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**Lavian et al.**

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(54) **DEVICE AND METHOD FOR PROVIDING  
ENHANCED TELEPHONY**

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Or-Bach**, San Jose, CA (US)

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U.S.C. 154(b) by 0 days.

This patent is subject to a terminal dis-  
claimer.

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**H04M 1/00** (2006.01)  
**H04M 3/493** (2006.01)

(52) **U.S. Cl.**  
CPC ..... **H04M 3/493** (2013.01)  
USPC ..... **455/556.1**; 704/275

(58) **Field of Classification Search**

None

See application file for complete search history.

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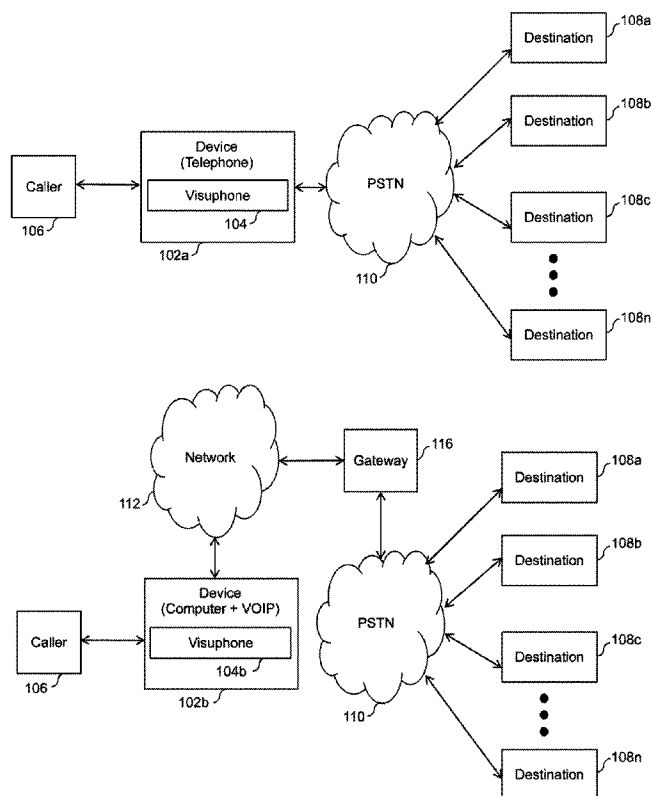
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*Primary Examiner* — Maria El-Zoobi

(57) **ABSTRACT**

Embodiments of the invention provide a communication system including a processor and a memory coupled to the processor. The memory includes instructions executable by processor to communicate with a database comprising a plurality of visual integrated voice response (IVR) menus associated with a plurality of destinations. Further, the instructions executable by the processor for receiving a dialed phone number of a destination. Furthermore, the instructions executable by the processor for comparing the dialed phone number with phone numbers stored in the database. Additionally, the instructions executable by the processor for transferring to be displayed a form based on the comparison. Herein, the form comprises one or more data request fields corresponding to a visual IVR menu associated with the dialed destination.

**20 Claims, 33 Drawing Sheets**



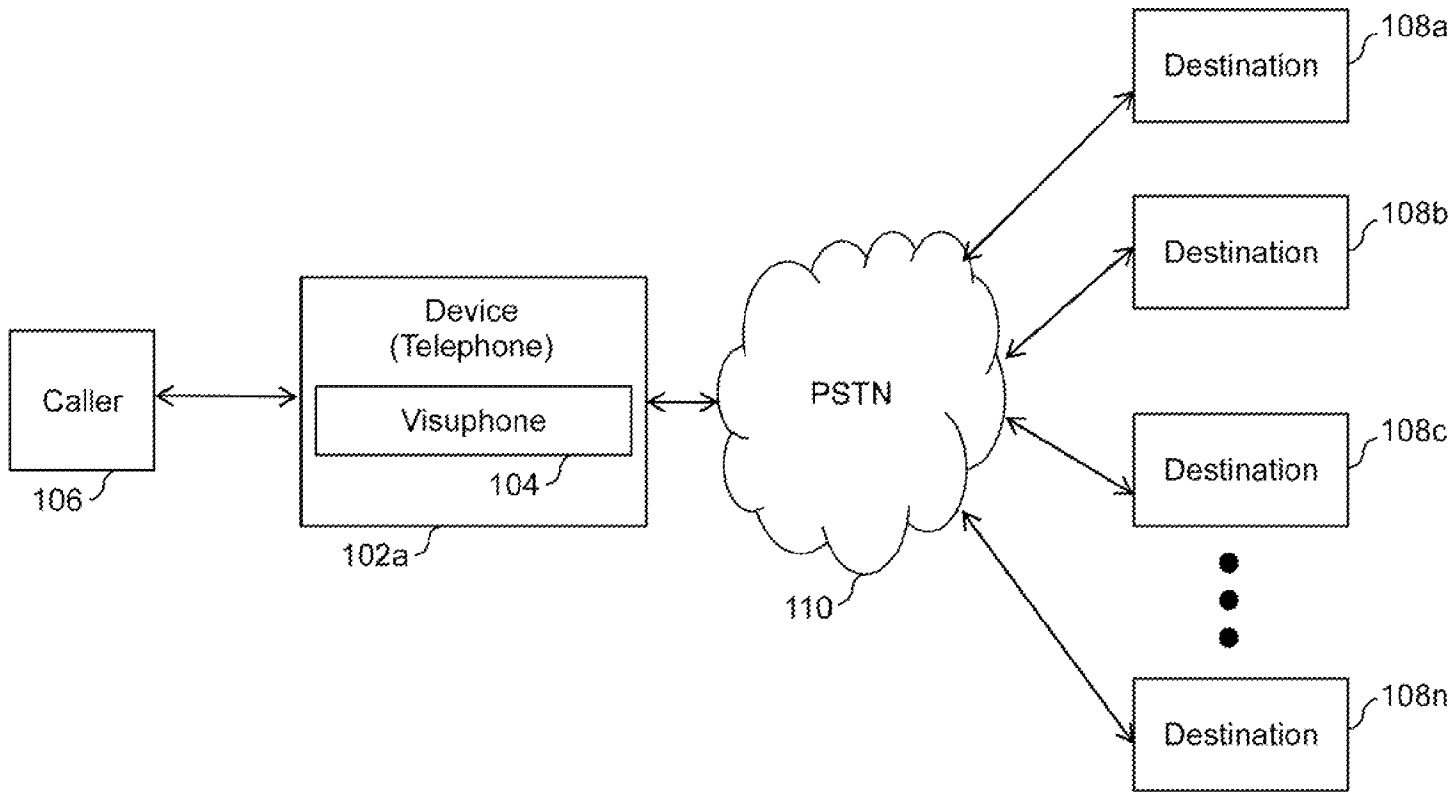


FIG. 1A

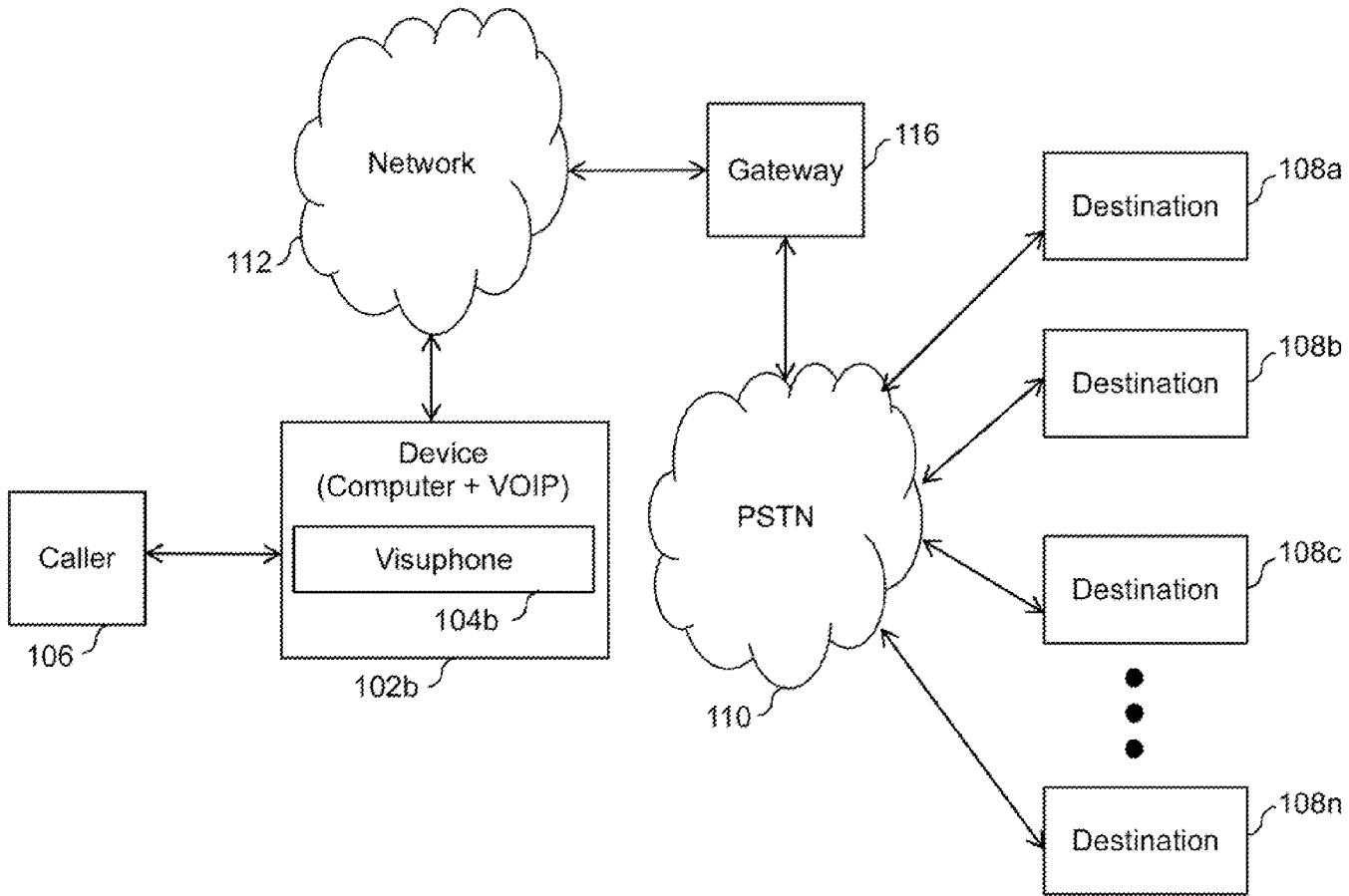


FIG. 1B

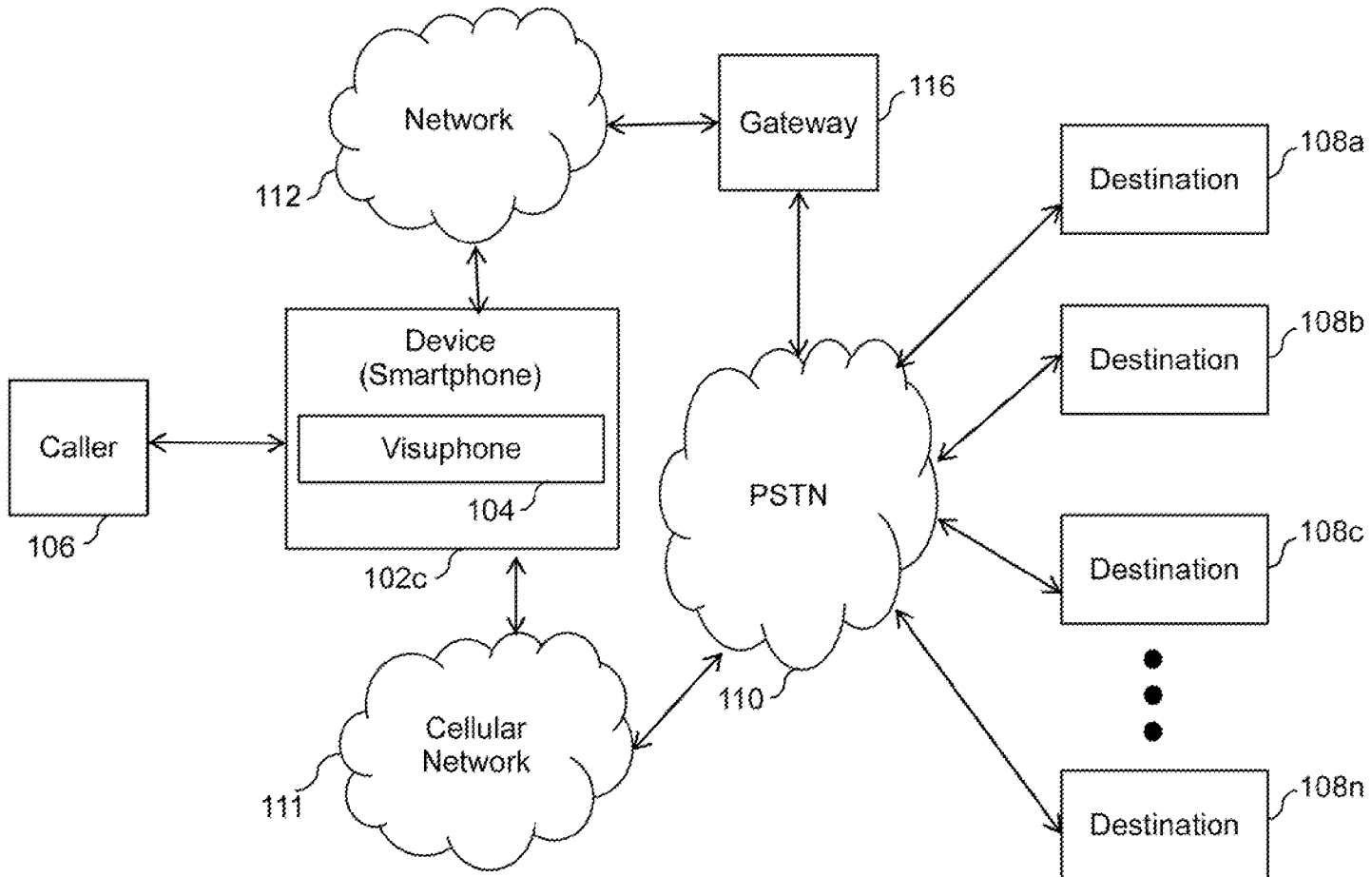


FIG. 1C

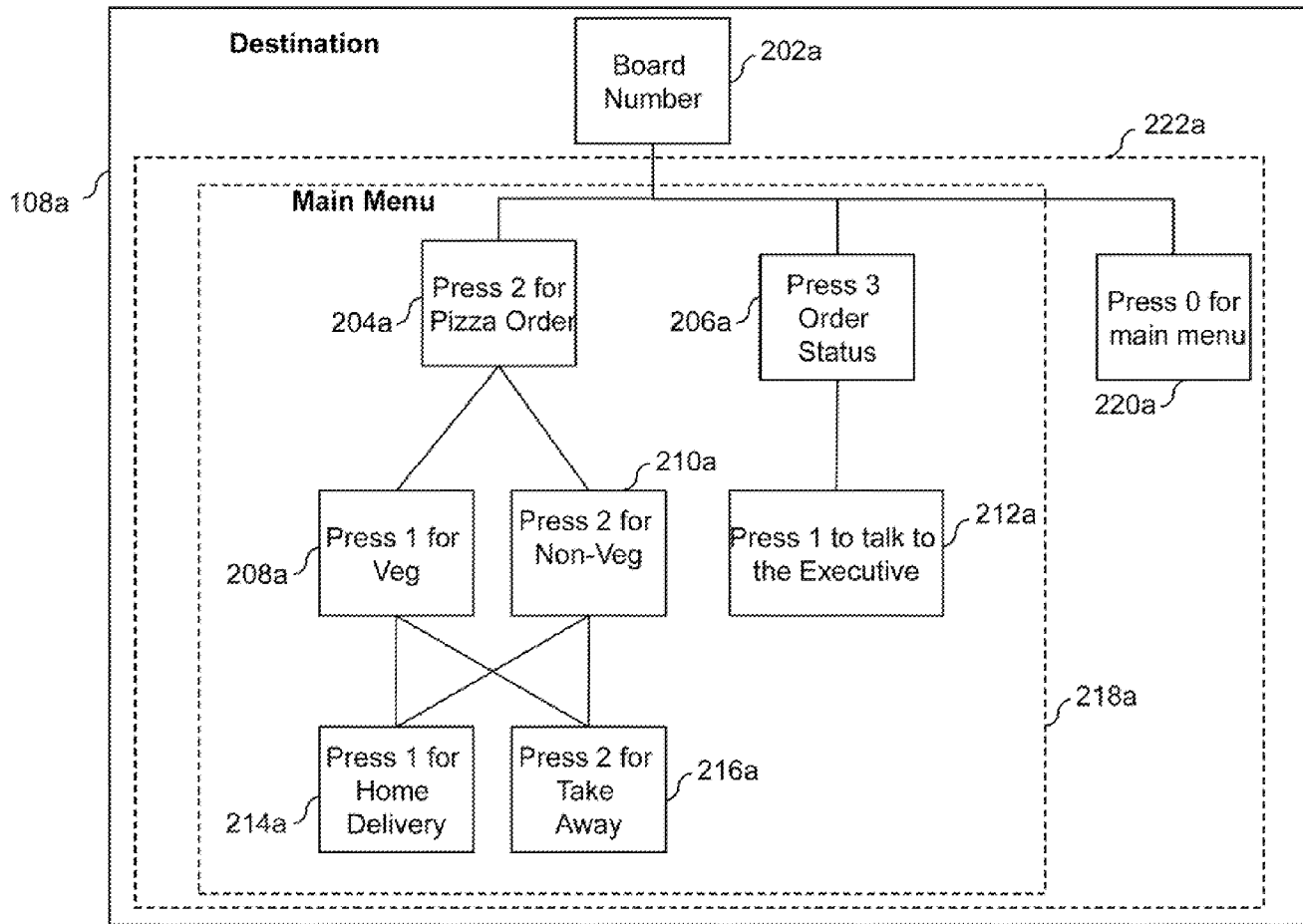
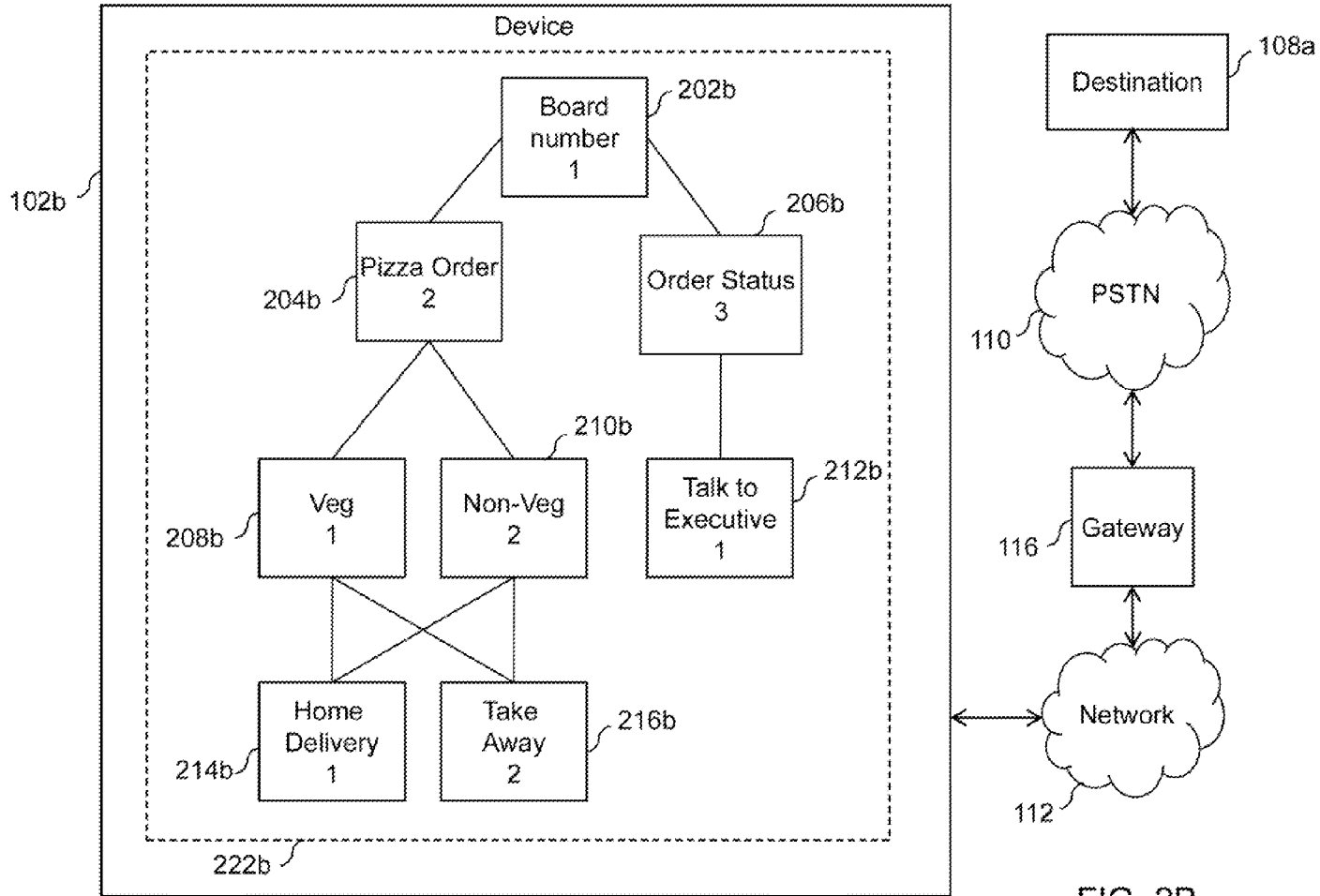
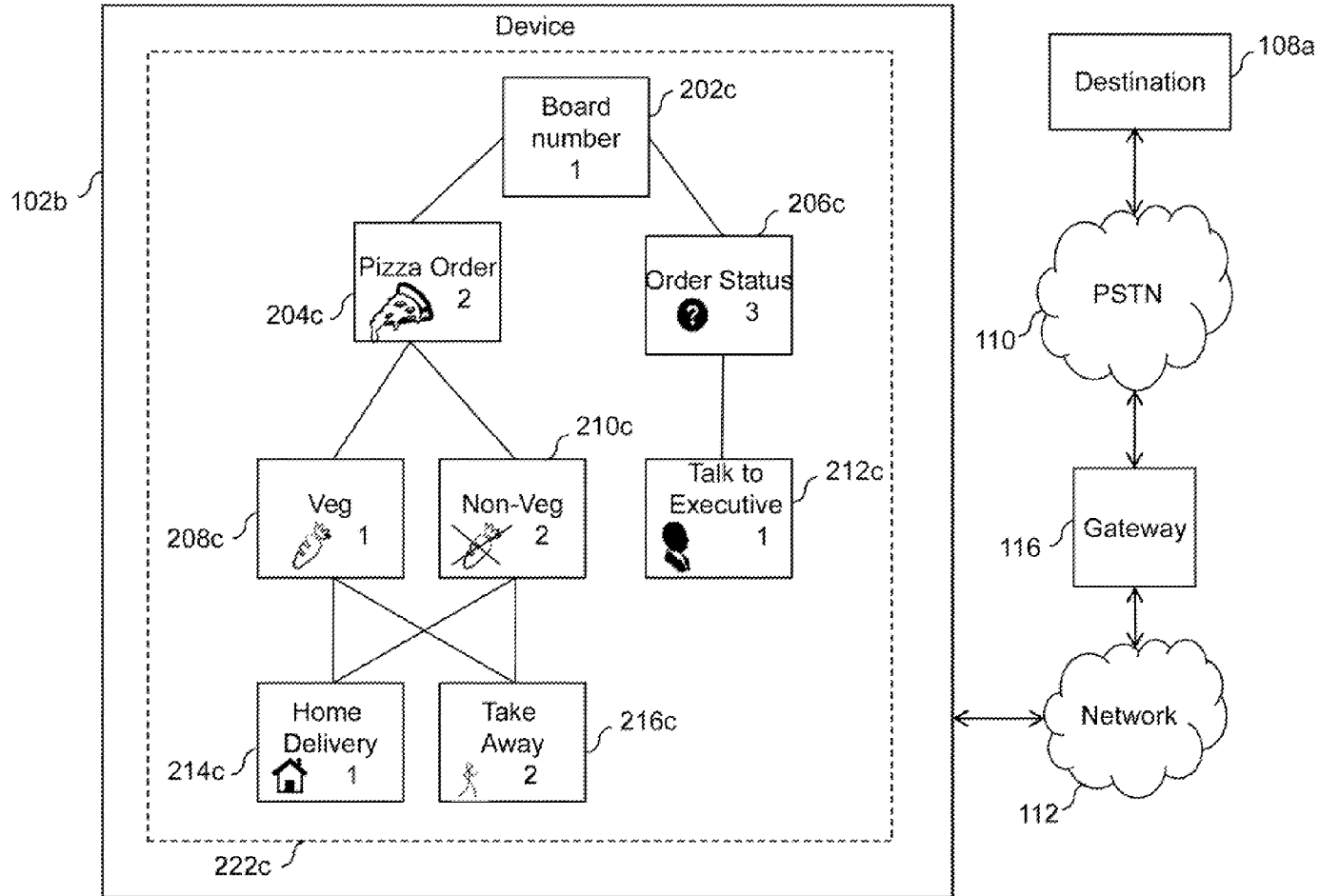


