior to expiry of the timer. If the pen is detected at the input surface prior to expiry of the timer ("Yes"), step **1108** resets the timer and the process returns to step **1100**.

[0088] If the pen is not detected at the input surface prior to expiry of the timer ("No"), step **1110** removes the ink content from the document and propagates the ink content to a transient layer for the document. For instance, response to expiry of the timer, the transient ink content is removed from display and propagated to a transient data layer for the document that is separate from a primary content layer of the document. In at least some implementations, a new transient ink layer is created for the document, and the transient ink content is propagated to the new transient ink layer. Alternatively or additionally, the transient ink content is propagated to an existing transient ink layer. For example, the transient ink layer may represent an accumulation of transient ink provided by a user over multiple different interactions with the document and over a period of time.

[0089] As discussed above, the transient ink layer may be associated with a particular user, e.g., a user that applies the transient ink content to the document. Thus, the transient ink is linked to the particular user and may subsequently be accessed by the user.

[0090] FIG. **12** is a flow diagram that describes steps in a method in accordance with one or more embodiments. The method, for instance, describes an example procedure for processing pen input based on a pen mode in accordance with one or more implementations. In at least some implementations, the method represents an extension of one or more of the methods described above.

[0091] Step **1200** detects pen input from a pen to an input surface. The ink module **118**, for instance, detects that the pen **124** is in contact with the display device **110** provides input to the display device **110**.

[0092] Step **1202** ascertains whether the pen is in an ink-enabled mode or an ink-disabled mode. The ink module **118**, for example, ascertains whether the pen **124** is in an ink-enabled or ink-disabled mode. In at least some implementations, the pen **124** can transmit a wireless signal that identifies whether the pen **124** is in an ink-enabled or ink-disabled mode. Alternatively or additionally, the ink module **118** can detect a state of the tip **702** and can ascertain whether the pen **124** is in an ink-enabled or ink-disabled mode based on the state. For instance, if the ink module **118** detects that the tip **702** is extended, the ink module **118** ascertains that the pen **124** is in an ink-enabled mode. However, if the ink module **118** detects that the tip **702** is retracted, the ink module **118** ascertains that the pen **124** is in an ink-disabled mode.

[0093] In at least some implementations, the ink module **118** detects whether the tip **702** is extended or retracted, and enables or disables ink functionality of the client device **102** based on whether the tip **702** is extended or retracted.

[0094] If the pen is in an ink-enabled mode ("Ink-Enabled"), step **1204** processes the pen input as digital ink input. For instance, the pen input is converted to ink content that is displayed on the display device **110**. According to various implementations, the ink content may be permanent ink or transient ink. As referenced above, the pen **124** will apply ink whenever the pen is in an ink-enabled mode.

[0095] If the pen is in an ink-disabled mode ("Ink-Disabled"), step **1206** processes the pen input as non-digital-ink input. Generally, non-digital-ink input does not cause ink content to be applied. For instance, non-digital-ink input is used for other purposes than applying ink content, such as object selection and manipulation, document navigation, and so forth.

[0096] FIG. **13** is a flow diagram that describes steps in a method in accordance with one or more embodiments. The method, for instance, describes an example procedure for processing pen input based on an ink mode in accordance with one or more implementations. In at least some implementations, the method represents an extension of one or more of the methods described above.

[0097] Step **1300** receives ink input to an input surface from a pen. The ink module **118**, for instance, detects that ink input is provided by the pen **124**. In at least some implementations, the ink module **118** detects that the ink input is provided when the pen **124** is in an ink-enabled mode.

[0098] Step **1302** ascertains whether the pen is in a permanent ink mode or a transient ink mode. For instance, the pen **124** communicates a signal to the client device **102** indicating whether the pen **124** is in a permanent ink mode or a transient ink mode. The signal, for instance, is communicated as a wireless signal from the pen **124**. Alternatively or additionally, the signal is communicated via contact between the pen **124** and an input surface, e.g., the display device **110**. For instance, the signal can be electrically conducted across the tip **702** to the display device **110** and to internal components of the client device **102** to convey information identifying a current mode of the pen **124**.

