US010936270B2

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

(10) **Patent No.: US 10,936,270 B2**
(45) **Date of Patent: Mar. 2, 2021**

(54) **PRESENTATION FACILITATION**

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(73) Assignee: **Microsoft Technology Licensing, LLC**, Redmond, WA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 834 days.

(21) Appl. No.: **15/374,540**

(22) Filed: **Dec. 9, 2016**

(65) **Prior Publication Data**

US 2017/0090845 A1 Mar. 30, 2017

Related U.S. Application Data

(63) Continuation of application No. 12/628,784, filed on Dec. 1, 2009, now Pat. No. 9,626,064, which is a continuation of application No. 10/957,037, filed on Oct. 1, 2004, now Pat. No. 7,640,502.

(51) **Int. Cl.**

G06F 3/14	(2006.01)
G06F 3/0481	(2013.01)
G06Q 10/10	(2012.01)
G06F 3/0484	(2013.01)

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

CPC ***G06F 3/1423*** (2013.01); ***G06F 3/0481*** (2013.01); ***G06F 3/04842*** (2013.01); ***G06Q 10/10*** (2013.01); *G06F 2203/04803* (2013.01)

(58) **Field of Classification Search**

CPC . G06Q 10/10; G06F 17/30017; G06F 3/0481; G06F 2203/04803

See application file for complete search history.

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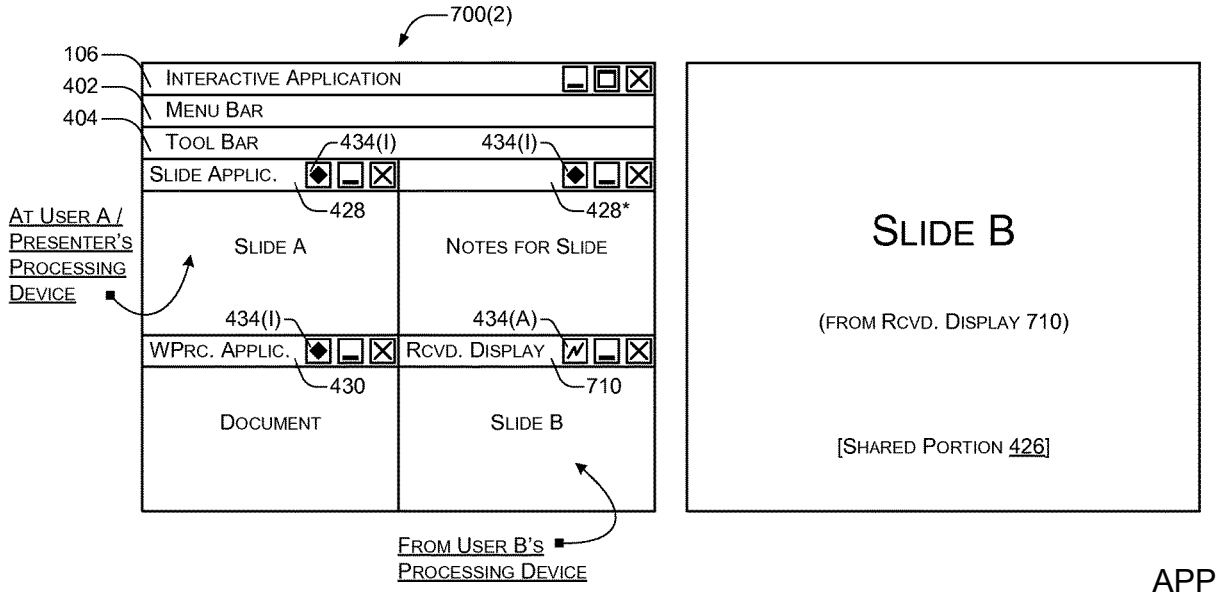
Primary Examiner — Maryam M Ipakchi

(57) **ABSTRACT**

Multiple schemes and techniques for facilitating presentations with an interactive application are described. For example, an interactive application provides a console view overlay for integrating multiple productivity applications into a graphical user interface (GUI) window. An interactive application can also share a selected display portion of the console view overlay with other interactive applications. As another example, presenters and other audience members can draw on the selected display portion being shared, and the drawn graphics are synchronously displayed by the other interactive applications. Interactive applications, as directed by their users, can join various member groups and specific presentations thereof. Moreover, a user may share content in accordance with membership grouping.

20 Claims, 22 Drawing Sheets



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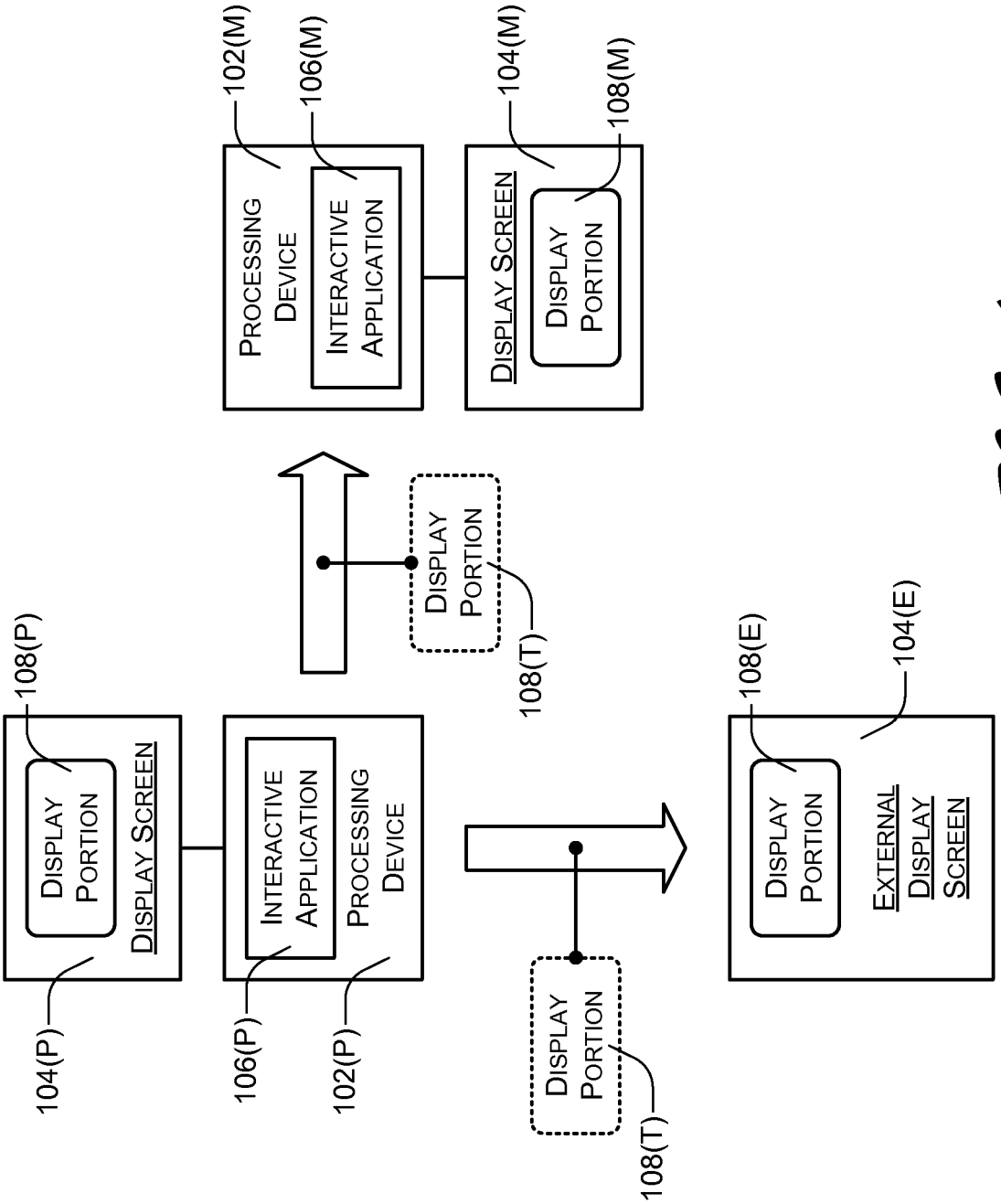

102(M)
106(M)
PROCESSING DEVICE
INTERACTIVE APPLICATION
104(M)
108(M)
DISPLAY SCREEN
DISPLAY PORTION
DISPLAY PORTION
108(T)
108(P)
DISPLAY PORTION
DISPLAY SCREEN
INTERACTIVE APPLICATION
PROCESSING DEVICE
104(P)
106(P)
102(P)
DISPLAY PORTION
108(T)
108(E)
104(E)
DISPLAY PORTION
EXTERNAL DISPLAY SCREEN

FIG. 1

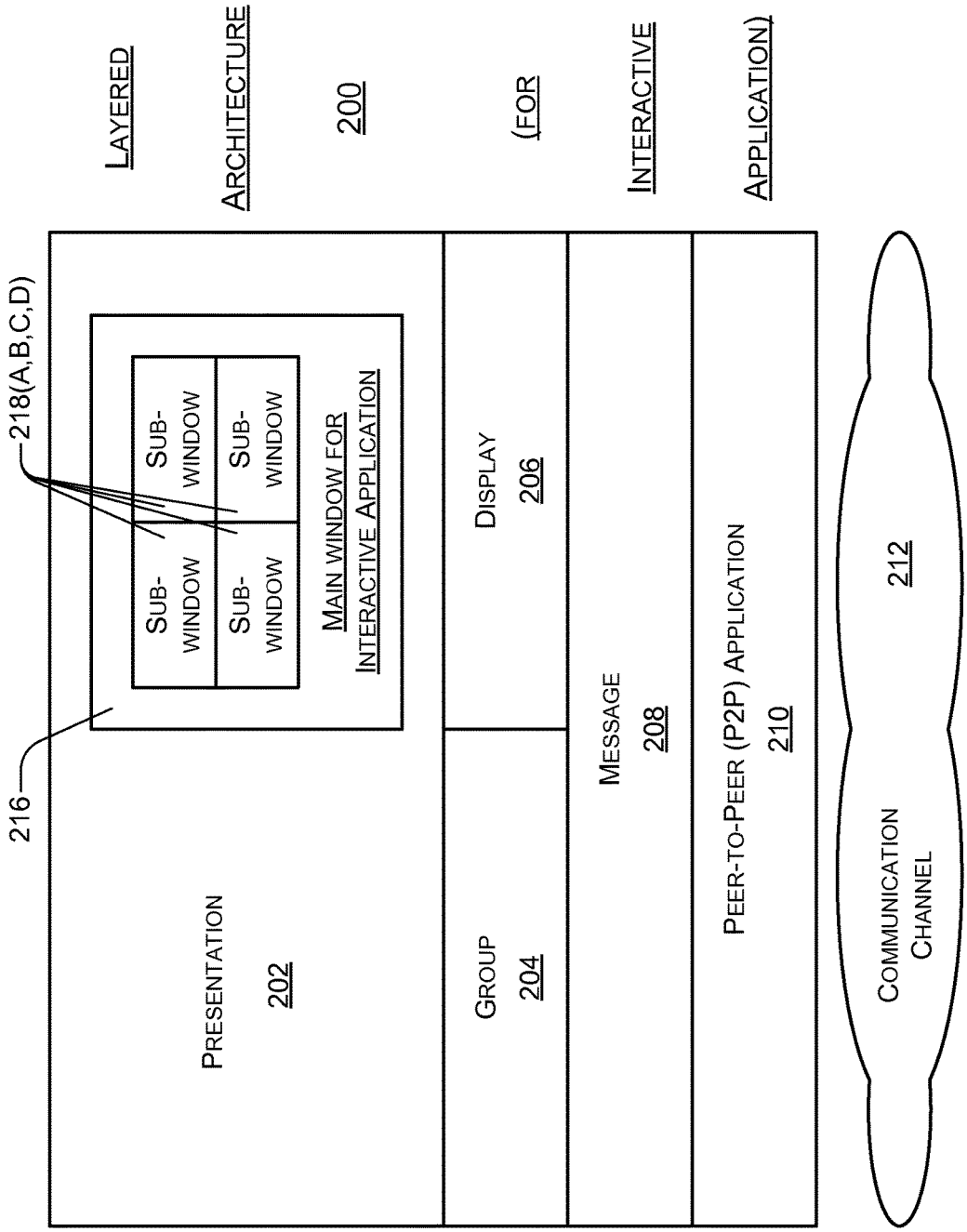

LAYERED ARCHITECTURE 200 (FOR INTERACTIVE APPLICATION)
218(A,B,C,D)
SUB-WINDOW
SUB-WINDOW
SUB-WINDOW
SUB-WINDOW
MAIN WINDOW FOR INTERACTIVE APPLICATION
216
PRESENTATION 202
DISPLAY 206
GROUP 204
MESSAGE 208
PEER-TO-PEER (P2P) APPLICATION 210
COMMUNICATION CHANNEL 212

FIG. 2

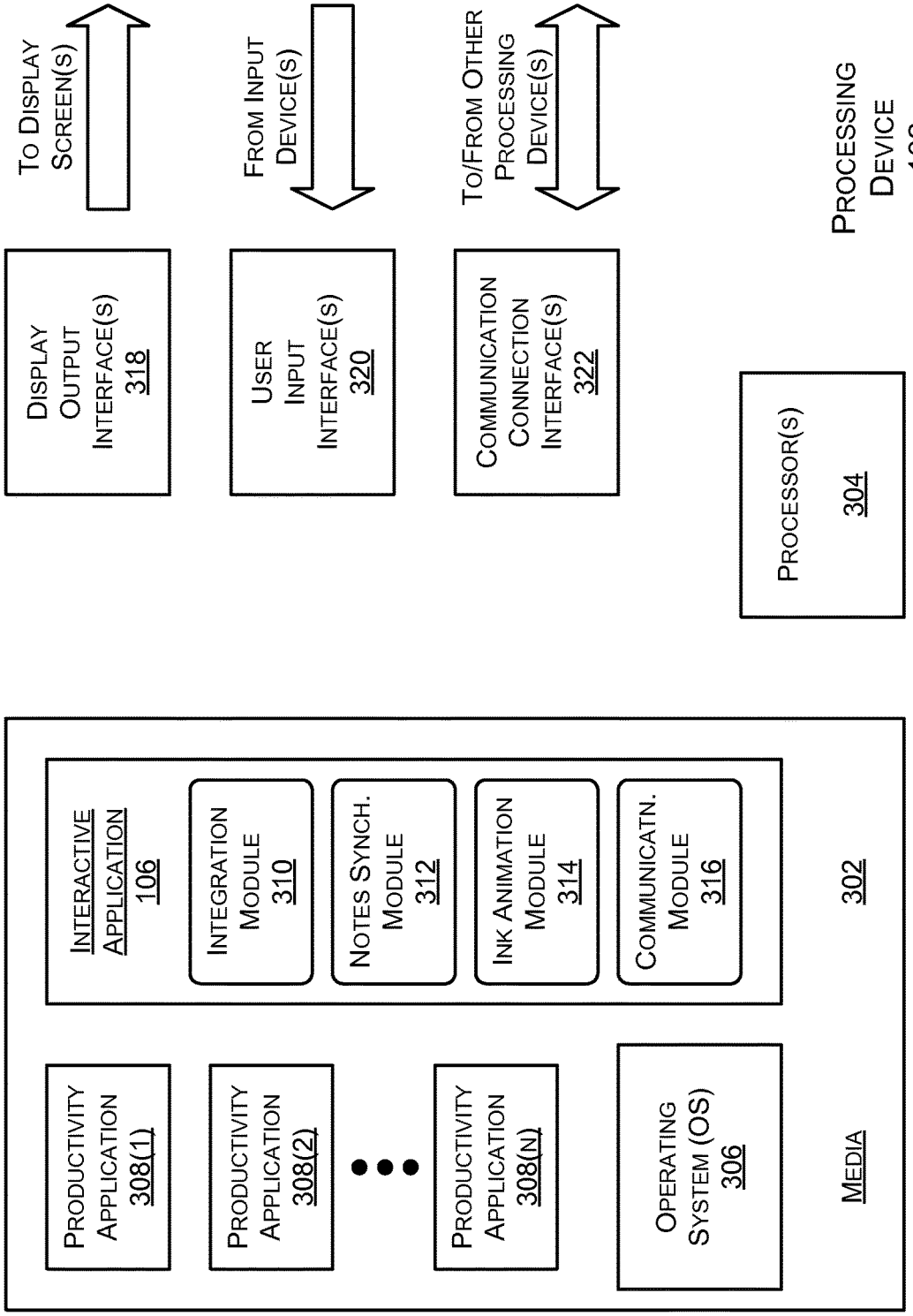

To Display Screen(s)
From Input Device(s)
To/From Other Processing Device(s)
Processing Device 102
Display Output Interface(s) 318
User Input Interface(s) 320
Communication Connection Interface(s) 322
Processor(s) 304
Interactive Application 106
Integration Module 310
Notes Synch. Module 312
Ink Animation Module 314
Communicatn. Module 316
302
Productivity Application 308(1)
Productivity Application 308(2)
Productivity Application 308(N)
Operating System (OS) 306
Media