FIG. 2A





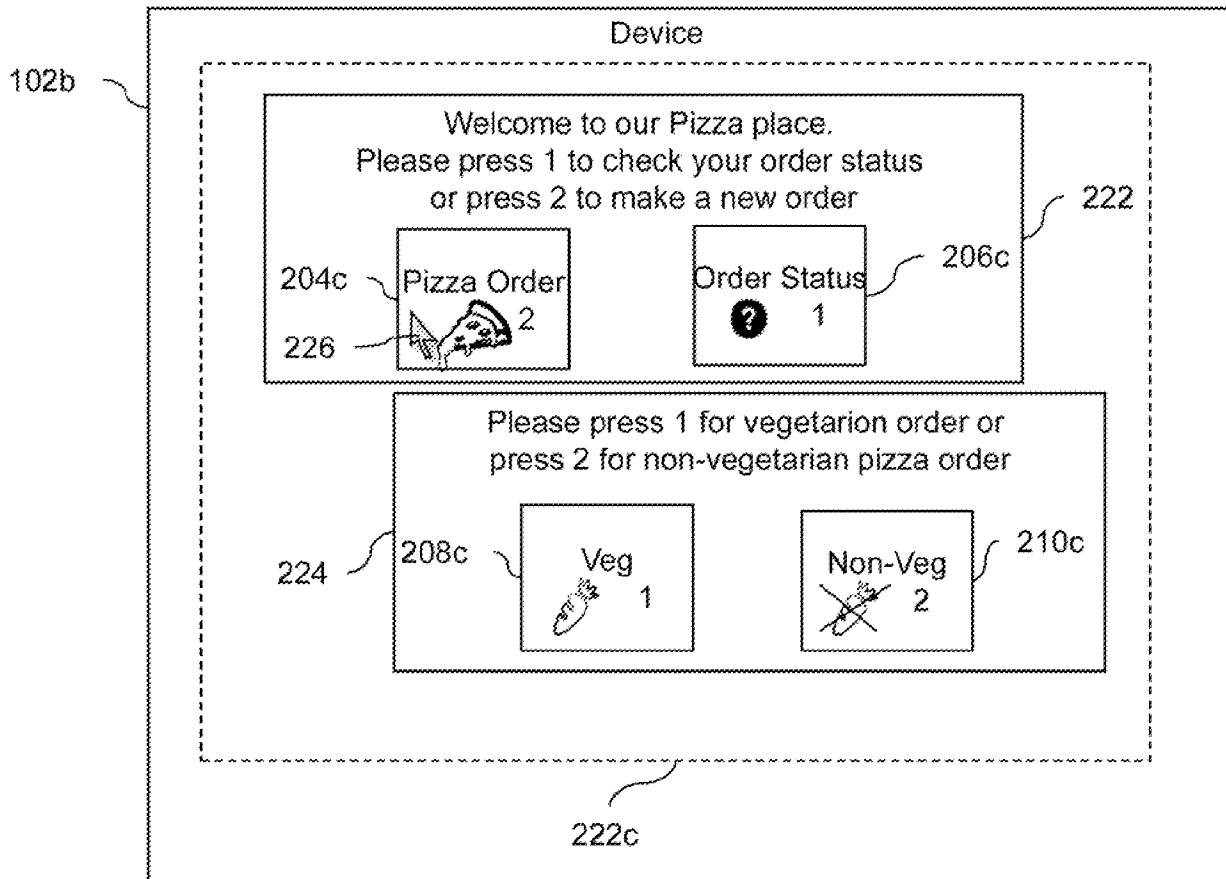


FIG. 2D



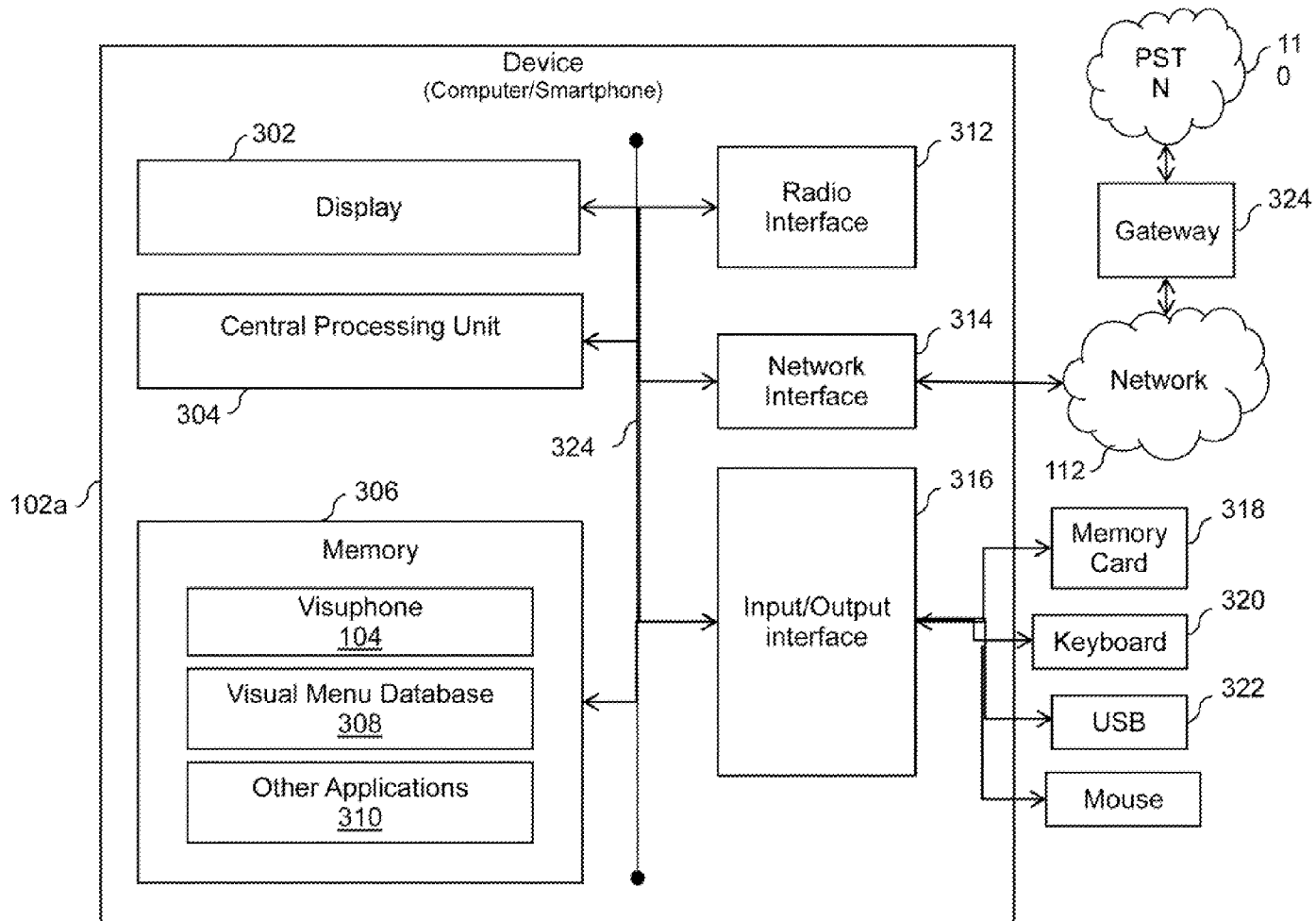


FIG. 3A

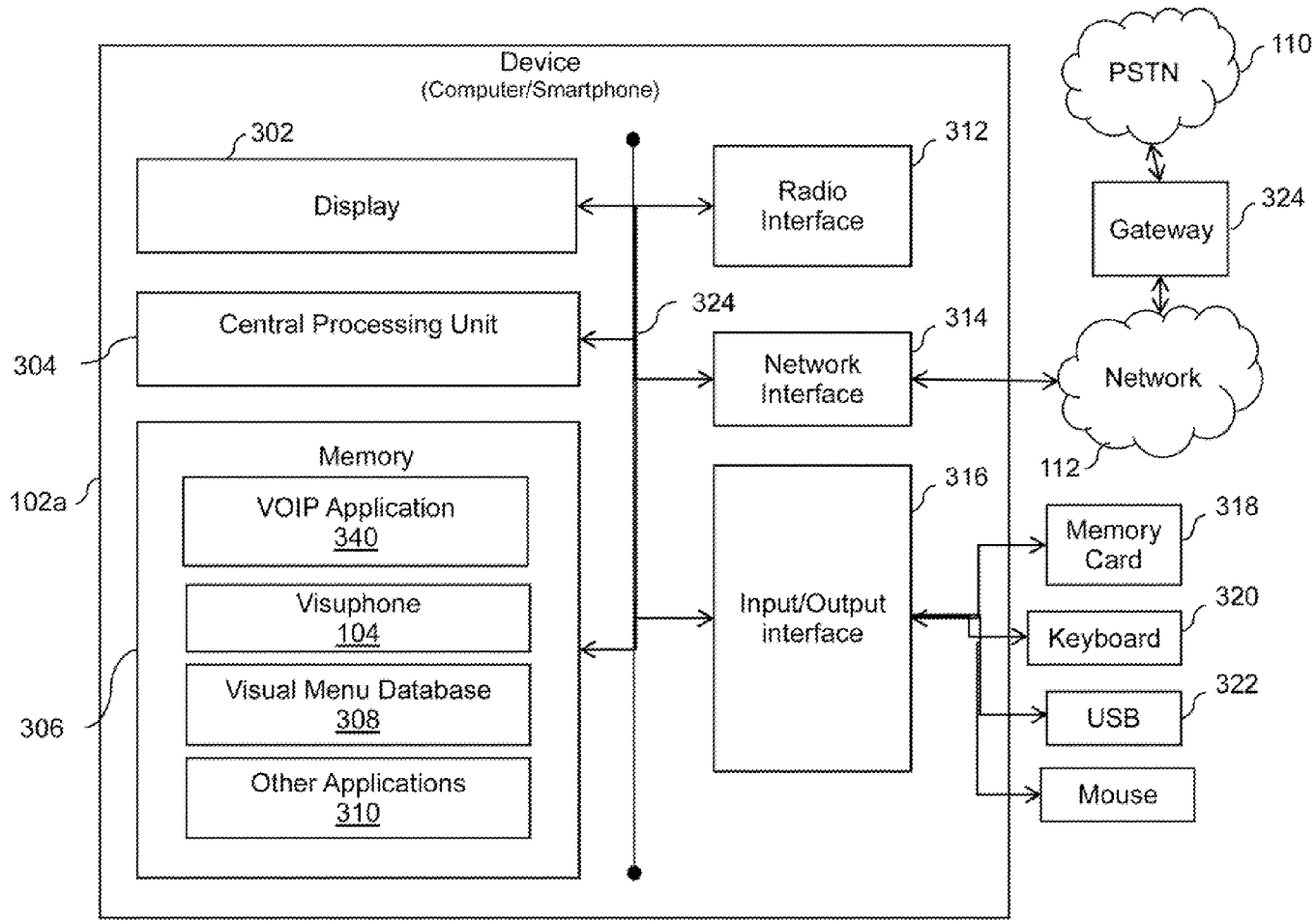


FIG. 3B

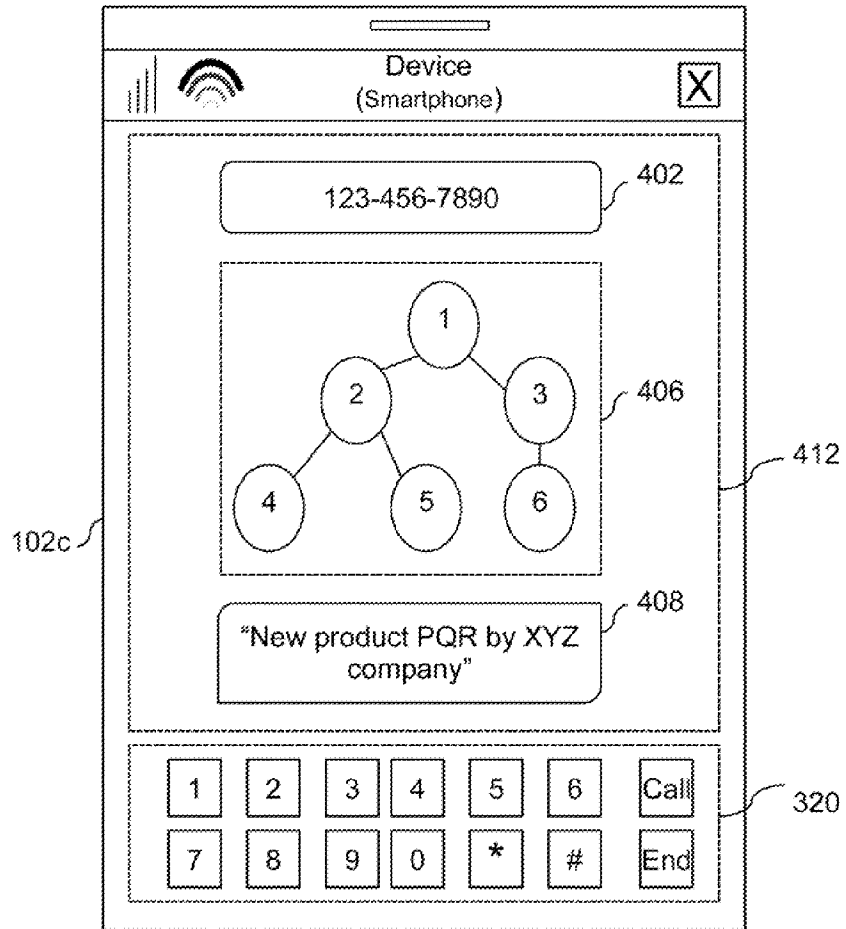


FIG. 4

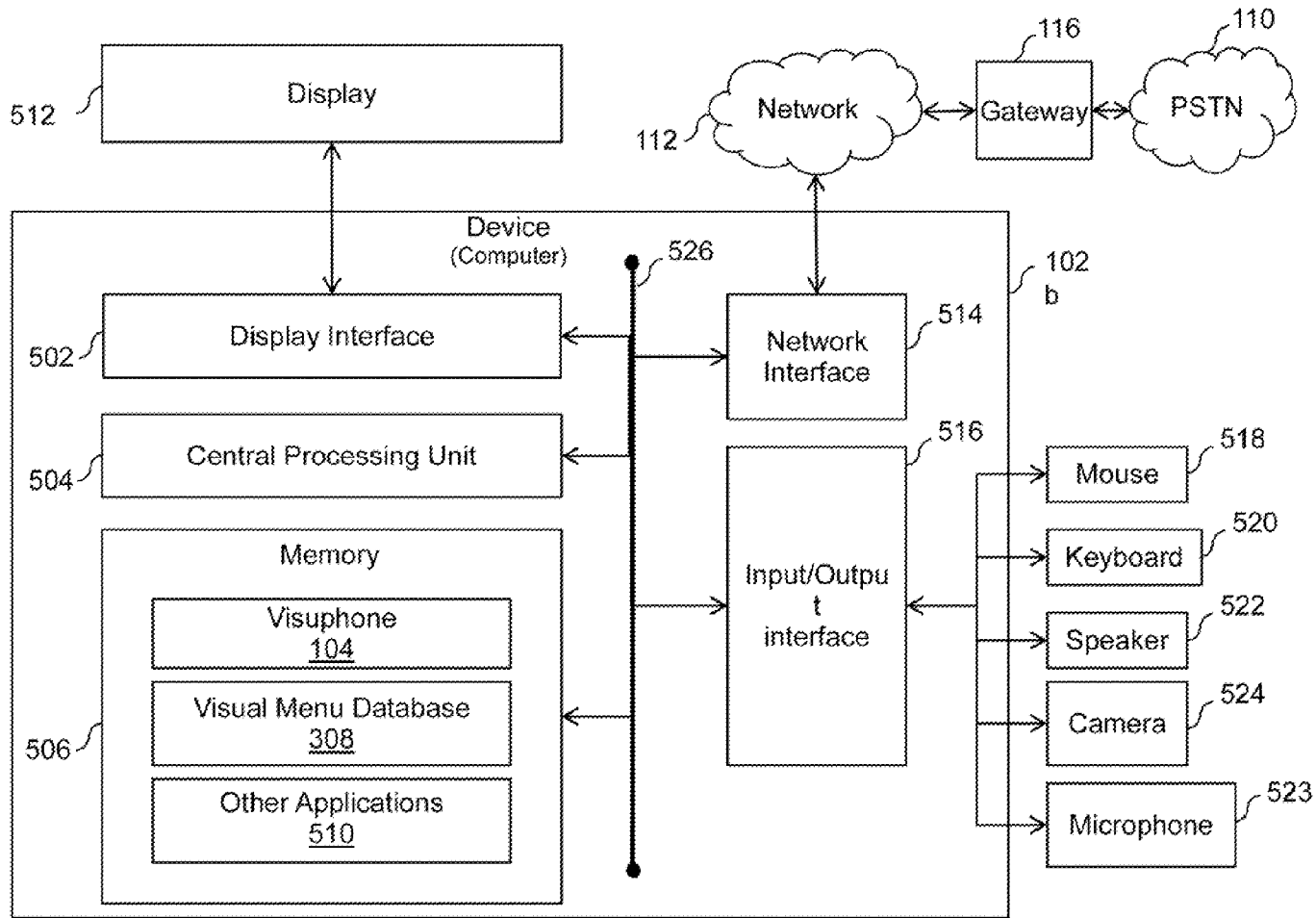


FIG. 5

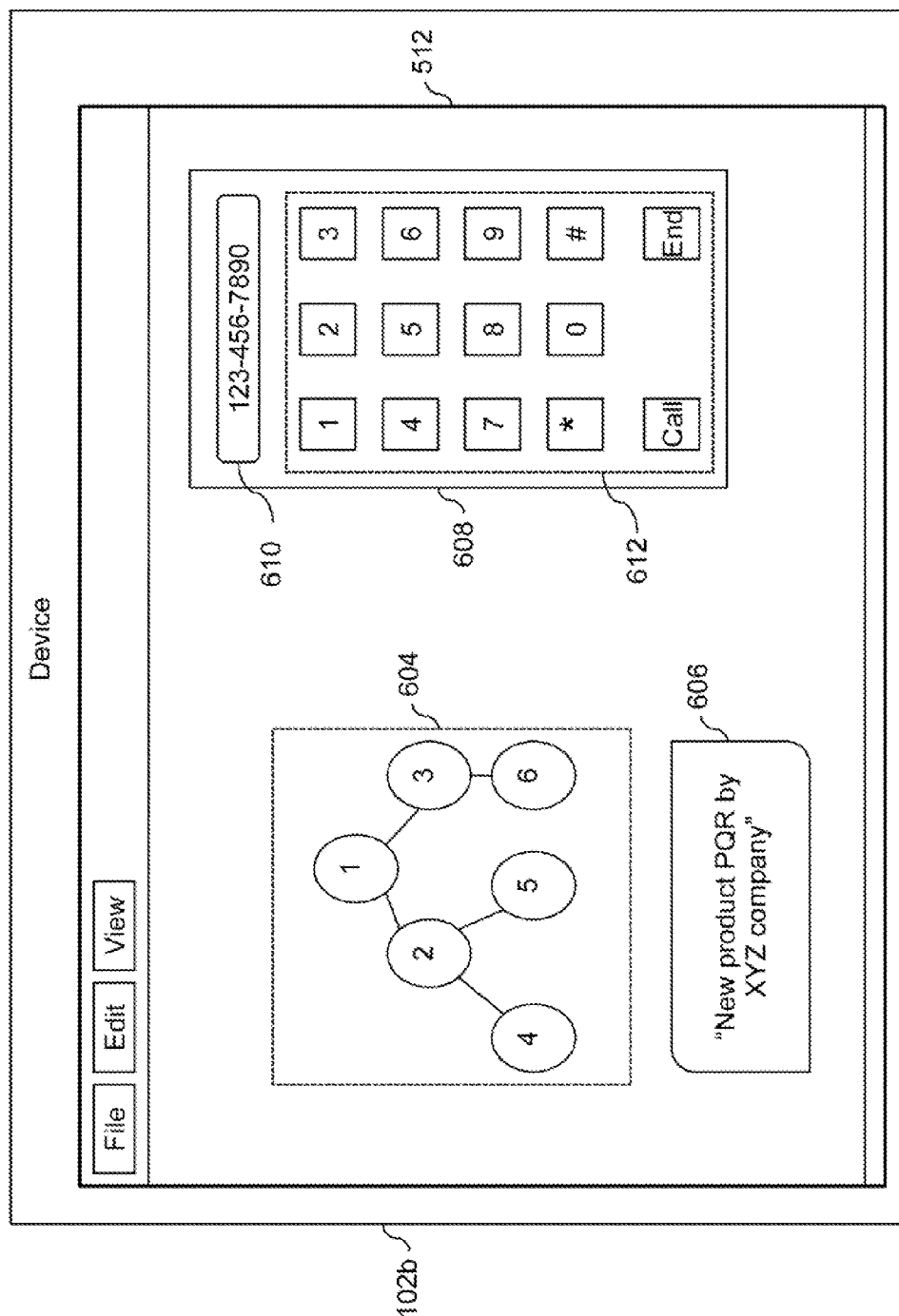


FIG. 6

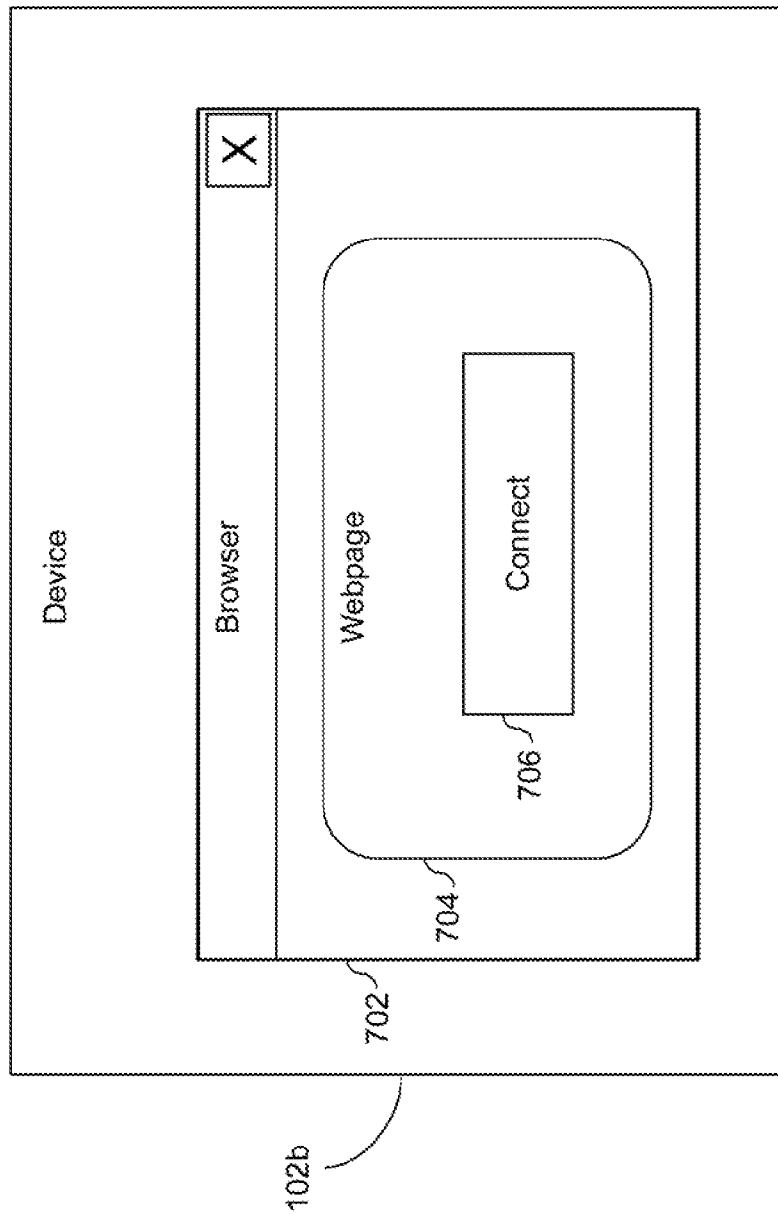


FIG. 7

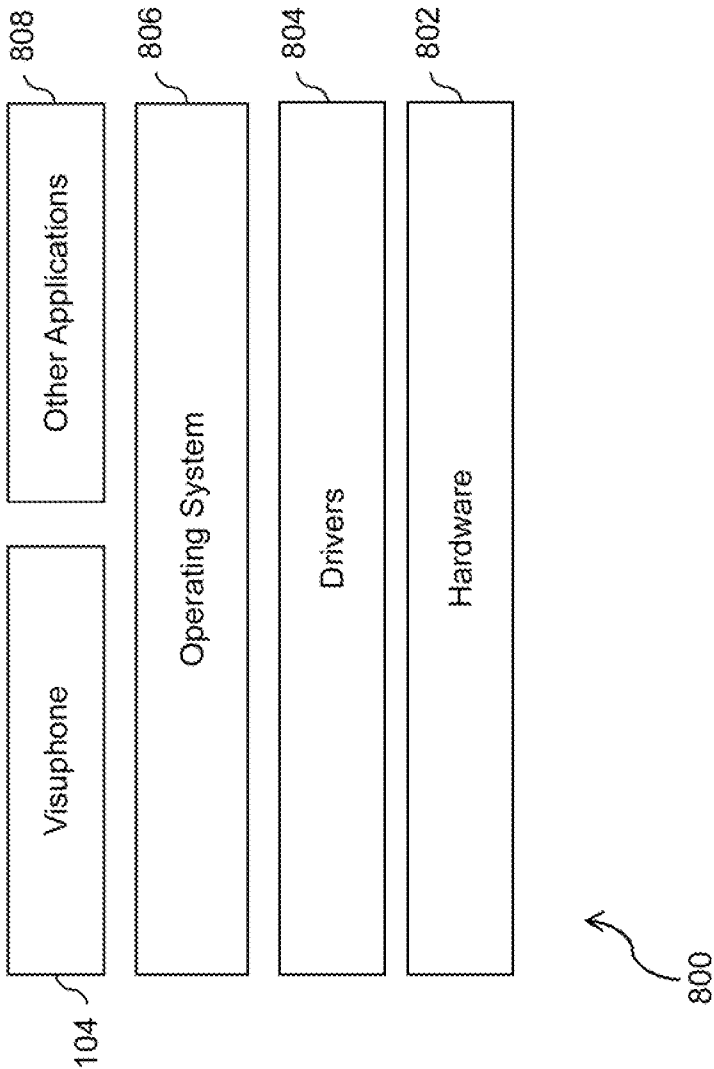


FIG. 8

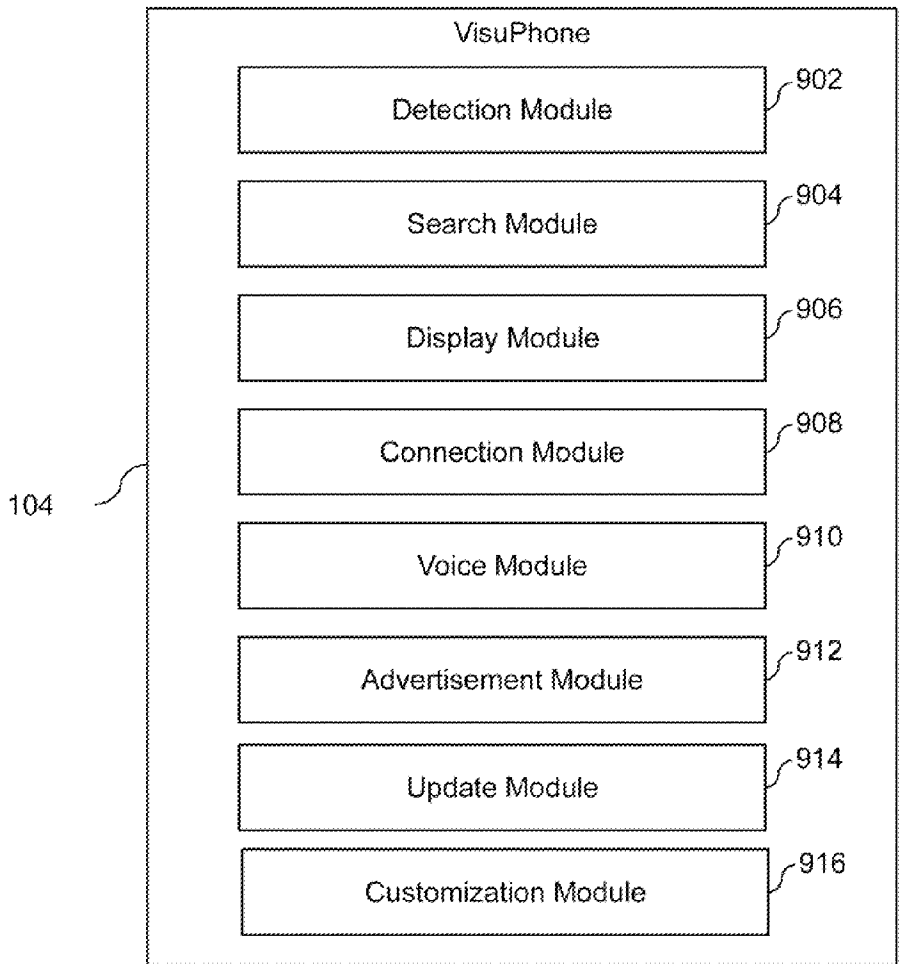


FIG. 9



