



(51) International Patent Classification:

H04M 1/56 (2006.01) H04M 1/65 (2006.01)
H04M 1/57 (2006.01) H04M 11/06 (2006.01)
H04M 1/64 (2006.01)

(21) International Application Number:

PCT/US2017/017045

(22) International Filing Date:

8 February 2017 (08.02.2017)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

62/292,460 8 February 2016 (08.02.2016) US

(71) Applicant: **WHOOZ CALLN, INC.** [US/US]; 9415 Culver Blvd., Culver City, CA 90232 (US).

(72) Inventor: **JOHNSON, Dwight**; 2522 South Cloverdale Avenue, Los Angeles, California 90016 (US).

(74) Agents: **HEGSTROM, Brandon** et al.; Dorsey & Whitney LLP, Columbia Tower, 701 5th Avenue, Suite 6100, Seattle, Washington 98104 (US).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

[Continued on next page]

(54) Title: MULTIPLE MODE INTERACTIVE VISUAL CALLER ID NOTIFICATION

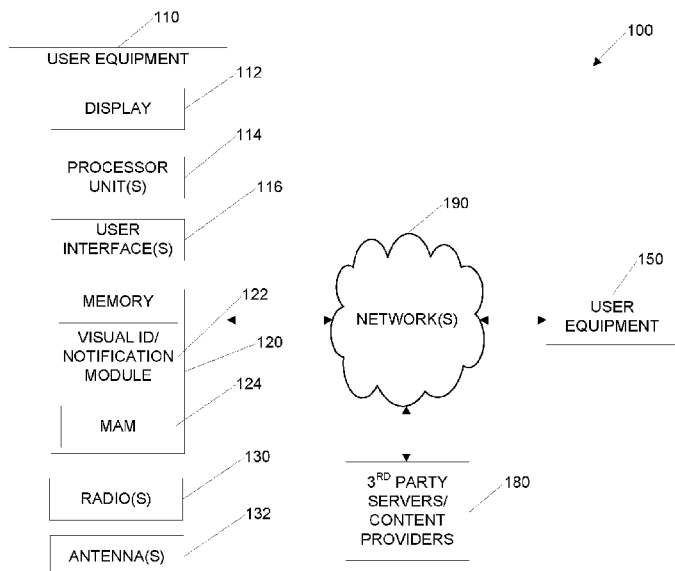


FIG. 1

(57) Abstract: Examples of a multiple mode interactive visual caller identification notification system are described herein. An example method to receive an incoming call in a video identification system may include during an ongoing call, receiving an incoming call at a first user equipment from a second user equipment. The example method may further include, in response to receiving the incoming call displaying a video notification icon on a display of the user equipment, and displaying a plurality of answer modes. The example method may further include, in response to a selection from a user, provide one of a video response hold message or a video response answer message to the second user equipment.



Published:

— *with international search report (Art. 21(3))*

MULTIPLE MODE INTERACTIVE VISUAL CALLER ID NOTIFICATION

CROSS-REFERENCE TO RELATED APPLICATION

[001] This application claims the benefit under 35 U.S.C. § 119 of the earlier filing date of U.S. Provisional Application Serial No. 62/292,460 filed February 8, 2016, the entire contents of which are hereby incorporated by reference in their entirety for any purpose.

BACKGROUND

[002] Conventional telephone answer modes were developed before phones had displays and powerful processors, and therefore provided limited options and limited ability to dynamically convey meaningful information. The capabilities a mobile phones with powerful processing capability and beautiful displays provide opportunity to provide more dynamic caller identification and notification answer modes in today's fast-paced society.

[003] Moreover, even today's mobile phone systems fail to provide as rich media experiences as users are desiring to have. Mobile phone systems often rely heavily on text or image-based approaches.

SUMMARY

[004] Example apparatuses are described herein. An example apparatus of a user equipment may include a memory; and a processor unit. The processor unit may be configured to receive an incoming call, receive an identifier associated with a caller, and provide a video notification icon to a display that plays a video identification message associated with the caller. The processor unit may be further configured to, in response to a selection from a user, encode a video response message to be provided to a second user equipment associated with the caller.

[005] Example methods are described herein. An example method to receive an incoming call in a video identification system may include during an ongoing call, receiving an incoming call at a first user equipment from a second user equipment. The example method may further include, in response to receiving the incoming call displaying a video

notification icon on a display of the user equipment, and displaying a plurality of answer modes. The example method may further include, in response to a selection from a user, provide one of a video response hold message or a video response answer message to the second user equipment.

[006] Another example method may include receiving an incoming call, receiving an identifier associated with a caller, and providing a video notification icon to a display that plays a video identification message associated with the caller. The example method may further include, in response to a selection from a user, encode a video response message to be provided to a second user equipment associated with the caller.

BRIEF DESCRIPTION OF THE DRAWINGS

[007] Figure 1 illustrates a video notification system (system) according to an embodiment of the disclosure.

[008] Figure 2 illustrates a flowchart for a method to create a VID greeting message in accordance with some embodiments of the disclosure.

[009] Figure 3 illustrates a flowchart for a method to receive and answer an incoming call with a video response message while on another call in accordance with some embodiments of the disclosure.

[010] Figure 4 illustrates a flowchart for a method to user video identification messages to address an incoming call while on another call in accordance with some embodiments of the disclosure.

[011] Figure 5 depicts a screenshot showing a notification icon on a display in response to receipt of a call in accordance with some embodiments of the disclosure.