[0099] If the pen is in a permanent ink mode ("Permanent"), step **1304** processes the ink input as permanent ink. For instance, the ink input is displayed and/or added to a permanent ink layer.

[0100] If the pen is in a transient ink mode ("Transient"), step **1306** processes the ink input as transient ink. The ink input, for example, is added to a transient ink layer that may be subsequent accessed. Examples of different permanent and transient ink behaviors are detailed throughout.

[0101] FIG. **14** is a flow diagram that describes steps in a method in accordance with one or more embodiments. The method, for instance, describes an example procedure for erasing digital ink in accordance with one or more implementations. In at least some implementations, the method represents an extension of one or more of the methods described above.

[0102] Step **1400** receives an indication of contact between an eraser portion of a pen and digital ink displayed on an input surface. The ink module **118**, for instance, detects that the eraser portion **712** of the pen **124** is in contact with digital ink displayed on the display device **110**.

[0103] Step **1402** causes the digital ink to be removed from the input surface in response to the indication. The ink module **118**, for example, deletes the digital ink. For instance, the digital ink is removed from display and data describing the digital ink is deleted.

[0104] Although discussed separately, it is to be appreciated that the implementations, scenarios, and procedures described above can be combined and implemented together in various ways. For instance, the implementations, scenarios, and procedures describe different functionalities of single integrated inking platform, such as implemented by the ink module **118**.

[0105] Having described some example implementation scenarios and procedures for pen input modes for digital ink, consider now a discussion of an example system and device in accordance with one or more embodiments.

[0106] Example System and Device

[0107] FIG. **15** illustrates an example system generally at **1500** that includes an example computing device **1502** that is representative of one or more computing systems and/or devices that may implement various techniques described herein. For example, the client device **102** discussed above with reference to FIG. **1** can be embodied as the computing device **1502**. The computing device **1502** may be, for example, a server of a service provider, a device associated with the client (e.g., a client device), an on-chip system, and/or any other suitable computing device or computing system.

[0108] The example computing device **1502** as illustrated includes a processing system **1504**, one or more computer-readable media **1506**, and one or more Input/Output (I/O) Interfaces **1508** that are communicatively coupled, one to another. Although not shown, the computing device **1502** may further include a system bus or other data and command transfer system that couples the various components, one to another. A system bus can include any one or combination of different bus structures, such as a memory bus or memory controller, a peripheral bus, a universal serial bus, and/or a processor or local bus that utilizes any of a variety of bus

architectures. A variety of other examples are also contemplated, such as control and data lines.

[0109] The processing system **1504** is representative of functionality to perform one or more operations using hardware. Accordingly, the processing system **1504** is illustrated as including hardware element **1510** that may be configured as processors, functional blocks, and so forth. This may include implementation in hardware as an application specific integrated circuit or other logic device formed using one or more semiconductors. The hardware elements **1510** are not limited by the materials from which they are formed or the processing mechanisms employed therein. For example, processors may be comprised of semiconductor(s) and/or transistors (e.g., electronic integrated circuits (ICs)). In such a context, processor-executable instructions may be electronically-executable instructions.

[0110] The computer-readable media **1506** is illustrated as including memory/storage **1512**. The memory/storage **1512** represents memory/storage capacity associated with one or more computer-readable media. The memory/storage **1512** may include volatile media (such as random access memory (RAM)) and/or nonvolatile media (such as read only memory (ROM), Flash memory, optical disks, magnetic disks, and so forth). The memory/storage **1512** may include fixed media (e.g., RAM, ROM, a fixed hard drive, and so on) as well as removable media (e.g., Flash memory, a removable hard drive, an optical disc, and so forth). The computer-readable media **1506** may be configured in a variety of other ways as further described below.