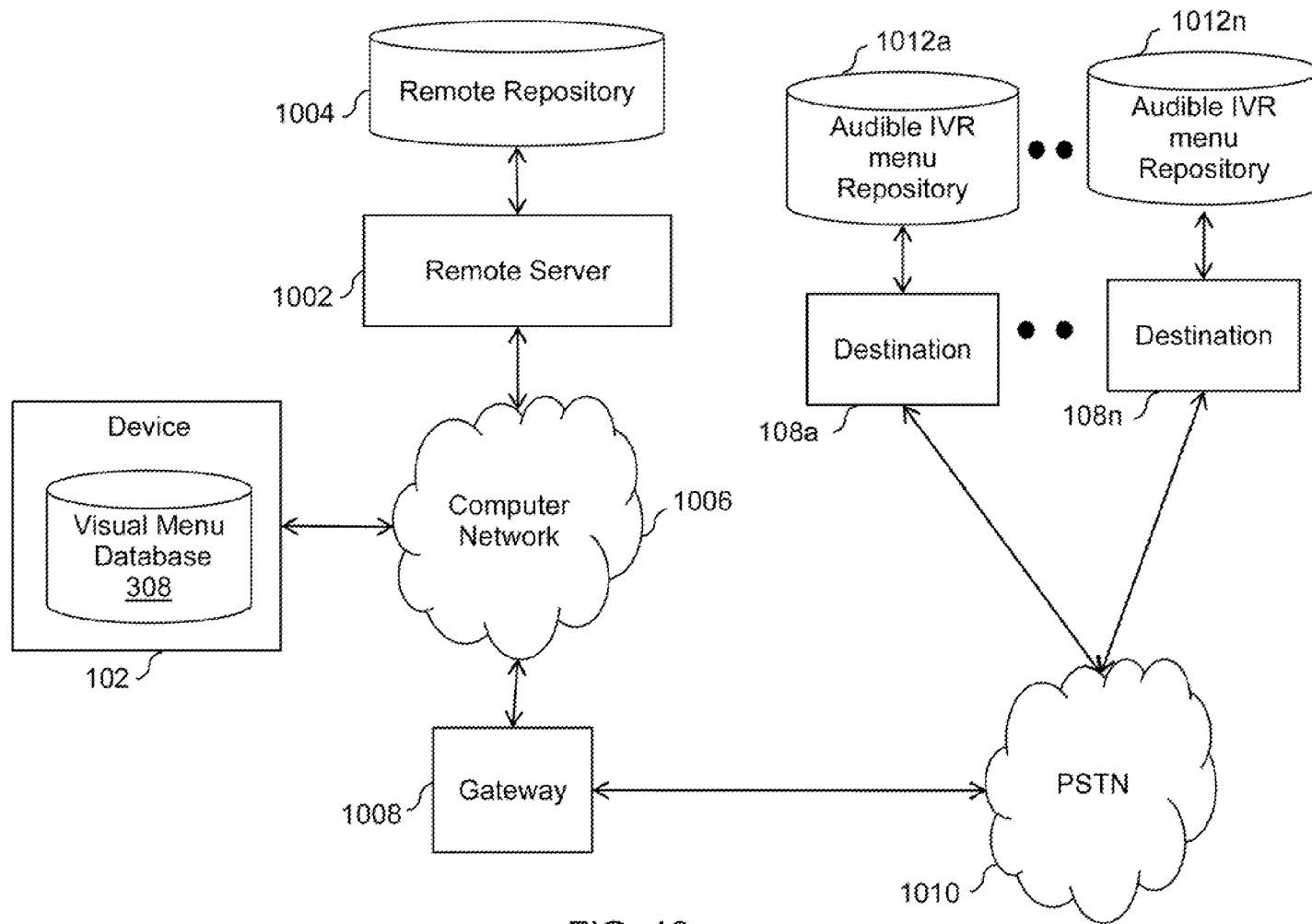


FIG. 10

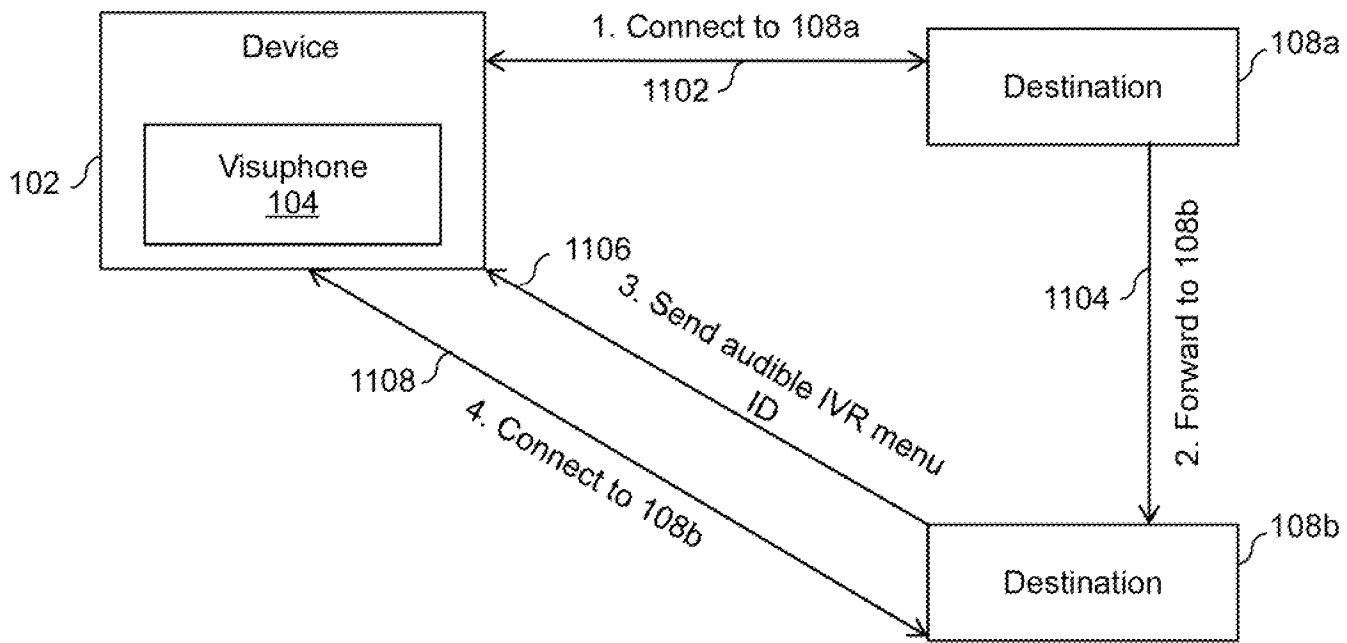


FIG. 11

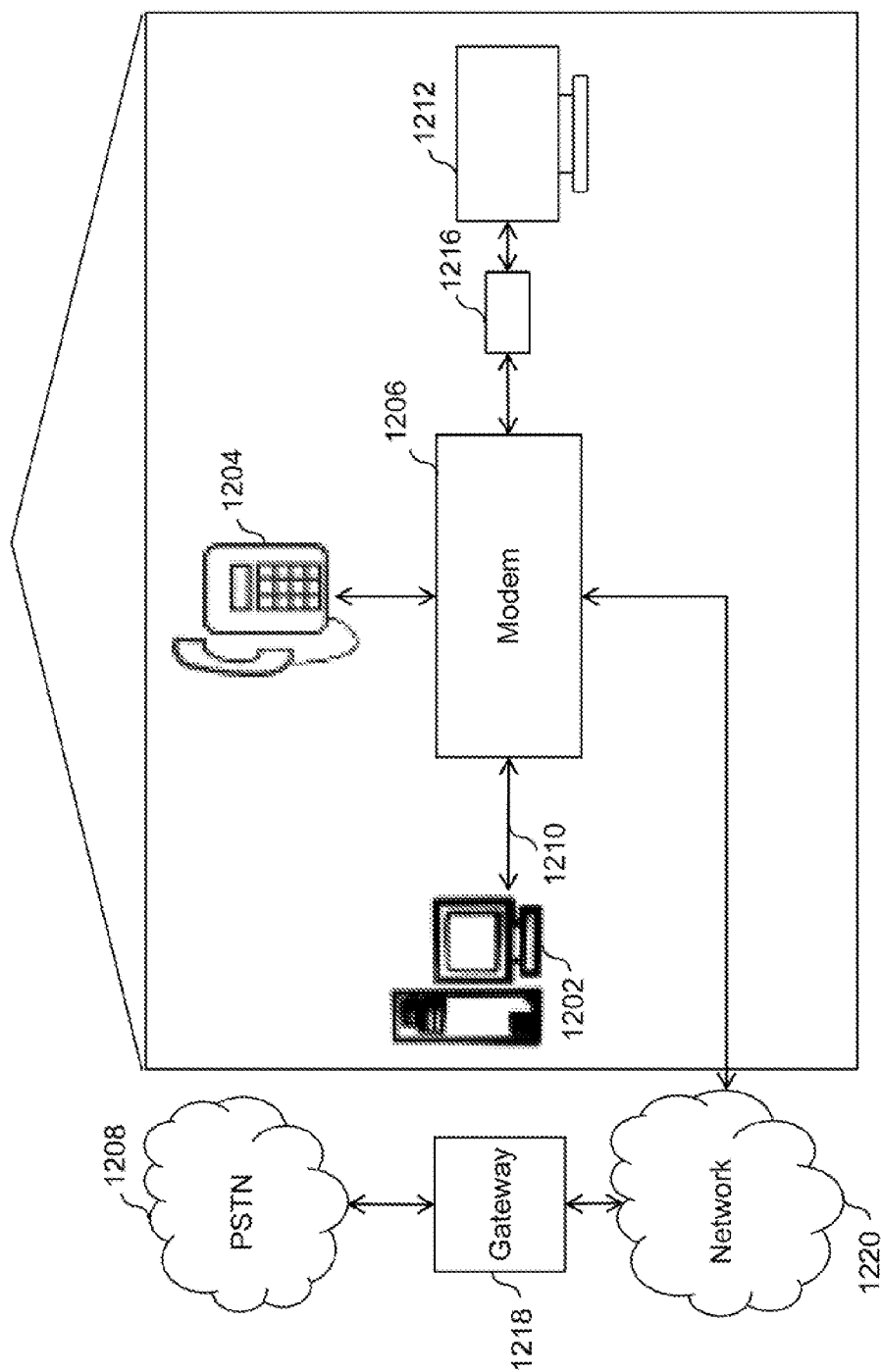


FIG. 12

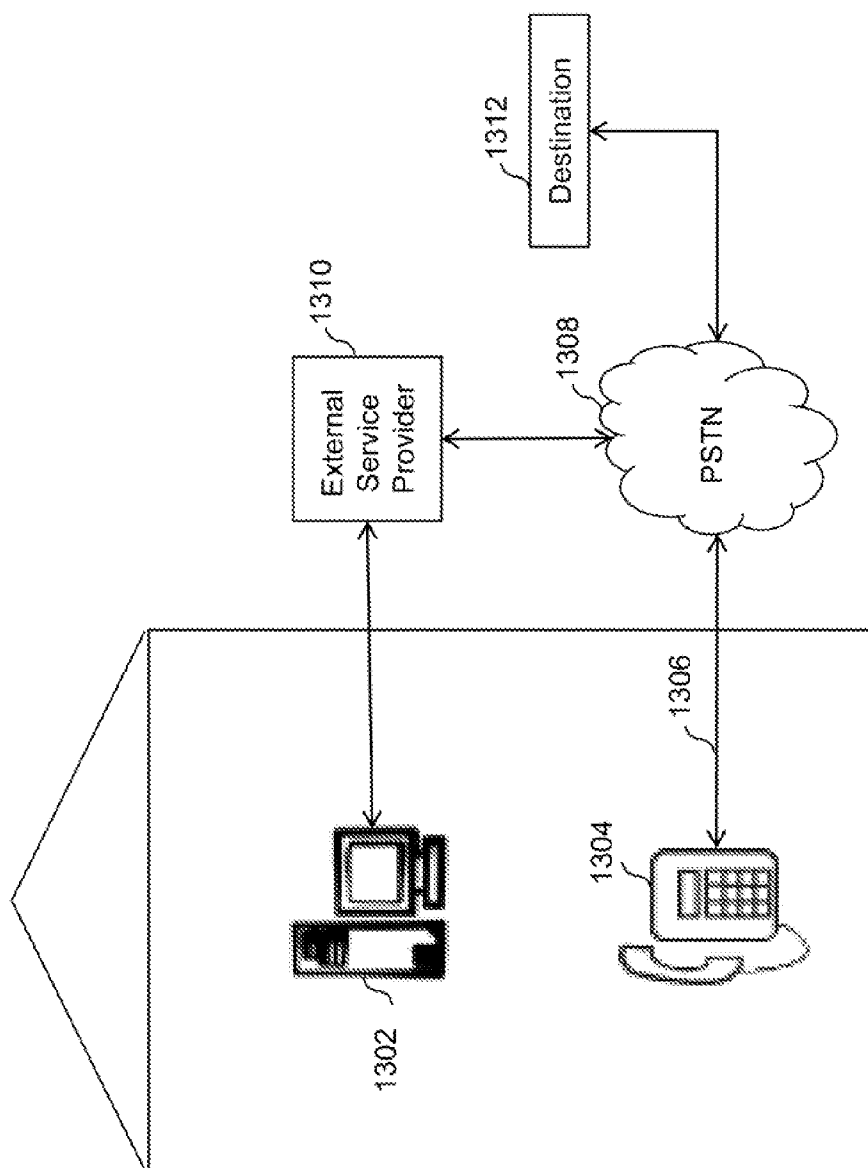


FIG. 13

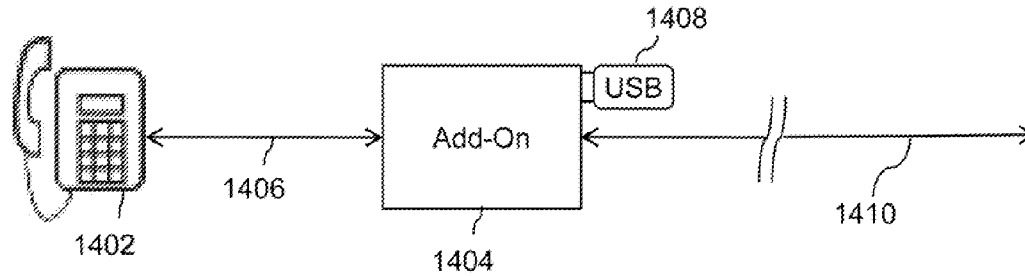


FIG. 14A

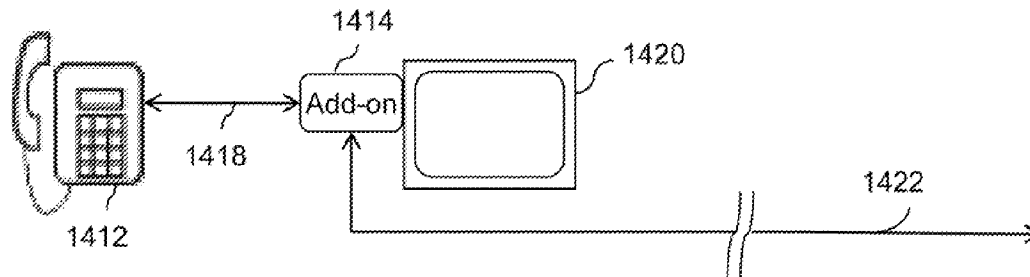


FIG. 14B

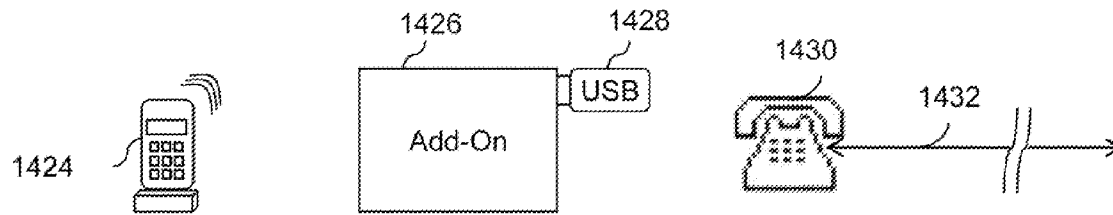


FIG. 14C

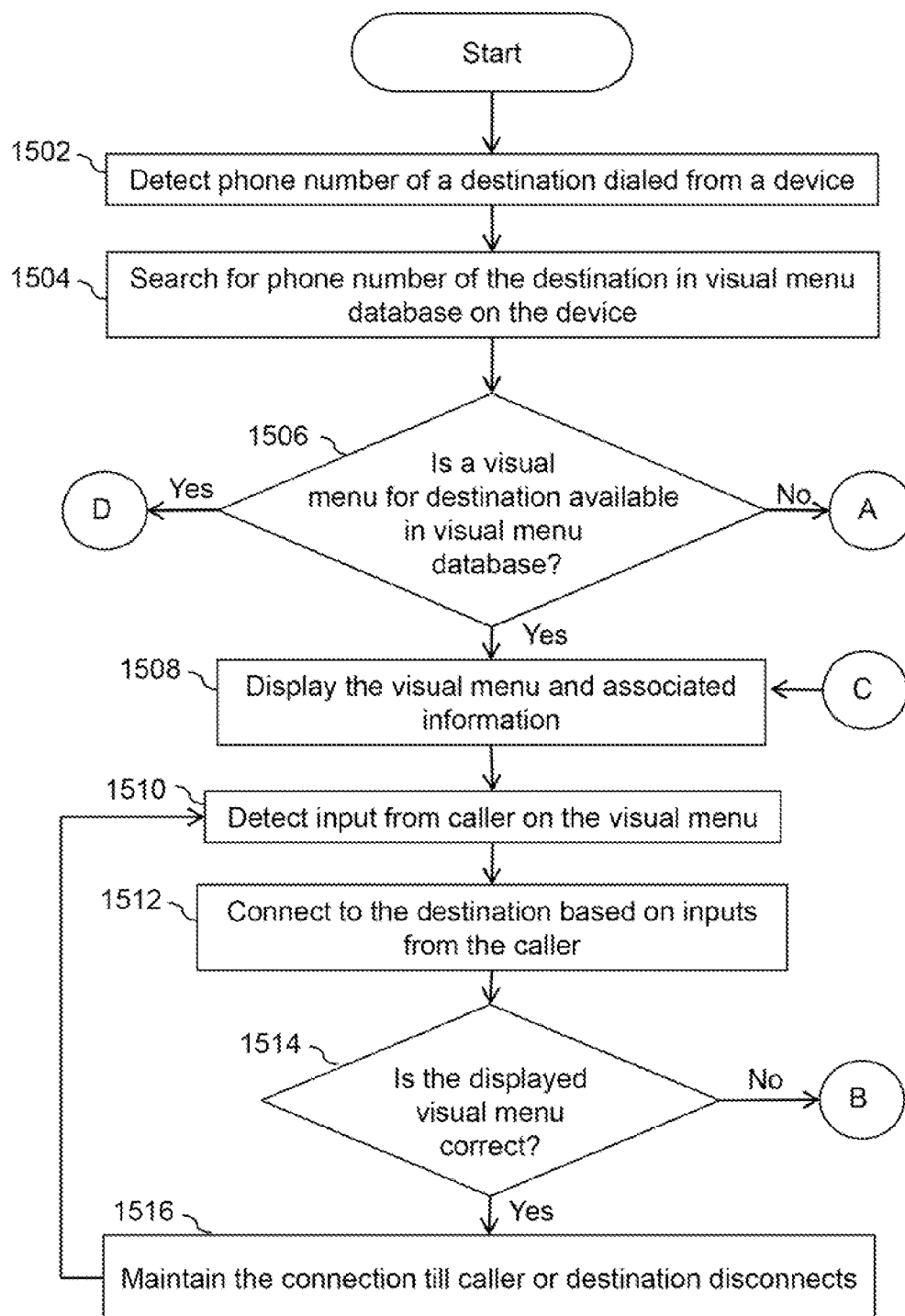


FIG. 15A

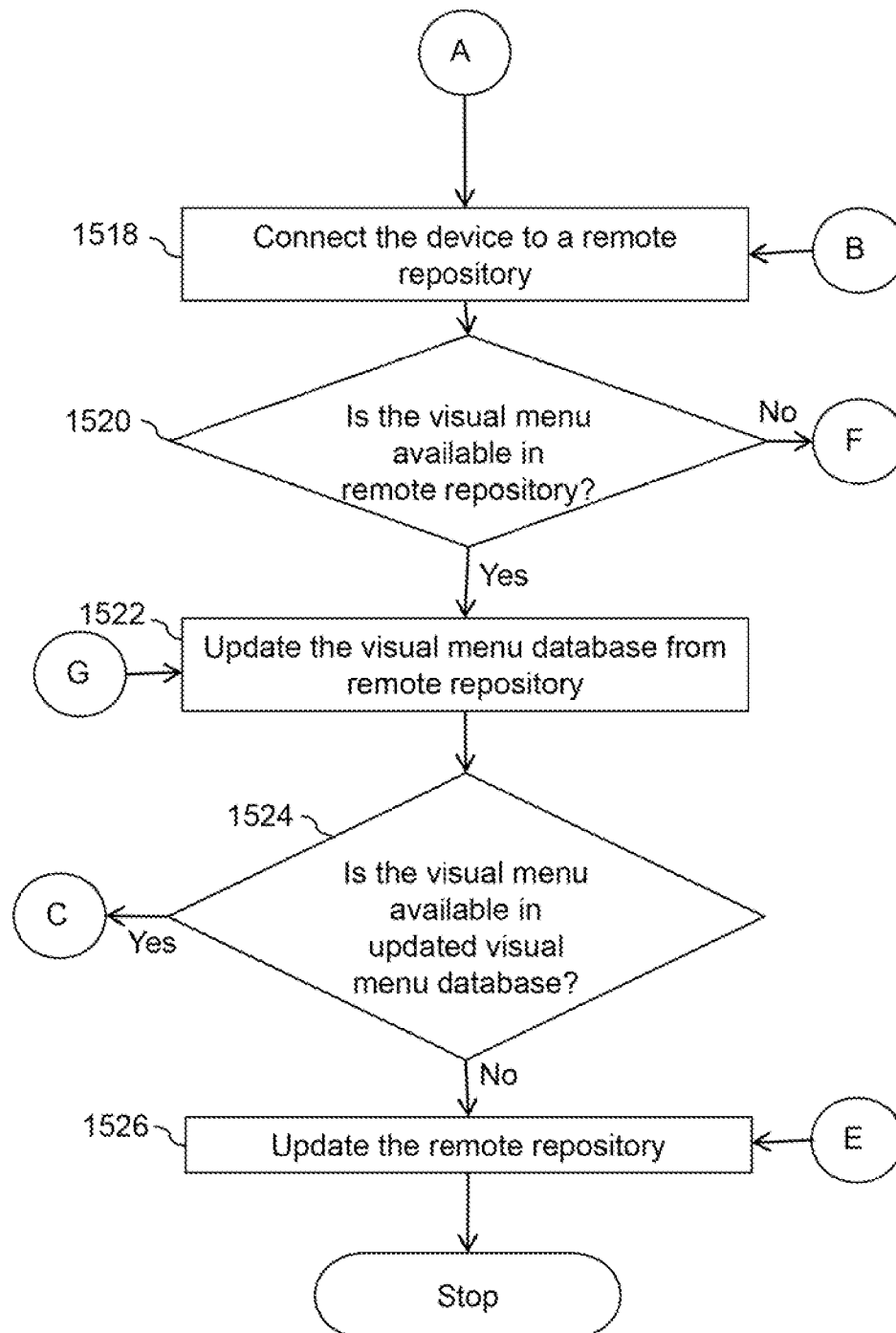


FIG. 15B

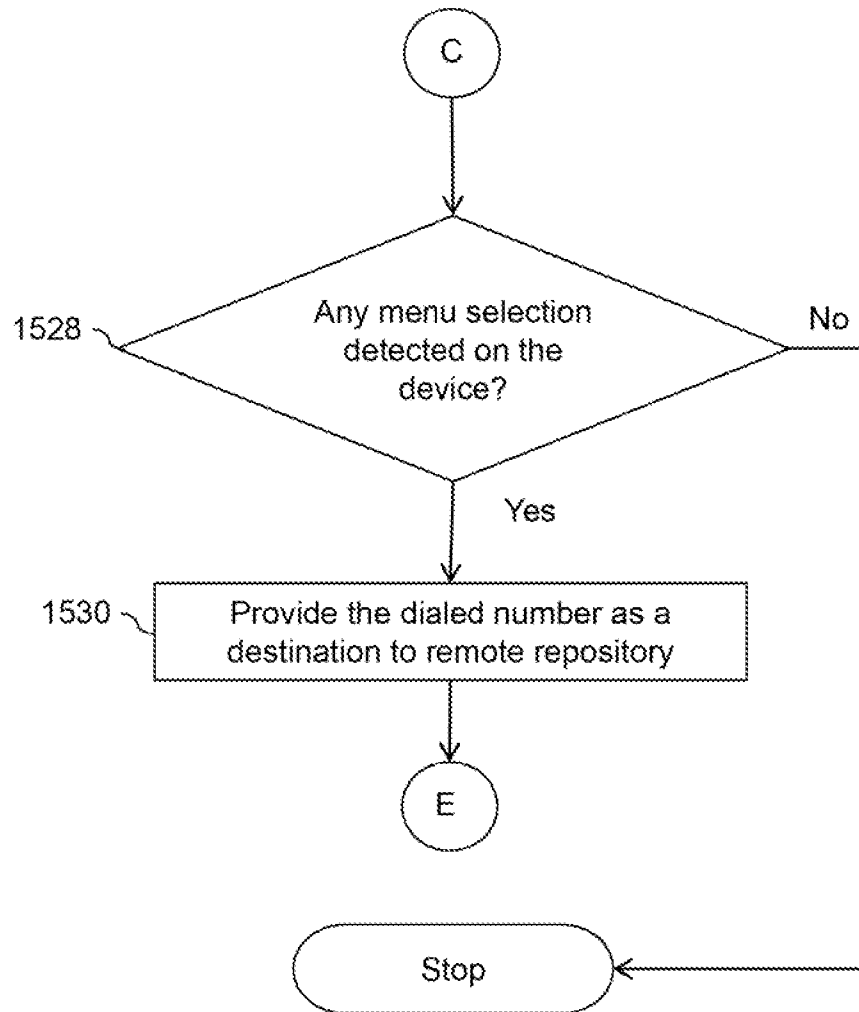