DETAILED DESCRIPTION

[012] Certain details are set forth below to provide a sufficient understanding of embodiments of the disclosure. However, it will be clear to one skilled in the art that embodiments of the disclosure may be practiced without various aspects of these particular details. In some instances, well-known circuits, control signals, timing protocols, computer

system components, and software operations have not been shown in detail in order to avoid unnecessarily obscuring the described embodiments of the disclosure.

[013] This disclosure describes embodiments of a visual caller identification and notification system. In some embodiments, a user equipment may allow a user to construct a custom visual caller ID (VID) greeting using a selected photo, video file, and/or audio file. The VID greeting may be synched to a contact list for designated identification, which may allow the user equipment to notify the user of callers dynamically, as opposed to standard or generic answer modes. In some examples, the VID may also include an in-call video notification option, where, when a user is engaged in a phone call, a beep and haptic alert on the user equipment will alert the user that there is an incoming call, and a small notification icon/box may appear on the user's screen displaying the caller's VID message. The VID message may be stored in a mailbox to be retrieved later. The VID messages may be personalized messages, such as invites to birthday parties, graduations, baby showers, and other special events. These personalized greetings are created with the VID. The user equipment may also allow a user to accept video notifications from advertisers and other business' which they have personally selected using the VID's video notification system (VNS).

[014] The user equipment may also respond with an in-call video response, which may include a VID response message that is sent to a caller if the callee is unable to answer during an ongoing call. The VID response message may direct the caller to hold or leave a message at the end of the VID response message. Generally, user equipment (UE) described herein may include devices having one or more processing unit(s) (e.g. processors) and computer readable media (e.g. memory) encoded with executable instructions causing the device to perform functions described herein, and/or display user interfaces described and/or shown herein.

[015] Figure 1 illustrates a video notification system (system) 100 according to an embodiment of the disclosure. Each of UEs 110 and 150 may be implemented using a computing device, including but not limited to a laptop, a desktop, a computer, a tablet, a media device, a smart phone, cellular phone or other mobile device, or any combination or

sub-combination of the same. The UE 110 may include a memory 120 encoded with executable instructions that may be executable by one or more processor units 114 of the UE 110. The UE 110 may further include a display 112 and one or more user interfaces 116. The UE 110 may further include radios 130 and one or more antennas 132 to communicate over the network 190. The UE 150 may include components similar to components included in the UE 110, in some examples.

[016] The UE 110 and the UE 150 may be coupled to the network 190 to send and receive data. The network 190 may be implemented using one or more networks, such as local area networks (LANs), wide area networks (WANs), metropolitan area networks (MANs), cellular networks, (e.g., long term evolution (LTE), LTE advanced (LTE-A), and/or 5G cellular networks. Communications provided to, from, and within the network 190 may be wired and/or wireless, and further may be provided by any networking devices known in the art, now or in the future. Devices communicating over the network 190 may communicate with any communication protocol, including, but not limited to, TCP/IP, UDP, RS-232, IEEE 802.11, long term evolution (LTE), LTE advanced (LTE-A), third generation partnership project (3GPP) 5G standard protocol, or other future communication protocol standards. The network 190 may include wireless access points, evolved Node Bs, and other communication infrastructure. The network may also be connected to third party content servers/content providers 160.

[017] In operation, the UE 110 and the UE 150 may communicate over the network 190 to make and receive phone calls. In some examples, the UE 110 and the UE 150 may each include a capability to create and store a VID greeting message, receive a VID message via the network 190, store a received VID message, and provide VID messages. In the interest of brevity, the foregoing discussion will focus on the UE 110 as the called party, and the UE 150 as the calling party. It will be appreciated that capabilities discussed with reference to one of the UE 110 and UE 150 may also be performed on the other of the UE 110 and UE 150.

[018] The UE 110 may include a capability to capture media at a media access module (MAM) 124 at the memory 120. The media may be captured via the user interfaces 116, in

some examples. The user interfaces 116 may include a video and/or photo camera, a microphone, touch screen, or other user interfaces. In some examples, the media may be received from another entity or third party content provider(s) via the network 190, such as the third party servers/content providers 180 that provide videos, photos, pictures, songs, sounds, etc. (e.g., video data and audio data). In some examples, the visual identification/notification module 122 executed via the processor units 114, may allow a user to create a VID greeting message to be stored at the memory 120 using the MAM 124. The VID greeting message may be condensed into a short clip, such as a 30 second video clip. The visual identification/notification module 122 may provide an interface to allow a user to personalize and customize their VID greeting message. For example, a user may be able to select from a suite of special effects, such as vintage filters and comic art, animation, movie quality special effects, etc., to allow a user to create a variety of potential video clips for the VID greeting message. The suite of special effects may be stored in the MAM 124. For an audio portion, a user may be able to select songs provided in a music library (e.g., stored at the MAM 124) or download an audio file (e.g., from the third party servers/content providers 180) to create their own personalized greeting. In some examples, the visual identification/notification module 122 may include a custom audio feature which allows the user to select from a suite of audio effects (e.g., horror screams, thunder, auto-tune, etc.). The visual identification/notification module 122 may further assign the VID greeting message to one or more contacts in a contact list stored at the memory 120. In some example, the VID greeting message may allow a user an ability to identify a caller dynamically, as compared with standard or generic answer modes.