[0111] Input/output interface(s) **1508** are representative of functionality to allow a user to enter commands and information to computing device **1502**, and also allow information to be presented to the user and/or other components or devices using various input/output devices. Examples of input devices include a keyboard, a cursor control device (e.g., a mouse), a microphone (e.g., for voice recognition and/or spoken input), a scanner, touch functionality (e.g., capacitive or other sensors that are configured to detect physical touch), a camera (e.g., which may employ visible or non-visible wavelengths such as infrared frequencies to detect movement that does not involve touch as gestures), and so forth. Examples of output devices include a display device (e.g., a monitor or projector), speakers, a printer, a network card, tactile-response device, and so forth. Thus, the computing device **1502** may be configured in a variety of ways as further described below to support user interaction.

[0112] Various techniques may be described herein in the general context of software, hardware elements, or program modules. Generally, such modules include routines, programs, objects, elements, components, data structures, and so forth that perform particular tasks or implement particular abstract data types. The terms "module," "functionality," "entity," and "component" as used herein generally represent software, firmware, hardware, or a combination thereof. The features of the techniques described herein are platform-independent, meaning that the techniques may be implemented on a variety of commercial computing platforms having a variety of processors.

[0113] An implementation of the described modules and techniques may be stored on or transmitted across some form of computer-readable media. The computer-readable media may include a variety of media that may be accessed by the computing device **1502**. By way of example, and not limitation, computer-readable media may include "computer-readable storage media" and "computer-readable signal media."

[0114] "Computer-readable storage media" may refer to media and/or devices that enable persistent storage of information in contrast to mere signal transmission, carrier waves, or signals per se. Computer-readable storage media do not include signals per se. The computer-readable storage media includes hardware such as volatile and non-volatile, removable and non-removable media and/or storage devices implemented in a method or technology suitable for storage of information such as computer readable instructions, data structures, program modules, logic elements/circuits, or other data. Examples of computer-readable storage media may include, but are not limited to, RAM, ROM, EEPROM, flash memory or other memory technology, CD-ROM, digital versatile disks (DVD) or other optical storage, hard disks, magnetic cassettes, magnetic tape, magnetic disk storage or other magnetic storage devices, or other storage device, tangible media, or article of manufacture suitable to store the desired information and which may be accessed by a computer.

[0115] "Computer-readable signal media" may refer to a signal-bearing medium that is configured to transmit instructions to the hardware of the computing device **1502**, such as via a network. Signal media typically may embody computer readable instructions, data structures, program modules, or other data in a modulated data signal, such as carrier waves, data signals, or other transport mechanism. Signal media also include any information delivery media. The term "modulated data signal" means a signal that has one or more of its characteristics set or changed in such a manner as to encode information in the signal. By way of example, and not limitation, communication media include wired media such as a wired network or direct-wired connection, and wireless media such as acoustic, radio frequency (RF), infrared, and other wireless media.

[0116] As previously described, hardware elements **1510** and computer-readable media **1506** are representative of instructions, modules, programmable device logic and/or fixed device logic implemented in a hardware form that may be employed in some embodiments to implement at least some aspects of the techniques described herein. Hardware elements may include components of an integrated circuit or on-chip system, an application-specific integrated circuit (ASIC), a field-programmable gate array (FPGA), a complex programmable logic device (CPLD), and other implementations in silicon or other hardware devices. In this context, a hardware element may operate as a processing device that performs program tasks defined by instructions, modules, and/or logic embodied by the hardware element as well as a hardware device utilized to store instructions for execution, e.g., the computer-readable storage media described previously.

