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(71) Applicant: **MICROSOFT TECHNOLOGY LICENSING, LLC** [US/US]; One Microsoft Way, Redmond, Washington 98052-6399 (US).

(72) Inventors: **CHALABI, Malek Mohamad Nafez**; MICROSOFT TECHNOLOGY LICENSING, LLC, One Microsoft Way, Redmond, Washington 98052-6399 (US). **MCCOY, Gary T.**; MICROSOFT TECHNOLOGY LICENSING, LLC, One Microsoft Way, Redmond, Washington 98052-6399 (US). **FEIGELSTOCK, Eliana Miri-**

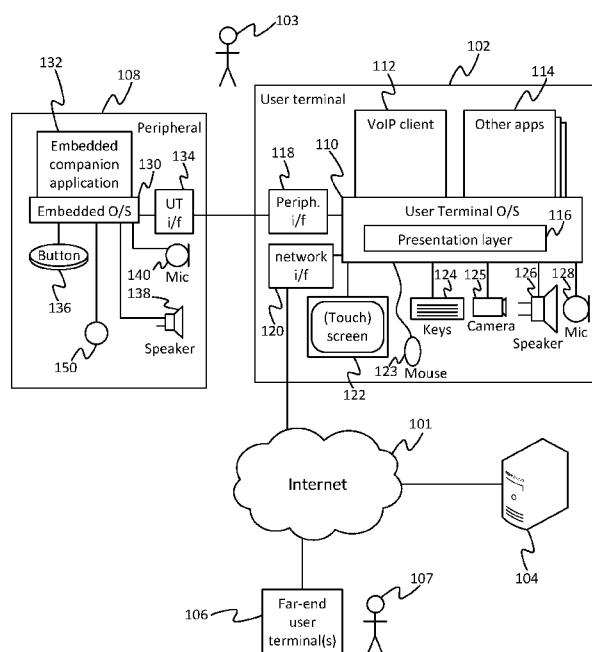
am; MICROSOFT TECHNOLOGY LICENSING, LLC, One Microsoft Way, Redmond, Washington 98052-6399 (US). **KHANDPUR, Vikram**; MICROSOFT TECHNOLOGY LICENSING, LLC, One Microsoft Way, Redmond, Washington 98052-6399 (US). **BROWN, Dustin R.**; MICROSOFT TECHNOLOGY LICENSING, LLC, One Microsoft Way, Redmond, Washington 98052-6399 (US). **KACHROO, Naveen**; MICROSOFT TECHNOLOGY LICENSING, LLC, One Microsoft Way, Redmond, Washington 98052-6399 (US).

(74) Agent: **MINHAS, Sandip** et al.; MICROSOFT TECHNOLOGY LICENSING, LLC, One Microsoft Way, Redmond, Washington 98052-6399 (US).

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(54) Title: PERIPHERAL DEVICE FOR USE WITH USER TERMINAL

FIG 1



(57) Abstract: A peripheral device for use with a user terminal, the peripheral device comprising an interface for connecting to the user terminal; at least one of a light and/or a speaker; and control logic for interfacing with the user terminal in order to interact with a communication client application running on the user terminal, which enables a voice or video call service that is conducted over a packet-based network from the user terminal using the communication client application. The control logic is configured to receive a notification from said communication client application of an event or state in the voice or video call service, and to provide to a user an indication of the event or state by providing an output from the light and/or speaker; wherein this indication is provided while the user terminal is in a locked or sleep state.

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PERIPHERAL DEVICE FOR USE WITH USER TERMINAL

BACKGROUND

[0001] One existing type of peripheral for use with a user terminal such as a mobile

5 phone is a docking station which acts as a speaker phone when the phone is docked in the docking station. This may operate in conjunction with the native dialler of the phone (e.g. a cellular dialler) or a separate application such as a VoIP application. Either way, when the phone is docked the audio to be transmitted from the near-end user to the far end-user(s) is captured by a microphone in the docking station instead of the phone's internal microphone,
10 and transferred from that microphone through the docking connection to the phone, then on to the far-end user terminal(s). And/or, the audio received from the far-end user terminal(s) is not played out through the phone's internal speaker, but rather is transferred from the phone to the docking station via the docking connection and played out through a speaker in the docking station. The docking station usually also supplies power to the phone during
15 the call and charges its battery. The user can answer and control the call in the normal way by navigating through the graphical user interface presented on the display screen of the phone (nowadays typically a touchscreen).