[019] The visual identification/notification module 122 may allow the user to select a specific cycle setting the VID greeting message. For example, the specific cycle may enable the VID greeting message to be displayed for designated intervals or for a specified number of plays (e.g., 5 to 30 or more). Once the desired cycle has expired, the visual identification/notification module 122 may permanently remove the VID from the UE 110, or de-assign it from association with any contacts. The visual identification/notification module 122 may allow a user create more than one VID greeting message (e.g., up to 3

different VIDs) per contact, and the VID greeting messages may rotate automatically, or via selection by a user.

[020] When the UE 110 receives a call from the UE 150, the visual identification/notification module 122 may compare caller identifying information (e.g., a phone number or other identifier) by comparing the identifying information with contacts in the contact list. If a contact is associated with a VID greeting message, the visual identification/notification module 122 may play the associated VID greeting message for the user on the display 112. The user may identify the calling party based on the VID greeting message. In some examples, if the UE 110 is currently engaged in another call, the visual identification/notification module 122 may provide an in-call video notification. The in-call video notification, the visual identification/notification module 122 may cause a beep and haptic alert (e.g., via the user interfaces 116) to alert the user that there is an incoming call. The visual identification/notification module 122 may provide a display notification icon on the display 112 showing the VID greeting message associated with the UE 150. The notification icon may continue to be displayed to inform the user that the call is waiting to be answered. If the user chooses not to accept the incoming call, the notification icon will disappear from the display 112. The user can answer the incoming call simply by simply tapping the notification icon, which may hang up or place the current call on hold. Figure 5 depicts a screenshot 500 showing a notification icon 520 on a display 510 in response to receipt of a call in accordance with some embodiments of the disclosure. The notification icon 520 may appear in other areas of the display 510, in other embodiments.

[021] In some examples, the visual identification/notification module 122 may further include an in-call video response feature that allows a user to create a VID response message that the caller will see if the callee is unable to answer during an ongoing call. For example, the visual identification/notification module 122 may also allow a user to create a VID response message. The VID response message may be provided from the called party to the calling party (e.g., from the UE 110 to the UE 150, in this example) if the user is unable to answer the call from the UE 150. If the called party is away from the UE 110, the

visual identification/notification module 122 may this automatically triggers the VID response message on the callee's behalf. For example, the visual identification/notification module 122 may provide the visual response message to the UE 150 after a set number of rings (e.g., 3, 4, 5, etc.) or after a set amount of time. In some examples, the ongoing call may be put on hold in response to a selection from the user, and a VID hold message may be provided to the connected caller's UE. In another example, in response to an input from the user, a visual response message may provide a request for the caller to hold or for the caller leave a message after a visual prompt at the end of the VID response message. The visual prompt may be customized using a suite of special effects. The UE 150 may enable the in-call video response feature to receive the VID response message or may disable the in-call video response feature to use a standard answering mode.

[022] In some examples, the visual identification/notification module 122 may further include an ability to generate video messages that are capable of being sent at a specified date and time to an assigned contact or contacts. For example, the video message may be assigned to a particular contact or to contacts and may be scheduled to be sent at a scheduled date and time. When the current date and time matches the scheduled date and time, the visual identification/notification module 122 may prepare the video message to be sent. The video message may include be personal invites to birthday parties, graduations, baby showers, or other special events.

[023] The visual identification/notification module 122 may also include a video notification mailbox that allows a user to receive video messages. The video messages may include be personal invites to birthday parties, graduations, baby showers, or other special events. For example, a caller (e.g., via the UE 150) may provide a video message to a mailbox associated with the UE 110. The video messages may include personalized greetings created using the visual identification/notification module 122. The visual identification/notification module 122 may also receive video notifications from advertisers and business personally selected by a user using a video notification system.

[024] Figures 2-4 depict various methods of implementing features of the visual identification/notification module 122. Figure 2 illustrates a flowchart for a method 200 to

create a VID greeting message in accordance with some embodiments of the disclosure. The method 200 may be implemented in the UE 110 and/or the UE 150 of Figure 1. The method may include recording a video, at 210. The video may be recorded via a video interface, such as the user interfaces 116 of Figure 1. The method 200 may further include assigning a message description to the video, at 220. The message description may include a designation as a call message, an answer message, a hold message, notification message, etc. The method 200 may further include assigning the video message to a contact, at 230. The method 200 may further include assigning a date, time, and duration for play of the video message, at 240. The method 200 may further include saving the video message configuration, at 250. In some examples, if the video message is a notification message, the method 200 may include assigning a date and time to the message, and sending the video message to the contact at the assigned date and time. The recipient may receive the video message at the designated date and time.

[025] Figure 3 illustrates a flowchart for a method 300 to receive and answer an incoming call with a video response message while on another call in accordance with some embodiments of the disclosure. The method 300 may be implemented in the UE 110 and/or the UE 150 of Figure 1. The method may include receiving a phone call at a user equipment, at 310. The method 300 may further include displaying the incoming call video notification icon, at 320. The method 300 may further include displaying several answer modes, at 330. The method 300 may further include, in response to respective selection from a user, placing ongoing call on hold and accepting incoming call, at 340. The method 300 may further include, in response to respective selection from a user, ending the ongoing call and accepting the incoming call, at 350. The method 300 may further include, in response to respective selection from a user, sending caller a hold video message, at 360. The method 300 may further include, in response to respective selection from a user, sending caller a default video answer message, at 370.