FIG. 3

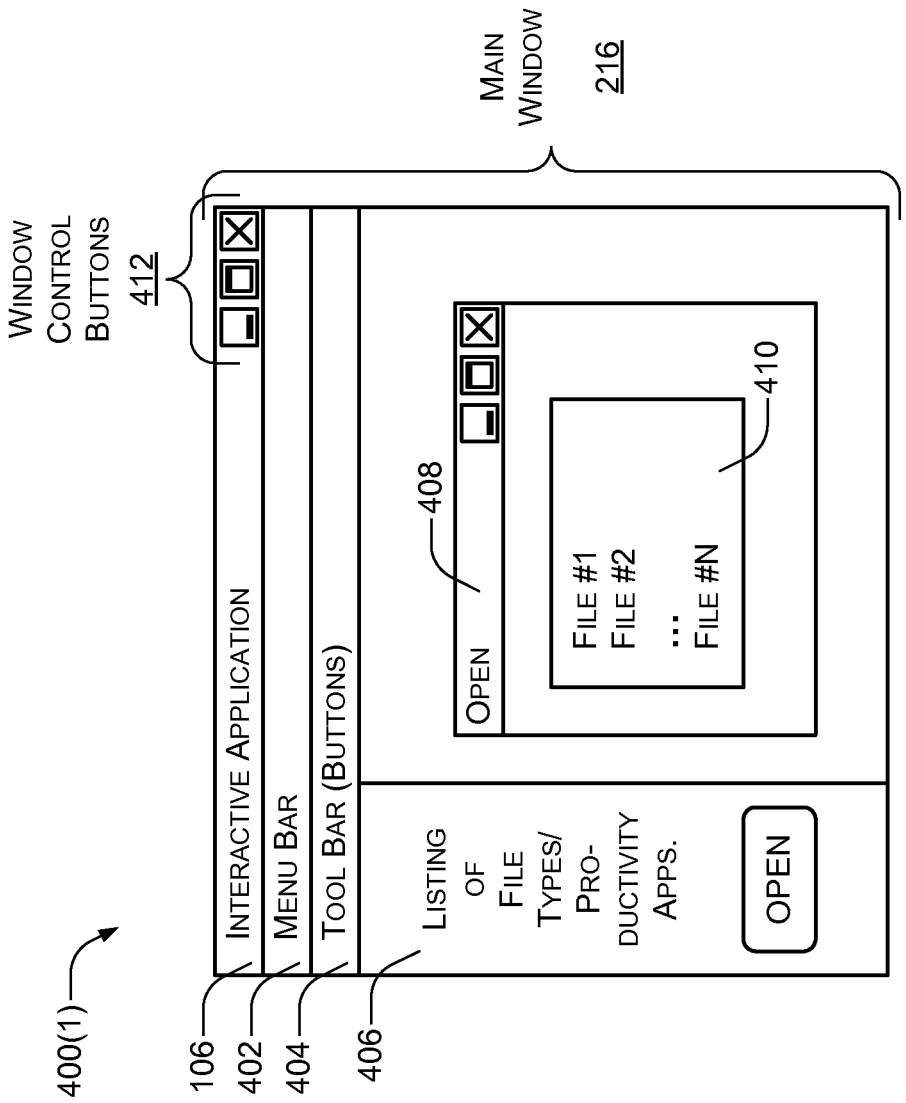

400(1)
106
402
404
406
INTERACTIVE APPLICATION
MENU BAR
TOOL BAR (BUTTONS)
LISTING OF FILE TYPES/ PRO-DUCTIVITY APPS.
OPEN
408
OPEN
FILE #1
FILE #2
...
FILE #N
410
WINDOW CONTROL BUTTONS
412
MAIN WINDOW
216

FIG. 4A

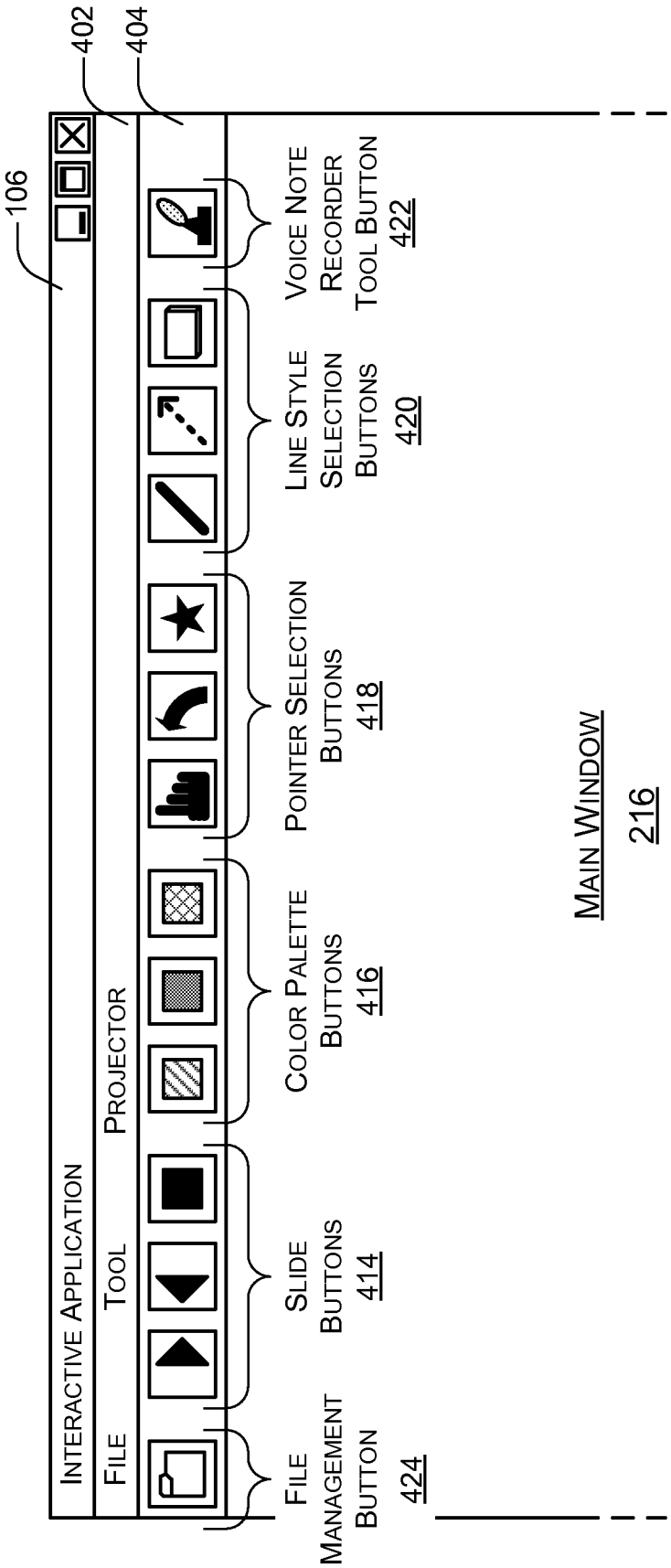

402
404
106
INTERACTIVE APPLICATION
FILE
TOOL
PROJECTOR
FILE MANAGEMENT BUTTON 424
SLIDE BUTTONS 414
COLOR PALETTE BUTTONS 416
POINTER SELECTION BUTTONS 418
LINE STYLE SELECTION BUTTONS 420
VOICE NOTE RECORDER TOOL BUTTON 422
MAIN WINDOW 216

FIG. 4B

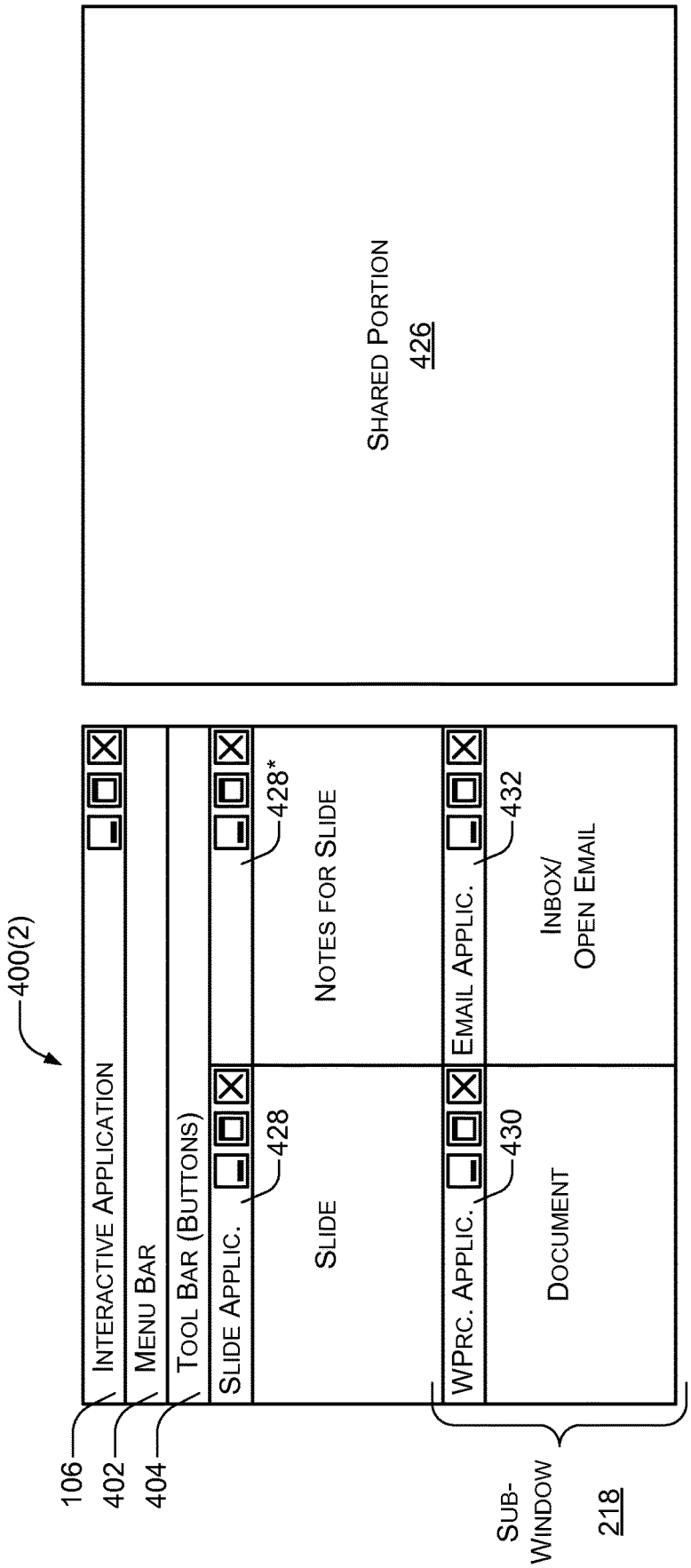

400(2)
INTERACTIVE APPLICATION
MENU BAR
TOOL BAR (BUTTONS)
SLIDE APPLIC.
428
SLIDE
428*
NOTES FOR SLIDE
WPRC. APPLIC.
430
DOCUMENT
EMAIL APPLIC.
432
INBOX/
OPEN EMAIL
SHARED PORTION
426
106
402
404
SUB-
WINDOW
218

FIG. 4C

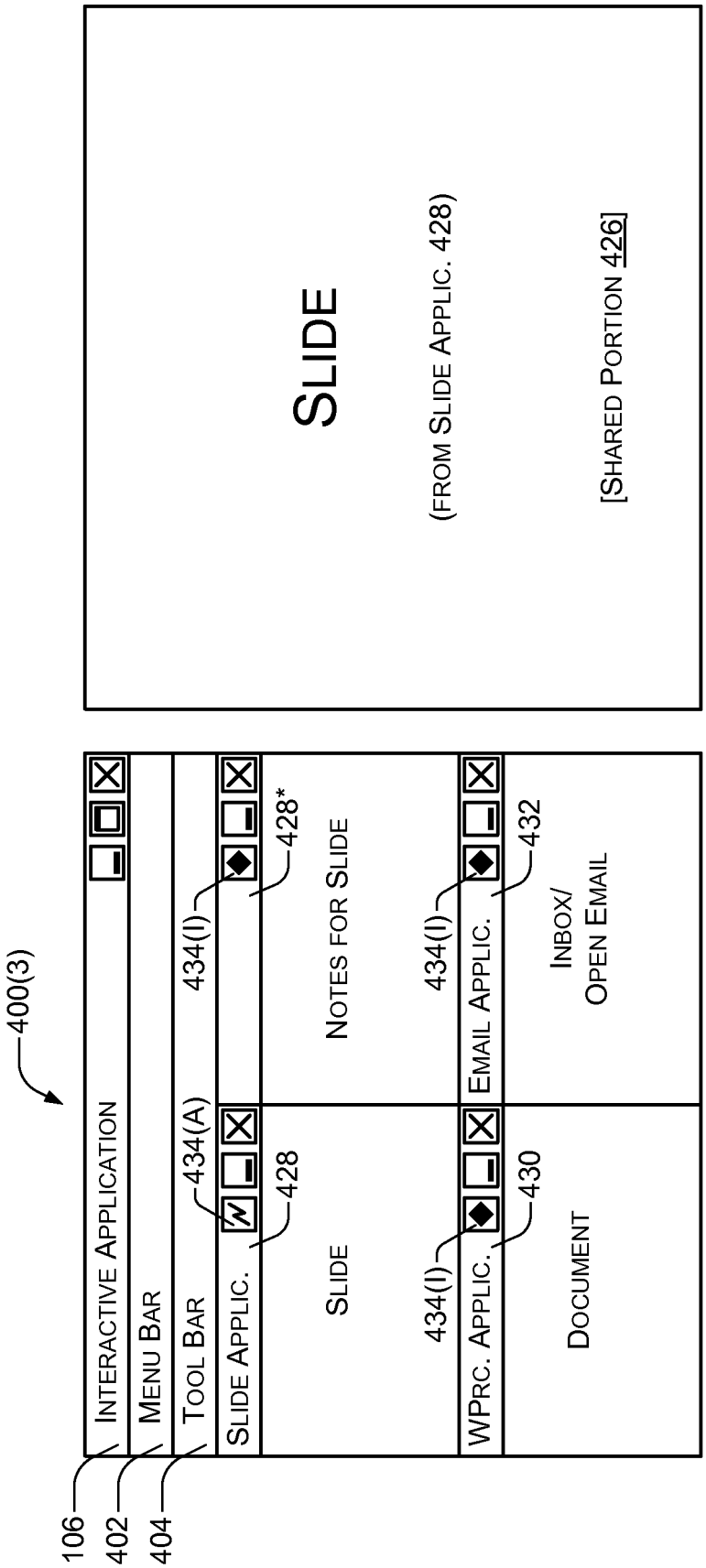

400(3)
INTERACTIVE APPLICATION
MENU BAR
TOOL BAR
SLIDE APPLIC.
SLIDE
NOTES FOR SLIDE
WPRC. APPLIC.
DOCUMENT
EMAIL APPLIC.
INBOX/
OPEN EMAIL
106
402
404
434(A)
434(I)
428
428*
430
432
SLIDE
(FROM SLIDE APPLIC. 428)
[SHARED PORTION 426]

FIG. 4D

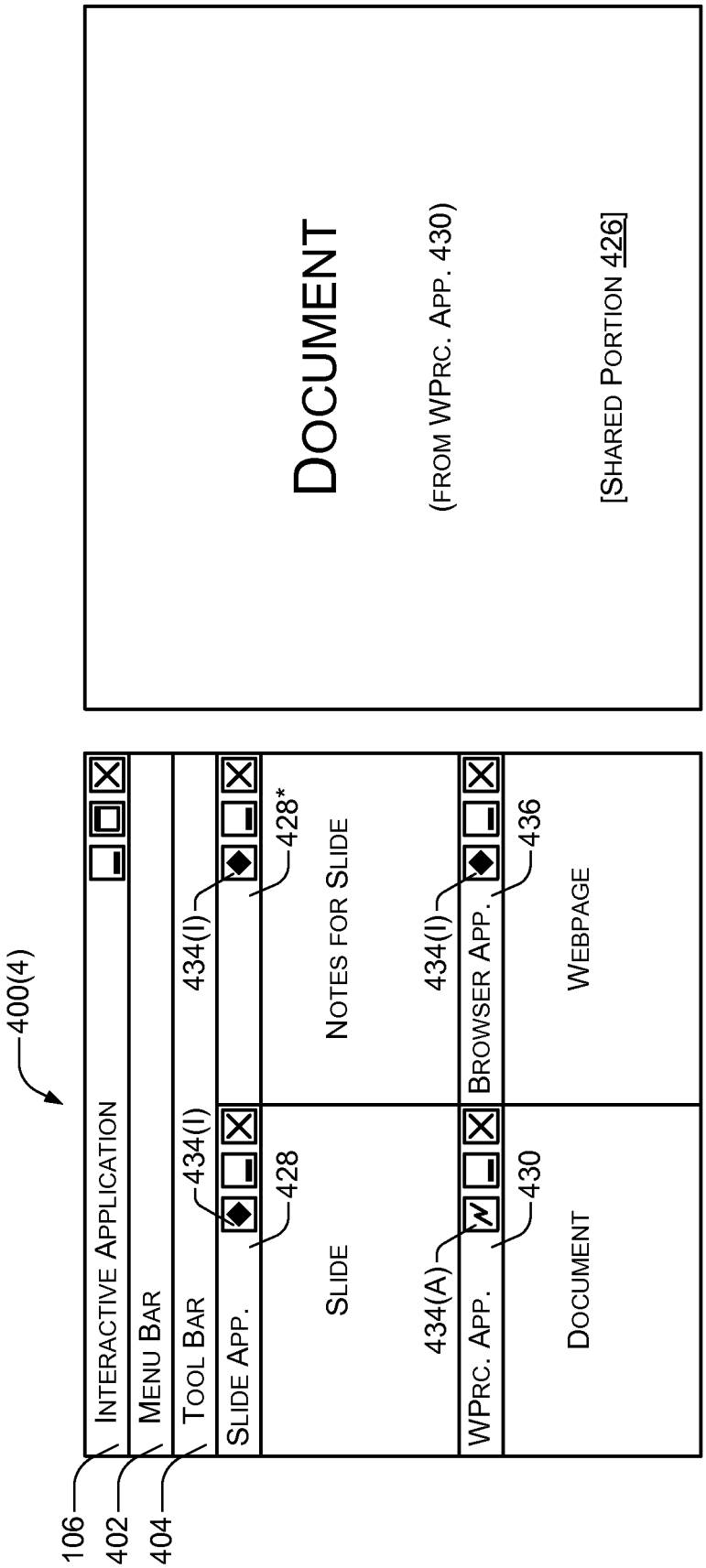

400(4)
INTERACTIVE APPLICATION
MENU BAR
TOOL BAR
SLIDE APP.
434(I)
428
SLIDE
428*
NOTES FOR SLIDE
WPRC. APP.
434(A)
430
DOCUMENT
BROWSER APP.
436
WEBPAGE
106
402
404
DOCUMENT
(FROM WPRC. APP. 430)
[SHARED PORTION 426]