[0117] Combinations of the foregoing may also be employed to implement various techniques and modules described herein. Accordingly, software, hardware, or program modules and other program modules may be implemented as one or more instructions and/or logic embodied on some form of computer-readable storage media and/or by one or more hardware elements **1510**. The computing device **1502** may be configured to implement particular instructions and/or functions corresponding to the software and/or hardware modules. Accordingly, implementation of modules that are executable by the computing device **1502** as software may be achieved at least partially in hardware, e.g., through use of

computer-readable storage media and/or hardware elements **1510** of the processing system. The instructions and/or functions may be executable/operable by one or more articles of manufacture (for example, one or more computing devices **1502** and/or processing systems **1504**) to implement techniques, modules, and examples described herein.

[0118] As further illustrated in FIG. **15**, the example system **1500** enables ubiquitous environments for a seamless user experience when running applications on a personal computer (PC), a television device, and/or a mobile device. Services and applications run substantially similar in all three environments for a common user experience when transitioning from one device to the next while utilizing an application, playing a video game, watching a video, and so on.

[0119] In the example system **1500**, multiple devices are interconnected through a central computing device. The central computing device may be local to the multiple devices or may be located remotely from the multiple devices. In one embodiment, the central computing device may be a cloud of one or more server computers that are connected to the multiple devices through a network, the Internet, or other data communication link.

[0120] In one embodiment, this interconnection architecture enables functionality to be delivered across multiple devices to provide a common and seamless experience to a user of the multiple devices. Each of the multiple devices may have different physical requirements and capabilities, and the central computing device uses a platform to enable the delivery of an experience to the device that is both tailored to the device and yet common to all devices. In one embodiment, a class of target devices is created and experiences are tailored to the generic class of devices. A class of devices may be defined by physical features, types of usage, or other common characteristics of the devices.

[0121] In various implementations, the computing device **1502** may assume a variety of different configurations, such as for computer **1514**, mobile **1516**, and television **1518** uses. Each of these configurations includes devices that may have generally different constructs and capabilities, and thus the computing device **1502** may be configured according to one or more of the different device classes. For instance, the computing device **1502** may be implemented as the computer **1514** class of a device that includes a personal computer, desktop computer, a multi-screen computer, laptop computer, netbook, and so on.

[0122] The computing device **1502** may also be implemented as the mobile **1516** class of device that includes mobile devices, such as a mobile phone, portable music player, portable gaming device, a tablet computer, a wearable device, a multi-screen computer, and so on. The computing device **1502** may also be implemented as the television **1518** class of device that includes devices having or connected to generally larger screens in casual viewing environments. These devices include televisions, set-top boxes, gaming consoles, and so on.

[0123] The techniques described herein may be supported by these various configurations of the computing device **1502** and are not limited to the specific examples of the techniques described herein. For example, functionalities discussed with reference to the client device **102** and/or ink module **118** may be implemented all or in part through use of a distributed system, such as over a "cloud" **1520** via a platform **1522** as described below.

[0124] The cloud **1520** includes and/or is representative of a platform **1522** for resources **1524**. The platform **1522** abstracts underlying functionality of hardware (e.g., servers) and software resources of the cloud **1520**. The resources **1524** may include applications and/or data that can be utilized while computer processing is executed on servers that are remote from the computing device **1502**. Resources **1524** can also include services provided over the Internet and/or through a subscriber network, such as a cellular or Wi-Fi network.

[0125] The platform **1522** may abstract resources and functions to connect the computing device **1502** with other computing devices. The platform **1522** may also serve to abstract scaling of resources to provide a corresponding level of scale to encountered demand for the resources **1524** that are implemented via the platform **1522**. Accordingly, in an interconnected device embodiment, implementation of functionality described herein may be distributed throughout the system **1500**. For example, the functionality may be implemented in part on the computing device **1502** as well as via the platform **1522** that abstracts the functionality of the cloud **1520**.