[026] Figure 4 illustrates a flowchart for a method 400 to user video identification messages to address an incoming call while on another call in accordance with some embodiments of the disclosure. The method 400 may be implemented in the UE 110

and/or the UE 150 of Figure 1. The method may include receiving a phone call at a user equipment, at 410. The method 400 may further include playing a video identification from the caller on the screen, at 420. The method 400 may include determining whether the incoming call is answered, at 430. If the incoming call is answered, the method 400 may further include connecting the voice call, at 440. If the incoming call is answered, the method 400 may further include, activate a video response message, at 450. The method 400 may further include, in response to selection from a user, ending the ongoing call and accepting the incoming call, at 450. The method 400 may further include receiving a video identification message from the caller in response to the video response message, at 460.

[027] The methods 200, 300, and 400 may be implemented by a field-programmable gate array (FPGA) device, an application-specific integrated circuit (ASIC), a processing unit such as a central processing unit (CPU), a digital signal processor (DSP), a controller, another hardware device, a firmware device, or any combination thereof. As an example, the method 200 of FIG. 2, method 300 of FIG. 3, and the method 400 of FIG. 4 may be initiated by a processor that executes instructions to perform the respective method. Various illustrative components, blocks, configurations, modules, and steps have been described above generally in terms of their functionality. Skilled artisans may implement the described functionality in varying ways for each particular application, but such implementation decisions should not be interpreted as causing a departure from the scope of the present disclosure.

[028] The previous description of the disclosed embodiments is provided to enable a person skilled in the art to make or use the disclosed embodiments. Various modifications to these embodiments will be readily apparent to those skilled in the art, and the principles defined herein may be applied to other embodiments without departing from the scope of the disclosure. Thus, the present disclosure is not intended to be limited to the embodiments shown herein but is to be accorded the widest scope possible consistent with the principles and novel features as previously described.

CLAIMS

What is claimed is:

1. An apparatus of a user equipment, the apparatus comprising:
a memory; and a processor unit, the processor unit configured to:
receive an incoming call;
receive an identifier associated with a caller;
provide a video notification icon to a display that plays a video identification message associated with the caller; and
in response to a selection from a user, encode a video response message to be provided to a second user equipment associated with the caller.
2. The apparatus of claim 1, wherein the processor unit is further configured to encode a video response hold message to be provided to the second user equipment to instruct the caller to hold.
3. The apparatus of claim 1, wherein the processor unit is further configured to encode a video response answer message to be provided to the second user equipment to instruct the caller to provide a video message.
4. The apparatus of claim 3, wherein the processor unit is further configured to receive and store the video message from the second user equipment provided in response to the video response message.
5. The apparatus of claim 1, wherein the processor unit is further configured to:
generate a video message in response to selections from a user;
assign the video message to a contact in a contact list;
assign a scheduled date and time to the video message; and

in response to a current date and time matching the scheduled date and time, encode the video message for provision to a third user equipment associated with the contact.

6. The apparatus of claim 5, wherein the processor unit is further configured to:

assign the video message to a plurality of contacts of the contact list; and

in response to the current date and time matching the scheduled date and time, encode the video message for provision to a plurality of user equipment associated with the contacts of the plurality of contacts to which the video message is assigned.

7. The apparatus of claim 5, wherein the video message is a personalized message announcing a special event.

8. The apparatus of claim 1, wherein the processor unit is further configured to cause a plurality of answer modes to be displayed.

9. The apparatus of claim 8, wherein the plurality of answer modes includes at least one of place an ongoing call on hold and answer the incoming call, end an ongoing call and answer the incoming call, provide a video response hold message to the caller, or send the caller a default video answer message.

10. A non-transitory, computer-readable medium including instructions that when executed by one or more processor units, cause the one or more processor units to:

receive an incoming call;

receive an identifier associated with a caller;

provide a video notification icon to a display that plays a video identification message associated with the caller; and

in response to a selection from a user, encode a video response message to be provided to a second user equipment associated with the caller.

11. The non-transitory, computer-readable medium of claim 10, further comprising instructions that when executed by the one or more processor units, cause the one or more processor units to:

generate the video response message in response to selections from the user; and
assign the video response message to a contact in a contact list associated with the caller.

12. The non-transitory, computer-readable medium of claim 11, wherein generation of the video response hold message in response to selections from the user comprises instructions that when executed by the one or more processor units, cause the one or more processor units to:

retrieve video data and audio data from a media access module;
apply special effects to the video data and the audio data to provide the video response hold message; wherein the special effects are stored at the media access module;
and
save the video response hold message at a memory.

13. The non-transitory, computer-readable medium of claim 10, wherein the video response message is one of a video response hold message or a video response answer message.

14. A method to receive a call in a video identification system, the method comprising:

during an ongoing call, receiving an incoming call at a first user equipment from a second user equipment;

in response to receiving the incoming call:

displaying a video notification icon on a display of the first user equipment;
and

displaying a plurality of answer modes; and

in response to a selection from a user, provide one of a video response hold message or a video response answer message to the second user equipment.

15. The method of claim 14, further comprising retrieving the one of the video response hold message or the video response answer message based on a contact in a contact list associated with the user equipment.

16. The method of claim 15, further comprising:
generating the video response hold message in response to selections from the user;
and
assigning the video response hold message to the contact in the contact list.

17. The method of claim 16, wherein generating the video response hold message in response to selections from the user comprises:
retrieving video data and audio data from a media access module;
applying special effects to the video data and the audio data to provide the video response hold message; wherein the special effects are stored at the media access module;
and
saving the video response hold message at a memory.

18. The method of claim 17, wherein generating the video response hold message in response to selections from the user further comprises retrieving the video data and the audio data from a third party content provider via a network.