FIG. 4B

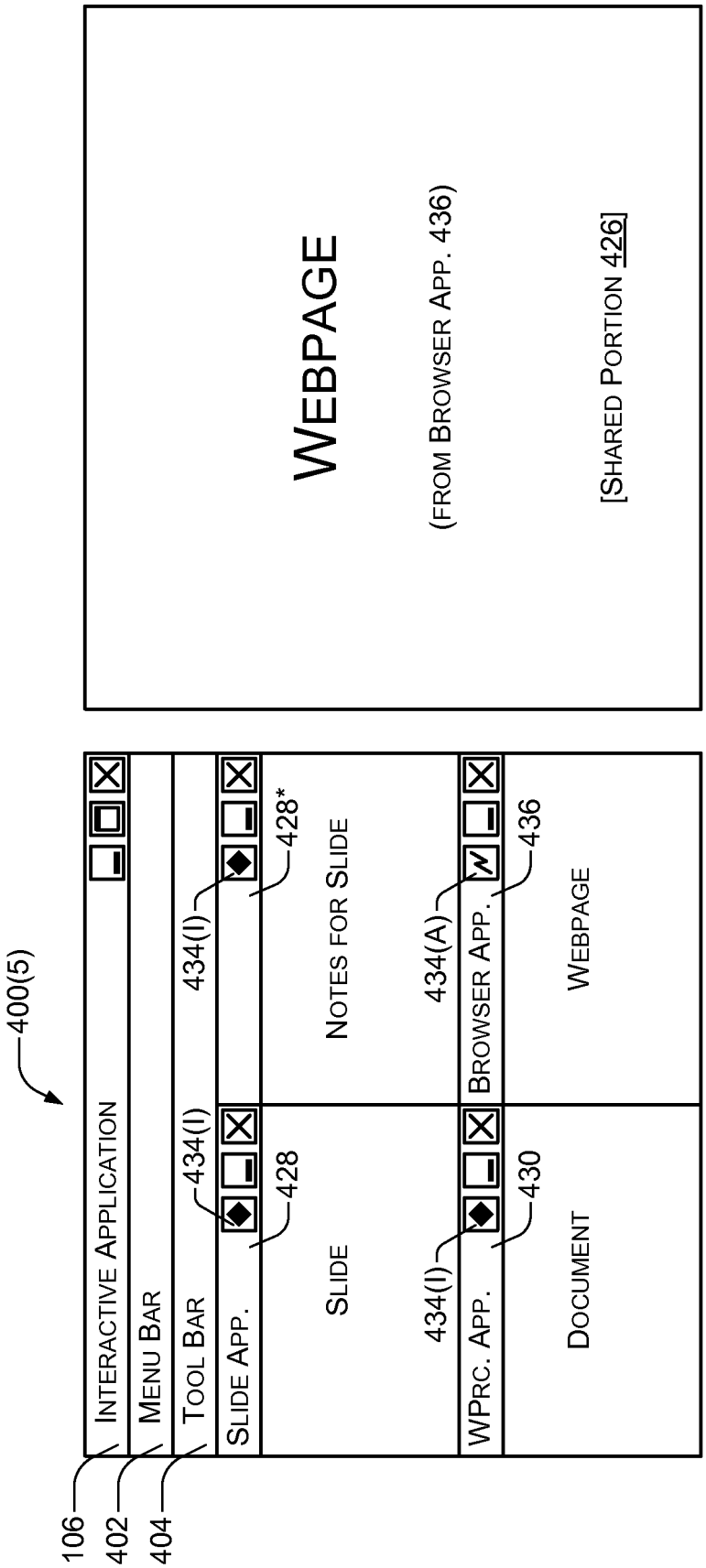

400(5)
106
402
404
INTERACTIVE APPLICATION
MENU BAR
TOOL BAR
SLIDE APP.
434(I)
428
SLIDE
434(I)
WPRC. APP.
430
DOCUMENT
434(I)
428*
NOTES FOR SLIDE
434(A)
BROWSER APP.
436
WEBPAGE
WEBPAGE
(FROM BROWSER APP. 436)
[SHARED PORTION 426]

FIG. 4F

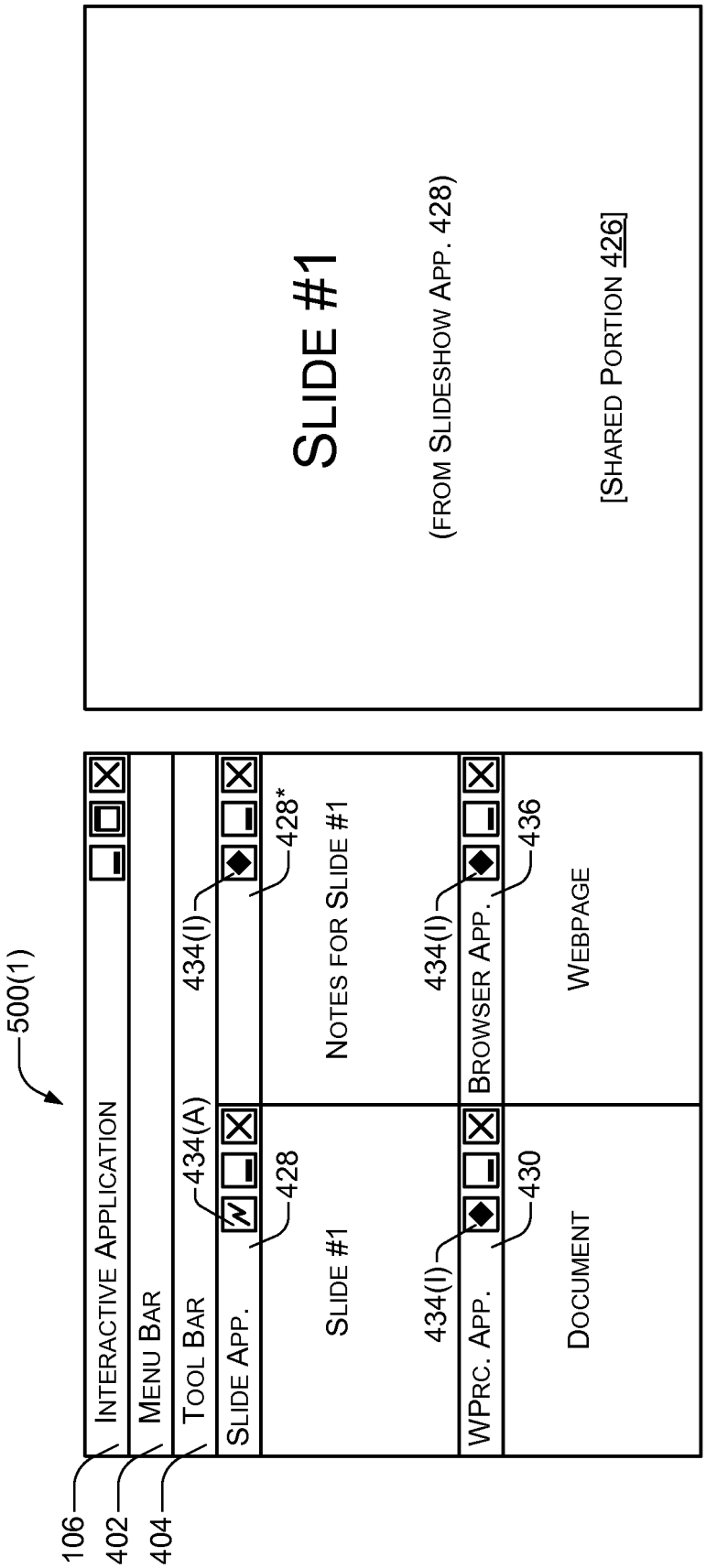

500(1)
INTERACTIVE APPLICATION
MENU BAR
TOOL BAR
SLIDE APP.
434(A)
434(I)
428
428*
SLIDE #1
NOTES FOR SLIDE #1
WPRC. APP.
BROWSER APP.
430
436
DOCUMENT
WEBPAGE
106
402
404
SLIDE #1
(FROM SLIDESHOW APP. 428)
[SHARED PORTION 426]

FIG. 5A

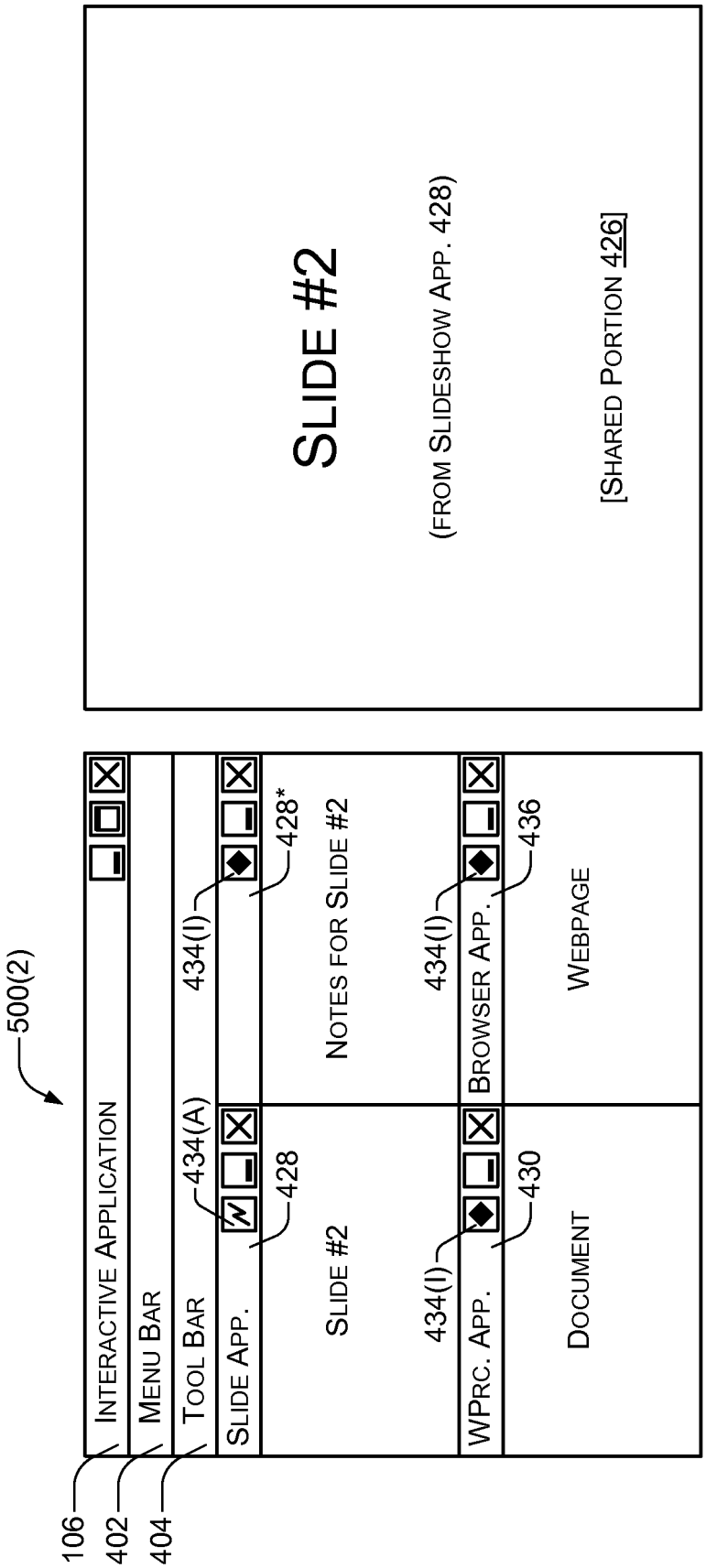

500(2)
INTERACTIVE APPLICATION
MENU BAR
TOOL BAR
SLIDE APP.
434(A)
434(I)
428*
NOTES FOR SLIDE #2
SLIDE #2
428
434(I)
WPRC. APP.
430
DOCUMENT
434(I)
BROWSER APP.
436
WEBPAGE
106
402
404
SLIDE #2
(FROM SLIDESHOW APP. 428)
[SHARED PORTION 426]

FIG. 5B

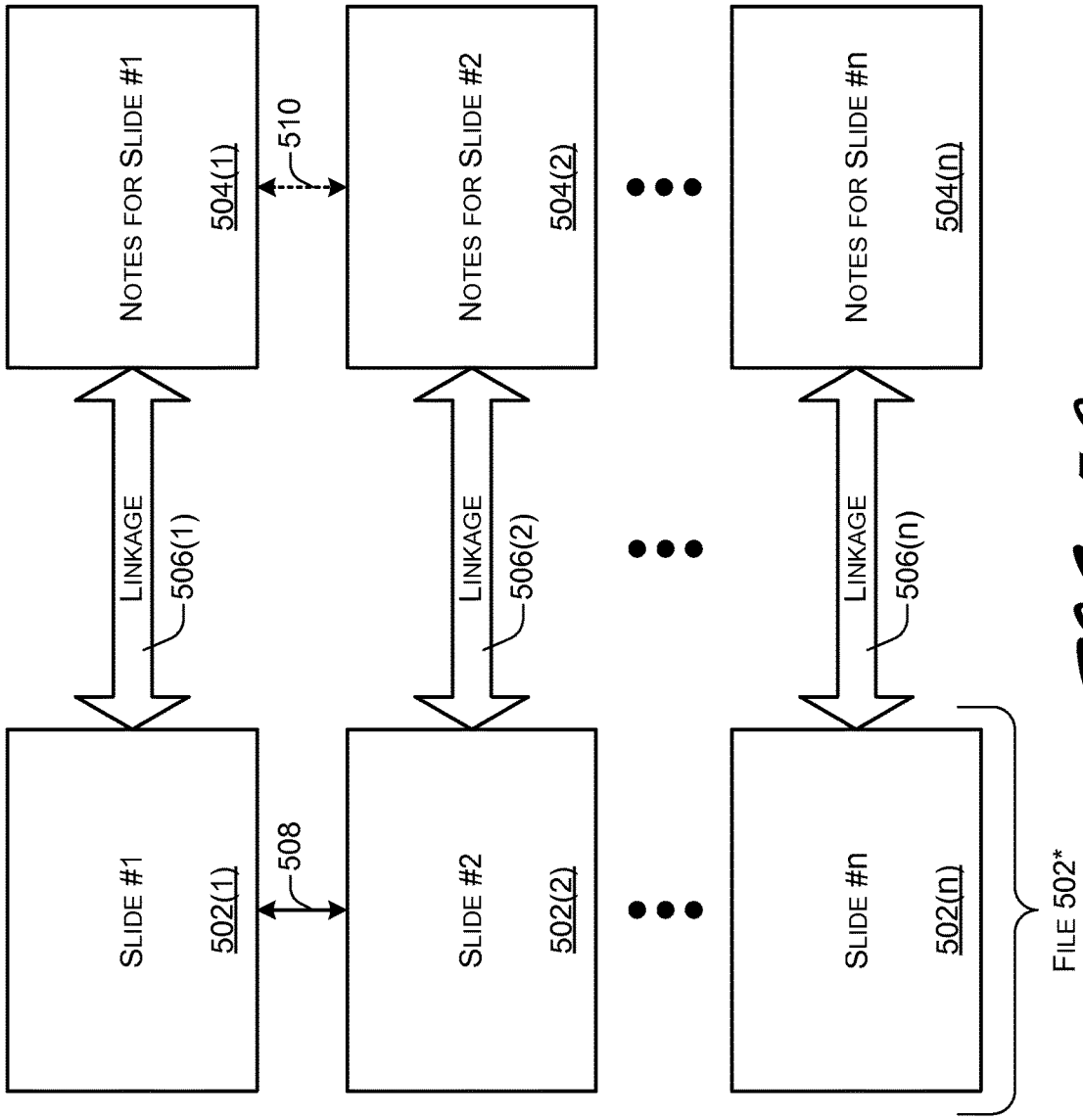

NOTES FOR SLIDE #1
504(1)
510
NOTES FOR SLIDE #2
504(2)
NOTES FOR SLIDE #n
504(n)
LINKAGE
506(1)
LINKAGE
506(2)
LINKAGE
506(n)
SLIDE #1
502(1)
508
SLIDE #2
502(2)
SLIDE #n
502(n)
FILE 502*

FIG. 5C

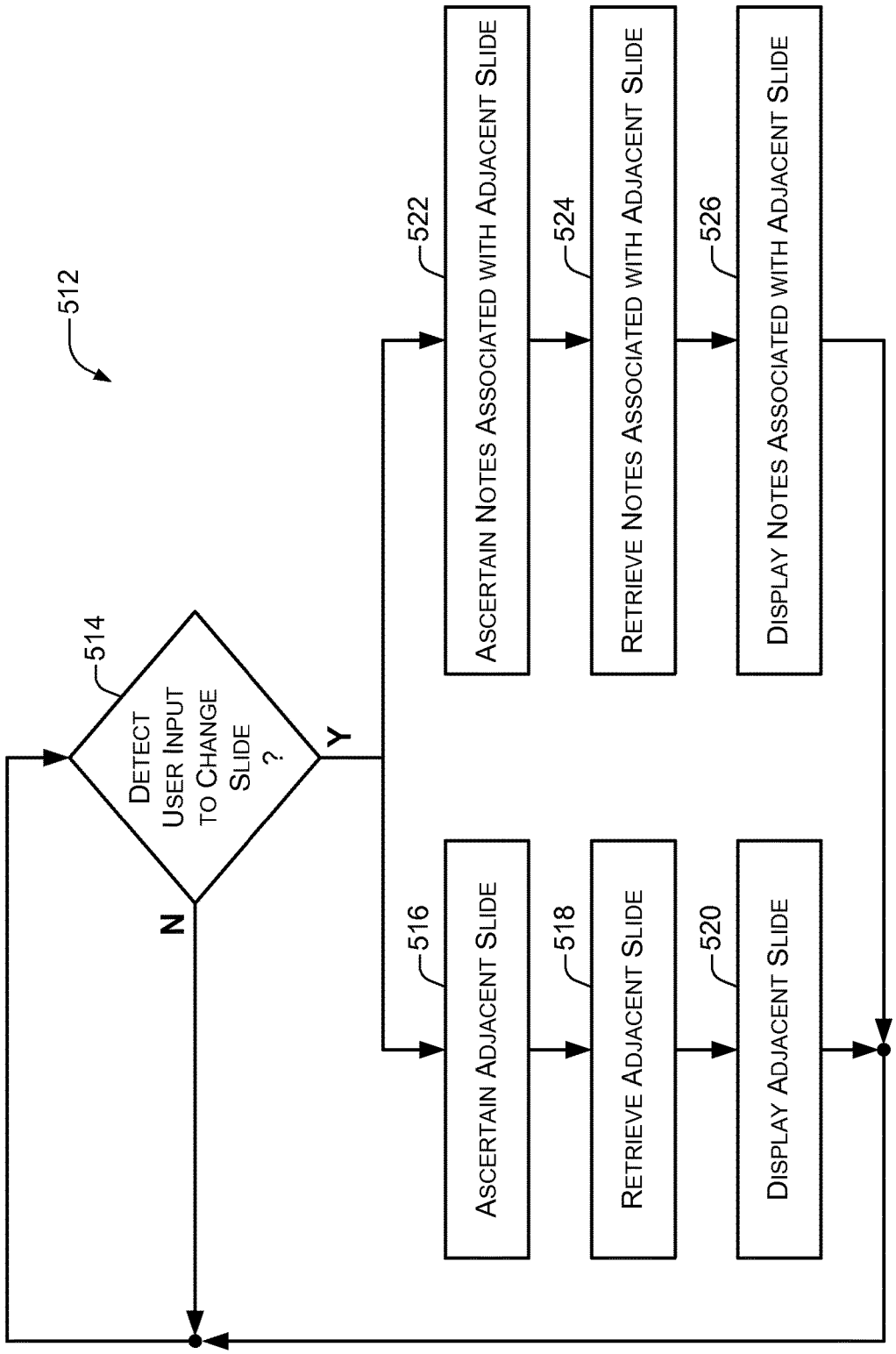

512
514
DETECT USER INPUT TO CHANGE SLIDE ?
Y
N
516
ASCERTAIN ADJACENT SLIDE
518
RETRIEVE ADJACENT SLIDE
520
DISPLAY ADJACENT SLIDE
522
ASCERTAIN NOTES ASSOCIATED WITH ADJACENT SLIDE
524
RETRIEVE NOTES ASSOCIATED WITH ADJACENT SLIDE
526
DISPLAY NOTES ASSOCIATED WITH ADJACENT SLIDE