[0126] Discussed herein are a number of methods that may be implemented to perform techniques discussed herein. Aspects of the methods may be implemented in hardware, firmware, or software, or a combination thereof The methods are shown as a set of steps that specify operations performed by one or more devices and are not necessarily limited to the orders shown for performing the operations by the respective blocks. Further, an operation shown with respect to a particular method may be combined and/or interchanged with an operation of a different method in accordance with one or more implementations. Aspects of the methods can be implemented via interaction between various entities discussed above with reference to the environment **100**.

[0127] Implementations discussed herein include:

EXAMPLE 1

[0128] A pen apparatus including: a shaft; a tip portion that is retractably engaged with the shaft such that the tip portion is extendable from the shaft and retractable at least partially into the shaft; and a tip button that is selectable to extend and retract the tip portion relative to the shaft, the pen apparatus configured to apply digital ink to an input surface of a computing device in response to interaction of the pen with the input surface with the tip portion extended from the shaft, and configured to apply non-digital-ink input to the input surface of the computing device in response to interaction of the pen with the input surface with the tip portion at least partially retracted into the shaft.

EXAMPLE 2

[0129] A pen apparatus as described in example 1, further including an active component configured to interact with the input surface to cause digital ink to be applied to the input surface in response to interaction of the pen with the input surface with the tip portion extended from the shaft.

EXAMPLE 3

[0130] A pen apparatus as described in one or more of examples 1 or 2, further including an active component configured to interact with the input surface to cause digital ink to be applied to the input surface in response to interaction of the pen with the input surface with the tip portion at least partially

extended from the shaft, and wherein the active component is further configured to interact with the input surface to cause non-digital ink input to be applied to the input surface in response to interaction of the pen with the input surface with the tip portion at least partially retracted into the shaft.

EXAMPLE 4

[0131] A pen apparatus as described in one or more of examples 1-3, wherein the non-digital ink input includes touch input to the input surface such that digital ink is not applied to the input surface in response to interaction of the pen with the input surface with the tip portion at least partially retracted into the shaft.

EXAMPLE 5

[0132] A pen apparatus as described in one or more of examples 1-4, further including a pen mode button positioned on the shaft, the pen mode button being selectable to cause the pen apparatus to apply digital ink to the input surface in different ink modes and in response to interaction of the pen with the input surface with the tip portion at least partially extended from the shaft.

EXAMPLE 6

[0133] A pen apparatus as described in one or more of examples 1-5, further including a pen mode button positioned on the shaft, the pen mode button being selectable to cause the pen apparatus to switch between applying digital ink in a permanent ink mode and applying digital ink in a transient ink mode.

EXAMPLE 7

[0134] A pen apparatus as described in one or more of examples 1-6, wherein retraction of the tip portion causes the tip portion to be non-detectable to the input surface.

EXAMPLE 8

[0135] A pen apparatus as described in one or more of examples 1-7, wherein the pen apparatus is configured such that retraction of the tip portion disables one or more of ink functionality of the pen apparatus or ink functionality of the input surface.

EXAMPLE 9

[0136] A pen apparatus as described in one or more of examples 1-8, wherein the shaft includes an eraser portion that is configured to erase digital ink applied to the input surface.

EXAMPLE 10

[0137] A system for processing digital ink input and non-digital-ink input, the system including: an input surface; one or more processors; and one or more computer-readable storage media storing computer-executable instructions that, responsive to execution by the one or more processors, cause the system to perform operations including: detecting pen input from a pen to the input surface; processing the pen input as digital ink input in response to ascertaining that the pen is in an ink-enabled mode; and processing the pen input as non-digital-ink input in response to ascertaining that the pen is in an ink-disabled mode.

EXAMPLE 11

[0138] A system as described in example 10, wherein the instructions further include ascertaining whether the pen is in the ink-enabled mode or the ink-disabled mode by determining whether a tip portion of the pen is in an extended or retracted position.

EXAMPLE 12

[0139] A system as described in one or more of examples 10 or 11, wherein the instructions further include determining that a tip portion of the pen is in a retracted position, and in response processing the pen input to the input surface as non-digital-ink input.