19. The method of claim 14, further comprising:
generating a video message in response to selections from the user;
assigning the video message to a contact in a contact list;
assigning a scheduled date and time to the video message; and
in response to a current date and time matching the scheduled date and time, sending the video message to a third user equipment associated with the contact.

20. The method of claim 14, wherein the plurality of answer modes includes at least one of place the ongoing call on hold and answer the incoming call, end the ongoing call and answer the incoming call, provide a video response message to the second user equipment, or send the second user equipment a default video answer message.

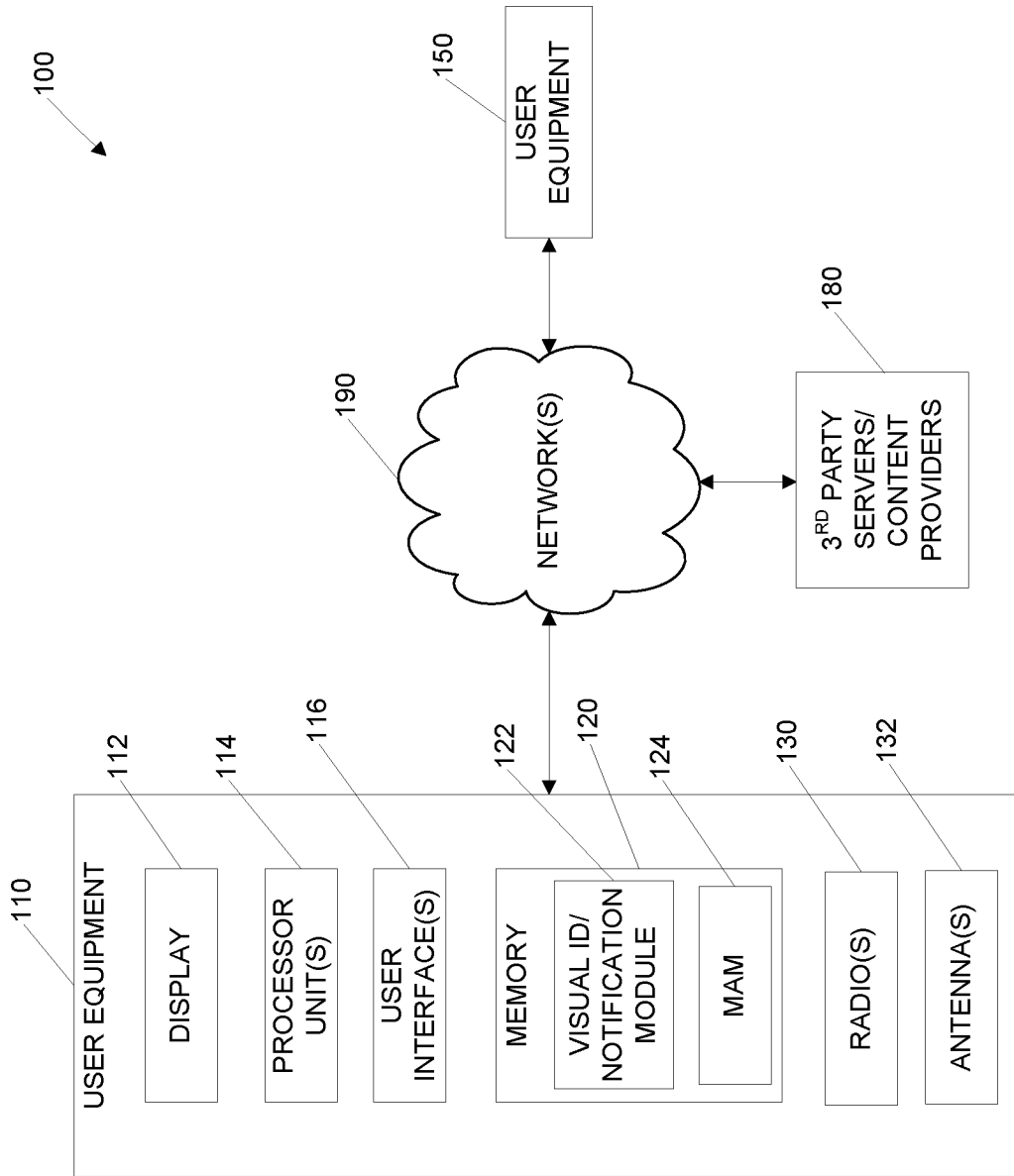


FIG. 1

2/5

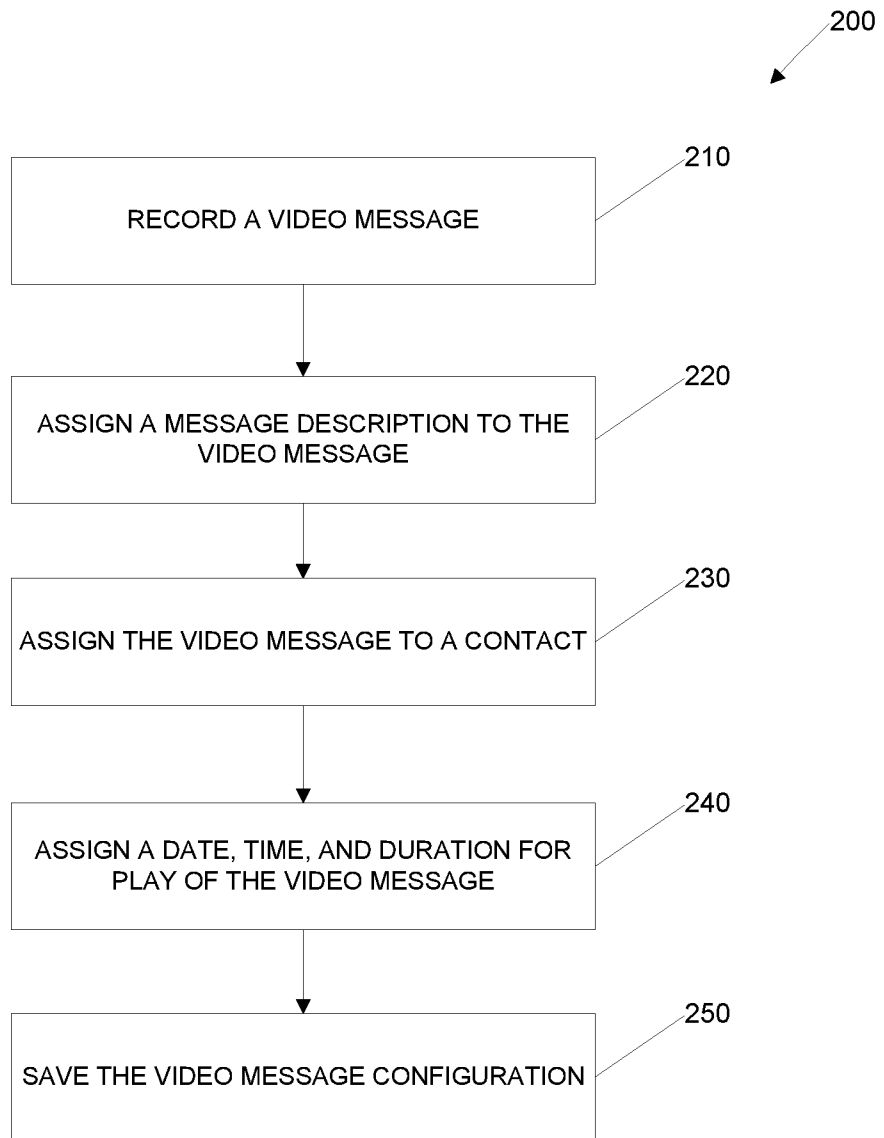


FIG. 2

3/5

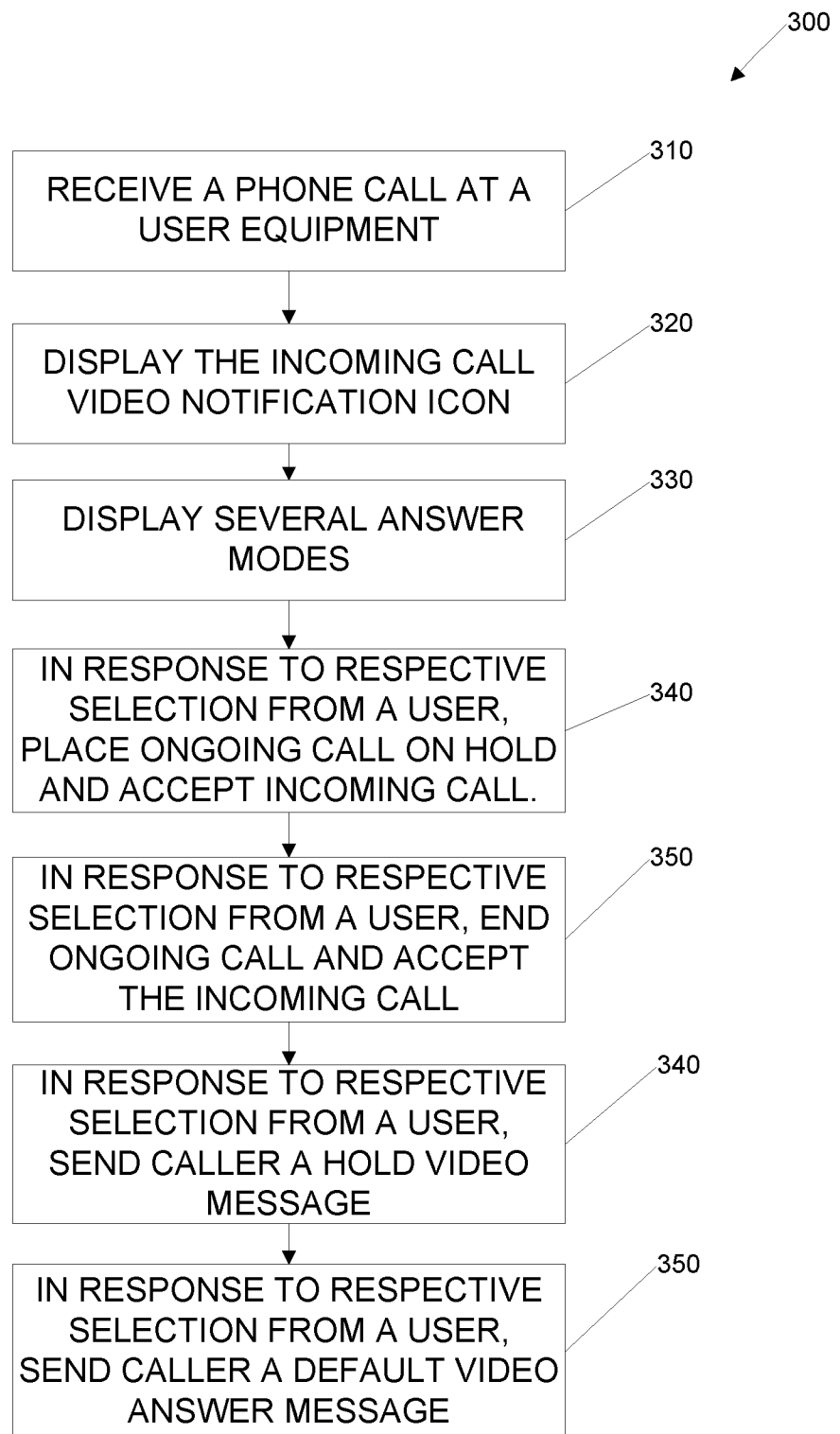