FIG. 5D

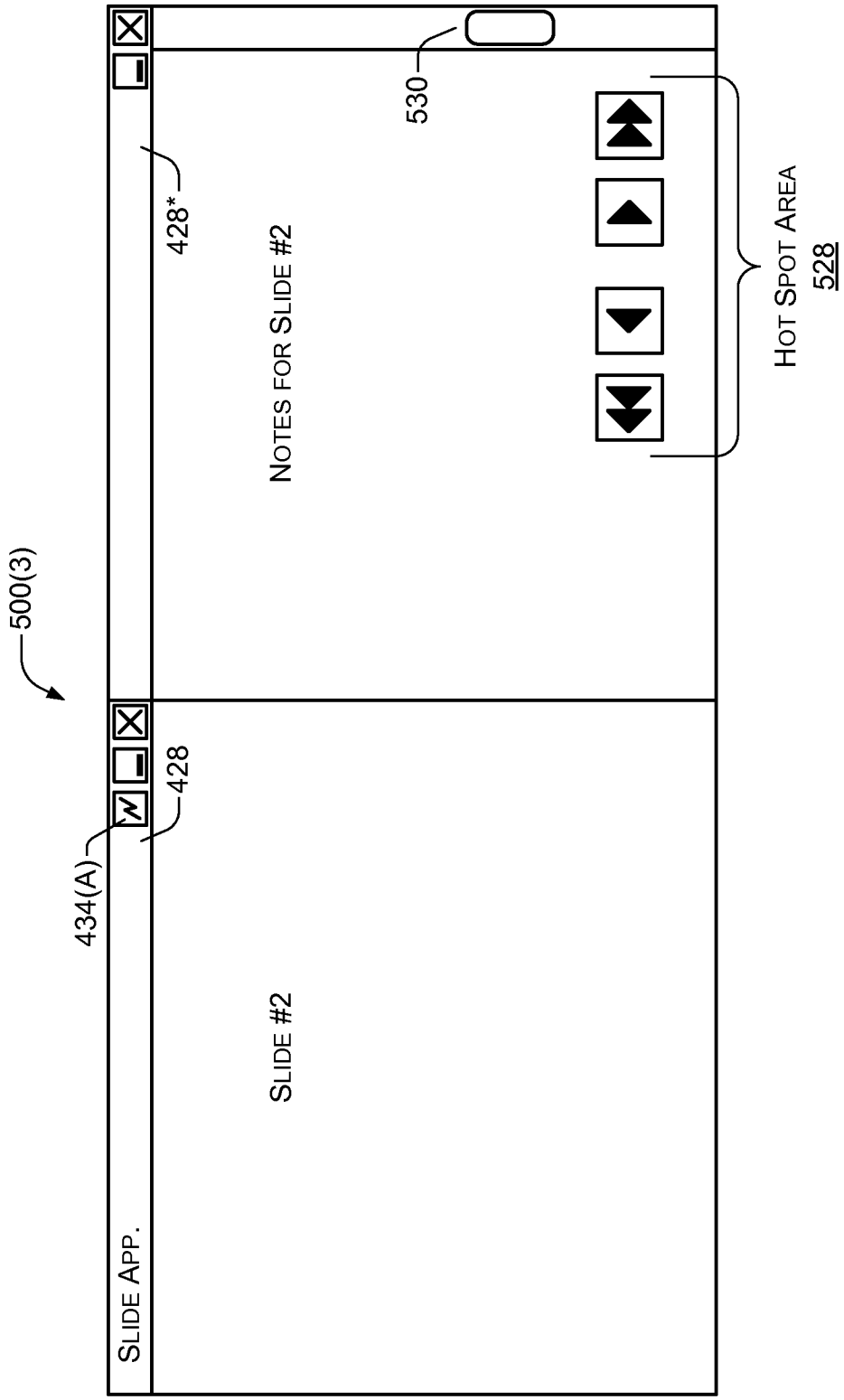

500(3)
SLIDE APP.
434(A)
428
SLIDE #2
428*
NOTES FOR SLIDE #2
530
HOT SPOT AREA
528

FIG. 5B

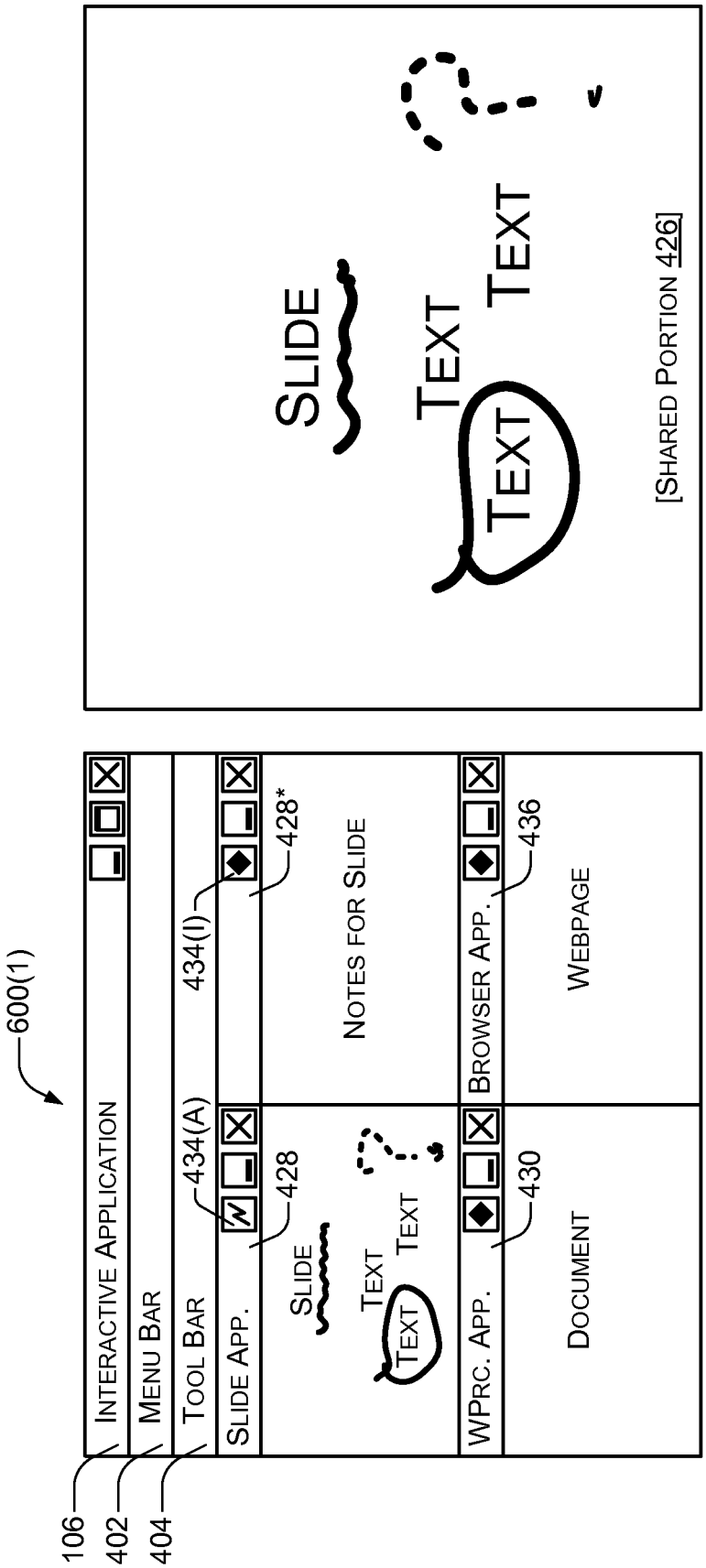

600(1)
106
402
404
INTERACTIVE APPLICATION
MENU BAR
TOOL BAR
434(A)
434(I)
SLIDE APP.
428
428*
SLIDE
TEXT
TEXT
TEXT
NOTES FOR SLIDE
WPRC. APP.
430
BROWSER APP.
436
DOCUMENT
WEBPAGE
SLIDE
TEXT
TEXT
TEXT
[SHARED PORTION 426]

FIG. 6A

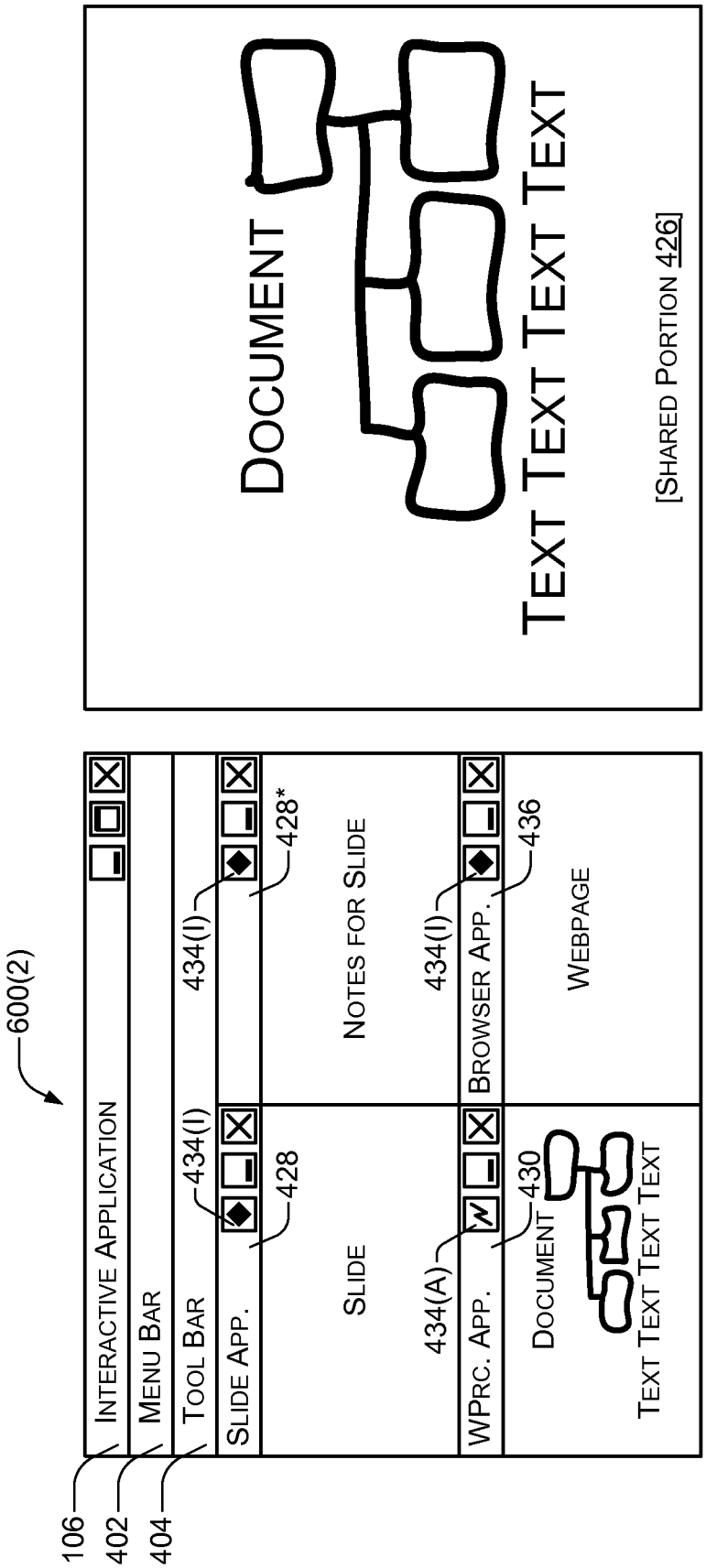

600(2)
106
402
404
INTERACTIVE APPLICATION
MENU BAR
TOOL BAR
SLIDE APP.
434(I)
428
428*
SLIDE
NOTES FOR SLIDE
WPRC. APP.
434(A)
430
DOCUMENT
TEXT TEXT TEXT
BROWSER APP.
436
WEBPAGE
DOCUMENT
TEXT TEXT TEXT TEXT
[SHARED PORTION 426]

FIG. 6B

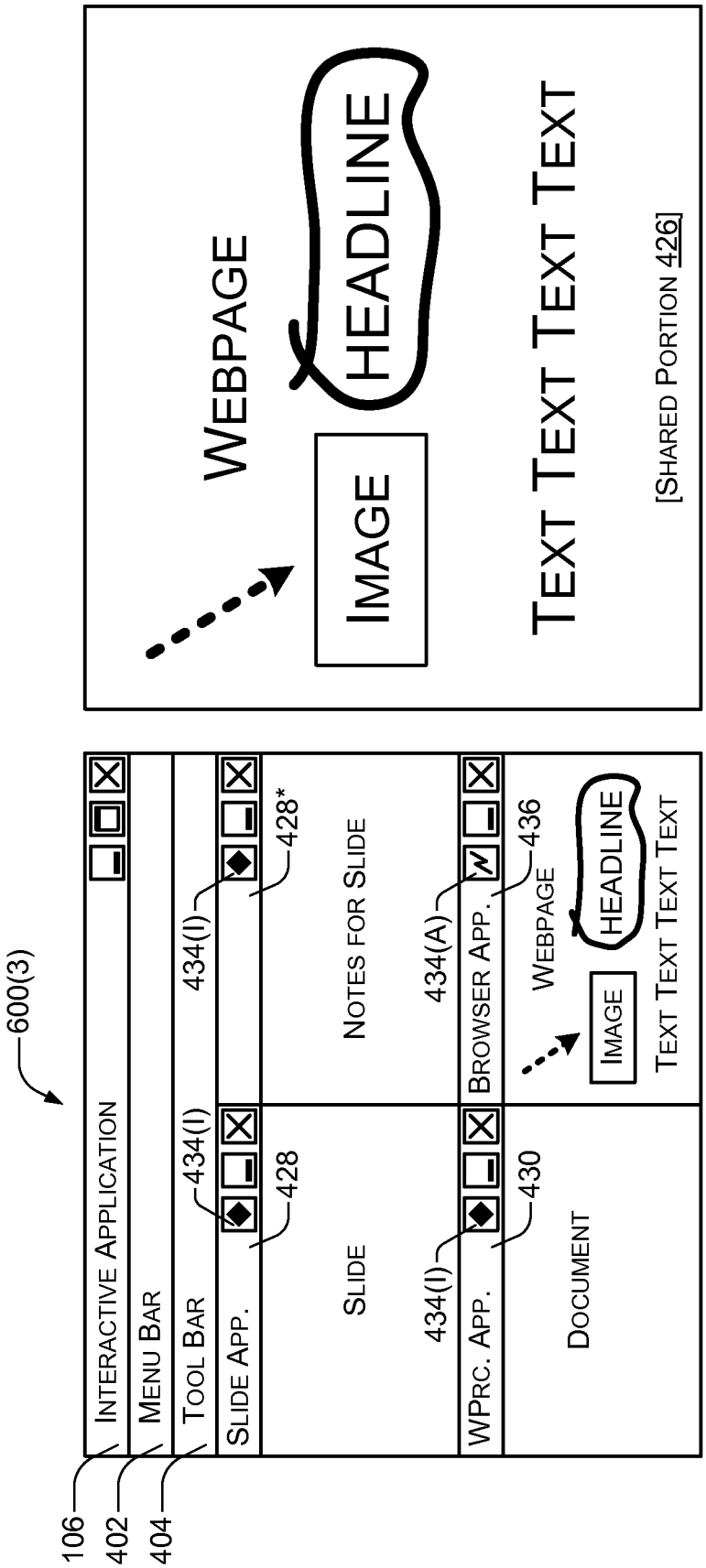

600(3)
106
402
404
INTERACTIVE APPLICATION
MENU BAR
TOOL BAR
SLIDE APP.
434(I)
428
SLIDE
434(I)
WPRC. APP.
430
DOCUMENT
428*
NOTES FOR SLIDE
434(A)
BROWSER APP.
436
WEBPAGE
IMAGE
HEADLINE
TEXT TEXT TEXT TEXT
WEBPAGE
IMAGE
HEADLINE
TEXT TEXT TEXT TEXT
[SHARED PORTION 426]