EXAMPLE 13

[0140] A system as described in one or more of examples 10-12, wherein said processing the pen input as non-digital-ink input includes processing the pen input such that digital ink is not applied to the input surface in response to contact between the pen and the input surface.

EXAMPLE 14

[0141] A system as described in one or more of examples 10-13, wherein the pen input includes pen input to a digital document, and wherein the operations further include: ascertaining that the pen is in a transient ink mode, wherein processing the pen input as digital-ink input includes causing the digital ink input to be propagated to a transient ink layer for the digital document.

EXAMPLE 15

[0142] A system as described in one or more of examples 10-14, wherein the operations further include: receiving an indication of contact between an eraser portion of the pen and digital ink displayed on the input surface; and causing the digital ink to be removed from the input surface in response to the indication.

EXAMPLE 16

[0143] A computer-implemented method for processing permanent ink input and transient ink input, the method including: receiving by a computing system ink input to an input surface from a pen apparatus; processing by the computing system the ink input as transient ink in response to ascertaining that the pen apparatus is in a transient ink mode; and processing by the computing system the ink input as permanent ink in response to ascertaining that the pen apparatus is in a permanent ink mode.

EXAMPLE 17

[0144] A computer-implemented method as described in example 16, further including ascertaining whether the pen apparatus is in the transient ink mode or the permanent ink mode based on a signal from the pen apparatus indicating a current active ink mode for the pen apparatus.

EXAMPLE 18

[0145] A computer-implemented method as described in one or more of examples 16 or 17, wherein the ink input includes ink input to a digital document, and wherein said

processing the ink input as transient ink includes propagating the ink input to a transient layer for the digital document.

EXAMPLE 19

[0146] A computer-implemented method as described in one or more of examples 16-18, wherein the ink input includes ink input to a digital document, wherein said processing the ink input as transient ink includes propagating the ink input to a transient ink layer for the digital document, and wherein the method further includes enabling the transient ink layer to be accessible separately from primary content of the digital document.

EXAMPLE 20

[0147] A computer-implemented method as described in one or more of examples 16-19, further including: detecting further pen input to the input surface; ascertaining that the pen apparatus is in an ink-disabled mode; and processing further pen input to the input surface as non-digital-ink input in response to ascertaining that the pen apparatus is in an ink-disabled mode.

CONCLUSION

[0148] Techniques for pen input modes for digital ink are described. Although embodiments are described in language specific to structural features and/or methodological acts, it is to be understood that the embodiments defined in the appended claims are not necessarily limited to the specific features or acts described. Rather, the specific features and acts are disclosed as example forms of implementing the claimed embodiments.

What is claimed is:

1. A pen apparatus comprising:

a shaft;

a tip portion that is retractably engaged with the shaft such that the tip portion is extendable from the shaft and retractable at least partially into the shaft; and

a tip button that is selectable to extend and retract the tip portion relative to the shaft,

the pen apparatus configured to apply digital ink to an input surface of a computing device in response to interaction of the pen with the input surface with the tip portion extended from the shaft, and configured to apply non-digital-ink input to the input surface of the computing device in response to interaction of the pen with the input surface with the tip portion at least partially retracted into the shaft.

2. A pen apparatus as recited in claim **1**, further comprising an active component configured to interact with the input surface to cause digital ink to be applied to the input surface in response to interaction of the pen with the input surface with the tip portion extended from the shaft.

3. A pen apparatus as recited in claim **1**, further comprising an active component configured to interact with the input surface to cause digital ink to be applied to the input surface in response to interaction of the pen with the input surface with the tip portion at least partially extended from the shaft, and wherein the active component is further configured to interact with the input surface to cause non-digital ink input to be applied to the input surface in response to interaction of the pen with the input surface with the tip portion at least partially retracted into the shaft.