FIG. 3

4/5

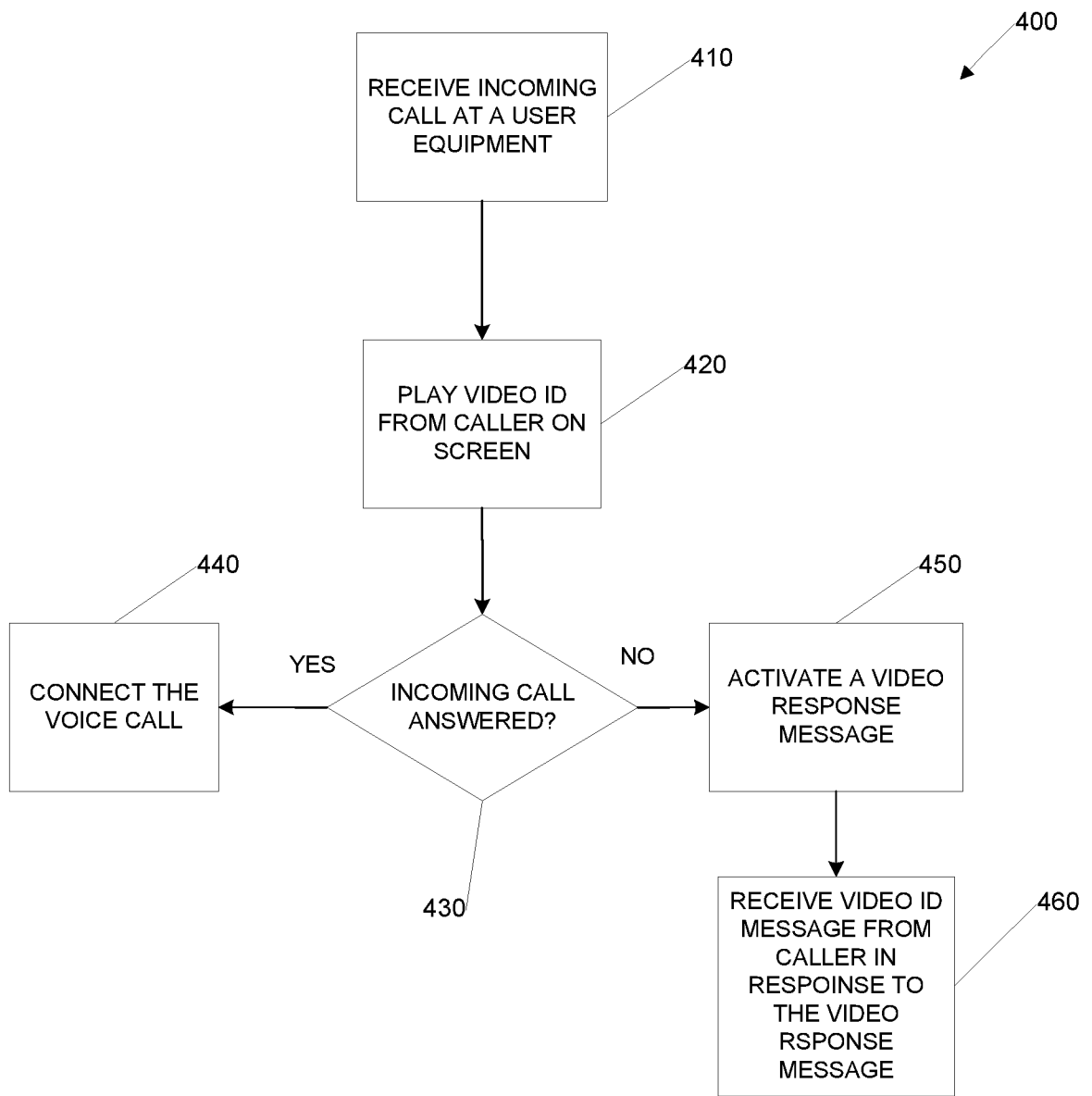


FIG. 4

5/5

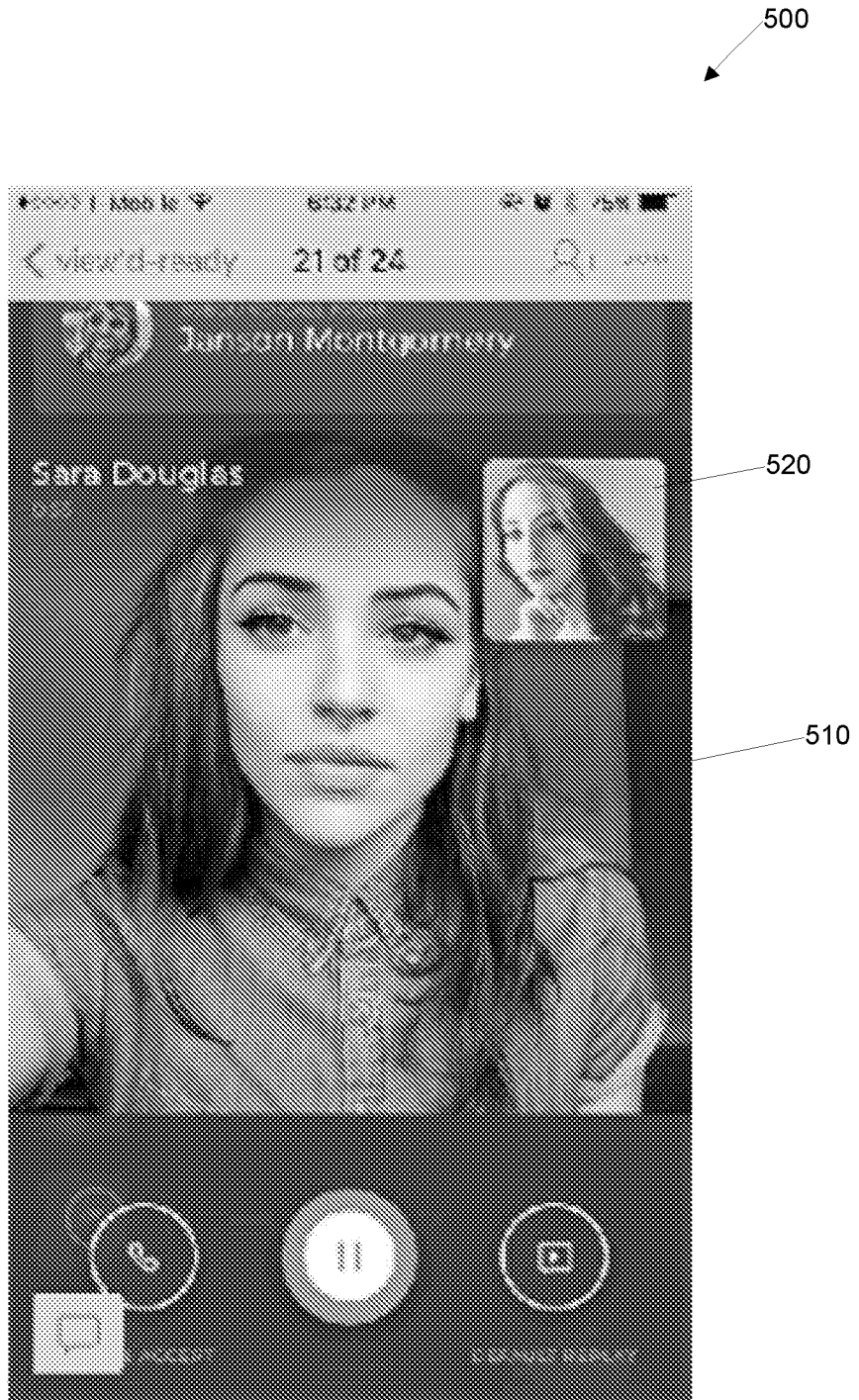


FIG. 5

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2017/017045

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - H04M 1/56; H04M 1/57; H04M 1/64; H04M 1/65; H04M 11/06 (2017.01)

CPC - H04M 1/56; H04M 1/57; H04M 1/576; H04M 1/578; H04M 1/64; H04M 1/65; H04M 1/6505; H04M 11/06 (2017.02)

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

See Search History document

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

USPC - 379/93.230; 379/93.010; 379/142.170; 379/142.040; 455/415.000; 348E07081 (keyword delimited)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

See Search History document

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 9,167,307 B2 (HOWARTER et al) 20 October 2015 (20.10.2015) entire document	1-20