FIG. 15C



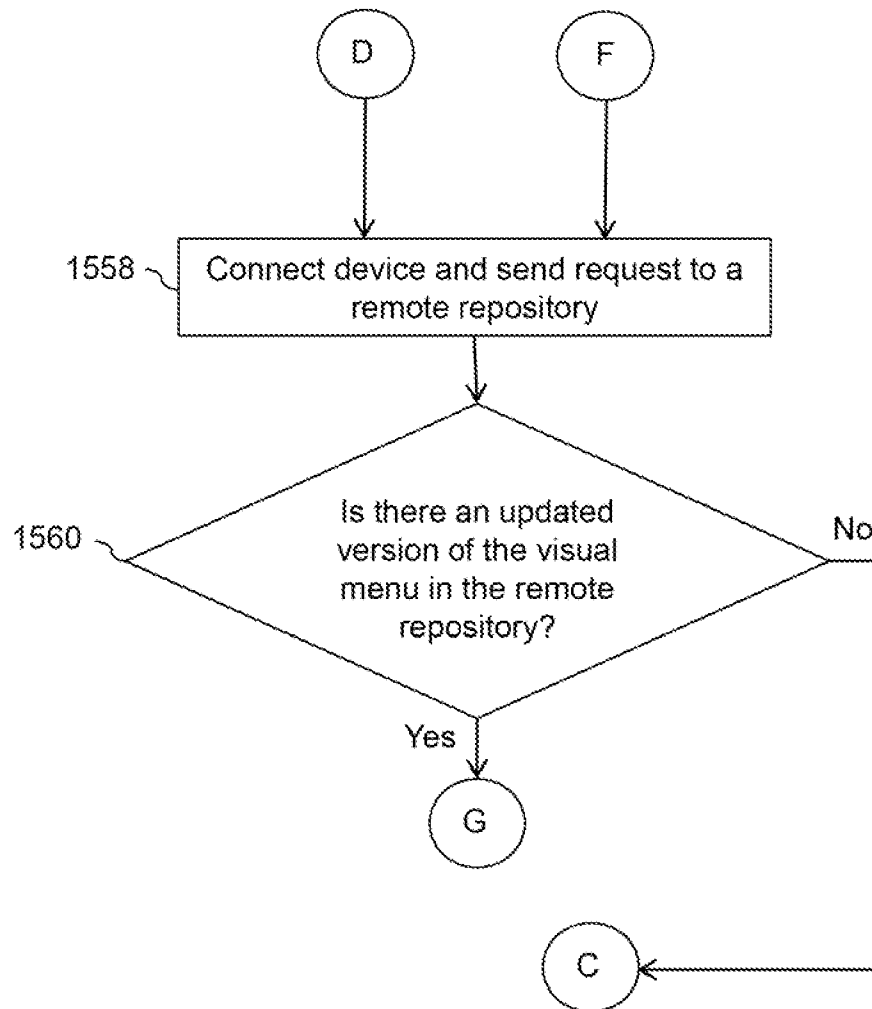


FIG. 15D

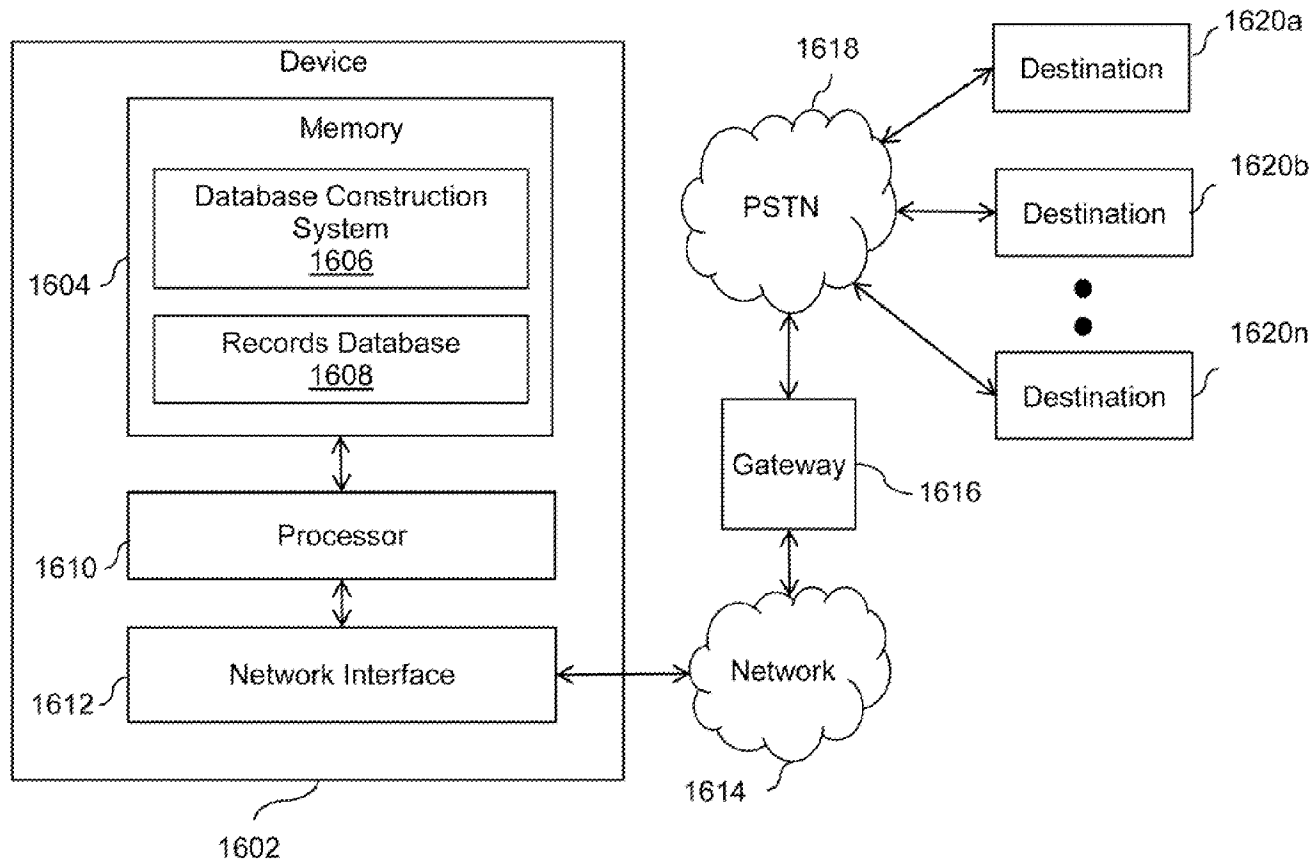


FIG. 16

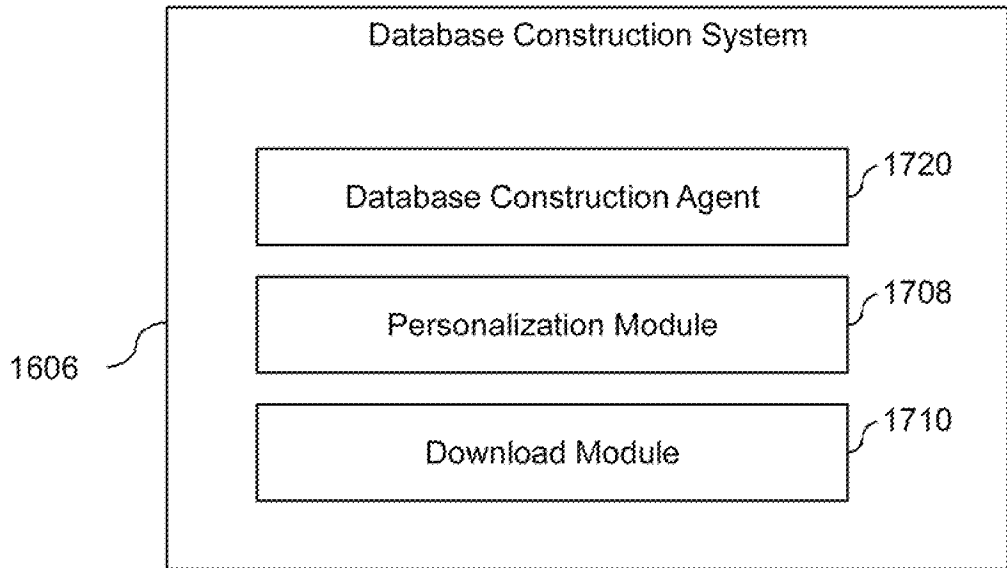


FIG. 17A

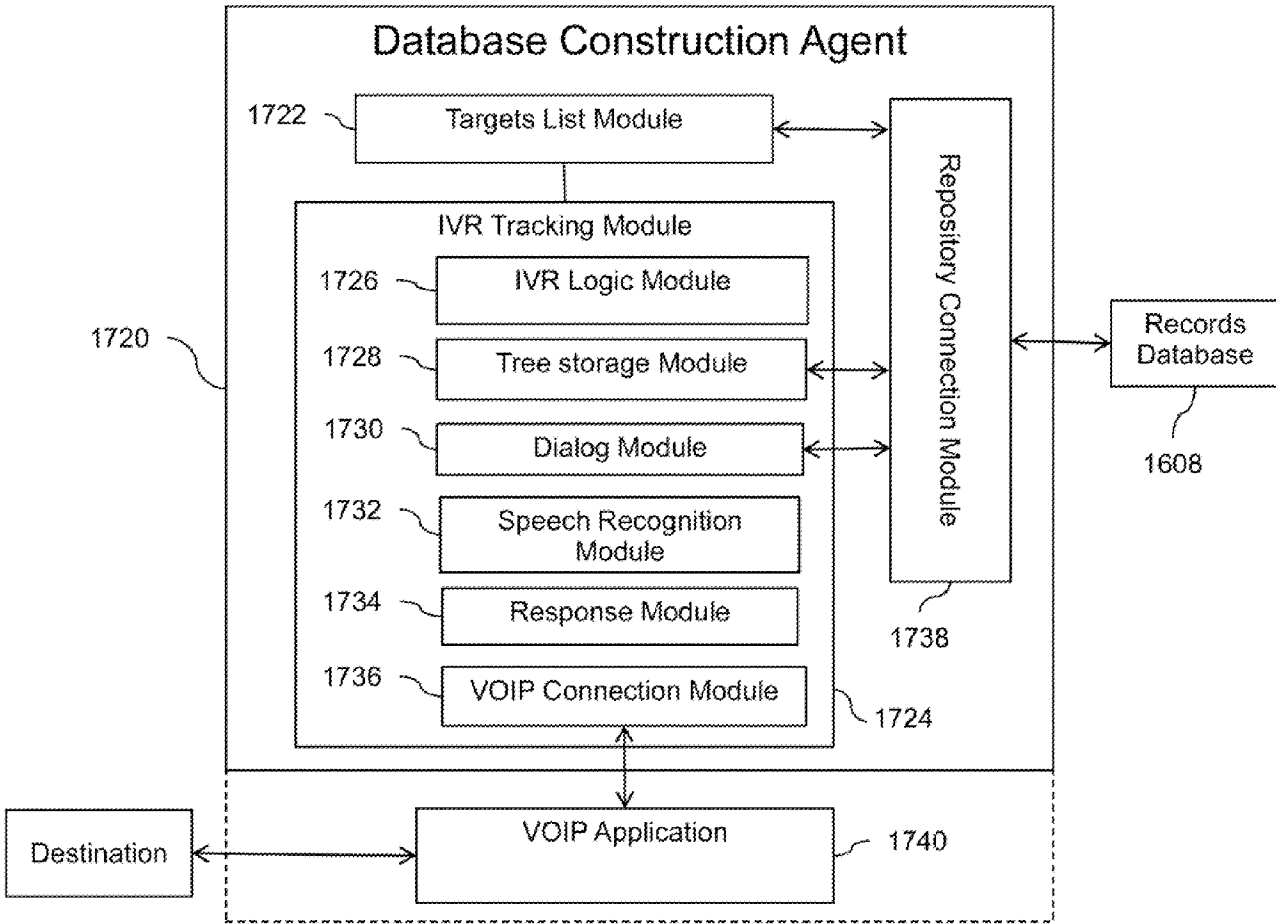


FIG. 17B

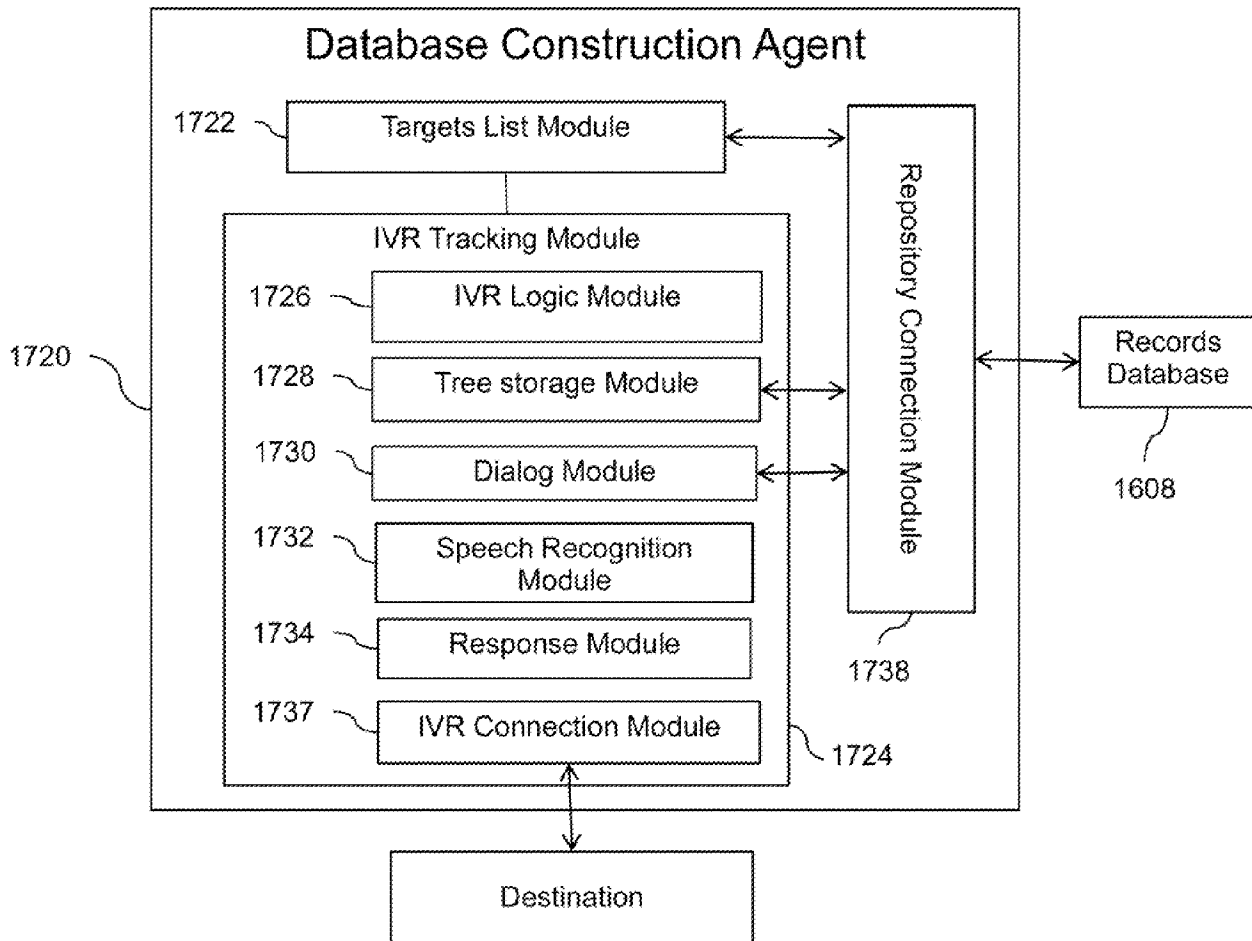


FIG. 17C

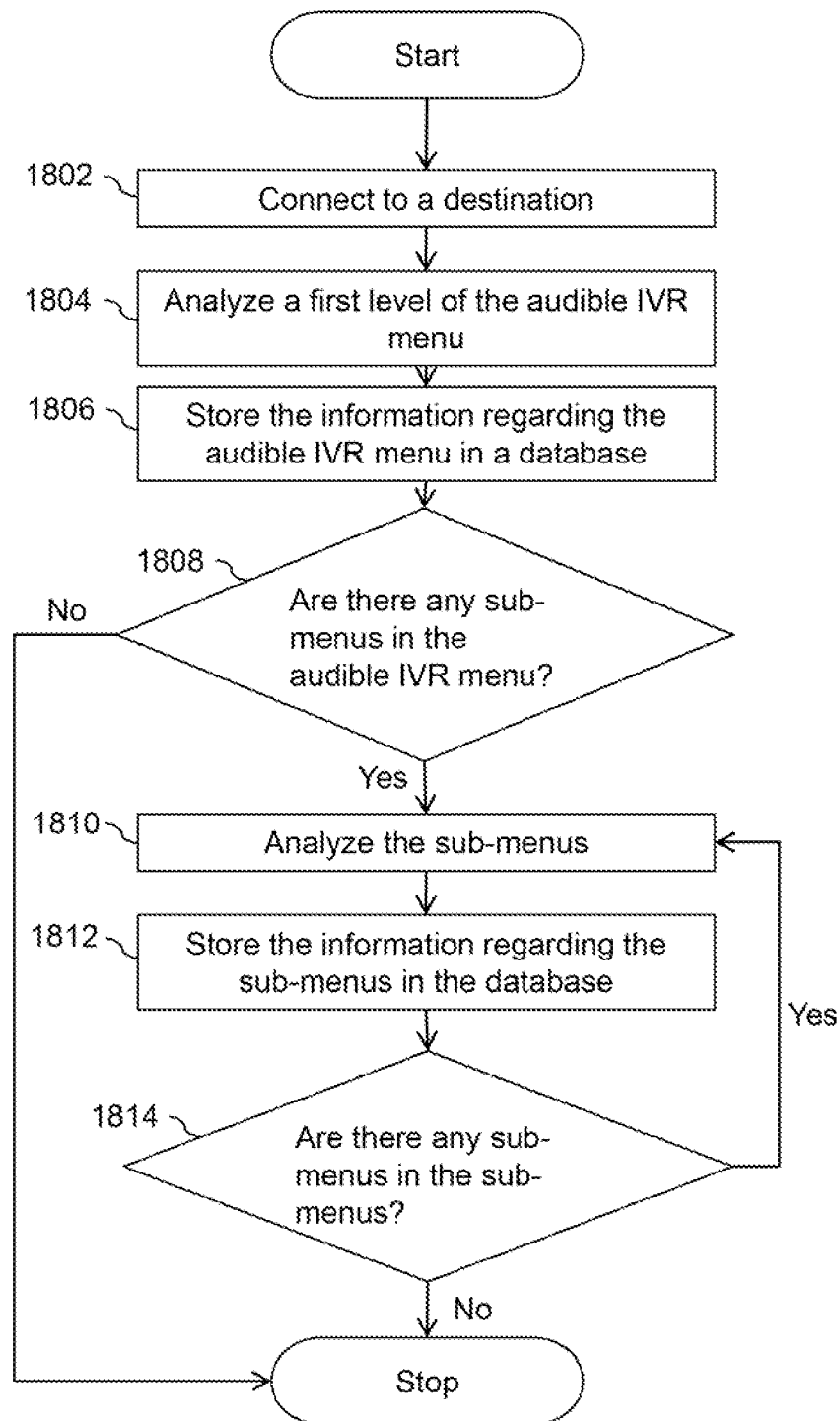


FIG. 18

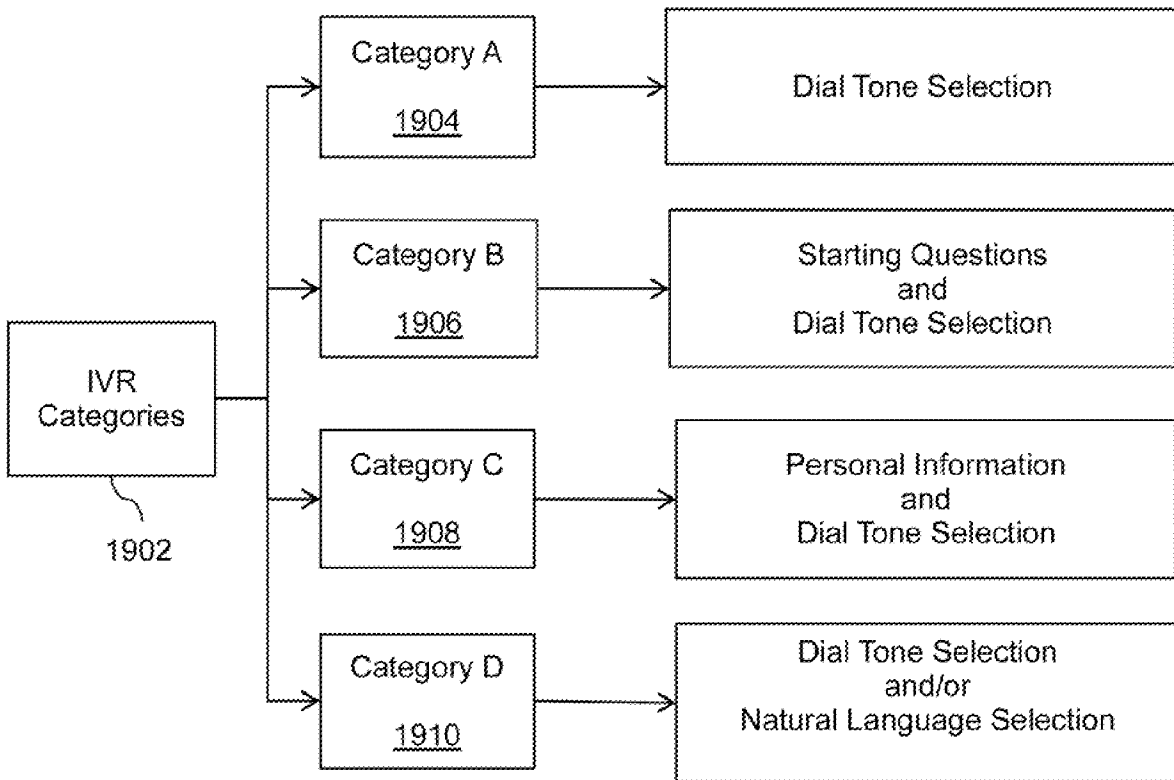


FIG. 19

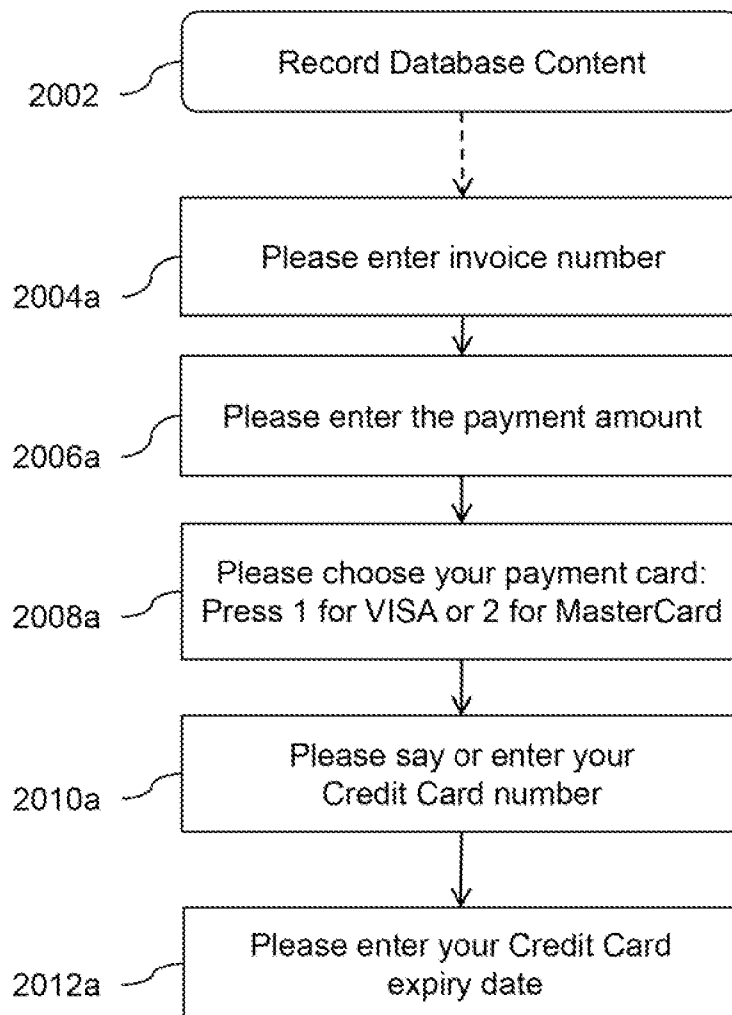


FIG.20A



**Payment Form for ABC**

2004b Please enter invoice number:

2006b Please enter the payment amount

2008b Please choose your payment card:

☒ VISA ☐ MasterCard

2010b Please enter your Credit Card number

2012b Please enter your Credit Card expiry date

2016 Submit

The diagram shows a payment form titled "Payment Form for ABC" enclosed in a rectangular border. The form contains several input fields and a submit button. The fields are arranged vertically and are each enclosed in a dashed rectangular box. The first field is labeled "Please enter invoice number:" and is associated with the reference numeral 2004b. The second field is labeled "Please enter the payment amount" and is associated with 2006b. The third field is labeled "Please choose your payment card:" and is associated with 2008b; it contains two radio buttons, one for "VISA" (which is selected) and one for "MasterCard". The fourth field is labeled "Please enter your Credit Card number" and is associated with 2010b. The fifth field is labeled "Please enter your Credit Card expiry date" and is associated with 2012b. Below these fields, there is a vertical ellipsis indicating more fields. At the bottom of the form is a "Submit" button, associated with the reference numeral 2016. The entire form is labeled with the reference numeral 2014.

FIG.20B

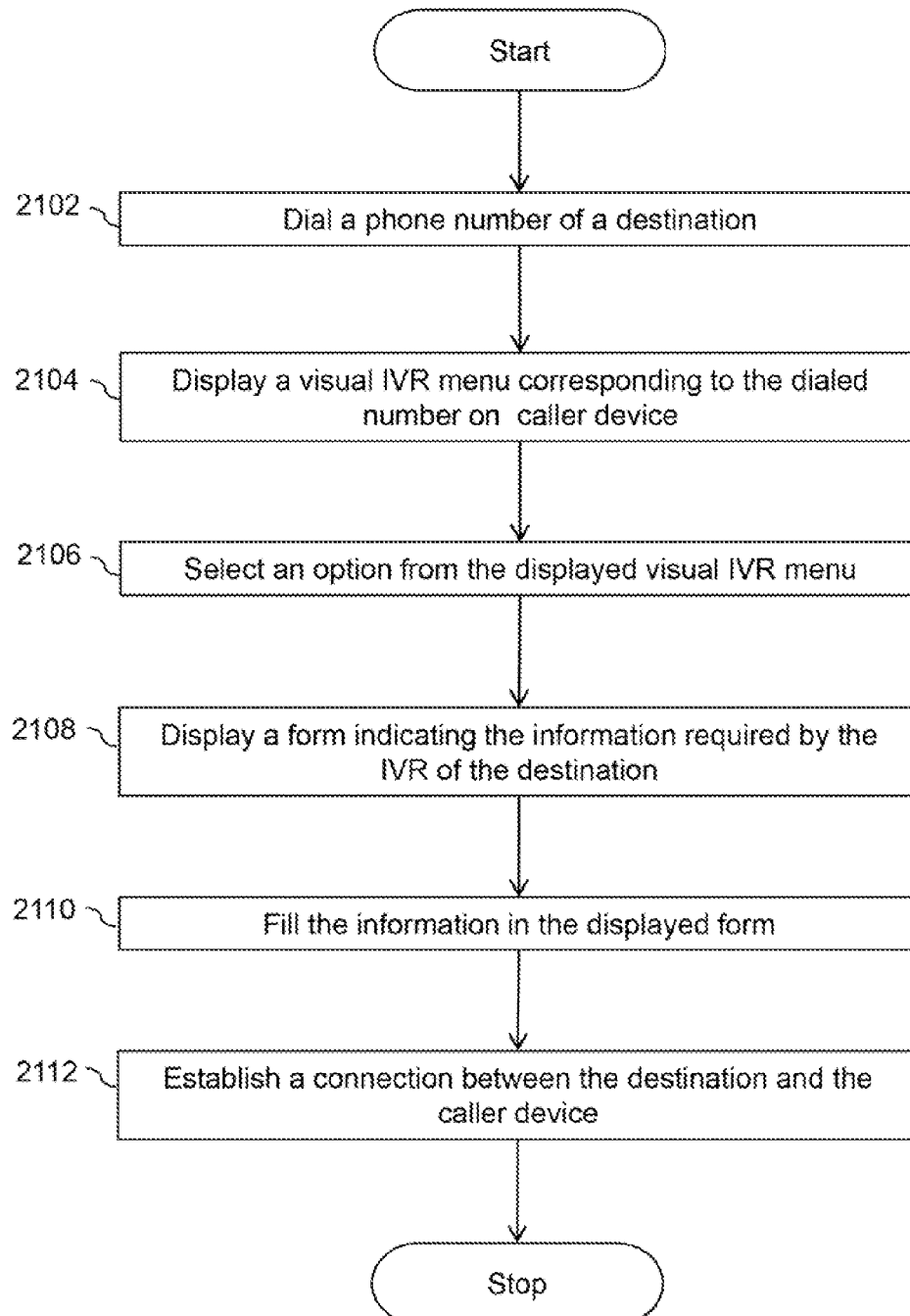


FIG. 21

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## DEVICE AND METHOD FOR PROVIDING ENHANCED TELEPHONY

### CROSS REFERENCE TO RELATED APPLICATIONS

This application is a Continuation of U.S. Non-Provisional application Ser. No. 13/022,909 entitled 'Device and Method for providing enhanced telephony' and filed on Feb. 8, 2011, which is Continuation-In-Part (CIP) of U.S. Non-Provisional application Ser. No. 12/699,618 entitled 'Systems and methods for visual presentation and selection of IVR menu' and filed on Feb. 3, 2010.

### FIELD OF THE INVENTION

The invention relates to Interactive Voice Response (IVR) system and more specifically the invention relates to presentation and visual selection of IVR option from a caller device.

### BACKGROUND OF THE INVENTION

Interactive Voice Response (IVR) technology is generally used to detect voice and key inputs from a caller. Various organizations such as banks, insurance companies, and other service providers use IVR technology to manage calls from their customers. Typically, IVR systems are used by organizations that have high call volumes. An objective for implementing the IVR system is to provide the customers with a quick and good experience. Moreover, the cost of providing the services is reduced.

Generally, when the caller calls a destination, such as a bank, an automated audio menu is played. The audio IVR menu can contain instructions to provide instant services such as account balance inquiry when the destination is a bank. Further, audio menu can provide options for the caller to connect to a desired end inside the destination. For example, the menu may direct the caller to press various keys on a telephone to connect to a particular department or agent. The audio IVR menu is designed specific to a destination. Therefore, each destination or organization may have different IVR menus. Further, the IVR menu in an organization can be based on the type of departments, type of services, customer care executives or agents and so forth. For example, an IVR menu of a bank may include options related to the account details of the caller, while an IVR menu of a pizzeria may contain options to order or select a pizza.

Typically, the caller calling the destination may have to listen and follow instructions on the menu to get a desired response or a function performed. Therefore, the process can be time consuming. Moreover, in case the caller provides an incorrect, input, the complete process may have to be repeated. Furthermore, the IVR menu for an organization may be updated or changed regularly. For example, extension numbers inside an organization may be changed and correspondingly, the extension numbers associated with the IVR menu may be updated. As a result, a frequent caller may not be able to reach a desired end by remembering a combination of numbers. Therefore, the caller may become frustrated with the IVR systems.

Some prior art try to address this problem by providing visual form of IVR. These prior arts display the IVR menu graphically on a caller device. U.S. Pat. No. 7,215,743 assigned to International Business Machines Corporation and a published U.S. patent application Ser. No. 11/957,605, filed Dec. 17, 2007 and assigned to Motorola Inc., provides the IVR menu of the destination in a visual form to the caller. The

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caller can select the options from the IVR menu without listening to the complete audio IVR menu. However, the IVR menu displayed on the caller device is stored on an IVR server at the destination end. As a result, the visual IVR menu is specific to the destination and only the IVR of the destination dialed is displayed. These techniques therefore, require each destination to set-up hardware, software and other facilities to be deployed for providing visual IVR servers.

Another existing technique as disclosed in U.S. Pat. No. 6,560,320 assigned to International Business Machines Corporation enables an operator of the IVR to send customized signals to the caller for generating and displaying graphical elements on the device of the caller. Thereafter, the caller can respond by selecting options through touch-screen interface of the device. Dual Tone Multi frequency (DTMF) signals of the IVR. However, this technique requires a specifically configured device to interpret the codes sent as Dual Tone Multi frequency (DTMF) signals for generating the graphics. Moreover, an operator is required to present the graphics to the caller. Furthermore, specialized software and hardware are required at the operator to design and generate DTMF codes. Therefore, the technique faces various practical limitations.

Generally, the IVR menus of the organizations are in form of audible menu. Moreover, there are a large number of organizations that use IVR menus. Therefore, converting the audible menus to visual IVR menus can be time consuming. An existing technique, as disclosed in U.S. Pat. No. 6,920,425 assigned to Nortel Networks Limited, discloses an automated script to convert the audible menus scripts to visual IVR menu scripts. However, the audible menus scripts must be available in a particular format to enable the conversion. Furthermore, the audio menu scripts must be available or downloadable for the program to function. As a result, only the audio menus scripts that are available can be converted to visual IVR menu scripts. Furthermore, the device of the caller must be designed or programmed to understand the visual IVR menu scripts.

Various organizations encourage the customers to call them for information on their products or services, or for helping existing customers. Generally, a contact number is provided by the organizations on their website as a button. Therefore, when the customer presses the button a form is displayed. The customer then enters his contact number where an executive from the organization may call. However, this may be time consuming for the customer. Moreover, the customer may be not being able to talk to another executive during the call in case the on-line executive is not able to satisfy the customer. U.S. patent application Ser. No. 12/049,021, filed Mar. 14, 2008 and assigned to Harprit Singh, provides methods and systems for displaying an IVR menu, when the caller clicks a link on a webpage provided by the organization. However, the customer is still required to request the webpage with embedded information from a server of the organization. Moreover, the methods and systems are limited to the organizations that provide the required webpage to the customers. Other technologies include U.S. patent application Ser. No. 11/877,952 filed Oct. 24, 2007 and assigned to International Business Machine Corporation.

The effectiveness of providing the IVR in visual form is discussed in a technical paper titled, 'The Benefits of Augmenting Telephone Voice Menu Navigation with Visual Browsing and Search' by Min Yin et al. The paper discusses a setup where visual content of the IVR is sent from a service provider to a computer connected to a mobile phone. However, the technique discussed in the paper is limited to the visual content provided by the service provider's end, after

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the connection is established. Moreover, the providers are required to individually set up the hardware and services for providing visual content.

As discussed above the existing technologies have various limitations.

### SUMMARY

Embodiments of the invention provide a communication device comprising a database comprising a plurality of visual Interactive Voice Response (IVR) menus associated with a plurality of destinations. The communication device further comprises means for dialing a phone number of a destination, means for comparing the dialed phone number with phone numbers stored in the database, and means for displaying a form based on the comparison, wherein the form comprises one or more data request fields corresponding to a visual IVR menu associated with the dialed destination.

Embodiments of the invention provide a communication device comprising a processor. Further, the communication device comprises a memory comprising a database. The database comprises a plurality of visual Interactive Voice Response (IVR) menus associated with a plurality of destinations. Further, the memory comprises instructions executable by the processor for dialing a phone number of a destination, comparing the dialed phone number with phone numbers stored in the database, and displaying a form based on the comparison, wherein the form comprises one or more data request fields corresponding to a visual IVR menu associated with the dialed destination.

A method for providing enhanced telephony is disclosed. The method comprises dialing, at a communication device, a phone number of a destination. The communication device comprises a plurality of visual IVR menus associated with a plurality of destinations. Further, the method comprises comparing the dialed phone number with phone numbers stored in the communication device. Furthermore, the method comprises displaying, at the communication device, a form based on the comparison, wherein the form comprises one or more data request fields corresponding to a visual IVR menu associated with the dialed destination.

An aspect of the invention is to provide to a caller using a device a visual IVR menu corresponding to an audible IVR menu of a destination.

Another aspect of the invention is to enable the caller to directly interact with the visual IVR menu without listening to the audible IVR menu of the destination.

Yet another aspect of the invention is to provide the visual IVR menu to the caller before establishing a connection of the device with the destination.

### BRIEF DESCRIPTION OF THE DRAWINGS

Having thus described the invention in general terms, reference will now be made to the accompanying drawings, which are not necessarily drawn to scale, and wherein:

FIG. 1A illustrates an exemplary environment where various embodiments of the invention function;

FIG. 1B illustrates another exemplary environment where various embodiments of the invention function;

FIG. 1C illustrates yet another exemplary environment where various embodiments of the invention function;

FIG. 2A illustrates an exemplary audible Interactive Voice Response (IVR) menu at a destination;

FIG. 2B illustrates an exemplary visual IVR menu at a device corresponding to the audible IVR menu of the destination;

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FIG. 2C illustrate an exemplary visual IVR menu that display graphics for each option;

FIG. 2D illustrate an exemplary visual IVR menu that display tooltip for when a cursor is hovering an option for more than certain time without action;

FIGS. 3A, 3B illustrates exemplary components of the device for implementing a Visuphone, in accordance with an embodiment of the invention;

FIG. 4 illustrates an exemplary display of the visual IVR menu on the device, in accordance with an embodiment of the invention;

FIG. 5 illustrates exemplary components of the device for implementing the Visuphone, in accordance with another embodiment of the invention;

FIG. 6 illustrates an exemplary display of the visual IVR menu on the device, in accordance with another embodiment of the invention;

FIG. 7 illustrates a webpage displayed on the device that may be used to initiate a connection to the destination, in accordance with an embodiment of the invention;

FIG. 8 illustrates an exemplary software architecture of Visuphone, in accordance with an embodiment of the invention;

FIG. 9 illustrates exemplary components of the Visuphone, in accordance with an embodiment of the invention;

FIG. 10 illustrates an exemplary remote server for storing information required by the Visuphone, in accordance with an embodiment of the invention;

FIG. 11 illustrates presentation of a visual IVR menu in case of call forwarding, in accordance with an embodiment of the invention;

FIG. 12 illustrates the presentation of the visual IVR menu when a phone connection is associated with a wide band internet 'smart' modem;

FIG. 13 illustrates the presentation of the visual IVR menu when a telephone connection is established through an external telephone service by using a computer;

FIGS. 14A, 14B, and 14C illustrate a Visu-add-on that provides the features and functionality of the Visuphone;

FIGS. 15A, 15B, 15C and 15D illustrate a flowchart diagram for presentation, selection and update of visual IVR menus, in accordance with an embodiment of the invention;

FIG. 16 illustrates exemplary components of a device for implementing a database construction system, in accordance with an embodiment of the invention;

FIGS. 17A, 17B, and 17C illustrate exemplary components of the database construction system, in accordance with an embodiment of the invention;

FIG. 18 illustrates a flowchart diagram for creating a database for visual IVR menus, in accordance with an embodiment of the invention;

FIG. 19 illustrates an exemplary set of IVR categories;

FIG. 20A illustrates an exemplary information process stored in a database;

FIG. 20B illustrates an exemplary web form generated for the information process of FIG. 20A; and

FIG. 21 illustrates a flowchart for submitting personal information of a user by the Visuphone, in accordance with an embodiment of the invention.

### DETAILED DESCRIPTION OF THE INVENTION

Illustrative embodiments of the invention now will be described more fully hereinafter with reference to the accompanying drawings, in which some, but not all embodiments of the invention are shown. Indeed, the invention may be embodied in many different forms and should not be construed as

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limited to the embodiments set forth herein; rather, these embodiments are provided so that this disclosure will satisfy applicable legal requirements. Like numbers refer to like elements throughout.

FIG. 1A illustrates an exemplary environment where various embodiments of the invention function. A caller **106** may use a device **102a** to connect to destinations **108a-n**. Device **102a** can be a telecommunication device that can connect directly to a Public Switched Telephone Network (PSTN) **110**. A person skilled in the art will appreciate, that device **102a** can also connect to a private telephone exchange. Examples of device **102a** include, but not limited to, a telephone, a mobile phone, a Smartphone or any other device capable of voice or data communication. When caller **106** dials a phone number and connects to any destination from destinations **108a-n**, an audible Interactive Voice Response (IVR) menu may be played to caller **106**. Each of destinations **108a-n** can have different IVR menus. For example, IVR menus of bank may be completely different from that of a hospital. Typically, the audible IVR menu provided by destinations **108a-n** comprises audible options or instructions. Caller **106** may be required to select various options from the audible IVR menu to obtain the required information or service from the dialed destination. Various types of destinations **108a-n** that implement the audible IVR menu include, for example, banks, hotels, fast-food outlets, utility services providers, corporate offices and so forth. Device **102a** includes a Visuphone **104** that displays a visual IVR menu on device **102a** corresponding to the audible IVR menu based on a phone number of the destination to be connected. Visuphone **104** may be hardware, an application stored as software, a firmware on device **102a**, or a combination thereof. Thereafter, caller **106** can select the options of the audible IVR menu from the visual display without the requirement to listen to the audible instructions. Exemplary audible IVR menu at destination **108a** and a corresponding visual IVR menu are explained in detail in conjunction with FIGS. 2A and 2B.

FIG. 1B illustrates another exemplary environment where various embodiments of the invention function. As shown, device **102b** can be a device that can be connected directly to a network **112**. Examples of device **102b** include, but are not limited to, a personal computer, a laptop, a mobile phone, a smart-phone, a fixed line telephone, Voice Over Internet Protocol (VoIP) phone or other devices capable of voice or data communication. Device **102b** may include various applications or computer programs that enable caller **106** to use device **102b** for connecting to destinations **108a-n** through PSTN **110** over network **112**. For example, the applications may be VoIP applications, such as but not limited to, Skype, Magic Jack, Google Talk and so forth. A gateway **116** provides interconnection between PSTN **110** and network **112**. Examples of network **112** include any wired or wireless network, such as but not limited to, a Local Area Network (LAN), a Wide Area Network (WAN), a Wi-fi network and so forth. As discussed with reference to FIG. 1A, destinations **108a-n** presents the audible IVR to caller **106**. Device **102b** includes Visuphone **104b** that displays a visual IVR menu on device **102b** corresponding to the audible IVR menu based on a phone number of the destination to be connected.

FIG. 1C illustrates yet another exemplary environment where various embodiments of the invention function. As shown, device **102b** can be connected to PSTN **110** through network **112** or through the cellular network **111**. Various service providers provide multiple or overlapping services to customers. For example, cable television service provider may also provide phone and Internet service, optical Internet provider may also provide phone or television services,

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WiMax service providers that provide phone service and so forth. Network **112** may be any service provider that provides such services, for example, but not limited to, cell phone services, wireless services, Internet services, cable television services, or various combinations of the above or other type of services. As discussed with reference to FIG. 1A, destinations **108a-n** presents the audible IVR to caller **106**. Device **102b** includes Visuphone **104** that displays a visual IVR menu on device **102b** corresponding to the audible IVR menu based on a phone number of the destination to be connected.

With reference to FIG. 2A, an audible IVR menu **222a** at destination **108a** is illustrated. A person skilled in the art will appreciate that audible IVR menu **222a** is an exemplary graphical representation of the audible instructions presented by destination **108a** for the sake of explanation and is not an actual graphical display. For explanation, assuming that destination **108a** is a pizzeria that provides home delivery and takes away services. Caller **106** connects to destination **108a** by dialing a board phone number **202a**. Subsequently, various options of audible IVR menu **222a** are played to caller **106**. The various options include an option **204a** that plays an audible instruction, "press 2 for pizza order", an option **206a** that plays an audible instruction, "press 3 for order status", an option **220a** that plays an audible instruction, "press 0 for main menu". Caller **106** can select an option by pressing from device **102**, a button corresponding to the instructions in the audible IVR menu. Subsequently, the selected options are transmitted to the destination and the menu is advanced if there are any further options. Alternatively the display can present the next layer of menu options to give the user better view of the option domain and allow even faster interface between user and the IVR.

For example, selection of option **204a** presents an option **208a** that plays an audible instruction, "press 1 for veg" and an option **210a** that plays an audible instruction, "press 2 for non-veg" is played. Similarly, selecting option **208a** or **210a** presents or option **214a** that plays an audible instruction, "press 1 for home delivery", an option **216a** that plays an audible instruction, "press 2 for take away". Similarly, selection of option **206a** presents an option **212a** that plays an audible instruction, "press 1 to talk to an executive".

Options **204a**, **206a**, **208a**, **210a**, **212a**, **214a**, and **216a** are part of a main menu **218a**. Main menu **218a** can be repeated by selecting option **220a** by caller **106**. Caller **106** may repeat main menu **218a** for example, in case of a mistake in selection. Therefore, caller **106** directly interacting with audible IVR menu **222a** may be required to listen to all or various audible options before executing a desired action. However, the interaction is simplified by Visuphone **104**, that presents a visual IVR menu **222b** to caller **106** corresponding to audible IVR menu **222a**, as explained with reference to FIG. 2B.