FIG. 6C

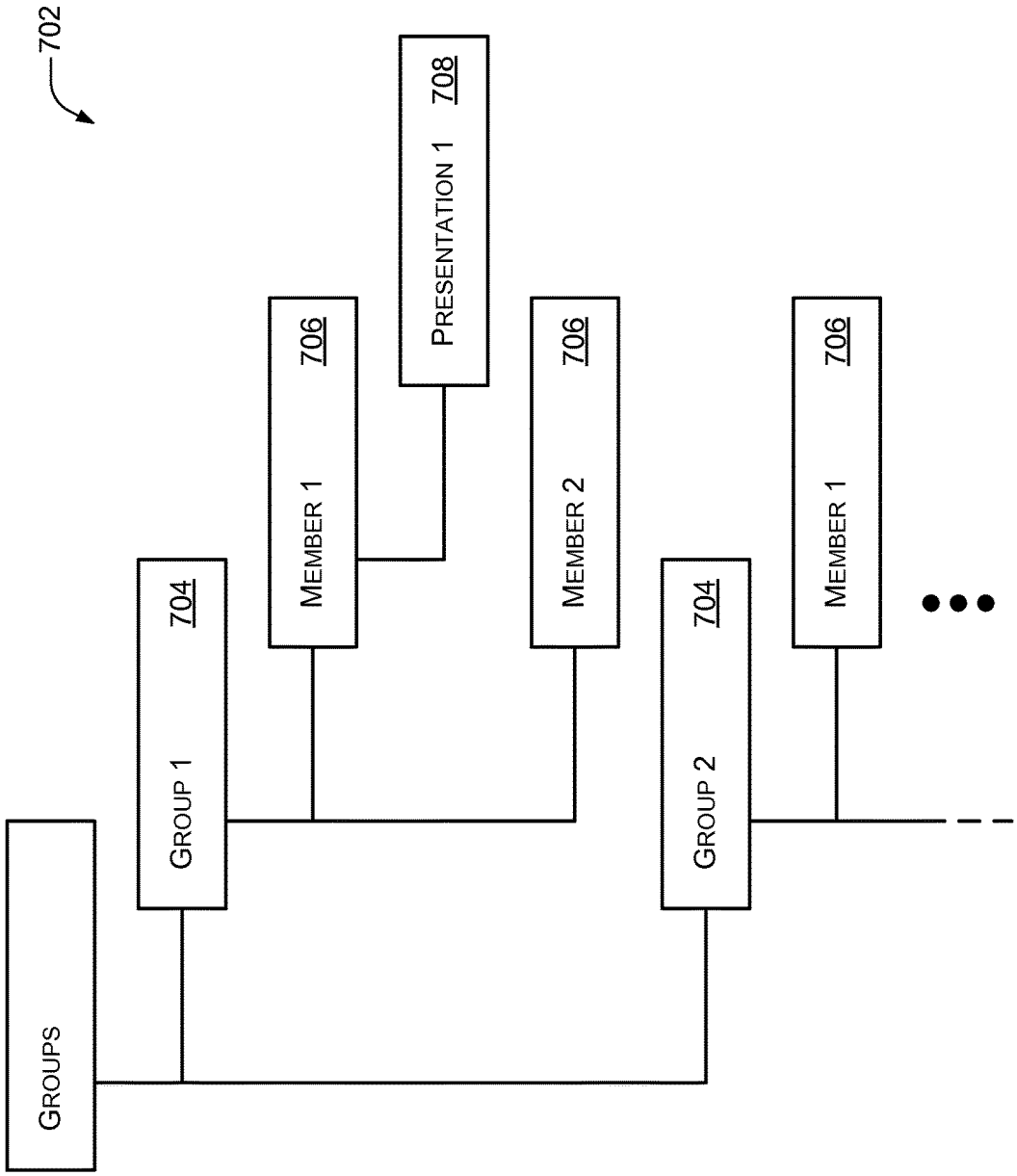

702
GROUPS
GROUP 1
704
MEMBER 1
706
PRESENTATION 1
708
MEMBER 2
706
GROUP 2
704
MEMBER 1
706

FIG. 7A

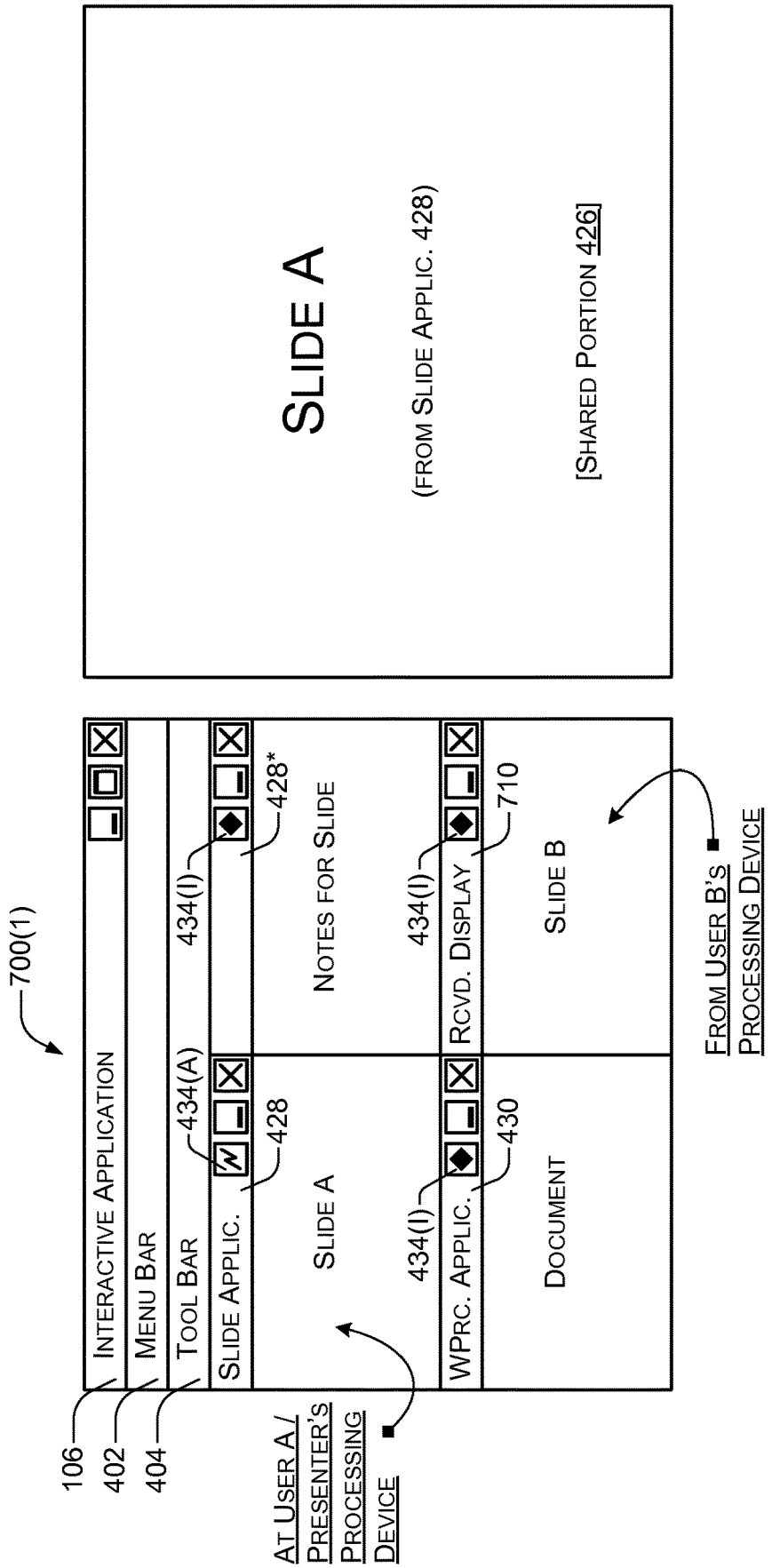

700(1)
INTERACTIVE APPLICATION
MENU BAR
TOOL BAR
SLIDE APPLIC.
434(A)
428
SLIDE A
434(I)
428*
NOTES FOR SLIDE
WPRC. APPLIC.
430
DOCUMENT
RCVD. DISPLAY
710
SLIDE B
106
402
404
AT USER A / PRESENTER'S PROCESSING DEVICE
FROM USER B'S PROCESSING DEVICE
SLIDE A
(FROM SLIDE APPLIC. 428)
[SHARED PORTION 426]

FIG. 7B

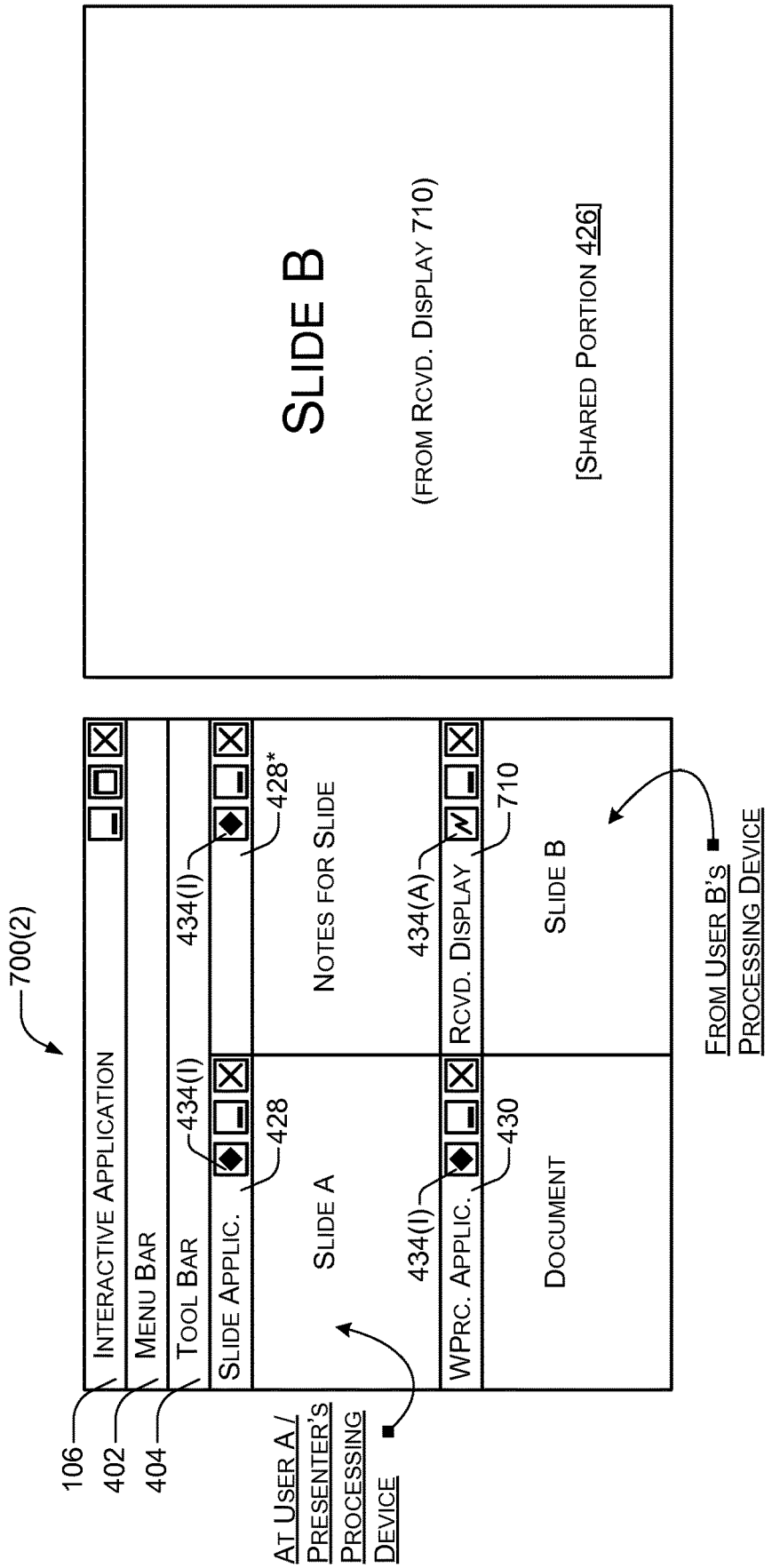

SLIDE B
(FROM RCVD. DISPLAY 710)
[SHARED PORTION 426]
700(2)
INTERACTIVE APPLICATION
MENU BAR
TOOL BAR
SLIDE APPLIC.
434(I)
428*
NOTES FOR SLIDE
434(A)
RCVD. DISPLAY
710
SLIDE B
FROM USER B'S PROCESSING DEVICE
434(I)
428
SLIDE A
434(I)
WPRC. APPLIC.
430
DOCUMENT
106
402
404
AT USER A / PRESENTER'S PROCESSING DEVICE

FIG. 7C

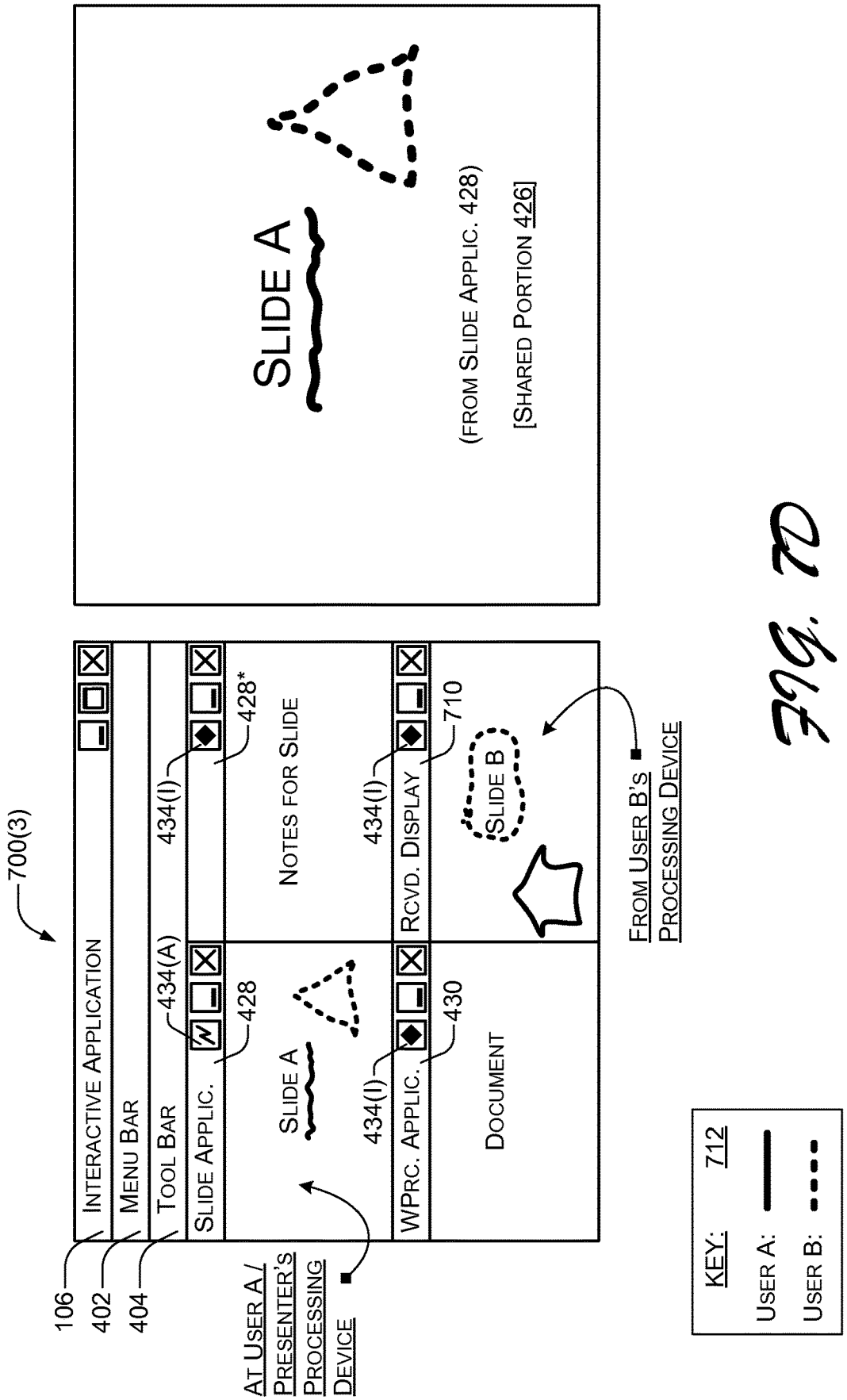

SLIDE A
(FROM SLIDE APPLIC. 428)
[SHARED PORTION 426]
700(3)
INTERACTIVE APPLICATION
MENU BAR
TOOL BAR
SLIDE APPLIC.
434(A)
428
SLIDE A
434(I)
428*
NOTES FOR SLIDE
434(I)
RCVD. DISPLAY
710
SLIDE B
WPRC. APPLIC.
430
DOCUMENT
106
402
404
AT USER A / PRESENTER'S PROCESSING DEVICE
FROM USER B'S PROCESSING DEVICE
KEY: 712
USER A:
USER B:

FIG. 7D

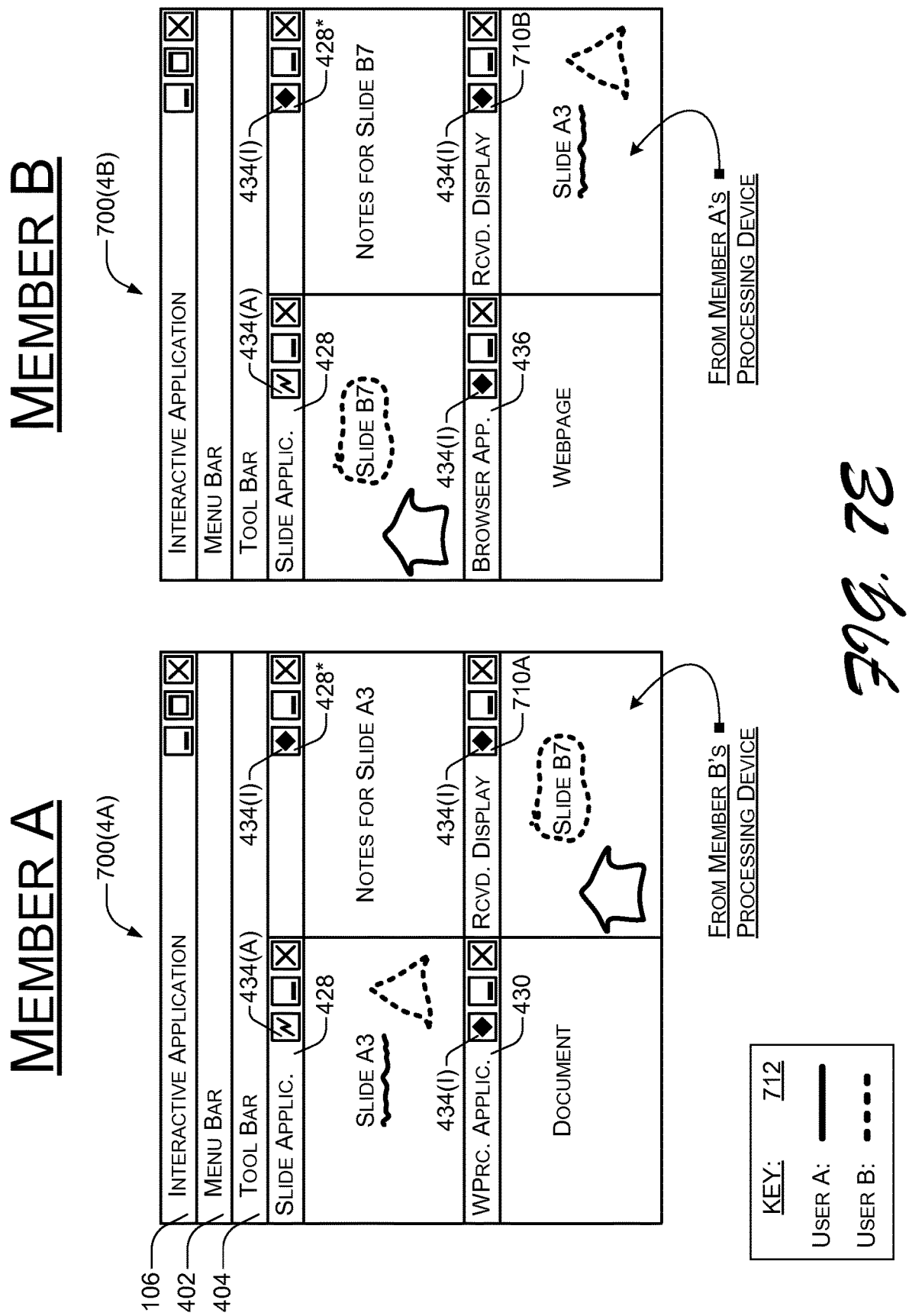

MEMBER B
700(4B)
INTERACTIVE APPLICATION
MENU BAR
TOOL BAR
434(A)
434(I)
SLIDE APPLIC.
428
SLIDE B7
428*
NOTES FOR SLIDE B7
BROWSER APP.
436
WEBPAGE
RCVD. DISPLAY
710B
SLIDE A3
FROM MEMBER A'S PROCESSING DEVICE
MEMBER A
700(4A)
WPRC. APPLIC.
430
DOCUMENT
710A
FROM MEMBER B'S PROCESSING DEVICE
106
402
404
KEY: 712
USER A:
USER B:

FIG. 7B

PRESENTATION FACILITATION

CROSS-REFERENCE TO RELATED APPLICATIONS

This U.S. patent application is a continuation of U.S. application Ser. No. 12/628,784, now U.S. Pat. No. 9,626,064, filed Dec. 1, 2009, which is a continuation of and claims the benefit of priority from, and hereby incorporates by reference the entire disclosure of U.S. application for Letters patent Ser. No. 10/957,037, now U.S. Pat. No. 7,640,502, filed Oct. 1, 2004, and titled "Presentation Facilitation." To the extent appropriate, a claim of priority is made to each of the foregoing applications.