Y	US 6,842,507 B2 (FUKUDA) 11 January 2005 (11.01.2005) entire document	1-20
Y	US 2011/0190012 A1 (WILLIAMS) 04 August 2011 (04.08.2011) entire document	2, 12, 16-18
Y	WO 2013/062482 A1 (PAN et al) 02 May 2013 (02.05.2013) entire document	5-7, 19
Y	US 2015/0074205 A1 (W.W. GRAINGER, INC.) 12 March 2015 (12.03.2015) entire document	7
A	US 6,990,181 B2 (CORBETT et al) 24 January 2006 (24.01.2006) entire document	1-20
A	US 6,226,362 B1 (GERSZBERG et al) 01 May 2001 (01.05.2001) entire document	1-20
A	US 8,160,221 B2 (HENDERSON) 17 April 2012 (17.04.2012) entire document	1-20
A	US 5,907,604 A (HSU) 25 May 1999 (25.05.1999) entire document	1-20
A	US 8,253,771 B2 (LAMMERS) 28 August 2012 (28.08.2012) entire document	1-20
A	US 8,953,761 B2 (MORRISSEY et al) 10 February 2015 (10.02.2015) entire document	1-20
A	US 9,172,905 B2 (SONG et al) 27 October 2015 (27.10.2015) entire document	1-20

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

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

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

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

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

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

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

"&" document member of the same patent family

Date of the actual completion of the international search

21 March 2017

Date of mailing of the international search report

21 APR 2017

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US, Commissioner for Patents
P.O. Box 1450, Alexandria, VA 22313-1450
Facsimile No. 571-273-8300

Authorized officer

Blaine R. Copenheaver

PCT Helpdesk: 571-272-4300
PCT OSP: 571-272-7774