As shown in FIG. 2B, visual IVR menu **222b** is displayed on a screen of device **102b** that may connects to destination **108a** through network **112** and the PSTN **110**. Visual IVR menu **222b** can be displayed before a connection is established with destination **108a**. A person skilled in the art will appreciate that device **102b** is illustrated for the sake of explanation, and similar visual IVR menu **222b** can be displayed on device **102a** that connects to destination **108a** directly through PSTN **110**. Visual IVR menu **222b** includes various nodes corresponding to the options of an audible IVR menu of destination **108a**. The various nodes of visual IVR menu **222b** include a node **202b** for connecting to board number **202a** of destination **108a**. Similarly, nodes **204b**, **206b**, **208b**, **210b**, **212b**, **216b** corresponds to option **204a**, **206a**, **208a**, **210a**, **212a**, **216a** respectively. A node corresponding to option **220a** may not be required in visual IVR menu **222b**, as the

complete menu is visible and caller **106** may not be required to repeat audible IVR menu **222a**. Therefore, when caller **106** selects a node from visual IVR menu **222b**, Visuphone **104** automatically transmits the desired action corresponding to the options in audible IVR menu **222a** to destination **108a**. For example, assuming that caller **106** calls destination **108a** to order a veg pizza for home delivery. In this case, caller **106** directly selects nodes **208b** and **214b** from a touch screen of device **102a**, corresponding to veg pizza and home delivery from visual IVR menu **222b**. Alternatively, caller **106** directly selects nodes **204b**, **208b** and **214b** by pressing corresponding keys and '2', '1', and '1', from a keypad or screen of device **102a** without a need to listen to the complete audible IVR menu. Visuphone **104** accordingly transmits the signals to audible IVR menu **222a**. In this case, the signals required by audible IVR menu **222a** may be the Dual Tone Multi-Frequency (DTMF) tones of '2', '2', and '1' for options **204a**, **208a**, and **214a**. Moreover, caller **106** may not be required to select all the options. For example, when caller **106** wants to order a veg-pizza for take away. Then, only the nodes **208b** and **216b** may be required to be selected, and node **204b** is automatically understood by Visuphone **104b**. Furthermore, a node that is necessary for a transaction is automatically highlighted. For example, if caller **106** only selects node **216b** for take away, then node **208b** for a veg-pizza or node **210b** for non-veg are highlighted for selection. In an embodiment of the invention, caller **106** may select nodes irrespective of the sequence presented in the audible IVR menu. For example, node **214b** for home delivery may be selected before node **208b** of veg-pizza. Visuphone **104** automatically generates a sequence of the selections made by caller **106** and transmits it to the destination. Furthermore, Visuphone **104** stores the selections and the numbers dialed by the caller during the call in association with the destination number. The Visuphone may enable callers to search or bookmark options in a menu with a large number of options. For example, callers can search for a node **214b** from the menu by typing 'home delivery'. As a result, navigation of a complete visual IVR menu may not be required.

In an embodiment of the invention, visual IVR menu **222b** is displayed to caller **106** when a call is received at device **102**. For example, a service provider may call to provide information about new services or account of caller **106**. Further, caller **106** may be required to select various options based on his preferences. Visuphone **104b** may detect the received number and correspondingly display a visual IVR menu to the caller.

FIG. **2C** illustrates a visual IVR menu **222c** with added graphics for the nodes. It is well known that graphics are easier to learn and are faster to recognize than words. Therefore, graphics are used in various computerized device interfaces. The exemplary graphics as shown with reference to FIG. **2C** are icons. Various other types of graphics can be displayed for example, animated icons, icons that highlight or animate when the node is highlighted, and so forth.

The graphics may be displayed for each node or a few nodes based on the usability of visual IVR menu **222c**. For example, for the node **208** can icon of a vegetable may be displayed to designate a vegetarian pizza, and for the node **214c** of home delivery, an icon of house may be displayed. In an embodiment of the invention, visual IVR menu **222c** can be customized to display only the text, only the icons or both. Furthermore, caller **106** can suggest or use various icons based on his preferences.

FIG. **2D** illustrate an exemplary tooltip that is displayed when a cursor is hovered over an option in the visual IVR menu. As shown, a tooltip box **222** is displayed when a cursor

**226** is hovered on option **204c** or **206c**. Similarly, A Tooltip box **224** may be displayed containing the next menu text with or without it's available options **210c**, **208c** in case the user decides to select the option over which cursor **226** is hovered, for example option **204c**.

In an embodiment of the invention, Visuphone **104b** may provide a standard menu per group of similar audible IVR or destinations. With reference to FIG. **2B** an example of a menu at a pizza provider is discussed. Generally, every pizza provider may have its specific audible IVR menu. However, caller **106** may prefer to use a single standard visual IVR menu for all pizza providers. Therefore, learning a single visual IVR menu will be useful for engaging various providers. In such a case, the database may include a standard menu per class of compatible providers. Visuphone **104b** may offer caller **106** an option to use the standard domain menu. Therefore, when caller **106** makes a selection on the standard menu, Visuphone **104** may translate the selection to the specific audible IVR menu selection and send the proper dialing tones to that specific audible IVR. Furthermore, the standard menus may be published. Therefore, various providers may modify their own menus to help their customers. Additional aspect of the standard menu is the use of icons as discussed with reference to FIG. **2C**. The icons may represent standard choice across various domains. For example, if a specific icon may represent sales, then the same icon may be used for sales of airlines tickets when the destination is an airline company or sales of telephone service when the destination is a telephone company. In an embodiment of the invention, the caller may customize the icons or graphics displayed on the menu.

FIG. **3** illustrates exemplary components of device **102a** for implementing Visuphone. Device **102a** includes a system bus **324** to connect the various components. Examples of system bus **324** include several types of bus, structures including a memory bus or memory controller, a peripheral bus, or a local bus using any of a variety of bus architectures. As discussed with reference to FIG. **1A**, device **102a** can be a device such as computer, a smart-phone and so forth. Device **102a** can connect to PSTN **110** through a gateway **324**, which is connected to network **112** through a network interface **314**. Input/Output (IO) interface **316** of device **102a** may be configured to connect external or peripheral devices such as a memory card **318**, a keyboard and a mouse **320** and a Universal Serial Bus (USB) device **322**. Although not shown, various other devices can be connected through IO interface **316** to device **102a**. In an embodiment of the invention, device **102a** may be connected to a hub that provides various services such as voice communication, Internet access, television services and so forth. For example, the hub may be a Home Gateway device that acts as a hub between the home environment and the Broadband Network.

Device **102a** includes a display **302** to output graphical information to caller **106**. In an embodiment of the invention, display **302** may includes a touch sensitive screen. Therefore, caller **106** can provide inputs to device **102a** by touching display **302** or by point and click using the 'mouse'. Memory **306** of device **102a** stores various programs, data and/or instructions that can be executed by Central Processing Unit (CPU) **304**. Examples of memory include, but are not limited to, a Random Access Memory (RAM), a Read Only Memory (ROM), a hard disk, and so forth. A person skilled in the art will appreciate that other types of computer-readable media which can store data that is accessible by a computer, such as magnetic cassettes, flash memory cards, digital video disks, and the like, may also be used by device **102a**. Memory **306** may include Operating System (OS) not shown) for device **102a** to function. Further, memory **306** may include other

applications **310** that enable the caller to communication with destinations. Examples of other applications **310** include, but are not limited to, Skype. Google Talk, Magic Jack, and so forth. Other applications **310** may be stored as software or firmware on device **102a**. Further, memory **306** includes Visuphone **104** for presenting a visual IVR menu corresponding to the audible IVR menu of destination as discussed with reference to FIGS. 2A, 2B and 2C. Visuphone may be an application stored as a software or firmware on device **102a**. The visual IVR menus are stored in a visual IVR menu database **308** in memory **306** of device **102a**. Visuphone **104** searches visual IVR menu database **308** for visual IVR menus corresponding a phone number of destinations **108a-n** dialed by caller **106**. Further, Visuphone **104** searches visual IVR menu database **308** for visual IVR menus corresponding a phone number of a call received from a destination to caller **106**. Subsequently, if the visual IVR menu for the phone number is available in the database, then the visual IVR menu is displayed on display **302**. Further, Visuphone **104** may be implemented as a plug-in to other applications **310**. Therefore, when a phone number is dialed from other applications **310**, Visuphone **104** detects the dialing of the number and automatically displays the visual IVR menu corresponding to the phone number. Thereafter, the caller can interact with the visual IVR menu, without listening to the complete audible IVR menu of destinations.

With reference to FIG. 4, an exemplary display of a visual IVR menu **406** on device **102c** is illustrated. The caller may dial a phone number **402** corresponding to a destination using keypad **320**. Keypad **320** may be a physical keypad or a virtual keypad displayed on a touch screen display **412**. Subsequently, visual IVR menu **406** corresponding to phone number **402** is searched and displayed on display **412**.

In an exemplary instance, if caller dials a phone number of an IVR destination, then a visual IVR menu corresponding to audible IVR menu of the destination is displayed on display **412**. Similarly, if the caller receives a call from a phone number of destination, then a visual IVR menu corresponding to audible IVR menu of destination is displayed on display **412**. Thereafter, caller can interact with the visual IVR menu to select options from the audible IVR menu. Visual IVR menu **406** may be displayed before actual connection of device **102c** to destinations. Therefore, caller can select a desired action from visual IVR menu **406** before connecting to destinations. In an embodiment of the invention, visual IVR menu **406** may be provided in real-time to caller. In an embodiment of the invention, visual IVR menu **406** is provided a messaging service such as a Short Messaging Service (SMS). Therefore, destinations may provide customized visual IVR menu **406** to caller **106**. Visual IVR menu **406** may be customized based on the profile of caller. In an embodiment of the invention, the profile may be generated based on access pattern of caller or the data capture by a hub connected to device **102c**.

Caller can interact with visual IVR menu **406** by pressing a desired button from keypad **320**. For example, caller can press a '5' key from keypad **320** to select a node 5 in visual IVR menu **406**. Further, caller can directly select the node 5 of visual IVR menu **406** from display **412**, in case of a touch sensitive screen. Depending on the complexity or size of destinations, visual IVR menu **406** may have various nodes. Moreover, display area of display **412** may be limited or small. As a result, all the nodes of visual IVR menu **406** may not be displayed together on display **412**. In such a case, Visuphone is configured to allow caller to navigate by scrolling horizontally and/or vertically to view nodes on visual IVR menu **406**. Further, Visuphone may detect the capability of

device **102a** before displaying the visual IVR menu. For example, in case device **102a** is a basic mobile phone with limited functionality of the display screen. Therefore, Visuphone may display the visual IVR menu in form of a simple list. Similarly, a list may be displayed in case of fixed line telephones. Moreover, in case device **102c** includes a high capability screen, such as but not limited to an iPhone, then the visual IVR menu is displayed in form of graphics.

Subsequently, after caller selects a desired action from visual IVR menu **406**, a connection is established between device **102c** and destinations based on the selected option. In one embodiment, Visuphone is configured to detect and present an application or computer program available on device **102c**.

Visuphone **104** can be further configured to display an advertisement **408**. Advertisement **408** may correspond to the type of services provided by the dialed destinations. For example, if destination dialed is a pizzeria, then advertisement **408** may include promotions or offers about a new pizza. Moreover, advertisement **408** may include promotions or offers from a third party or a competitor of the destination. Further, Visuphone **104** may be coupled to an advertising database. The advertising database may include advertisements related to the phone numbers of the destinations. The advertising database may be stored at device **102c**, the destinations, service providers or other third party servers. Further, the advertisements may be provided based on a profile of caller. For example, assuming that the caller calls a bank holding his saving account. Therefore, the advertisement displayed to the caller may be based on the location, address, account balance, type and volume of transactions, loans, purchases and so forth.

Visuphone **104** may be configured to connect to an intended destination, when caller selects advertisement **408**. Further, Visuphone **104** displays visual IVR menu **406** of the intended destination. In an embodiment, Visuphone **104** stores the interactions of caller with visual IVR menus. For example, Visuphone **104** may automatically learn the numbers dialed or options selected from the menu. Moreover, the learned numbers or choices are associated with the dialed phone number of the destination. Therefore, the caller is assisted in his future calls. For example, when caller calls the destination again, then the actions that were performed in the last interaction are presented prominently to caller; or a previous sequence may be automatically performed. Further, the actions that are frequently performed are presented prominently to caller. For example, if caller dials a bank frequently to enquire about his account balance, then the options for selecting his account balance may be highlighted.

FIG. 5 illustrates exemplary components of device **102b** for implementing Visuphone, in accordance with another embodiment of the invention. Device **102b** includes a system bus **526** to connect the various components. Examples of system bus **526** include several types of bus structures such as, but not limited to, a memory bus or memory controller, a peripheral bus, or a local bus using any of a variety of bus architectures. As discussed with reference to FIG. 1B, device **102b** can be a computing device such as, but not limited to, a personal computer, a laptop, a mobile phone, a smart-phone, and so forth. Device **102b** can connect to network **112** through a network interface **514**. Further, device **102b** can connect to PSTN **110** through gateway **116** and network **112** through network interface **514**. Input/Output (IO) interface **516** of device **102b** may be configured to connect external or peripheral devices such as a mouse **518**, a keyboard **520**, a speaker **522**, microphone **523** and a camera **524**. Although not shown, various other devices such as hard disk, a Universal Serial Bus

(USB) device or others can be connected through IO interface **516** to device **102b**. A person skilled the art will appreciate that although not described, various other types of devices capable of voice and/or data communication can be connected to device **102b**.

Device **102b** includes a display interface **502** to connect to a display **512**. Display interface **502** can be for example, a video adapter. Display **512** outputs graphical information to caller. In an embodiment of the invention, display **512** includes a touch sensitive screen. Therefore, caller **106** can provide inputs to device **102b** by touching display **512** or by pointing with the mouse and click. Memory **506** of device **102b** stores various programs, data and/or instructions that can be executed by Central Processing Unit (CPU) **504**. Examples of memory include, but are not limited to, a Random Access Memory (RAM), a Read Only Memory (ROM), a hard disk, and so forth. A person skilled in the art will appreciate that other types of computer-readable media which can store data that is accessible by a computer, such as magnetic cassettes, flash memory cards, digital video disks, and the like, may also be used by device **102b**. Memory **506** may include Operating System (OS) (not shown) for device **102b** to function. Further, memory **506** may include other applications **510** that enable caller **106** to communication with destinations **108a-n**. Examples of other applications **510** include, but are not limited to, Skype, Google Talk, Magic Jack, and so forth. Other applications **510** may be stored as software or firmware on device **102b**. Further, memory **506** includes Visuphone **104** for searching and presenting a visual IVR menu corresponding to the audible IVR menu of a destination as discussed with reference to FIGS. 2A and 2B. Visuphone **104** may be an application stored as a software or firmware on device **102b**. The visual IVR menus are stored in visual IVR menu database **308** in memory **506** of device **102b**. Visuphone **104** searches visual IVR menu database **308** for visual IVR menu corresponding a phone number of a destination dialed by caller. Subsequently, the visual IVR menu is presented on display **512** for selection of options by caller. Further, Visuphone **104** may be implemented as plug-in to other applications **510**. Therefore, when a phone number is dialed from other applications **510**, Visuphone **104** detects the dialing and automatically searches and displays the visual IVR menu corresponding to the dialed phone number. Thereafter, caller can interact with the visual IVR menu, without listening to the audible IVR menu of destinations.

With reference to FIG. 6, an exemplary display of a visual IVR menu **604** on device **102b** is illustrated. Caller may dial a phone number **610** from a VoIP application **608** on device **102b**. Phone number **610** may correspond to any of destinations. In an embodiment, caller selects a pre-stored phone number from the application **608**. Subsequently, visual IVR menu **604** corresponding to a dialed destination is displayed on display **512**. In an embodiment, display **512** may comprises a touch sensitive screen. Therefore, caller can interact with device **102b** directly through display **512**.

In an exemplary instance, if caller **106** dials a phone number of destination, then a visual IVR menu corresponding to audible IVR menu of destination is displayed. Thereafter, caller can interact with the visual IVR menu to select options and to transmit inputs for the audible IVR menu of the corresponding destination. Visual IVR menu **604** could be displayed before actual connection of device **102b** to destinations. Therefore, caller **106** can select a desired option from visual IVR menu **604** before establishing a connection to the destination. Depending on the complexity or size of the destinations, visual IVR menu **604** may have various nodes. For example, an organization with 50 departments may have

more menu options or nodes than that of an organization with 10 departments. Further, the display area of display **512** may be limited. As a result, all the nodes of visual IVR menu **604** may not be displayed together on display **512**. In such a case, Visuphone **104** is configured to allow caller **106** to navigate by scrolling horizontally and/or vertically to view nodes on visual IVR menu **604**. Moreover, caller **106** can search for a desired option from the visual IVR menu.

Subsequently, after caller **106** selects a desired option from visual IVR menu **604**, a connection is established between device **102b** and a destination based on the selected action. In one embodiment, Visuphone **104** is configured to detect and present applications suitable to caller for initiating the connection. For example, Visuphone **104** may detect more than one VoIP applications present in device **102b** and present them to caller **106** on display **512**. Thereafter, caller can select an application to be used or initiate the connection in a default configuration. The default configuration can be for example, VoIP application **608** on which phone number **610** was dialed. In another embodiment, caller **610** may select a phone number displayed in applications such as a browser, messenger, or a mail client. Subsequently, Visuphone **104** detects and presents applications suitable to caller for initiating the connection. Furthermore, Visuphone **104** is configured to display visual IVR menu **604** for the phone number selected from the applications.

Visuphone **104** is further configured to display an advertisement **606**. Advertisement **606** may correspond to the type of services provided by destinations. For example, if the destination is a bank, then advertisement **606** may include promotions or offers about new loans or schemes. Moreover, advertisement **606** may include promotions or offers from a third party or a competitor of destination. Visuphone **104** may be configured to connect to intended destination, when caller selects advertisement **606**. Further, Visuphone **104** displays visual IVR menu **606** of the intended destination. In an embodiment, Visuphone **104** stores the interactions of caller with visual IVR menus after a call to an IVR was made. Therefore, when caller calls the same destination again, then the options that were selected in the last interaction are presented prominently. Further, the options that are frequently selected can be presented prominently. For example, if caller dials a bank frequently to check his account balance, then the options for selecting his account balance may be highlighted. Additionally, the information such his account number can be brought up to save effort for the user who can than just OK for that 'auto fill' to be dialed out to the IVR at the proper time.

With reference to FIG. 7, device **102b** may include a web browser **702** to display web pages from the Internet and/or other computer networks. Various websites provide a phone number on the web pages as a click-to-talk button. The clickable button can provide, for example, a contact number of executives of the organization. The clickable button may be programmed to display a phone number of the organization and/or display a caller a form to provide his contact details, so that an executive from the organization can call back the caller. Visuphone **104** is configured to detect a connect button **706** on a webpage **704**. Connect button **706** may be used by Visuphone **104** to initiate a connection to a destination.

Visuphone **104** detects and launches a VOIP application on device **102b**. In an embodiment, in case more than one application is available on device **102**, Visuphone **104** selects a VoIP application preferred by caller. Moreover, Visuphone **104** may be configured to automatically login into the VoIP application. In an embodiment, caller **106** stores the login details for the VoIP application in Visuphone **104**. Further, Visuphone **104** displays a visual IVR menu corresponding to



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audible IVR menu of the destination connected once click on the connect **706** tab. Therefore, caller can connect to the destination from web browser **702** automatically and may not be required to dial the phone number or provide call-back information.

In an embodiment of the invention, Visuphone **104** may include a VoIP plug-in that monitors the outgoing calls made from the VoIP application. Therefore, the VoIP plug-in may search each dialed number in visual IVR menu database **308**. In case, the dialed number is found in visual IVR menu database **308** and is associated with an IVR, then the VoIP plug-in may display the visual IVR menu corresponding to the audible IVR menu of the dialed number.

Another embodiment of the invention allows the user to select the visual IVR menu using car display like GPS display. Hands-free cell phone system is used in many cars as a separated device or as an integrated system in the car. These devices allow the user to talk with the cell phone without holding the cell phone in his hands. Some devices are using the car speakers for the phone call. In many cases, the hands-free system can use a display screen in the car like GPS screen or other display. Following voice menu while driving might not be the optimal way to use hands-free cell phone system. In some cases, selecting an option from a visual IVR menu is preferred. While driving or stopping in red light, it might be easier to use larger display like the GPS display in the car. The display can present the visual IVR menu and the user can select the option from the menu. The computing engine to support the visual IVR menu could be embedded in the car GPS system or in another controller that have access to the car display. Once the system recognizes a destination of a call to be an IVR it will access the database pull out the menu and display. Accordingly all the other Visuphone **104** features could be incorporated.

FIG. **8** illustrates exemplary software architecture **800** of Visuphone **104**, in accordance with an embodiment of the invention. Hardware layer **802** includes various hardware of device. For example, but not limited to, a mouse, a keyboard, a speaker, a microphone, a camera, a USB device, a display and so forth. The drivers required for the hardware of device are provided by drivers layer **804**. Moreover, drivers layer **802** interfaces with Operating System **806**.

Operating System **806** provides memory and environment required by Visuphone **104** and other applications **808** for functioning on device. Examples of Operating System **806** include, but are not limited to, Windows, Macintosh, Linux, Symbian, Andriod and so forth. Visuphone **104** may be implemented as a plug-in to other applications **808**, such as Skype, Google Talk, web browser, mail client, and so forth. In an embodiment, Visuphone **104** may be implemented as a standalone application on device. Further, Visuphone **104** may be configured to execute as a background application. Therefore, caller may not be required to specifically launch Visuphone **104**. Furthermore, Visuphone **104** may be implemented as a multi-threaded application. Therefore, visual IVR menus of more than one destination may be displayed simultaneously on device.

FIG. **9** illustrates exemplary components of Visuphone **104**, in accordance with an embodiment of the invention. As discussed above, Visuphone **104** may be implemented as hardware, software, or firmware on a device. Further, Visuphone **104** may be configured to execute as a background process on device. In an embodiment, Visuphone **104** may be configured to execute as a system service. Therefore, other processes or applications executing on the device may not block the operation of Visuphone **104**.

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When caller dials, selects or receives a phone number on the device, a detection module **902** of Visuphone **104** detects that a phone number has been dialed, selected or received. For example, detection module **902** may detect key presses or caller ID on device. Caller may use a VoIP application on device for dialing the phone number. Moreover, caller may use a mouse to a joystick to select or press icons of numbers displayed on the VoIP application. Further, detection module **902** is configured to identify the VoIP applications available on device and used by caller. Moreover, detection module **902** may detect the position co-ordinates of the VoIP application on a display of device. For example, in case device includes the Microsoft Windows OS, then the position co-ordinates of the VoIP application can be detected from the registry of the OS. Detection module **902** may be configured to store the position of number icons relative to position co-ordinates of various VoIP applications. Therefore, based on the co-ordinates of the position of the VoIP application, detection module **902** can detect the exact position of each number icon on the display of device. For example, if the co-ordinates of a top-left edge of the VoIP application is (X,Y) on the display, and the co-ordinates of an icon for number '1' on VOIP application is (X1,Y1) relative to its top-left edge, then the exact co-ordinates of the icon for number '1' may be calculated as (X+X1, Y+Y1) on the display. A person skilled in the art will appreciate that other types of mathematical operations can be applied to calculate the co-ordinates of the icons on the display of the device.

Detection module **902** may be configured to detect the co-ordinates of the cursor on the display of device. Further, detection module may be configured to detect the action events generated by the mouse or joystick, such as a click, a double-click, drag, select, scroll and so forth. Therefore, when caller selects or press a number on the VoIP application, detection module **902** may detect the number from the position of the cursor, the VoIP application and the number icon. In an embodiment, detection module **902** may be configured to store the last used co-ordinates of the VoIP application and number icons. Therefore, detection and/or calculation of the co-ordinates may not be required. Furthermore, detection module **902** may be configured to detect a connect button displayed on a web page of a browser on device as explained with reference to FIG. **7**. Therefore, when caller clicks the connect button, detection module **902** identifies the phone number behind the connect button. In an embodiment, detection module **902** detects the connect button and the associated phone number by scanning the source code of the web page.

The phone number detected by detection module **902** is used by a search module **904** of Visuphone. In an embodiment, detection module **902** may be configured to transfer each digit to search module **904** in real-time as clicked by caller. Search module **904** searches visual IVR menu database for visual IVR menu corresponding to the phone number. An exemplary visual IVR menu is as explained above in conjunction with FIGS. **2B** and **2C**. As discussed above, visual IVR menu database stores visual IVR menus corresponding to the audible IVR menus of destinations. Moreover, visual IVR menu database may store other information, which is explained in conjunction with FIG. **10**. Search module **904** may also be configured to search for other information in visual IVR menu database. In an embodiment, search module searches visual IVR menu database in real-time based on the digits received from detection module **902**. Therefore, a visual IVR menu may be identified based on the best match of the number formed by the received digits in visual IVR menu

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database. As a result, caller may not be required to dial, click, press or select the complete number, which may be convenient and time saving.

The visual IVR menu identified by a search module **904** is displayed on the display of device by display module **906** of Visuphone **104**. Display module **906** identifies the position on the display where the visual IVR menu is to be displayed. In an embodiment, the visual IVR menu is displayed such that there is minimum overlap with the VoIP application from which the phone number was dialed or selected. Moreover, display module **906** identifies the size of the visual IVR menu for display based on the characteristics of the display screen of device. Examples of characteristics of the display screen include, but are not limited to, a screen size, resolution, and so forth. Furthermore, in case the visual IVR menu is not completely displayed on the display, then display module **906** may allow caller to navigate the visual IVR menu by scrolling. Moreover, display module **906** may be configured to display other information received from search module **904**.

Caller may interact with the visual IVR menu or other information displayed on device. For example, caller may scroll through the visual IVR menu, or select a node from the visual IVR menu. Therefore, when caller selects a node from the visual IVR menu, detection module **902** detects the selected node and communicates the selection to a connection module **908**. Thereafter, connection module **908** may establish a connection between device and a destination based on the nodes selected by caller. Connection module **908** may be configured to detect communication systems available in device. For example, in a case, device is a phone not connected to the Internet, connection module **908** may detect that only a radio connection can be made. Otherwise, a most suitable or a connection preferred by caller can be made. In an embodiment, connection module **908** may allow caller to select a VoIP application to establish the connection. In another embodiment, communication module **908** may launch a default VoIP application on the device **102**. In yet another embodiment of the invention, connection module **908** can use a VoIP protocol stack defined by Visuphone to establish the connection.

Sometimes, a call of caller may be transferred from one point in the organization to another point within the same organization or to a completely different organization. For example, the call of caller with destination **108a** may be transferred to destination **108h**. However, destinations **108a** and **108b** may have different audible IVR menus. Connection module **908** is configured identify the transfer of call and to switch the visual IVR menu of destination **108a** with destination **108b**. The switching of visual IVR menus is explained in detail in conjunction with FIG. **11**.