TECHNICAL FIELD

This disclosure relates in general to facilitating presentations and in particular, by way of example but not limitation, to enabling a presenter to synchronously share with audience members a portion of displayed content while keeping other displayed content private.

BACKGROUND

Individuals have been giving presentations using slides and manual reflective projectors for decades. In recent years, presenters have started using computers and digital projectors. Slides are prepared electronically using a slide show program. An example of such a slideshow program is "PowerPoint™" from Microsoft® Corporation. The author of the slides can include words, drawings, and even animations at the time of creation of the slides. The slides are then stored in a specific slideshow format.

When it is time for a presenter to give a presentation, the slideshow program is used to open the file in the specific slideshow format. Each slide can then be forwarded from the computer running the slideshow program to a digital projector for display. During the presentation, while the presenter is lecturing to an audience on a given topic, the presenter references the contents of each slide. This computer-enabled approach to presentations does offer a few advantages over previous manual approaches, such as fancier slides and easier updating thereof. Unfortunately, it still results in a relatively unidirectional and unilateral, as well as static, presentation.

Accordingly, there is a need for schemes and/or techniques that can facilitate active, bidirectional, and/or bilateral presentations, including those that facilitate seamless presentations and/or greater presenter-audience interaction.

SUMMARY

Multiple schemes and techniques for facilitating presentations with an interactive application are described. For example, an interactive application provides a console view overlay for integrating multiple productivity applications into a graphical user interface (GUI) window. An interactive application can also share a selected display portion of the console view overlay with other interactive applications. As another example, presenters and other audience members can draw on the selected display portion being shared, and the drawn graphics are synchronously displayed by the other interactive applications. Interactive applications, as directed by their users, can join various member groups and specific presentations thereof. Moreover, a user may share content in accordance with membership grouping.

Other method, system, approach, apparatus, device, media, procedure, arrangement, etc. implementations are described herein.

BRIEF DESCRIPTION OF THE DRAWINGS

The same numbers are used throughout the drawings to reference like and/or corresponding aspects, features, and components.

FIG. **1** illustrates an example of a sharing of a display portion of a display screen during a presentation using an interactive application running on a processing device.

FIG. **2** illustrates an example of a layered architecture for an interactive application running on a processing device.

FIG. **3** is an example of a logical diagram of a processing device running an interactive application.

FIG. **4**A is an example of an initial screenshot of an interactive application.

FIG. **4**B illustrates examples for menu bar and tool bar aspects of a graphical user interface (GUI) for an interactive application.

FIG. **4**C illustrates a general example of a screenshot, including a shared portion, for an integration feature of an interactive application.

FIGS. **4**D-**4**F illustrate specific examples of screenshots with shared portions for an integration feature of an interactive application.

FIGS. **5**A-**5**B illustrate examples of screenshots for a note synchronization feature of an interactive application.

FIG. **5**C illustrates a linkage enabling a synchronization between slides and associated notes for a note synchronization feature of an interactive application.

FIG. **5**D is a flow diagram that illustrates an example of a method for synchronizing notes to associated slides during a presentation.

FIG. **5**E illustrates a hot spot area that is an example of a control scheme for a note synchronization feature of an interactive application.

FIGS. **6**A-**6**C illustrate examples of screenshots for an ink animation feature of an interactive application.

FIG. **7**A illustrates an example of a group membership organizational tree for a distributed communication feature of an interactive application.

FIGS. **7**B-**7**D illustrate examples of screenshots for a distributed communication feature of an interactive application.

FIG. **7**E illustrates example display screens of an interactive application for members A and B who are sharing content.

DETAILED DESCRIPTION

Introduction

In described implementations, a console is produced on a display screen of a processing device. The console facilitates the giving of presentations. For example, the standard one-person unilateral presentation model is extended to a multi-user interactive presentation model. The members involved in a presentation can interact with the presenter and supporting material, including slides, at some increased level, regardless of the status or type of a pre-fixed file. Additionally, spontaneity and/or a smooth presentation are facilitated.

A described interactive application can be used in a range of scenarios including conference speeches, department meetings, casual discussions, and so forth. In a conference speech, for example, a presenter can discuss material from a computer which is connected to a projector and a number

of computers (e.g., writing-enabled laptop computers such as a "Tablet PC") that are held by audience members. First, the presenter shares a slideshow presentation with the audience while referring to synchronized notes that are appearing in another window on the desktop of the presenter's computer. Second, the presenter selects a webpage and shares it with the audience. The contents of files of other file types can also be presented directly without necessarily converting them to a slideshow-specific format.

Thus, the interactive application is capable of integrating multiple productivity applications onto and/or into the console. The console, or area of the desktop that is being utilized by the interactive application, can be divided into multiple portions for display of different files. A user can select which portion (or portions in alternative implementations) is to be shared for a current ongoing presentation and can modify another file's content or open another document through the console at the same time without interrupting the presentation which prevents the audience from becoming aware of this unseen background action. This integration aspect is described further below, particularly in the section entitled "Integration Feature Examples of an Interactive Application".

For slideshow presentations, a relatively miniaturized view of the slides is displayed in a portion of the console. These slides are synchronized with the slides that are also being presented to the audience members. Along with the view of the displayed slides, notes that are associated with the slides are displayed in another portion of the console. The notes may be displayed in relatively large text for easy readability. The display of the notes is synchronized to the associated slides such that changing a viewed slide changes the displayed note. This synchronized notation aspect is described further below, particularly in the section entitled "Notes Synchronization Feature Examples of an Interactive Application".

The interactive application also enables manual drawing (e.g., hand writing, notations, etc.) to be performed on shared content by the presenter or an audience member with the manual drawing being replicated on the shared display portion. In other words, ink animation is communicated across interconnected consoles for shared content so that added comments or notes are made apparent as if everyone is viewing and working on a single whiteboard. Thus, manual drawings are relatively simultaneously displayed on each member's console. This ink animation aspect is described further below, particularly in the section entitled "Ink Animation Feature Examples of an Interactive Application".

In this distributed system for audience members, the terminating devices thereof can be a personal computer, a projector, a mobile device, some combination thereof, and so forth. Users can participate in different interest groups, and each member may share his or her presentation with other group members. The synchronized content of the presentation, including spontaneous manual drawings, are shared across the multiple terminating devices of the group members. This simultaneous distributed communication aspect is described further below, particularly in the section entitled "Peer-to-Peer (P2P) Real-Time Communication (RTC) Feature Examples of an Interactive Application".

General Interactive Application Attribute Examples

FIG. **1** illustrates an example of a sharing of a display portion **108** of a display screen **104** during a presentation using an interactive application **106** running on at least one processing device **102**. Processing device **102**(P) is being operated by a presenter, and processing device **102**(M) is being operated by a member (e.g., a group and/or audience member). Although only one member processing device **102**(M) is illustrated, multiple such member processing devices **102**(M) may alternatively participate in a shared distributed presentation.

As illustrated, display screen **104**(P) is coupled to processing device **102**(P), and display screen **104**(M) is coupled to processing device **102**(M). Although not required, display screens **104**(P) and **104**(M) are described as relatively personal display screens, such as a screen of a laptop computer, a screen of a tablet personal computer (PC), and so forth. Processing device **102**(P) is also coupled to an external display screen **104**(E). Although also not required, external display screen **104**(E) is described as a relatively public or shared display screen, such as a projector/projection screen, a large monitor, and so forth. Processing devices **102** may be coupled to display screens **104** by any appropriate interface, including wired or wireless mechanisms.

In a described implementation, interactive application **106**(P) is running (e.g., functioning, executing, etc.) on processing device **102**(P), and interactive application **106**(M) is running on processing device **102**(M). As introduced above, interactive applications **106** are capable of providing a number of presentation facilitating features, including application integration, notes synchronization, ink animation, and P2P RTC for distributed sharing of interactive presentation features.

Interactive application **106**(P) enables a display portion **108**(P) to be displayed on display screen **104**(P). By way of example only, display portion **108** may be one portion of multiple portions of a console graphical user interface (GUI). Interactive application **106**(P) also causes display portion **108**(P) to be transmitted to processing device **102**(M) and external display screen **104**(E) as transit display portions **108**(T). These respective transit display portions **108**(T) may be in different formats in dependence upon the respective communication channels on which they are propagating and/or the respective destinations for which they are intended.

After arrival at their respective destinations, display portion **108**(E) is displayed on external display screen **104**(E), and display portion **108**(M) is displayed on display screen **104**(M). Display portion **108**(M) may be displayed on display screen **104**(M) by interactive application **106**(M) in a console GUI format. Updates, changes, ink animations applied, etc. to display portion **108** at processing device **102**(P) or processing device **102**(M) are synchronized across the various display screens **104** by interactive applications **106**. These synchronizations, as well as other features, are described further herein below.

FIG. **2** illustrates an example of a layered architecture **200** for an interactive application **106** running on a processing device **102**. Layered architecture **200** includes a presentation layer **202**, a group/display layer **204**/**206**, a message layer **208**, a peer-to-peer (P2P) application **210**, and a communication channel (layer) **212**.

At presentation layer **202**, a main window or console area **216** for the interactive application is divided into different portions (e.g., four portions in a described implementation). Each portion is for one sub-window **218** of four sub-windows **218**(A,B,C,D). Each sub-window **218** can be used to operate a productivity application for opening/manipulating a file, which can be shared with other members, or can be used to display other members' shared content.

Automation technology ensures file type compatibility with the interactive application. Because a presenter is actually operating through the relevant productivity application, the presenter can edit files during a presentation instead of being limited to static, pre-prepared content. The presenter can switch between/among different sub-windows **218** to select which sub-window **218** is to be shared with others.

At group/display layer **204/206**, a group management component **204** is responsible for managing interaction between/among group members. Such management actions may include: member joins, member quits, shared content broadcasts, and support for distributed ink animations. As described further herein below, any processing device having an interactive application **106** can organize into one or more groups via various communication channels **212**. Examples of such communication channels **212** include the Internet, a local area network (LAN) cable, a wireless connection, some combination thereof, and so forth.

Group management component **204** contains information regarding each member of each group. It can transfer a group member's action and status to other group members and provide group membership data to display management component **206** for coordinating the transmission of display broadcast information. This transferred information is passed to or retrieved from message processing layer **208** for packing, unpacking, and network transmission at lower layer(s).

The duty of display management component **206** is twofold: firstly, it synchronizes local shared presentations with corresponding member termination devices; secondly, it receives synchronization data from other termination devices and updates the corresponding local display sub-window **218**.

If a particular sub-window **218** is selected as the shared window, display component **206** (i) monitors changes to the display of that particular sub-window **218**, (ii) captures the image of the displayed portion, (iii) retrieves group member information from group component **204**, and (iv) passes relevant broadcast display data and parameters to the lower message layer **208**. When the broadcast display data arrives at another member's processing device, the message component **208** thereat forwards the unpacked display information to the display component **206** thereat. That display component **206** then displays the information (e.g., the changes, the additions, etc.) at the content for the corresponding display portion or sub-window **218**.

At message layer **208**, message component **208** performs the following functions: packing data from the upper layers and unpacking data from the lower layers. The packed data is transmitted between and among interactive applications using defined message types. The network layer, or communication channel, richly makes use of various network connection methods including Internet, LAN, wireless networking, and so forth.

The P2P application layer **210** is responsible for control of the location resource of each group member device in a group. P2P application **210** maintains network connections between member devices. It also handles message sending and receiving between two points. When group component **204** decides to send a message to a member, P2P application **210** determines the network address of the destination and uses the network connection of communication channel **212** to send it. The mapping method is analogous during the receiving process.

Additional description of the functionalities of group component **204**, display component **206**, and P2P application **210** is provided herein below, especially in the section entitled "Peer-to-Peer (P2P) Real-Time Communication (RTC) Feature Examples of an Interactive Application".

FIG. **3** is an example of a logical diagram of a processing device **102** running an interactive application **106**. As illustrated, processing device **102** includes media **302**, one or more processors **304**, and a variety of interfaces **318**, **320**, and **322**. Although only certain components are illustrated in FIG. **3** and described with reference thereto, other components may be, and likely are, present in a processing device **102**.

In a described implementation, processor **304** is capable of executing, performing, and/or otherwise effectuating processor-executable instructions. Media **302** is comprised of one or more processor-accessible media, such as a volatile or nonvolatile memory, a wireless or wired propagation channel, some combination thereof, and so forth. Media **302** includes processor-executable instructions that are executable by processor **304** to effectuate the performance of functions by processing device **102**.

Specifically, media **302** includes an operating system (OS) **306**, at least one productivity application **308(1)**, **308(2)** . . . **308(*n*)**, and interactive application **106**. Additional description and examples of media **302** are provided in the sub-section below entitled "Additional Environmental, Component, and Operational Examples for a Processing Device".

OS **306** establishes a foundation for the operation of other applications on processing device **102** by, for example, providing a user interface framework, handling input/output functions, managing memory requirements, orchestrating resource division, and so forth. Productivity applications **308** enable the performance of business, entertainment, educational, etc. tasks. Examples of productivity applications **308** include word processing applications, slide presentation applications, email and/or schedule management applications, web browsing applications, art/drawing applications, music/movie creation applications, some combination thereof, and so forth.

Interactive application **106** includes an integration module **310**, a notes synchronization module **312**, an ink animation module **314**, and a communication module **316**. Each module, possibly in conjunction with another module, performs at least one function of interactive application **106**. Hence, although illustrated separately, two or more modules may operate together when performing any given function. For example, integration-related functions may be effectuated using integration module **310** and communication module **316**.

Each module is described further herein below. Specifically, integration module **310** is described further below, particularly in the section entitled "Integration Feature Examples of an Interactive Application". Notes synchronization module **312** is described further below, particularly in the section entitled "Notes Synchronization Feature Examples of an Interactive Application". Ink animation module **314** is described further below, particularly in the section entitled "Ink Animation Feature Examples of an Interactive Application". Communication module **316** is described further below, particularly in the section entitled "Peer-to-Peer (P2P) Real-Time Communication (RTC) Feature Examples of an Interactive Application".

Interfaces **318**, **320**, and **322** include one or more display output interfaces **318**, one or more user input interfaces **320**, and one or more communication connection interfaces **322**. In a described implementation, display output interfaces **318** include those video interfaces for interfacing with personal

and external display screens **104**(P) and **104**(E) (of FIG. **1**), respectively. User input interfaces **320** include those man-machine interfaces enabling a human to provide input to processing device **102**. Examples of input devices include a keyboard, a tablet, a touch-sensitive screen, a mouse, a stylus, an electronic pin, a gyroscopic-based input device, some combination thereof, and so forth. Output interfaces for output devices besides displays (e.g., speakers, printers, etc.) may additionally be included as part of processing device **102**. Display output interfaces **318** and user input interfaces **320** may be configured for wired or wireless communication.

Communication connection interfaces **322** may also be configured for wired or wireless communication. Communications effectuated via a communication connection interface **322** are propagated over a communications channel (e.g., communications channel **212** of the network layer of FIG. **2**) to or from another processing device **102**, for example. Such communications can include broadcast display data being sent from one display management component **206** at one processing device **102** to another display management component **206** at another processing device **102**. Additional description and examples of communication channels and corresponding communication connection interfaces **322** are provided in the following sub-section entitled "Additional Environmental, Component, and Operational Examples for a Processing Device".

Additional Environmental, Component, and Operational Examples for a Processing Device

Generally, processing device **102** may comprise any (e.g., electronic) device with computing/processing capabilities. As partially described above with reference to FIG. **3**, the components of processing device **102** may include, but are not limited to, processor(s) **304**, media **302**, and one or more interconnecting buses that couple various system components including processor **304** to media **302** and/or interfaces **318**, **320**, and **322**.

Presentation facilitation may be realized with numerous general purpose or special purpose devices, systems, environments, and/or configurations. Examples of well known devices, systems, environments, and/or configurations that may be suitable for use include, but are not limited to, personal computers (PCs), server computers, thin clients, thick clients, personal digital assistants (PDAs) or mobile telephones, watches, hand-held or tablet devices, laptop devices, multiprocessor systems, microprocessor-based systems, set-top boxes, programmable consumer electronics, video game machines, game consoles, portable or handheld gaming units, video conferencing equipment, network PCs, minicomputers, mainframe computers, wired or wireless networks, distributed or multi-processing computing environments that include any of the above systems or devices, some combination thereof, and so forth.

Processors **304** are not limited by the materials from which they are formed or the processing mechanisms employed therein. For example, processor **304** 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. Alternatively, the mechanisms of or for processors **304**, and thus of or for processing device **102**, may include, but are not limited to, quantum computing, optical computing, mechanical computing (e.g., using nanotechnology), and so forth.