4. A pen apparatus as recited in claim **1**, wherein the non-digital ink input comprises touch input to the input surface such that digital ink is not applied to the input surface in response to interaction of the pen with the input surface with the tip portion at least partially retracted into the shaft.

5. A pen apparatus as recited in claim **1**, further comprising a pen mode button positioned on the shaft, the pen mode button being selectable to cause the pen apparatus to apply digital ink to the input surface in different ink modes and in response to interaction of the pen with the input surface with the tip portion at least partially extended from the shaft.

6. A pen apparatus as recited in claim **1**, further comprising a pen mode button positioned on the shaft, the pen mode button being selectable to cause the pen apparatus to switch between applying digital ink in a permanent ink mode and applying digital ink in a transient ink mode.

7. A pen apparatus as recited in claim **1**, wherein retraction of the tip portion causes the tip portion to be non-detectable to the input surface.

8. A pen apparatus as recited in claim **1**, wherein the pen apparatus is configured such that retraction of the tip portion disables one or more of ink functionality of the pen apparatus or ink functionality of the input surface.

9. A pen apparatus as recited in claim **1**, wherein the shaft includes an eraser portion that is configured to erase digital ink applied to the input surface.

10. A system comprising:

an input surface;

one or more processors; and

one or more computer-readable storage media storing computer-executable instructions that, responsive to execution by the one or more processors, cause the system to perform operations including:

detecting pen input from a pen to the input surface;

processing the pen input as digital ink input in response to ascertaining that the pen is in an ink-enabled mode; and

processing the pen input as non-digital-ink input in response to ascertaining that the pen is in an ink-disabled mode.

11. The system as described in claim **10**, wherein the instructions further include ascertaining whether the pen is in the ink-enabled mode or the ink-disabled mode by determining whether a tip portion of the pen is in an extended or retracted position.

12. The system as described in claim **10**, wherein the instructions further include determining that a tip portion of the pen is in a retracted position, and in response processing the pen input to the input surface as non-digital-ink input.

13. The system as described in claim **10**, wherein said processing the pen input as non-digital-ink input includes processing the pen input such that digital ink is not applied to the input surface in response to contact between the pen and the input surface.

14. The system as described in claim **10**, wherein the pen input comprises pen input to a digital document, and wherein the operations further include:

ascertaining that the pen is in a transient ink mode,

wherein processing the pen input as digital-ink input comprises causing the digital ink input to be propagated to a transient ink layer for the digital document.

15. The system as described in claim **10**, wherein the operations further include:

receiving an indication of contact between an eraser portion of the pen and digital ink displayed on the input surface; and

causing the digital ink to be removed from the input surface in response to the indication.

16. A computer-implemented method, comprising:

receiving by a computing system ink input to an input surface from a pen apparatus;

processing by the computing system the ink input as transient ink in response to ascertaining that the pen apparatus is in a transient ink mode; and

processing by the computing system the ink input as permanent ink in response to ascertaining that the pen apparatus is in a permanent ink mode.

17. A computer-implemented method as recited in claim **16**, further comprising ascertaining whether the pen apparatus is in the transient ink mode or the permanent ink mode based on a signal from the pen apparatus indicating a current active ink mode for the pen apparatus.

18. A computer-implemented method as recited in claim **16**, wherein the ink input comprises ink input to a digital document, and wherein said processing the ink input as transient ink comprises propagating the ink input to a transient layer for the digital document.

19. A computer-implemented method as recited in claim **16**, wherein the ink input comprises ink input to a digital document, wherein said processing the ink input as transient ink comprises propagating the ink input to a transient ink layer for the digital document, and wherein the method further comprises enabling the transient ink layer to be accessible separately from primary content of the digital document.

20. A computer-implemented method as recited in claim **16**, further comprising:

detecting further pen input to the input surface;

ascertaining that the pen apparatus is in an ink-disabled mode; and

processing further pen input to the input surface as non-digital-ink input in response to ascertaining that the pen apparatus is in an ink-disabled mode.

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