Some organizations such as banks may require caller to present a voice input for the purpose of authentication. For example, caller may be required to voice out his name or an answer to a security question specified by caller to the bank. Furthermore, voice input may be required to accept or decline a transaction. Caller may record and store the voice responses for such authentications or questions alternatively the system can use synthesis voice. Therefore, when connection module **908** detects that a voice authentication is required, and then voice module **910** is used. Voice module **910** provides voice inputs on behalf of caller by using the using responses recorded by caller. Subsequently, the connection or the transaction can be processed.

As discussed in conjunction with FIGS. **4** and **6**, Visuphone **104** may be configured to display advertisements on device **102**. The advertisements are managed by advertisement module **912** of Visuphone **104**. The advertisement may be selected

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based on the type of destinations. For example, when a dialed destination is a bank, then an advertisement related to banking may be displayed. Moreover, the advertisement can be related a third-party dealing in the same business or professional area or a competitor of the dialed destination. The displayed advertisement may be a text, audio, image or video. In one embodiment, advertisement module **912** may display the advertisements based on the connection bandwidth available at device **102**. In another embodiment, advertisement module **912** may display the advertisements based on the pre-set preferences by caller. In one embodiment, advertisement module **912** may be configured to receive the advertisements directly from the dialed destination. In another embodiment, advertisement module **912** may be configured to receive the advertisements from a remote server on a network. The remote server is explained in detail in conjunction with FIG. **10**. A selection or click by caller on advertisements may be detected by detection module **902** to display a visual IVR menu of the destination for which the advertisement was displayed.

In some cases, the audible IVR menu of destination may change. For example, the extension numbers of agents in banks may be changed due to addition of new agents. A person skilled in the art will appreciate that there can be other reasons for the audible IVR menu of a destination to be edited, amended or updated. Further, new organizations may be available that use audible IVR menus. The visual IVR menus for these new organizations may not be available in visual IVR menu database stored on device. Therefore, visual IVR menu database may be required to be updated. In an embodiment, Visuphone may be updated to provide additional functionalities to caller. Update module **914** may be configured to update the visual IVR menus stored in visual IVR menu database of device. Moreover, update module **914** may be configured to update Visuphone. Update module **914** may receive the updated visual IVR menus from the remote server on the network. The remote server is explained in detail in conjunction with FIG. **10**.

Visuphone may record the caller's selections or keystrokes for audible IVR menus by using customization module **916**. The keystrokes may be some personal data of the caller such as his account number, customer number, and so forth. Visuphone can provide better support to caller by presenting the recorded keystrokes so that the caller can approve and sending them without entering them every time. Customization module **916** personalizes the generic visual IVR menu by associating the keystrokes with it and storing in visual IVR menu database **308**. Alternatively, an additional set of standard may be defined for representing caller data. In this case, only the code indicating the type of required data is added to visual IVR menu database **308**. Visuphone can than build a relatively small table in visual IVR menu database **308**, with the various personal data codes and the actual caller data as analyzed from the caller's keystrokes during his connection with destinations of the audible IVR menus.

FIG. **10** illustrates an exemplary remote server **1002** connected to a remote repository **1004**. As shown remote server **2002** is connected to device **102** through a computer network **1006**. Further, remote server **1002** can be connected to destinations **108a-n** through network **1006**, a gateway **1008**, and a PSTN **1010**. A person skilled in the art will appreciate that device **102** can connect to destinations **108a-n** directly through PSTN **1010**, therefore the connection is not limited to network **1006**. Each of destinations **108a-n** may be connected to audible IVR menu repository **1012a-n**, here after referred to as destination repository **1012a-n**.

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Further, device 102 includes visual IVR menu database 308. As discussed above, visual IVR menu database 308 includes visual IVR menus corresponding to audible IVR menus of destinations 108a-n. Moreover, visual IVR menu database 308 may store other information such as profile of caller, voice response of caller, login details for a VoIP application, preferences of caller, ratings for visual IVR menus, identity of visual IVR menus and so forth. As discussed in conjunction with FIG. 9, Visuphone 104, the visual IVR menus or other information stored in visual IVR menu database 308 may require to be updated. In an embodiment, visual IVR menu database 308 is updated by information received from remote repository 1004. In another embodiment of the invention, visual IVR menu database 308 may be updated by receiving menus through Short Messaging Service (SMS). The SMS may be sent from destination 108a-n or remote repository 1004 to device 102. Remote repository 1004 includes visual IVR menus corresponding to audible IVR menus of destinations 108a-n. Further, remote repository 1004 stores advertisements related to destinations 108a-n, last updated time of the visual IVR menus, rating of visual IVR menus and so forth.

In case, the audible IVR menu of a destination is changed, caller may not be able to connect to the destination by using Visuphone 104. Visuphone 104 is configured to detect the error generated while establishing the connection. For example, caller may select a node in the visual IVR menu that may not have a corresponding option available in audible IVR menu, or a connection not be established between device 102 and the destination. The error is detected by update module 914 of Visuphone 104. Subsequently, update module 914 sends an error report to remote server 1002. Remote server 1002 may check remote repository 1004 for updates related to the visual IVR menu. Thereafter, in case any updates are available, remote server 1002 may send the updates to device 102 for performing the update. In an embodiment, visual IVR menu database 308 may be checked and updated based on a pre-defined time interval by the device 102. In an embodiment, the error report may include the error generated and an Identity (ID) or version of the visual IVR menu on which the error was generated. In case, the updates are not available in remote repository 1004, then an update of remote repository 1004 may be required. In an embodiment of the invention, remote repository 1004 is updated based on a pre-defined time interval. In another embodiment of the invention, the caller can rate the relevance or correctness of the visual IVR menu from device 102. Therefore, remote repository 1004 can be updated based on a cumulative ratings received from callers and other users of the visual IVR menu. The remote server 1002 can comprise a process of continuously scanning the IVRs 108a to 108n updating the remote repository 1004 with changes of various IVR menus and adding addition menu records for new IVRs. Also the remote server 1002 might get a 'problem report' from device 102 if caller identify problem between the menu as it is in the database 308 and the audible menu of a specific IVR. In such case a recheck process will be initiated to update the remote repository 1004 and the new information can be than offered to device 102 for download an update.

In an embodiment of the invention, visual IVR menu database 308 may include other information and parameters related to the visual IVR menus. The parameters related to the visual IVR menus enable accessing, modifying or updating of the visual IVR menus. Examples of parameters of visual IVR menus include, but are not limited to, ID or version of the visual IVR menus, destination phone numbers, and a last update timestamp. Furthermore, visual IVR menu database

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308 may include other information such as a profile, the calling history, or preferences of the caller. The calling history of a caller may include the numbers dialed or received, most frequent numbers dialed or received, most frequent nodes selected from visual IVR menus. The profile of a caller may include, but is not limited to, the name, age, sex, address, phone number, profession, office address, recorded voice responses for visual IVR menus, or other personal and professional details of the caller.

With reference to FIG. 11, the exemplary process for presentation of the visual IVR menu is illustrated when the call of a caller is forwarded or transferred from destination 108a to destination 108b. Destination 108a may have completely different audible IVR menus as compared to destination 108b. For example, destination 108a may be a loan department and destination 108b may be an insurance department of a bank. Similarly, the call may be forwarded from one organization to another. Therefore, caller may be required to respond to a different audible IVR menu. Visuphone 104 may be configured to detect that the call has been forwarded and subsequently display the visual IVR menu of destination 108b.

As shown in FIG. 11, device 102 establishes a connection with destination 108a as depicted by arrow 1102. The connection is established by using the visual IVR menu provided by Visuphone 104 based on destination 108a. In an embodiment, the connection is established directly without using Visuphone 104. Thereafter, destination 108a may forward the call to destination 108b, as indicated by arrow 1104. The visual IVR menu corresponding to the audible IVR menu of destination 108b may not be visible on device 102, as the call was forwarded between destination 108a and destination 108b. In an embodiment, Visuphone 104 may not detect the forwarding of the call. In this case, device 102 may be presented with audible IVR menu of destination 108b. Thereafter, Visuphone 104 may record the options and responses on device 104 for the audible IVR menu of destination 108b. The recorded options and responses may be stored at remote repository 1004 for updating it. Further, the recorded options and responses may be stored visual IVR menu database of device 102.

In an embodiment, destination 108b sends an identity (ID) or version of the audible IVR menu to a caller as shown by arrow 1106. The audible IVR menu ID is specific to the audible IVR menu of destination 108b. Subsequently, display module 906 of Visuphone 104 uses the audible IVR menu ID to display the corresponding visual IVR menu. Further, a caller may select a node from the visual IVR menu corresponding to destination 108b. Therefore, when a caller selects a node, a connection may be established with destination 108b. In an embodiment of the invention, connection between device 102 and destination 108a is disconnected after establishing a connection between device 102 and destination 108b. In another embodiment of the invention, connection between device 102 and destination 108a is maintained for complete communication session till the caller disconnects the call.

Another embodiment of the invention allow visual IVR menu for calls made from a conventional home telephone. FIG. 12 illustrate a phone 1204 connected to a Public Switched Telephone Network (PSTN) 1208 and through a gateway 1218 to the Internet network 1220. Network 1220 may be any service provider that provides services, for example, but not limited to, telephone services, cell phone services, wireless services, Internet services, cable television services, or various combinations of the above or other type of services.

Further, the connection to network **1220** is associated with a wide band Internet 'smart' modem **1206**. Phone **1204** may be a regular phone, such as a landline phone or a cordless landline phone. Modem **1206** may be a Digital Subscriber Link (DSL) modem or a cable modem that connects the home device to the Internet and/or computer network. Modem **1206** is connected to a service provider, and can provide the home devices with telephone, Internet and television services. Modem **1206** may provide both wired and wireless connections. As shown with reference to FIG. 12, modem **1206** provides the home with the Internet through wire **1210** to a computer **1202**, or through a Wi-Fi connection. Modem **1206** comprises the ability to detect and recognize the dialing made by phone **1204**. The numbers dialed by phone **1204** to establish connection are then compared with a database, such as visual IVR menu database **308**. Therefore, in case the dialed number corresponds to a destination with an audible IVR menu, and a corresponding visual IVR menu exists then, modem **1206** may provide the visual IVR menu on computer **1202** connected to it. Moreover, modem **1206** may use private web sites to present the visual IVR menu or just provide the dialed number to computer **1202**. Thereafter, a software tool on computer **1202** may present the visual IVR menu on the screen of computer **1202**.

Once the connection with the destination has been established, 'smart' modem **1206** will continue to monitor the numbers dialed or received by phone **1204** to browse or advance the visual IVR menu accordingly. Furthermore, the numbers dialed or received may be stored for future processing such as highlighting previous selections in the visual IVR menu, providing customized visual IVR menu and so forth. The Visual IVR menu system comprising computer **1202** and Modem **1206** may incorporate additional enhancements as presented before such as automatic dialing of customer information. The automatic dialing may be achieved by using computer **1202** to initiate and execute such automatic dialing.

In another embodiment of the invention, a house television **1212** may be used to present the visual IVR menu. In various houses modem **1206** decodes television signals and transfer it to a set-top box **1216** that provide signals to television **1212**. The visual IVR menu may be presented on a channel dedicated for IVR. Therefore, when phone **1204** is used to initiate a call, modem **1206** can detect it and present the visual IVR menu corresponding to the dialed number on the designated channel of the television **1212**. Further, all the options described before can be provided now using the screen of television **1212** for the visual IVR menu. The caller selection can be done by using the simple home phone or alternatively using the TV **1212** set top box **1216** remote control. Further, television **1212** screen may be used to present the visual IVR menu in a few alternatives ways. For example, a device provided by a company named RokuInc., allows streaming of content from the Internet to television. Most set-top boxes now have an Internet connection or telephone connections. Furthermore, various devices such as some Digital Versatile Disc (DVD) players, and video game players or controllers such as Xbox or Playstation, can be connected to the Internet. Each of those devices may allow 'smart' modem **1206** to provide a visual IVR menu on the screens of television **1212**.

In another embodiment of the invention a telephone connection may be established through an external telephone service by using a computer, as discussed with reference to FIG. 13. External telephone service provider **1310**, such as 'Google Voice', which a user may use through the Internet network from computer **1302**. In such case, the user can cause a telephone call to be established by indicating on service provider **1310** 'Google Voice' web site a request to establish

call to a designated location. Thereafter, the external service provider **1310** establishes connection **1306** by using PSTN **1308** to connect the user telephone **1304** to a desired destination **1312**. External service provider **1310** can now present, the visual IVR menu as discussed above. External service provider **1310** may present the visual IVR menu on its web site and processed or advanced based on the dial choices made by the user on his computer **1302**. Furthermore, external service provider **1310** can also add various options as described before, such as but not limited to highlighting previous choices, automatic dialing of user information and presenting related advertisements.

Another enhancement for such external service provider **1310** is to provide a 'smart' connect. In case of the 'smart' connect, the user can designate not just destination **1312**, but a specific node of visual IVR menu, such as node **212b** as discussed with reference to FIG. 2B. The 'smart' connect will dial the proper selection in the visual IVR menu and connect to node **212b** of the audible IVR. The 'smart' connect can even wait until the selected node 'Talk to Executive' yields the desired result of the executive answering the line and then connect the user. Therefore, the efficiency of the IVR system does not come at the cost of inefficiency of the user, rather both sides can become more efficient by using the 'smart' connect.

Additional alternatives to the invention are illustrated with reference to FIGS. 14A, 14B, and 14C. FIG. 14A illustrates a Visu-Add-on **1404** which can be connected to a standard home phone **1402** to provide all the features and functionalities as described above with respect to the Visuphone **104**. Accordingly, phone **1402** may be connected through connection **1406** to add-on **1404** that can be connected to a standard telephone connection line **1410**. Add-on **1404** may comprise a processing unit, a display and a database. The database may be similar to visual IVR menu database **308** as discussed in FIG. 3. Therefore, when phone **1402** is used to call a destination with an audible IVR menu, a corresponding visual IVR menu is presented on the display of add-on **1404**. Furthermore, the display of add-on **1404** may comprise as touch sensitive screen for added convenience of a user. Add-on **1404** may be loaded and updated by the use of removable memory devices, such as USB flash memory **1408**. Alternatively, Add-on **1404** may comprise a modem to connect either by the use of the telephone connection line **1410** or by wireless means such as WiFi or Bluetooth.

FIG. 14B illustrates an embodiment, where an add-on unit **1414** is plugged into a conventional digital picture frame **1420** by using a USB port. Digital picture frames recently became quite popular as a convenient way to display family photos in digital format. In this embodiment, picture frame **1420** can display family photo until a call is made by using a phone **1412** to a destination with an audible IVR menu. Phone **1412** may be connected to picture frame **1420** through a connection **1418** and add-on **1414** may be further connected to standard telephone line connection **1422**. Add-on **1414** may comprise a processor and a database. The database may be similar to visual IVR menu database **308** as discussed in FIG. 3. Therefore, when a connection is made to a destination having an audible IVR menu, then add-on **1414** will present the visual IVR menu on picture frame **1420**. Picture frame **1420** may resume presenting the photos after the completion of the call. Furthermore, the database of add-on **1414** could be updated with one of the options described before in respect to the add-on **1404** of FIG. 14A. It should be noted that various home television provides functionality similar to picture frame **1420**. Therefore, television can be used as an alternative to picture frame **1420**.

FIG. 14C present another embodiment that can be applied as presented with respect to FIGS. 14A and 14B. It quite common these days to use a telephone handset 1424 that are connected by wireless means to a base station 1430 that is connected by a wire 1432 to the standard telephone lines. Add-on 1426 can comprise an internal radio circuit to detect the wireless communication. Therefore, add-on 1426 can detect the communication between handset 1424 and base station 1430 to present, the visual IVR menu. As can be seen with reference to FIG. 14C, connection through wires such as wires 1406 or 1418 may not be required. Add-on 1426 may be provided by the manufacturer of the handset 1424 and the base station 1430, or by a third party. A person skilled in the art will appreciate that the functionalities of the add-on units as described in conjunction with FIGS. 14A, 14B and 14C can be combined into a single unit. Therefore, a single add-on unit may be used in various environments as discussed above.

FIGS. 15A, 15B, 15C and 15D illustrate a flowchart diagram for presentation of the visual IVR menus, in accordance with an embodiment of the invention. Caller 106 may dial, select or receive a number to connect to a destination from device 102. The destination may include an audible IVR menu for interaction with a caller. Further, device 102 may include Visuphone 104 to present a visual IVR menu corresponding to the phone number of the destination. Therefore, a caller can directly interact with an IVR of destination through the visual IVR menu without listening to the audible IVR menu.

At step 1502, Visuphone such as of device 102 detects a phone number dialed, selected or received by caller for destination. In an embodiment of the invention, the number is clicked according to the display of device 102. The number is detected by detection module 902 of Visuphone 104. Thereafter, search module 904 searches visual IVR menu database 308 of device 102 for the phone number, at step 1504. Search module 904 searches for visual IVR menu and other information corresponding to the phone number. Other information may include, for example, the caller profile, call history of the caller, advertisement associated with the phone number and so forth. In an embodiment of the invention, search module 904 searches visual IVR menu database 308 in real-time. Therefore, the visual IVR menu and other information may be searched with only a few digits of the phone number.

At step 1506, it is determined by search module 904 whether the visual IVR menu and other information are available for the phone number in visual IVR menu database 308. In case, the visual IVR menu is available, then the process continues to step 1508. In case, the visual IVR menu is not available, then device 102 may be connected to remote repository 1004 by update module 914, at step 1518 as shown with reference to FIG. 15B. Thereafter, it is checked whether the visual IVR menu is available in remote repository 1004, at step 1520. Subsequently, if the visual IVR menu is available, then visual IVR menu database 308 is updated from the information available at remote repository 1004, at step 1522. The process then continues to step 1524.

Further, at step 1506, once it been determined by the search module 904 that the visual IVR menu for the destination is available in the visual IVR menu database 308 an asynchrony request is sent to remote repository 1004, at step 1558. The request is sent to check whether a newer version of the menu with different content is available, at step 1560. Subsequently, if such version exists in remote repository 1004, then visual IVR menu database 308 is updated accordingly, at step 1522. The process is then continues to step 1524.

In case, the visual IVR menu is not available in remote repository 1004, then the process continues to step 1528. At

step 1528, audible IVR menu selection is detected on device 102. The audible IVR menu selection may be determined based on Dual Tone Multi Frequency (DTMF) tones or keys pressed by the user of device 102. Thereafter, in case a selection is detected, then the dialed number may be detected as a possible destination number. The dialed number may be provided to remote repository 1004 at step 1530. Thereafter, the process continues to step 1526, where remote repository 1004 is updated for information.

At step 1524, it is determined by search module 904 if visual IVR menu is available for the dialed number in updated visual IVR menu database 308. In an embodiment, Visuphone detects the correctness of information based on the error received on connection to the IVR destination or behavior of the caller. In case, visual IVR menu is available, then the process continues to step 1508. Otherwise, in case the visual IVR menu is not available, then the process continues to step 1526, where remote repository 1004 is updated for information. In an embodiment, Visuphone 104 sends an error report to remote repository 1004 to initiate the update. The error report may include the error details of connection, behavior of the caller and other information required to update remote repository 1004. In another embodiment, the caller may provide ratings for the correctness of the visual IVR menu and other information. Subsequently, the ratings are sent to remote repository 1004. In an embodiment of the invention, ratings from multiple devices are received at remote repository 1004. Thereafter, remote repository 1004 may be updated based on the ratings. In an embodiment of the invention, remote repository 1004 may be updated based on a pre-defined time interval. In another embodiment of the invention, remote repository 1004 is updated by an administrator of remote server 1102.

At step 1508, if the visual IVR menu is available in the visual IVR menu database, then the visual IVR menu corresponding to the audible IVR menu of destination is displayed on device 102. In an embodiment of the invention, advertisements related to the type of destination are also displayed on device 102. At step 1510, inputs from the caller are detected on the visual IVR menu. In an embodiment, the inputs include the nodes of the visual IVR menu selected by the caller. In another embodiment, the inputs include the advertisement selected by the caller. Subsequently, device 102 is connected to destination based on the inputs provided by the caller, at step 1512. At step 1514, it is determined if the visual IVR menu displayed on device 102 is correct. In case, the visual IVR menu is not correct, then the process continues to step 1518. Thereafter, the process steps as discussed above are followed. However, in case the visual IVR menu is correct, then the connection between device 102 and destination is maintained, at step 1516. Moreover, further inputs from the caller are received, to continue the communication till the caller or destination disconnects the connection.

The information stored in remote repository 1004 may be gathered from various destinations. For example, various destinations may be called to detect audio IVR menus and accordingly generate the information for remote repository 1004. With reference to FIG. 16 exemplary components of a device 1602 for implementing a database construction system 1606 are illustrated. Device 1602 can be a computing device such as, but not limited to, a server, a personal computer, a laptop, a mobile phone, a smart-phone, and so forth. Device 1602 can connect to network 1614 through a network interface 1612. Further, device 1602 can connect to a PSTN 1618 through gateway 1616 and network 1614 through network interface 1612. Examples of network 1614 include, but are not limited to a LAN, WAN, the Internet and so forth.

Although not shown, device **1602** can connect to various external devices such as hard disks, mouse, keyboard, speaker, microphone, displays, Universal Serial Bus (USB) devices and so forth. Further, device **1602** can connect to various destinations **1620a-n** through PSTN **1618**. Destinations **1620a-n** may provide audio IVR menu services. In an embodiment of the invention, device **1602** can connect to various devices that include Visuphone for providing updates to visual IVR menu database **308**.

Device **1602** may include a memory **1604** that stores various programs, data and/or instructions that can be executed by a processor **1610**. Examples of memory include, but are not limited to, a Random Access Memory (RAM), a Read Only Memory (ROM), a hard disk, a computer-readable medium and so forth. A person skilled in the art will appreciate that other types of computer-readable media which can store data that is accessible by a computer, such as magnetic cassettes, flash memory cards, digital video disks, and the like, may also be used by device **1602**. Memory **1604** may include Database Construction System (DCS) **1606** for gathering audible IVR menu information, which could be called the IVR customization record, from the destinations and store it in a records database **1608**. In an embodiment of the invention DCS **1606** may be an application stored as software or firmware on device **1602**.

DCS **1606** may include various modules or instructions that may be executed by processor **1610** for generating information in records database **1608**, as explained in detail with reference to FIG. 17. As discussed above, DCS **1606** may be implemented as software, or firmware on a device. DCS **1606** may be implemented as a standalone module or as several independent instances performing similar jobs without coupling to the IVR destinations. Further, the non-coupling may be managed by a centralize module that may allocate different IVR destinations to each implementation instance of DCS **1606**. In an embodiment of the invention, DCS **1606** and record database **1608** may be implemented on different devices.

Records database **1608**, may include multiple records. Further each record may include an IVR identity code, multiple internal destinations and an activation code for each said internal destination. The IVR identity code may be for example, the phone number of the destinations. The activation code may be for example, a telephone key that should be dialed such as a dial tone associated with the phone number. The internal destination is usually an extension to which the call will be forward once the caller makes a choice, according to the provided menu, and apply the activation code that is usually a dial tone transmitted to the IVR from the Visuphone once the caller dials or selects a proper number or option. Each internal destination may further include another internal destination or extension that may be referred to as a sub-internal destination. Moreover, each sub-internal destination may be associated with a sub-record. Furthermore, the internal destinations may be associated with an icon code. As discussed above, the icons provide a convenient display for the user of a visual IVR menu. In some audible IVR menus the activation code may be a voice command that could be activated by the caller by voicing his selection, or the Visuphone may transmit a pre-recorded voice command or a synthesized voice command when the caller makes a selection from the option menu of the visual IVR menu provided by the Visuphone. Further, records database **1608** may include a record of the metadata or keywords associated with the various options in the menus. The metadata and/or keywords may be used by the Visuphone to enable the caller to search for a

desired menu by providing keywords. In an embodiment of the invention records database **1608** is remote repository **1004**.

FIG. 17A illustrates exemplary components of DCS **1606**, in accordance with an embodiment of the invention. DCS **1606** may include a Database Construction Agent (DCA) **1720** for generating information in records database **1608**, as explained in detail with reference to FIG. 17B and FIG. 17C. Some destinations may provide downloadable records or information for the callers. Download module **1710** of DCS **1606**, downloads the information or records provided by the destinations. For example, download module **1710** may download recorded voice phrases, audio data of the audible IVR menu, activation codes, complete audible IVR menu file in a variety of formats and so forth. In an embodiment of the invention, DCS **1606** may connect to various devices that include Visuphone. Therefore, DCS **1606** may receive information from Visuphone, such as personal records, customized records of the callers, and frequently used numbers, keys and so forth. In an embodiment of the invention, download module **1710** may obtain permissions before downloading the information. The permission may be obtained from the user, the destination or both. For example, download module **1710** may display a notification on screen on the device to the user or administrator to permit or reject a download. Moreover, download module **1710** may send an authorized communication such as, but not limited to, a private key to the destination to authorize and obtain permission for download. Personalization module **1708** may generate personalized records for the callers by associating the personal information of the caller with the information, such as the telephone numbers stored in records database **1608**. The records can then be forwarded to the user's device by download module **1710**. Personalization module **1708** may be implemented as instructions executable by a processor. For example, the processor can be processor **1610** or a second processor dedicated for personalization module **1708**. Moreover, the second processor may be CPU **304**, CPU **504** or implemented in another device in communication with DCS **1606**.

DCA **1720** may include a Target List Module (TLM) **1722** that assigns the IVR destination or a target list to each instance of DCA **1720** for connecting and gathering information. The target list may include the IVR identity code, which can be as phone number or any type of information on how to connect to the IVR directly or indirectly. Further, the target list may include additional details such as internal destination. In an embodiment of the invention, the additional information of the internal destination may be implemented as one or more activation codes associate with the IVR identity code.