Processing device **102** typically includes a variety of processor-accessible media **302**. Such media may be any available media that is accessible by processing device **102** or another device, and it includes both volatile and nonvolatile media, removable and non-removable media, and storage and transmission media.

Examples of storage media **302** include, but are not limited to, hard disks, removable magnetic disks, removable optical disks (e.g., compact disks (CDs), digital versatile disks (DVDs), etc.), flash memory, random access memory (RAM), read only memory (ROM), some combination thereof, and so forth. Other examples include magnetic cassettes or other magnetic storage devices, electrically-erasable programmable read-only memories (EEPROM), and so forth. Such storage media **302** may also include so-called special purpose or hard-wired IC chips. In other words, any processor-accessible storage media may be utilized to realize the storage media **302** of processing device **102**.

Additionally, media **302** may comprise transmission media **302**. Transmission media **302** includes communications connection interface(s) **322**, as well as wired or wireless communication channels **212** that allow processing device **102** to communicate with other devices. Transmission media typically comprises processor-accessible instructions (e.g., coding, data structures, program modules, messages, or other data) in a modulated data signal such as a carrier wave or other transport mechanism; it can also include any information delivery media. The term "modulated data signal" embraces signals that have one or more of their characteristics set or changed in such a manner as to encode information in the signal. By way of example but not limitation, transmission media includes wired media such as a wired network or a direct-wired connection and wireless media such as acoustic, radio frequency (RF), infrared, and other wireless media.

Thus, realizations for presentation facilitation may be described in the general context of processor-executable instructions. Generally, processor-executable instructions include routines, programs, coding, modules, protocols, objects, interfaces, components, metadata and definitions thereof, data structures, etc. that perform and/or enable particular tasks and/or implement particular abstract data types. Implementations of presentation facilitation, as described in certain embodiments herein, may also be practiced in distributed processing environments where tasks are performed by remotely-linked processing devices that are connected through a communications channel and/or network. Especially but not exclusively in a distributed computing environment, processor-executable instructions may be located in separate storage media, executed by different processors, and/or propagated over/extant on transmission media.

Logical connections between different processing devices **102** may be realized, for example, as a local area network (LAN) or a general wide area network (WAN). Such networking environments are commonplace in offices, enterprise-wide computer networks, intranets, the Internet, fixed and mobile telephone networks, ad-hoc and infrastructure wireless networks, other wireless networks, gaming networks, some combination thereof, and so forth. Such networks and communications channels thereof are additional examples of transmission media.

Especially in a networked environment, program modules or other processor-executable instructions that are depicted relative to one processing device **102**, or portion thereof, may be fully or partially stored in a remote media storage

device. By way of example, communication module **316** of interactive application **106** may reside on a memory component of one processing device **102** but may be usable or otherwise accessible via a different processing device **102**. Also, although interactive application **106**, as well as other processor-executable instructions such as OS **306**, are illustrated herein as discrete blocks, it is recognized that such programs, modules, components, and other instructions or portions thereof reside at various times in different storage components (e.g., RAM and a hard disk) of processing device **102** and are executed by processor **304** of processing device **102**.

Integration Feature Examples of an Interactive Application

In a described implementation, interactive application **106** facilitates presentations by, at least in part, enabling multiple productivity applications **308** to be integrated together into one console view. Integration module **310** performs the initial and primary integration, but communication module **316** and ink animation module **314** contribute to the presentation facilitation, especially from a distributed, audience-member-participation perspective, as is described further below in subsequent sections.

FIG. **4**A is an example of an initial screenshot **400**(**1**) of an interactive application **106**. Interactive application **106**, as represented by its main window **216**, is illustrated in a start-up or other mode in which a new file is being accessed. Main window **216** includes standard (e.g., those that are determined by OS **306**) window control buttons **412**. As illustrated, window control buttons **412** include, from left to right, a minimization button, a maximization button, and a closing or termination button.

Interactive application **106** includes a menu bar **402** and a tool bar **404**, which includes user-selectable buttons. An example of a menu bar **402** and a tool bar **404** (including buttons thereof) for an interactive application **106** is described further below with reference to FIG. **4**B.

In the illustrated initialization or other file-accessing mode, main window **216** of interactive application **106** includes a first region **406** (e.g., a pane of a window) devoted to a listing of eligible file types and/or available productivity applications **308**, along with an "OPEN" activation button. Once a file type and/or productivity application **308** has been selected, an open-file dialog window **408** appears with a listing **410** of file names that have the selected file type and/or that are appropriate for the selected productivity application **308**.

Selection of a named file of listing **410** causes interactive application **106** to launch or cause to be launched the (selected) productivity application **308** that is appropriate for the selected file. The selected file is also opened in a sub-window **218**. An example of such a sub-window **218** is described further below with reference to FIG. **4**C.

FIG. **4**B illustrates examples for menu bar **402** and tool bar **404** aspects of a graphical user interface (GUI) for an interactive application **106**. A top portion of a main window **216** for interactive application **106** is illustrated. Menu bar **402** includes three menu items: a "File" menu item, a "Tool" menu item, and a "Projector" menu item. A different set of menu items may alternatively be implemented.

The "File" menu item enables file-related functions to be accessed. These functions may include opening files, closing files, and so forth. Furthermore, other standard file menu options, such as printing or converting, may be included. The "Tool" menu item enables access to various tools offered by interactive application **106**, possibly including the tools present on tool bar **404**. A "Projector" menu item enables access through interactive application **106** to adjustable features and/or general control of a projection function and/or of a projector that is coupled to processing device **102**.

Tool bar **404**, as illustrated, includes buttons for tools that are likely to be routinely used during a presentation. These control buttons include slide buttons **414**, color palette buttons **416**, pointer selection buttons **418**, line style selection buttons **420**, voice note recorder tool button **422**, and file management button **424**, which provides quick access to common file functions (e.g., open file). More or fewer buttons for each of the illustrated button tool sets and/or other button tool sets may alternatively be implemented.

Slide buttons **414** enable a presenter to switch between slides or to terminate a slideshow presentation. For example from left to right, slides may be changed to a next slide or a previous slide, and the presentation may be ended. Color palette buttons **416** enable selection of colors for highlighting text and/or figures with semi-transparent colors and for drawing and/or marking on the slide for emphasis.

Pointer selection buttons **418** enable the selection of a desired pointer shape, such as a hand or finger, an arrow, a character, a symbol, etc. Line style selection buttons **420** enables a presenter to choose between lines of differing thickness, broad and narrow highlighters, motion animating arrows, and so forth.

Voice note recorder tool button **422** allows a presenter to record follow-up action items, questions, etc. that are to be addressed later. It can also be used to recall specific names or contact information for audience members that are to be contacted later. The speech being recorded may be collected in a manner that is opaque to the audience members so that the fluidity of the presentation is not jeopardized. In other words, a presenter may press the recording button during the presentation and then press the cease recording button when the relevant speech information has been recorded and that voice note is therefore complete.

FIG. **4**C illustrates a general example of a screenshot **400**(**2**), including a shared portion **426**, for an integration feature of an interactive application **106**. The console view provided by interactive application **106** divides main window **216** (as indicated in FIGS. **2** and **4**A) into four sub-windows **218** (as also indicated at FIG. **2**).

The pane for listing **406** (of FIG. **4**A) may be left visible or slid closed. In FIG. **4**C, pane **406** having the listing of eligible file types and/or available productivity applications **308** has been slid closed and rendered (at least temporarily) un-viewable. Although not so pictured, each sub-window **218** that is providing a portal for a productivity application **308** may include one or more menu and/or tool bars for that productivity application **308**.

As illustrated, the four sub-windows **218** are occupied by three different productivity applications **308**. These productivity applications **308** include: a slideshow application **428**/**428*** (which is occupying two sub-windows **218**), a word processing application **430**, and an email application **432**. Hence, interactive application **106** is integrating three different productivity applications **308** onto the viewing console. However, additional productivity application(s) **308** that have been previously minimized may be brought onto the working area of the console view of interactive application **106** (e.g., by replacing or covering a current one). Alternatively, more (or fewer) than 4 sub-windows **218** may be presented.

Email application **432** is displaying an inbox and/or an opened email. Word processing application **430** is displaying an opened document. Slideshow application **428** is displaying a slide of an opened slideshow presentation file. As is described further below with particular reference to FIGS. **5**A-**5**E, slideshow application **428*** is also displaying a note or notes associated with the displayed slide, but in a different sub-window **218**. Because each particular file is opened through its corresponding native productivity application **308**, each particular file may be amended or otherwise manipulated in manners provided by its corresponding native productivity application **308**.

Any one (or possibly more) of the portions of main window **216** may be shared with audience members participating in a presentation. The shared portion **426** (or portions) is transmitted as shared display portions **108**(T) (of FIG. **1**) to other processing devices **102** and/or to an external display screen **104**(E). Shared portions **426** are described further below with particular reference to FIGS. **4**D-**4**F.

FIGS. **4**D-**4**F illustrate specific examples of screenshots **400**(**3**) to **400**(**5**) with shared portions **426** for an integration feature of an interactive application **106**. With interactive application **106**, a user may select (the displayed content of) which productivity application **308** is to be shared with audience members. The sharing may be effectuated with other processing devices **102** and/or an external display screen **104**(E).

Selection of a display portion for sharing may be accomplished using any one or more of a myriad of e.g. GUI input mechanisms. These include key combinations with a keyboard, typed commands, drop-down menus (e.g., from menu bar **402**), pressing a button on a tool bar (e.g., tool bar **404**), pressing a window control button **412** (of FIG. **4**A), some combination thereof, and so forth.

As illustrated at screenshot **400**(**3**) of FIG. **4**D, a specialized window control button **434** is added by interactive application **106** to each sub-window **218** for each productivity application **308**. Share selection window control button **434** can be in an active state **434**(A) or an inactive state **434**(I). The states can be toggled by selecting this project-out button with an input device that is directing a pointer icon.

If a sub-window **218** has an active share selection window control button **434**(A), the contents displayed in that window are shared as shared portion **426** with other audience members. Thus, the slide of slideshow application **428** is shared as shared portion **426**. If a sub-window **218** has an inactive share selection window control button **434**(I), the contents displayed in that window are not shared with other audience members. Hence, the windowed contents displayed by word processing application **430** and email application **432** are not shared.

Optionally, the "notes for slide" sub-window **218** may not have a sharing capability. Interactive application **106** may be configured to enable the sharing of one sub-window **218** or multiple sub-windows **218**. If only one sub-window **218** is sharable at any given moment, then the set of four (or three) share selection window control buttons **434** may act in a "radio style" in which activating one deactivates a previously-active button.

As illustrated at screenshot **400**(**4**) of FIG. **4**E, share selection window control buttons **434**(I) are inactive for slideshow application **428** (both windows) and a browser application **436**. On the other hand, share selection window control button **434**(A) is active for word processing application **430**. Hence, the document being displayed and possibly modified through word processing application **430** is being shared as shared portion **426**.

As illustrated at screenshot **400**(**5**) of FIG. **4**F, share selection window control button **434**(A) for browser application **436** has been activated by a user, and share selection window control buttons **434**(I) are inactive for word processing application **430** and slideshow application **428**. Hence, the webpage being displayed through browser application **436** is being shared as shared portion **426**.

Notes Synchronization Feature Examples of an Interactive Application

FIGS. **5**A and **5**B illustrate examples of screenshots **500**(**1**) and **500**(**2**) for a note synchronization feature of an interactive application **106**. This feature may be implemented, at least in part, by notes synchronization module **312** (of FIG. **3**). As illustrated at screenshot **500**(**1**) of FIG. **5**A, slideshow application **428** is selected as a project-out sub-window **218** as indicated by active share selection window control button **434**(A). Consequently, the displayed slide #**1** is shared as shared portion **426**.

Alongside the sub-window **218** that is displaying slide #**1** through slideshow application **428**, another sub-window **218** is displaying notes for slide #**1** as indicated at **428***. The notes for slide #**1** may be referred to or even read from by a presenter during a presentation part that is referencing slide #**1**. When the presenter is finished with slide #**1**, the presenter advances the slideshow to the next slide, slide #**2**. This slide advancement may be accomplished, for example, by pressing a next slide button from among slide buttons **414** (of FIG. **4**B).

As illustrated at screenshot **500**(**2**) of FIG. **5**B, slideshow application **428** continues to be selected as a project-out sub-window **218** as indicated by active share selection window control button **434**(A). Consequently, the displayed slide #**2** is shared as shared portion **426**. Alongside the sub-window **218** that is displaying slide #**2** through slideshow application **428**, another sub-window **218** is displaying notes for slide #**2** as indicated at **428***.

Notes synchronization module **312** of interactive application **106** maintains the displayed notes portion **428*** so as to be synchronized to the slides that are currently being displayed by slideshow application **428**. In other words, notes synchronization module **312** displays notes that are associated with each slide as each slide is changed during a presentation.

FIG. **5**C illustrates a linkage **506** enabling a synchronization between slides **502** and associated notes **504** for a note synchronization feature of an interactive application **106**. A file **502*** includes multiple slides **502**. Slide #**1** **502**(**1**), slide #**2** **502**(**2**) . . . slide #n **502**(*n*) are illustrated along with associated respective notes for slide #**1** **504**(**1**), notes for slide #**2** **504**(**2**) . . . notes for slide #n **504**(*n*).

More specifically, respective slides #**1**, #**2** #n **502**(**1**,**2** . . . n) are associated with respective notes for slides #**1**, #**2** #n **504**(**1**,**2** . . . n) via respective linkages **506**(**1**), **506**(**2**) . . . **506**(*n*). The linkages **506** may be established and/or maintained by slideshow application **428** and/or notes synchronization module **312**. Typically, slides **502** are (e.g., doubly) linked together in an intended display order as indicated by double arrow **508**. Notes for slides **504** may also be (e.g., doubly) linked together in an intended display order as indicated by dashed double arrow **510**; alternatively, their respective linkages **506** may be used for ordering purposes.

FIG. **5**D is a flow diagram **512** that illustrates an example of a method for synchronizing associated notes to slides

during a presentation. At block **514**, it is determined if user input requesting a slide change has been detected. For example, interactive application **106** (e.g., integration module **310** and/or notes synchronization module **312**) may detect that a presenter has pressed a forward or backward slide button **414**. If not, then monitoring is continued to detect the pressing of a slide button.

If, on the other hand, user input to switch slides is detected (at block **514**), then the method of flow diagram **512** continues at block **516**. The actions of blocks **516-520** and those of blocks **522-526** may be performed sequentially or fully or partially simultaneously. At block **516**, an adjacent slide is ascertained. For example, a next or previous (according to user input) adjacent slide **502** is ascertained according to a link **508** and/or using some mechanism of slideshow application **428**. At blocks **518** and **520**, the adjacent slide is retrieved and displayed. For example, the adjacent slide **502** may be retrieved from a file **502*** of slides **502** and displayed in a sub-window **218** for slideshow application **428**.

At block **522**, a note that is associated with the (ascertained) adjacent slide is ascertained. For example, a linkage **506** for the adjacent slide **502** is used to ascertain a note for the adjacent slide **504**. At block **524**, the note associated with the adjacent slide is retrieved. For example, the note for the adjacent slide **504** may be extracted from the same file **502*** having the associated slide **502** (e.g., especially if slideshow application **428** enables a presenter to add un-displayed notes to slides **502** during creation of the slideshow). Alternatively, the note for the adjacent slide **504** may be extracted from a separate file created and/or maintained by e.g. interactive application **106**.

At block **526**, the note associated with the adjacent slide is displayed. For example, the note for the adjacent slide **504** may be displayed in a sub-window **218** for slideshow application **428***. These notes may be adjusted by the presenter to facilitate a seamless and/or more complete presentation as described below.

FIG. **5**E illustrates a hot spot area **528** that is an example of a control scheme for a note synchronization feature of an interactive application **106**. Screenshot **500**(**3**) includes a sub-window **218** for slideshow application **428** and an associated sub-window **218** as indicated by **428***. Slide #**2** is displayed through slideshow application **428** and may be amended using slideshow application **428**. Notes for slide #**2** are displayed and may be updated through interactive application **106** in this example implementation.

In a described implementation, the text size of the notes prompt view is large for easy readability. However, the text size may be adjusted by the presenter. The presenter may directly read from the notes view, take cues from it, or use it to recall specific data points. The notes viewing portion may also be used like a teleprompter. By leaving the cursor over one of four hot spots of hot spot area **528**, the presenter may choose to have the text scroll at automatic fast backward, slow backward, slow forward, and fast forward. The presenter may also scroll the text directly using a scrollbar **530**.

Ink Animation Feature Examples of an Interactive Application

In a described implementation, an ink animation feature is provided by an ink animation module **314** of an interactive application **106**. A presenter can draw on main window **216**, and ink graphics that fall within a sub-window **218** that is selected for sharing are displayed to the audience members in sync. Communication module **316** is used when the sharing includes other processing devices **102** to transmit broadcast display data collected by display management component **206**.

FIGS. **6**A-**6**C illustrate examples of screenshots **600**(**1**) to **600**(**3**) for an ink animation feature of an interactive application **106**. One use of ink is to create attention marks. Attention marks draw viewers' attention to specific content on slides or other displayed files. Examples of attention marks include: checks next to bullet points to indicate a current topic and an underlying of a current phrase.

Lecturers often have specific meanings in mind for different marks. For example, an instructor may annotate sequences by underlining terms to indicate progress, by adding a constant or repeating highlight, by circling key terms, and/or by using vertical bars to distinguish groups of terms. The use of attention marks can also refocus the audience's attention back to the slides, which makes the slides more central to the discussion.

At screenshot **600**(**1**) of FIG. **6**A, an underlining, a circling, and a question mark have been drawn on a slide of slideshow application **428** by a user. The question mark is formed from a dashed line, which may be selected using line style selection buttons **420**. With share selection window control button **434**(A) being activated for slideshow application **428**, the ink graphics are synchronously included on shared portion **426** for the audience to see.

At screenshot **600**(**2**) of FIG. **6**B, a diagram has been added to a document by the user. The width and color of the ink animation may be changed by the user with line style selection buttons **420** and color palette buttons **416**. With share selection window control button **434**(A) being activated for word processing application **430**, the ink graphics are synchronously included on shared portion **426** for the audience to see.

Prepared slides are generally able to display diagrams. However, when discussing the slides, it is important to draw attention to details, such as by tracing a data path in an architectural diagram or by showing active nodes in a state diagram. The inking can serve the purpose of an animation, where a process is demonstrated with contemporaneous inking.

At screenshot **600**(**3**) of FIG. **6**C, ink animation has been added to a webpage by the user. The ink may be further animated with line style selection buttons **420**. For example, the arrow may repeatedly point towards the "image" block, and the circling around the "headline" may change colors and/or blink. With share selection window control button **434**(A) being activated for browser application **436**, the ink graphics are synchronously included on shared portion **426** for the audience to see.

Peer-to-Peer Real-Time Communication Feature Examples of an Interactive Application

In a described implementation, a (substantially) simultaneous distributed communication feature is provided by a communication module **316** of an interactive application **106** to realize peer-to-peer (P2P) real-time communication (RTC). Opened file contents from integration module **310** and ink animations made thereon from ink animation module **314** are shared to processing devices **102** using group management component **204** and display management component **206**.

FIG. **7**A illustrates an example of a group membership organizational tree **702** for a distributed communication feature of an interactive application **106**. Organizational tree **702** may be visible, for example, in a window pane that is

accessible at main window **216** of interactive application **106**. Organizational tree **702** includes groups **704**, members **706** belonging to each group **704**, and presentations **708** corresponding to members **706**. Thus, resources (e.g., presentations) may be organized into groups **704**. A group **704** may have multiple group members **706**, and each member **706** may have at least one shared presentation **708**.

A user has the ability to choose which group **704** to enter and to choose in which group a presentation **708** is to be shared. In other words, a member **706** can enter different groups **704** and share different presentations **708** in each group **704**. These groupings, and organizational tree **702** overall, is instituted (i.e., created and maintained) by group management component **204**. For privacy purposes, viewing of a shared presentation **708** (including the title and/or existence thereof) can be confined to members **706** of the specified corresponding group **704**.

The P2P RTC of communication module **316** enables the broadcast of presented content and the synchronization of ink. As described above especially with regard to share selection window control buttons **434**, a user A/presenter can specify which sub-window's **218** content is shared. Another user B may click the user A's membership node **706** and/or presentation node **708** in organizational tree **702** to open a new sub-window **218** that displays the content shared by user A. The content is synchronized at regular intervals. Screenshots illustrating this content sharing are described below with reference to FIGS. **7**B and **7**C.

As noted above, for a P2P environment, a member's ink as well as file content is transferred between participating members. Thus, if user A marks ink at his or her processing device **102**, the ink is displayed in sync on user B's desktop, and vice versa. A screenshot illustrating this content sharing is described below with reference to FIG. **7**D.

FIGS. **7**B-**7**D illustrate examples of screenshots **700**(**1**) to **700**(**3**) for a distributed communication feature of an interactive application **106**. At screenshot **700**(**1**) of FIG. **7**B, user A, who is the primary presenter, is providing slide content for a presentation. Specifically, user A is sharing slide A through slideshow application **428** as shared portion **426**. User A is also receiving a slide B from user B's processing device **102** at received display **710**. At screenshot **700**(**2**) of FIG. **7**C, user A has pressed share selection window control button **434**(A) to activate the contents of received display **710** for sharing. Hence, slide B from user B becomes part of user A's presentation as slide B is shared as shared portion **426**.

At screenshot **700**(**3**) of FIG. **7**D, user A and user B are employing ink animation to contribute to the presentation. As indicated by key **712**, solid lines are drawn by user A, and dashed lines are drawn by user B. Both user A and user B have drawn ink graphics on slide A. Because the contents of slideshow application **428** has been selected for sharing, the line from user A and the triangle from user B are included as shared portion **426**. Although not currently shared from user A's processing device **102**, both user A and user B can also draw ink over slide B of received display **710**.

Interactive application **106**, especially when used in a distributed architecture mode, facilitates interactions between users. In meetings one or more users can write answers to questions raised by other audience members. With interactive application **106**, the answer writing can be performed using an electronic whiteboard (e.g., a blank sub-window **218** from a productivity application **308** or interactive application **106**) or by writing directly on slides.

Example Communication Implementation for Interactive Applications

An example implementation of communications between and among interactive applications **106** is described in this section. These communications can relate to, for example, a general distributed communication feature, an ink animation feature, and so forth.

With reference to FIG. **7**A, each given group **704** has a group administrator (not specifically indicated) that is the chief member **706** of the given group **704**. The group administrator is responsible for maintaining a member registry (not shown) having information for group members **706** of the given group **704**. Non-administrative members **706** thus register their information with the group administrator member **706**, which maintains the member registry.

The member registry may be stored at a processing device **102** of the group administrator member **706** or at another location (e.g., a central server or database). The information registered for each new group administrator member **706** includes a member identifier or identification (ID), a network connection, and a network address (e.g., an internet protocol (IP) address). This information is provided by the new member **706** to the group administrator member **706**, and the group administrator member **706** adds the information to the member registry. This information that is stored in the member registry is used in the process of distributing screenshots and ink data.

Distributed Communication of Screenshots

An active member (not specifically indicated in FIG. **7**A) is the member **706** who is sharing content (e.g., "Presentation **1**" **708**) to other group members **706**. Optionally, an active member indicator (not shown) may be presented on display screen **108**. For example, with reference to FIG. **7**B, an active member indicating icon or button may be presented next to active share selection window control button **434**(A) in the sub-window **218** of slideshow application **428** or next to window control buttons **412** of main window or console area **216** of interactive application **106**.

The application content data that is shared from an active member **706** with other group members **706** is a screenshot image of the selected sub-window **218**. First, at a predetermined frequency, a screenshot of the area of the selected project-out sub-window **218** is taken. In other words, a display portion **108** that is to be shared is screenshot at a specific frequency. This predetermined specific frequency may be, for example, once a second, every five seconds, once a minute, and so forth. If the user changes the selected active sub-window **218**, the screenshot area is changed accordingly.

Second, the screenshot is saved as an image data structure. The image data structure may be, for example, a bitmap image, a JPEG image, and so forth. Optionally, the image data structure may be compressed to facilitate storage and/or transmission.

Third, the image data structure is distributed from a processing device **102** of the active member **706** to processing devices **102** of other group members **706**. This distribution may be effectuated at the same predetermined frequency to realize a synchronization display feature at multiple terminations.

Alternatively, a previously-saved screenshot may be compared to a currently-taken screenshot. If there is a difference between the two (i.e., the displayed application content has changed), then the currently-taken screenshot is distributed.

Otherwise, if the screenshots are identical, the image data structure distribution may be omitted, at least until the next screenshot is taken at the predetermined frequency.

Distributed Communication of Ink

As described herein above and with reference to FIG. **7**D, ink applied to a selected active sub-window **218** of the active member **706** is distributed to other members **706** of the corresponding group.

In a first step, ink is collected. More specifically, at least the ink that is drawn on a selected active sub-window **218** is collected. In a described implementation, an ink layer is applied to and covers the application content displayed in a sub-window **218**. This upper ink layer is responsible for capturing the user's ink data and saving the data in order to collect the ink. The ink may be stored in an ink layer object (e.g., in an 'InkOverlay' object).

In a second step, an ink update is broadcast. When a user makes an ink drawing on the ink layer, this drawing event activates a drawing event processing function. The drawing event processing function captures the ink update data and saves it in the ink layer object as noted in the first step. The drawing event processing function also transmits an ink update message to other members **706** of the corresponding group **1**. The ink update message includes the originating active member **706** that is sending the message and the ink update data.

In a third step, the ink drawings are updated synchronously. After receiving the broadcasted ink update message, each member **706** terminator processing device **102** determines whether there is an opened sub-window **218** associated with the received ink update data. In other words, it is determined if there is displayed application content on which the received ink update data is to be overlain to synchronize display portion **108** of an active member **706** with display portion **108** of the terminating processing device **102**. If yes, the associated application content is currently being displayed in a sub-window **218**, then the ink update data is reflected in that sub-window **218**.

FIG. **7**E illustrates example display screens of an interactive application for members A and B who are sharing content. Screenshot **700**(**4**A) shows an interactive application **106** for member A, and screenshot **700**(**4**B) shows an interactive application **106** for member B. At member A's processing device **102**, slideshow application **428** is displaying slide A**3**, and ink has been drawn thereon. This slide A**3**, as well as the ink overlaid thereon, is synchronously reproduced at received display **710**B at member B's processing device **102**.

At member B's processing device **102**, slideshow application **428** is displaying slide B**7**, and ink has been drawn thereon. This slide B**7**, as well as the ink overlaid thereon, is synchronously reproduced at received display **710**A at member A's processing device **102**. An example messaging format for exchanging ink update data is described further herein below. As shown, the ink update data is reciprocally reflected by reproducing the visual effect originally created by the respective active members **706**.

In an alternative implementation, screenshots and ink data may be distributed together by binding one with the other. The ink update data captured by the ink layer is bound with a screenshot of the underlying sub-window **218** under the ink layer. The bound data can then be broadcast together. Thus, the drawn ink and the underlying screenshot of the selected sub-window **218** are distributed together and may be presented together at a display screen **104** at the receiver.

Example Communication Approaches, Protocols, and Formats

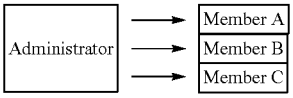
Information is communicated between and among different processing devices **102** using messages. One or more different types of messages may be defined and/or utilized. In a described implementation, each message includes sender/originating ID, receiver/destination ID, and the message content data. An example message format structure is:

Sender ID	Receiver ID	Content Data

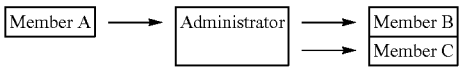
The content data can be ink update data or screenshot update data depending on whether the message is an ink update message or a screenshot update message, respectively. The content data may also comprise both ink update data and screenshot update data when they are bound together.

In an example P2P implementation, the P2P communication is based on a registry and message system. Message component **208** packs and unpacks the data for the messages. As described above, the member registry maintains the location and address information of members **706** of a group **704**. The member registry is stored at the terminator/processing device **102** of the group administrator member **706**. The system (e.g., each interactive application **106**) can ascertain group membership from the member registry and also extract therefrom network address locations to determine where to send the data.

The message distribution process differs in two example instances. In a first instance, the active member is also the group administrator. When the active member is also the group administrator, the processing device **102** thereof directly acquires the member information of the other group members from the member registry. The processing device **102** of the group administrator then distributes the screenshot image data and/or ink data to the other members. This first instance is graphically represented as follows:



In a second instance, on the other hand, the active member is not the group administrator. When the active member is not the group administrator, the processing device **102** thereof first sends the message to the group administrator. The processing device **102** of the group administrator then distributes the data to other members based on the information about the other group members in the member registry. This second instance is graphically represented as follows:



Alternatively, the member registry can be sent from the group administrator member to the active member upon request or automatically upon becoming active so that the

group administrator need not be involved in communicating every message. This approach can reduce the likelihood of the group administrator becoming a bottleneck, especially if there are multiple active members simultaneously sharing content in a single group.

In an example TCP/IP implementation, messages are transferred via the network layer. From the member registry, the network layer acquires the destination's IP address and sends the message via a socket connection.

Upon receipt of a message at the destination processing device **102**, the message is unpacked and forwarded to display component **206**. Firstly, it identifies the message type. If it is not a screenshot message or an ink update message, it is processed in the background. Otherwise, display component **206** identifies the origin member from which the data was sent. If there is an opened sub-window **218** for displaying the received screenshot and/or ink data from the sending member, display component **206** displays the screenshot first and thereafter repaints the ink data thereon in an ink layer.

The devices, actions, aspects, features, procedures, components, screenshots, etc. of FIGS. **1**-**7**E are illustrated in diagrams that are divided into multiple windows, blocks, or other portions. However, the order, interconnections, interrelationships, layout, etc. in which FIGS. **1**-**7**E are described and/or shown is not intended to be construed as a limitation, and any number of the windows, blocks, or other portions can be modified, combined, rearranged, augmented, omitted, etc. in any manner to implement one or more systems, methods, devices, procedures, media, apparatuses, arrangements, etc. for presentation facilitation implementations. Furthermore, although the description herein includes references to specific implementations, the illustrated and/or described implementations can be implemented in any suitable hardware, software, firmware, or combination thereof and using any suitable device architecture(s), GUI(s), network communication protocol(s), man-machine interface(s), display mechanism(s), and so forth.

Although systems, media, devices, methods, procedures, apparatuses, techniques, schemes, approaches, procedures, arrangements, and other implementations have been described in language specific to structural, logical, algorithmic, visual, and functional features and/or diagrams, it is to be understood that the invention defined in the appended claims is not necessarily limited to the specific features or diagrams described. Rather, the specific features and diagrams are disclosed as exemplary forms of implementing the claimed invention.

We claim:

1. A computer-implemented method comprising:

displaying, on a local terminating device in a distributed system, a main window of an interactive application displaying a set of sub-windows, wherein the main window includes a minimization button configured to, upon selection, minimize the main window and the set of sub-windows;

displaying within the main window, a first sub-window having first content generated by a first productivity application, wherein the first productivity application is one of a word processing application, a slide presentation application, an email application, a schedule management application, or a web browsing application;

displaying within the main window, a second sub-window having second content generated by a second productivity application, wherein the second productivity application is one of a word processing application, a slide presentation application, an email application, a schedule management application, or a web browsing application;

displaying, within the first sub-window, a first selectable button configured to toggle transmission of the first content, but not the second content;

displaying, within the second sub-window, a second selectable button configured to toggle transmission of the second content, but not the first content;

receiving a first selection of the first selectable button;

based on receiving the first selection of the first selectable button, transmitting, from the local terminating device to a remote terminating device in the distributed system, the first content but not the second content;

receiving, from the remote terminating device, annotations to at least one of the first content or the second content, wherein the annotations are received from the remote device;

displaying, on the local terminating device, the received annotations to the at least one of the first content or the second content, wherein the annotations are displayed as an overlay of one of the first content or the second content;

receiving a second selection of the first selectable button; and

based on receiving the second selection of the first selectable button, ceasing transmission of the first content, wherein the first content continues to be displayed in the first sub-window.

2. The computer-implemented method of claim **1**, further comprising displaying an updated version of the first selectable button while the first content is being transmitted.

3. The computer-implemented method of claim **1**, wherein transmitting, to the remote device, the first content includes sharing screenshots of the first content.

4. The computer-implemented method of claim **1**, wherein the annotations are displayed within the sub-window corresponding to the content being shared and the annotations are displayed as an overlay on top of the content being shared.

5. The computer-implemented method of claim **1**, further comprising:

receiving a user-input annotation to the at least one of the first content or the second content in addition to the displayed annotations; and

sharing the user-input annotation with the remote terminating device.

6. The computer-implemented method of claim **1**, wherein the first and second productivity applications comprise different productivity applications.

7. The computer-implemented method of claim **1**, wherein the remote terminating device is a tablet personal computer.

8. The method of claim **1**, further comprising displaying, in the second sub-window, a termination button configured to, upon selection, close the second sub-window.

9. The method of claim **1**, wherein the main window further includes a termination button configured to, upon selection, close the main window and the set of sub-windows.

10. The method of claim **1**, further comprising:

based on receiving the first selection of the first selectable button, changing the display of the selectable button from a first state to a second state, wherein the second state indicates the first content is being transmitted; and

based on receiving the second selection of the first selectable button, changing the display of the selectable button from the second state to the first state.

11. A computer-implemented method comprising:

displaying, on a local device, a main window of an interactive application having a first sub-window, a second sub-window, and a third sub-window, wherein the main window includes a minimization button configured to, upon selection, minimize the main window and the first sub-window, the second sub-window, and the third sub-window;

receiving, at the local device, shared content from a remote device, wherein the shared content is from one of a word processing application, a slide presentation application, an email application, a schedule management application, or a web browsing application;

displaying the shared content in the first sub-window;

receiving user-input annotations to the shared content from a user at the local device, wherein the annotations are provided as an overlay of the shared content;

displaying the user-input annotations to the shared content in the first sub-window;

sending the annotations received at the local device to the remote device;

receiving, from the remote device, additional annotations to the shared content;

concurrently displaying, within the second sub-window, the additional annotations along with the user-input annotations on the display of the local device;

displaying, in the third sub-window, productivity content generated from a productivity application;

displaying, in the third sub-window, a selectable button configured to toggle transmission of the productivity content;

receiving a first selection of the selectable button;

based on receiving the first selection of the selectable button, transmitting, from the local device to the shared device, the productivity content but not the shared content;

receiving a second selection of the selectable button; and

based on receiving the second selection of the selectable button, ceasing transmission of the productivity content, wherein the productivity content continues to be displayed in the third sub-window.

12. The computer-implemented method of claim **11**, further comprising sending an annotation update message to the remote device indicating that the user has provided user-input annotations.

13. The computer-implemented method of claim **11**, displaying the user-input annotations in a format different from a format of the additional annotations.

14. The computer-implemented method of claim **11**, wherein the shared content and user-input annotations are displayed in the first sub-window and the additional annotations are displayed in the second sub-window.

15. A system comprising:

at least one processor; and

a memory storing instructions that when executed by the at least one processor perform a set of operations comprising:

displaying, on a local terminating device in a distributed system, a main window of an interactive application displaying a set of sub-windows, wherein the main window includes a minimization button configured to, upon selection, minimize the main window and the set of sub-windows;

displaying within the main window, a first sub-window having first content generated by a first productivity application;

displaying, within the first sub-window, a first selectable button configured to toggle transmission of the first content but not the second content;

displaying within the main window, a second sub-window having second content generated by a second productivity application;

displaying, within the second sub-window, a second selectable button configured to toggle transmission of the second content but not the first content;

receiving a first selection of the first selectable button;

based on receiving the first selection of the first selectable button, transmitting, from the local terminating device to a remote terminating device, the first content but not the second content;

receiving a second selection of the first selectable button; and

based on receiving the second selection of the first selectable button, ceasing transmission of the first content, wherein the first content continues to be displayed in the first sub-window.

16. The system of claim **15**, wherein the operations further comprise displaying an updated version of the first selectable button subsequent to and based on the selection of the first selectable button.

17. The system of claim **15**, wherein the first and second productivity applications comprise different productivity applications selected from a group of productivity applications including: a word processing application, a slide presentation application, an email and/or schedule management application, a web browsing application, an art/drawing application, and a music/movie playing/creating application.

18. The system of claim **15**, wherein the operations further comprise:

receiving a user-input annotation to the at least one of the first content or the second content; and

sharing the user-input annotation with the remote terminating device.

19. The system of claim **15**, wherein the operations further comprise:

based on receiving the first selection of the first selectable button, changing the display of the first selectable button from a first state to a second state, wherein the second state indicates the first content is being transmitted; and

based on receiving the second selection of the first selectable button, changing the display of the first selectable button from the second state to the first state.

20. The system of claim **15**, wherein the main window of the interactive application includes a termination button configured to, upon selection, close the main window and the set of sub-windows.

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