DCA **1720** may include an IVR Tracking Module (ITM) **1724** that tracks IVR content from a root location associated with the Target information assigned by TLM **1722**. ITM **1724** constructs the full IVR content from a given IVR root.

ITM **1724** may include IVR Logic Module (ILM) **1726**. ILM **1726** may detect the type of IVR of the destination. Typically, various types of audible IVR menus are implemented by destinations. The audible IVR menus may be categorized into various types, such as a simple IVR. IVR with audio response, IVR with additional data authentication and so forth. ILM **1726** detects the type of audible IVR menu, and accordingly the information is generated for records database **1608**. Various categories of the audible IVR menu are explained in detail in conjunction with FIG. 19. ITM **1724** may call the destinations to determine the category the audible IVR menu. Thereafter, ILM **1726** constructs the database based on the category of the IVR. In an embodiment of the invention, ITM **1724** may call the destinations multiple

times to determine the category of the invention. Various audible IVR menus may include a legal notice. For example, the audible IVR menu of a mortgage bank usually include an header stating that this is debt collector and anything stated during the call could be used for future collections. Other statements can be such as those that relate to the option to record the call and so forth. ILM 1726 may detect the legal statements and store them in records database 1608 in association with IVR identity code.

ILM 1726 as part of its internal algorithm will drive the interaction sessions with the IVR. ILM 1726 may include data structure optimized with the tracked IVR menus to decide a right, path or a next choice at any existing stage of the IVR tracking. The decisions made by ILM 1726 may be optimized as a mathematically directed graph tracking process. The tracking process may use an option from the audible IVR menu that corresponds to a "return to a previous menu" option of the audible IVR menu. As a result, the number of sessions required for tracking the audible IVR menu is reduced.

The process of IVR tracking may require multiple communications with the audible IVR menu to completely determine the content. Further, during the tracking process the content of the audible IVR menu may be discovered partially. Therefore, ITM 1724 may include a Tree storage Module (TSM) 1728 to manage a temporary database record. Thereafter, when the process or a phase is complete, TSM 1728 may use Repository Connection Module (RCM) 1738 to submit the content as a hatch of records to records database 1608. In case, a connection to records database 1608 is not available, then TSM 1728 may accumulate the information until a connection can be established.

Dialog Module 1730 of ITM 1724 interacts with the audible IVR menu. Further, dialog module 1730 manages the IVR requests and sends responses according to the decisions of ILM 1726. Further, dialog module 1730 may use a Speech recognition Module (SRM) 1732 to interpret the audio of the IVR request to generate multiple records for records database 1608. In an embodiment of the invention, the audio is interpreted to generate text information. Moreover, SRM 1732 can provide a score to the text generated for each audio, according to the amount of guessing that is required for translating the IVR audio request. SRM 1732 may use a single grammar or a combination of dedicated grammars, for example, but limited to, a specific IVR service topic, IVR service sub topic, IVR stage, IVR location, the specific IVR, the hour of the day, and so forth. Furthermore, SRM 1732 may use multiple preset terms stored in the memory. Examples, of preset terms include, but not limited to, "yes", "no", name of the caller, and so forth. The text generated by SRM 1732 from speech recognition may be parsed by dialog module 1730 to enable ILM 1726 to select a next path or option.

Dialog module 1730 may be required to respond to the IVR requests during a tracking session. Dialog module 1730 may use a Response module 1734 to generate the required response. Various audible IVR menus require a voice response from the caller. For example, the voice response may be required for the authentication of the caller. Response module 1734 may provide a recorded voice response to the audible IVR menu. For example, the voice response may be recorded voice phrase or preset of terms such as, but not limited to "yes", "no", name of the caller, and so forth. Further, the voice response may be a synthesized voice response, generated by response module 1734. Therefore, response module 1734 may include a voice synthesizer. In this case, the activation code may be the recorded voice phrase and/or the synthesized voice phrase. Moreover, response module 1734

may include a voice decoder to recognize the voice. For example, the voice prompts generated by an audible IVR menu. In some other cases, the IVR menus may require a simple key tone (DTMF). The response module 1734 may include recorded tones or an internal module to generate the require tones.

Various destinations may provide a different audible IVR menu in the working hours and a different menu after working hours or during the holidays. DCA 1720 may detect the various times or time periods for which the audible IVR menus are presented in different mode. SRM 1732 may decode the voice from the audible IVR menu to recognize the IVR message. Further, ILM 1726 may analyze the response message for the periods and different operating mode. Therefore, ILM 1726 may call the destinations based on the recognized periods to generate records database 1608. Further, records database 1608 may include the time information for which a particular audible IVR menu is active. Accordingly, ITM 1724 may call the destinations multiple times based on the time information.

Various audible IVR menus include multi-level menus, as discussed with reference to FIG. 2A. Therefore, each level of menu may include sub-menus, which may further include sub-menus, and so forth. Accordingly, records database 1608 may include multiple sub-records, and each of the sub-records may have activation codes associated with them. Furthermore, records in records database 1608 may include a code to indicate a business domain of the destinations, such as airlines, banks and so forth. In an embodiment of the invention, TLM 1722 may use a web-based list such as yellow pages to call the destinations. Generally, the phone numbers of the destinations in the yellow pages are organized based on the business domains of the destinations. Accordingly the business domain code could be added to record database 1608. As graphics and icons are very effective in enhancing user interface, ITM 1724 may associate various phrases with specific icons. For example, ITM 1724 may include a dictionary of various terms or phrases that are frequently used in IVR menus, such as "customer care", "main menu", and so forth. The terms may be decoded by Dialog module 1730 and icons may be associated with them. Accordingly, records database 1608 may include a code for icons associated with the IVR menus of the destinations.

ITM 1724 may include components to connect to the audible IVR menu. As shown with reference to FIG. 17B, ITM 1724 may include a VoIP connection module 1736 to interact with a VoIP application 1740. VoIP application 1740 may be implemented within or outside DCA 1720. In such a case, VoIP connection module 1736 may use VoIP application 1740 to interact with the audible IVR menus.

Further, as shown with reference to FIG. 17C, ITM may include an IVR Connection module 1737, to interact directly with the audible IVR menu. IVR connection module 1737 may connect to multiple audible IVR menus through a network, a PSTN or any other communication or protocol. Moreover, IVR Connection module 1737 may act as a gateway between DCA 1720 and the destination of audible IVR menu.

FIG. 18 illustrates a flowchart diagram for generating records database 1608 by using DCS 1606, in accordance with an embodiment of the invention. The audible IVR menus of destinations may be analyzed to generate records database 1608 for corresponding visual IVR menus. At step 1802, a phone number may be dialed to connect to an audible IVR menu of destination. The phone numbers and destinations may be selected automatically from a database of phone numbers. For example, yellow pages for a selected territory, category, business or other suitable classifications. As dis-



cussed with reference to FIG. 2A, the audible IVR menu may include various options for a user to select. Typically, the options are structured and presented in form of levels to the user. For example, with reference to FIG. 2A, options **204a**, **206a**, and **220a** may form a first level of the audible **111a** menu **222a**. Further, options **208a** and **210a** may be referred to as sub-menus to option **204a**. Similarly, each sub-menu may further comprise sub-menus, such as options **214a** and **216a**. Therefore, DCS **1606** is presented with audible instructions at first level. Thereafter, based on the selection by DCS **1606**, corresponding audible instructions of sub-menus may be provided. The first level of the audible IVR menu is analyzed at step **1804**. The audible IVR menu may be analyzed by voice recognition.

In an embodiment of the invention, the voice recognition for constructing records database **1608** is based on context-enhanced voice recognition. As the process of calling the destination is initiated by selecting a number from a list such as yellow pages, the voice recognition system would be provided file of potential menu terms, which could be farther narrowed base on knowledge of the business domain and the potential options such destinations may offer. Therefore, the process of voice recognition is greatly enhanced, when the recognition is done with respect to a relatively small number of choices. SRM **1732** in DCA **1720** may be pre-loaded with a small set of terms most likely used by the destination and, therefore, may be required to make the recognition out of the relatively small set of terms.

Further, the voice may be converted to a text format. In an embodiment of the invention, a voice-to-text application may be used to convert the audible instructions to text format. Subsequently, the information generated from the analysis of the first level is stored in records database **1608**, at step **1806**. The information may include the details about the sub-menu and the numbers to be dialed to access the sub-menu. For example, with reference to FIG. 2A, the information for option **204A** may include, instruction part 'pizza order' and number part '2' in the database. At step **1808**, it is determined whether there are any sub-menus in the audible IVR menu. The sub-menu may be detected based on the information analyzed from the audible IVR menu. In an embodiment of the invention, sub-menus are detected based on the information stored in the database. In case the audible IVR menu contains sub-menus, then the sub-menus are analyzed, at step **1810**. The sub-menus may be analyzed in a similar manner as the first level of audible IVR menu as discussed above. Subsequently, at step **1812**, the information corresponding to the sub-menus is stored in records database **1608**. At step **1814**, it is determined whether there are any further sub-menus in the sub-menus of the audible IVR menu. DCS **1606** may make select an option for every menu to connect accordingly and determine if a final destination is reached or there is another layer of menu options to be processed. Once the final destination it reached. DCS **1606** may "hang-up" the connection and register the results. Further, DCS **1606** may dial again to iteratively discover the full menu of the IVR. In case, there are further sub-menus then each sub-menu is analyzed as discussed above. The process is iterated till the complete audible IVR menu with the sub-menus is analyzed. Further, the destinations may be dialed multiple times to ensure that complete audible IVR menu and sub-menus are analyzed. Moreover, records database **1608** may be automatically checked and verified after complete analysis of the audible IVR menu. For example, all or various options or sub-menus in the audible IVR menu may be selected randomly or based on a pre-defined pattern to verify the information in records database **1608**. In an embodiment of the invention. DCS **1606** may be

use quality marks for every term recognized during the process. For example, low marks may indicate relatively higher probability that the recognition was wrong. Further, follow-up steps may provide higher priority to check and validate the terms that received low marks. Such check may be performed by an additional automatic system or by human operators. In an embodiment of the invention, the destinations may be connected automatically through various probe servers to analyze the audible IVR menus. The probe may be implemented as a script, a computer program, or firmware, on remote server **1002**, as shown with reference to FIG. **10**. Further, the audible IVR menus may be analyzed by human operators, in case of malfunction or other issues with the automatic functioning.

In an embodiment of the invention, records database **1608** may be updated automatically based on a pre-defined update time interval. The update may be required to validate the correctness of information in the database. Moreover, records database **1608** may be updated based on ratings from users of Visuphone. For example, the caller may identify that a visual IVR menu incorrect or incomplete, and may subsequently provide a rating to the visual IVR menu. Further, an administrator or user of records database **1608** may update it manually.

Various audible IVR menus require audio commands from the caller instead of selecting options. DCS **1606** analyzes such IVRs to generate records database **1608**. In an embodiment of the invention, a two-phase process may be applied to generate records database **1608**. In the first phase a standard menu is generated for the IVR that may relate to a particular class of the destinations. A class can be a business class, for example, banks, airlines, hospitals and so forth. The first phase could be extended to cover as many domains as possible so that standard menus exist for most business classes of destinations. In the second phase, the IVR that requires a natural language voice command may be interrogated by repetitively applying, the standard menus according to the class. Therefore, the relevance of the standard menu for the specific IVR is confirmed. In the process, a stored voice or synthesized voice could be use for each menu option. Thereafter, the menu may be stored in records database **1608** based on the confirmation. Some IVR menus may require any or both of natural language commands and dial tones. In such a case, both options could be made available in the records database **1608**, and eventually in the visual IVR menu database for the caller at the time of use. As discussed with reference to FIG. **17**, DCS **1606** may determine the type of audible IVR menu for generating records database **1608**.

FIG. **19** illustrates an exemplary set of IVR categories **1902**. As shown a category A **1904** refers to typical audible IVR menus that present IVR options to the caller that can be selected from simple dial tone selections. In this case, DCS **1606** may provide various dial tones to the IVR for analyzing, it, and generating records for records database **1608**. A category B **1906** refers to an audible IVR menu that requires the caller to answer some initial questions, before presenting simple dial tone options for further menu. For example, the caller may be required to select a language preference, before presenting the menu. A category C **1908** may require the caller to provide some personal information before presenting the menu. For example, the caller may be required to input an account number, a phone number, a customer number and so forth. A category C **1910** refers to an IVR menu that may require voice inputs or natural language selection from the caller. In this case, DCS **1606** generates an activation code that points to a recorded voice phrase or a code that can instruct to synthesize the proper voice phrase required.



Additional variations of the categories include an IVR menu that provides a legal notice. For example, the audible IVR menu of a mortgage bank usually include a header stating that this is debt collector and anything stated during the call could be used for future collections. Other statements can be such as those that relate to the option to record the call and so forth. The statement may be registered and added to records database **1608**, so that the legal statement can be presented with the visual IVR menu. Further, additional statements may be added at the end of the statements regarding the last time when the IVR was verified.

FIG. **20A** illustrates an exemplary information process for an IVR menu stored in records database **1608**. Sometimes, an audible IVR may request the caller for some specific or personal information that is other than selection of IVR options. ILM **1726** may mark such requests and process them separately. ILM **1726** can identify such requests based on a combination of the identity code and an ordered list of activation codes. Further, as discussed above, the audio prompts may be stored in the records database **1608** as content **2002**. For example, the audio prompts may be converted to text and stored as content **2002**. As shown, the content **2002** of records database **1608** may include exemplary request **2004a** "Please enter the invoice number", request **2006a** "Please enter the payment amount", request **2008a** "Please choose your payment card: Press 1 for VISA and 2 for MasterCard", request **2010a** "Please say or enter credit card number", and request **2012a** "Please enter your Credit Card expiry date". As also discussed above, the Visuphone maintains a profile of the user. Moreover, the user can edit, remove, and/or update the profiles. For example, the profile may include the name, address, credit card type and codes, passwords and so forth. Therefore, the Visuphone may match the content **2002** with the profile of the user.

FIG. **20B** illustrates an exemplary web form **2014** generated for the information process of FIG. **20A**. As shown, web form **2014** may be generated corresponding to the requests. Web form **2014** may be presented on a web browser of the user's device. In another embodiment of the invention, the display is presented as an independent form on the display screen of the device of the user. Therefore, the device may not require a web browser application. Web form **2014** may include single or multiple pages. Further, in case the information is displayed directly on the device, then various screens, layers or scroll may be used to display the information. Web form **2014** may include an input box **2004h** corresponding to request **2004a**, input box **2006b** corresponding to request **2006a**, input box **2008b** corresponding to request **2008a**, input box **2010b** corresponding to request **2010a**, input box **2012b** corresponding to request **2012a**, and a submit button **2016**. The Visuphone **104** on the user's device may automatically complete some or even all the require details based on stored profile or previous inputs of the user. Therefore, the user may only (if at all) be required to complete the missing information manually. Subsequently, the Visuphone **104** may connect to the IVR after the user clicks on the submit button **2016**. Further, the Visuphone **104** may navigate to the process root within the IVR menu, revalidate the process input requests, and transmit the user data to the IVR without any action from the user. Moreover, the Visuphone **104** may hide the IVR validation question such as questions like "are you sure", "did you mean XXXX?" and so forth. After the submission, a response such as, but not limited to, a receipt number, specific flight landing time, and so forth may be presented to the user. The response from the IVR can be in various formats, for example, but not limited to, a recorded audible response or a transcript of the audible response. In an

embodiment, the Visuphone **104** may convert the format of the received response from a first format to a second format. In an embodiment, the Visuphone **104** may change the format of the response from an audio format to a text format.

In an embodiment of the invention, electronic yellow pages directory allows the dialing the number directly from the directory and further provides the visual IVR menu of the destination. The caller can select the exact destination before dialing or follow the visual IVR menu after dialing. For example, an airline company might have various option, menus and layers in the large organization. Selecting the exact department in the organization before dialing can save the user the time and overhead of listening to the menu and making decisions based on the voice menu. The yellow pages company can have a copy of the visual IVR menu database or can be connected to a visual IVR menu service in order to provide the menu to the user.

Alternatively an enhanced web base yellow page could be provided, wherein the caller can first choose the provider he requires to contact. Thereafter, if that destination provides an IVR, then the enhanced yellow page will use the visual IVR menu database to present a visual IVR menu on the web page. Moreover, the caller can click to choose the internal destination of that provider and the enhanced yellow page may accordingly initiate the call. The call could be made using the conventional telephone network or PSTN. In this case, the enhanced yellow page may need the caller's telephone number to perform the connection. Alternatively, the enhanced yellow page could use VoIP to connect the caller over the web to the IVR of the destination.

In some IVR systems, the caller may have to wait or hold on a queue of previous dialers until the specific department or agent is available. In another embodiment of the invention, the enhanced yellow page system will connect the caller only after the specific agent is available, without waiting in a long waiting line queue. The system can recognize that the waiting queue message of the specific department, and to connect the user only after the agent is answering. Therefore, the waiting time of the caller on the phone queue that sometimes may be very long, may be reduced. The system can park on the line for the waiting line on the specific entry in the menu, as soon as the agent is available the caller gets a signal to start the conversation with the agent. Additional advantage of the invention relates to callers who are more proficient in foreign language. Visuphone **104** may provide the visual IVR menu in multiple languages. A caller can than choose a language of his choice and download to his device database the menu in that language. Yet another advantage of the invention relates to IVR that ask for voice commands. This IVR interface is for some user harder to use due to accent or other problems. The database could be provided with the option as been described before for the system to output voice command according to caller selection of the menu options.

FIG. **21** illustrates a flowchart for submitting personal information of a caller by Visuphone **104**, in accordance with an embodiment of the invention. At step **2102**, caller **106** dials a phone number of a destination **108** such as destination **108a**. Subsequently, at step **2104** a visual IVR menu associated with the dialed number is displayed on the display screen of caller device **102**. For example, destination **108** may be a bank. Thereafter, at step **2106** caller **106** may select an option from the displayed visual IVR menu. For example, caller **106** may select to make a transaction from account, so caller **106** may select an appropriate option from the displayed visual IVR menu. In an embodiment, the caller device **102** can be a communication device such as a mobile phone, a laptop computer, and so forth. Typically, banking services may require

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caller 106 to provide authentication information before a transaction can be made. At step 2108, a form indicating the information required by the IVR of the dialed destination 108 may be displayed on the display screen of caller device 102. In an embodiment, the form may include one or more data request fields. Further, the form is displayed corresponding to the visual IVR menu associated with the dialed destination. The exemplary form is discussed in conjunction with FIG. 20B. Subsequently, at step 2110, Visuphone 104 may fill the information in the form displayed. In an embodiment, Visuphone 104 may fill the form partially. In an embodiment, the one or more data request fields may be filled based on predefined information. The predefined information may be associated and/or specific to the visual IVR menu of the dialed destination. In an embodiment, the predefined information may be defined by caller 106. In an embodiment of the invention, Visuphone 104 may require caller 106 to provide at least one count of authentication information from the perspective of security. In an embodiment, caller 106 may fill the one or more data request fields with important information. Further, caller 106 may define the predefined information. Caller 106 can also be referred as a user. For example, Visuphone 104 may submit the name and account number of caller 106, but may not submit the transaction password. In another embodiment of the invention, Visuphone 104 may allow caller 106 to submit, edit and/or update the complete information in the form. Therefore, the updated information may be stored in the database on caller device 102. Thereafter, at step 2112 the connection between dialed destination 108 and caller device 102 may be established and the information stored in the form is submitted. Typically, the IVR of destination 108 may require caller 106 to provide the information in form of audio inputs. Therefore, Visuphone 104 may provide audio inputs corresponding to the information of the form. In an embodiment of the invention, the audio format of the information may be stored in caller device 102. In another embodiment of the invention, Visuphone 104 may convert the stored text data to audio information and submit it to the IVR of destination 108. Thereafter, caller 106 may interact with dialed destination 108.

In an embodiment, the caller device 102 may receive a response from the dialed destination. In an embodiment, the Visuphone 104 may convert a format of the received response from a first format to a second format. For example, the Visuphone 104 may convert, the receiver format of the response from the audio to text. In an embodiment, the first format of the received response may be an audio format. Examples of the audio format include, but are not limited to, WAV, Real Audio, Musical Instrument Digital Interface (MIDI), Windows Media Audio (WMA), MP3, Ogg, and so forth. In another embodiment, the second format may be a text format such as a Unicode text, Rich Text format, HyperText Markup Language (HTML) or any other format compatible with the caller device 102.

Embodiments of the invention are described above with reference to block diagrams and schematic illustrations of methods and systems according to embodiments of the invention. It will be understood that each block of the diagrams and combinations of blocks in the diagrams can be implemented by computer program instructions. These computer program instructions may be loaded onto one or more general purpose computers, special purpose computers, or other programmable data processing translator to produce machines, such that the instructions which execute on the computers or other programmable data processing translator create means for implementing the functions specified in the block or blocks. Such computer program instructions may also be stored in a

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computer-readable memory that can direct, a computer or other programmable data processing apparatus to function in a particular manner, such that the instructions stored in the computer-readable memory produce an article of manufacture including instruction means that implement the function specified in the block or blocks.

While the invention has been described in connection with what is presently considered to be the most practical and various embodiments, it is to be understood that the invention is not to be limited to the disclosed embodiments, but on the contrary, is intended to cover various modifications and equivalent arrangements included within the spirit and scope of the appended claims. The invention has been described in the general context of computing devices, phone and computer-executable instructions, such as program modules, being executed by a computer. Generally, program modules include routines, programs, characters, components, data structures, etc., that perform particular tasks or implement particular abstract data types. A person skilled in the art will appreciate that the invention may be practiced with other computer system configurations, including hand-held devices, multiprocessor systems, microprocessor-based or programmable consumer electronics, network PCs, minicomputers, mainframe computers, and the like. Further, the invention may also be practiced in distributed computing worlds where tasks are performed by remote processing devices that are linked through a communications network. In a distributed computing world, program modules may be located in both local and remote memory storage devices.

This written description uses examples to disclose the invention, including the best mode, and also to enable any person skilled in the art to practice the invention, including making and using any devices or systems and performing any incorporated methods. The patentable scope the invention is defined in the claims, and may include other examples that occur to those skilled in the art. Such other examples are intended to be within the scope of the claims if they have structural elements that do not differ from the literal language of the claims, or if they include equivalent structural elements with insubstantial differences from the literal languages of the claims.

The invention claimed is:

1. A communication system comprising:

a processor; and

a memory coupled to the processor, the memory comprising:

instructions to communicate with a database storing a plurality of visual Integrated Voice Response (IVR) menus associated with a plurality of destinations, wherein each of the IVR menu comprises a plurality of forms associated therewith;

instructions executable by the processor for receiving a phone number of a destination dialed by a caller;

instructions executable by the processor for comparing the dialed phone number with phone numbers stored in the database; and

instructions executable by the processor for transferring to be displayed a form based on the comparison, wherein the form comprises one or more caller's data request fields to accept information related to the caller, and wherein the information be entered by the caller.

2. The communication system of claim 1, wherein said comparing further comprises a time at which said dialed occurred.

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3. The communication system of claim 1, wherein the memory further comprises instructions executable by the processor for automatic filling at least a portion of said one or more data request fields.

4. The communication system of claim 1, wherein said form comprise an icon or an icon code.

5. The communication system of claim wherein the memory further comprises instructions executable by the processor for:

establishing a connection with the dialed destination; and submitting the form to the dialed destination.

6. The communication system of claim 1, wherein the memory further comprises instructions executable by the processor for converting a format of the form from a first format to a second format.

7. A non-transitory tangible computer readable medium comprising said executable instructions according to claim 1.

8. A communication system comprising:

a processor; and

a memory coupled to the processor, the memory comprising:

instructions to communicate with a database storing a plurality of visual Integrated Voice Response (IVR) menus associated with a plurality of destinations;

instructions executable by the processor for receiving a dialed phone number of a destination dialed by a caller;

instructions executable by the processor for comparing the dialed phone number with phone numbers stored in the database; and

instructions executable by the processor for transferring to be displayed a visual IVR menu based on the comparison, wherein said visual IVR menu comprises one or more caller's data request fields for accepting information related to the caller, and wherein the information be entered by the caller.

9. The communication system of claim 8, wherein said comparing further comprises the time at which said dialed occurred.

10. The communication system of claim 8, wherein the memory further comprises instructions executable by the processor for automatic filling at least a portion of said one or more data request fields.

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11. The communication system of claim 8, wherein said visual menu comprise an icon or an icon code.

12. The communication system of claim 8, wherein the memory further comprises instructions executable by the processor for:

establishing a connection with the dialed destination; and submitting the data of said one or more data request fields.

13. The communication system of claim 8, wherein the memory further comprises instructions executable by the processor for converting a format of said visual menu from a first format to a second format.

14. A non-transitory tangible computer readable medium comprising said executable instructions according to claim 8.

15. A method for providing enhanced telephony comprising:

receiving a dialed phone number of a destination, wherein the phone number is dialed by a caller;

communicating with a database storing a plurality of visual integrated Voice Response (IVR) menus associated with a plurality of destinations in order to retrieve a visual IVR menu associated with the dialed phone number; and

transferring to be displayed the visual IVR menu associated with the destination dialed, wherein said visual menu comprises one or more caller's data request fields for accepting, information related to the caller, and wherein the information be entered by the caller.

16. The method of claim 15, wherein said visual menu is further associated with the time at which said dialed occurred.

17. The method of claim 15, further comprising automatic filling at least a portion of said one or more data request fields.

18. The method of claim 15, wherein said visual menu comprise an icon or an icon code.

19. The method of claim 15, further comprising:

establishing; a connection with the dialed destination; and submitting the data of said one or more data request fields.

20. The method of claim 15, further comprising converting a format of said visual menu from a first format to a second format.

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