[0002] Another type of peripheral is a hands-free headset or earpiece which pairs

with a phone via a wired or more often wireless connection, e.g. a Bluetooth connection. In
20 this case, when the phone is so paired, the audio to be transmitted from the near-end user to the far end-user(s) is captured by a microphone in the headset or earpiece instead of the phone's internal microphone, and transferred from that microphone through the pairing connection to the phone, then on to the far-end user terminal(s). And/or, the audio received from the far-end user terminal(s) is not played out through the phone's internal speaker, but
25 rather is transferred from the phone to the headset or earpiece via the pairing connection and played out through a personal speaker in the headset or earpiece. The headset or earpiece often also comprises a set of dedicated mechanical buttons for controlling the call via the pairing connection, with a different respective dedicated function mapped to each button - such as a volume up button for increasing the volume of the playout of the received audio,
30 a volume down button for decreasing the volume, an answer button for answering the call, a hang-up button for terminating the call, and/or a mute button for muting the transmitted audio of the call.

SUMMARY

[0003] It is identified herein that existing peripherals can be improved, particularly in relation to providing an indication to a user or users of a state or event of a voice or video call service.

5 [0004] Accordingly, in a first aspect of the invention there is provided a peripheral device for use with a user terminal, said peripheral device comprising an interface for connecting with said user terminal; at least one of a light and/or a speaker; control logic for interfacing with the user terminal via said interface, in order to interact with a communication client application running on the user terminal, said communication client
10 application operable to enable a voice or video call service that is conducted over a packet-based network from the user terminal using the communication client application; wherein the control logic is configured to receive a notification from said communication client application of an event or state in the voice or video call service, and to provide to a user an indication of said event or state by providing an output from said light and/or said speaker;
15 wherein the control logic is configured to provide said indication while the user terminal is in a locked or sleep state.

[0005] In this way the peripheral is able to provide an indication of an event or state, such as an incoming call, or a received voicemail, in a way which may be more noticeable that would be possible with the user terminal alone. This may particularly be the case in
20 embodiments where the voice or video call service is not the native calling/messaging service of the user terminal. Typically, the user terminal, or its Operating System (OS) will have a native calling and/or messaging service, usually including a dialler and/or directory also. Such a service is typically operated on a cellular or mobile network such as GSM or CDMA for example. However, other services may be provided by a communication client
25 application which can be installed on the user terminal, using other telephony protocols, such as a voice over IP (VoIP) protocol. This may be a proprietary protocol, owned or operated by an organization which is not the manufacturer of the user terminal for example.

[0006] As such, the communication client application may not have access to all functions of the user terminal under the control of the OS. In particular, certain notification
30 functions or processes such as audio or visual alerts or processes may not be available to non-native applications running on the user terminal. Therefore, providing an indication of an event or state to a user may be non-trivial for such applications and the services they provide. By providing an indication with a peripheral device, more reliable and effective indication can be achieved.

[0007] In embodiments the peripheral device is adapted to provide said user indication when the user terminal is in a locked or sleep state. Such a user terminal state may be a state in which a code or pattern or fingerprint is required before certain functionality is activated, or may be a power saving state for example. Where the user terminal has a screen, a visual indication can be provided by the peripheral device, in
5 embodiments, when the screen is not powered. This may be particularly relevant when a persistent indication is required, as will be described below, for an extended duration such as hours or days for example.

[0008] Thus the peripheral can provide enhanced functionality for a communication
10 client application, and equivalently the service it provides. In order to focus on that service, and to potentially reduce confusion and complexity, embodiments of the peripheral may not provide and may not be able to provide said user indication of any event or state of other voice or video call services on the user terminal. In such embodiments the peripheral can be focussed on one service, and a user is in no doubt as to the service if and when in indication
15 is received.

[0009] Communication and data exchange between the user terminal and the peripheral device is performed via the interface, which may be a wired or physical connection, or may be wireless. In embodiments the peripheral device may comprise a docking station, and include a port in the form of a connector to physically receive the user
20 terminal directly, without using a wire. In this way the peripheral device can provide a support or stand for the user terminal, and may secure it in a desired orientation for example. The port or connector may be a “lightening” port or connector which is a proprietary interface created by Apple Inc.

[0010] Alternatively, a wireless connection can be established using any appropriate
25 wireless protocol such as Wi-Fi, Bluetooth, or ZigBee for example.

[0011] In embodiments the peripheral device does not comprise any display screen, and in such embodiments or further embodiments the peripheral device may not be used or usable as a standalone user terminal without being connected as a peripheral to a user terminal. In this way the device can be kept simple, and may be better able to perform a
30 small number of functions more effectively, than a more complex device. Furthermore, power consumption can be reduced, and this may be advantageous for battery life.

[0012] The event or state may be any event or state which a user may wish to be notified of, as part of a communication system or environment. In a typically voice or video call scenario examples include an incoming call, and active call, a missed call or a voicemail.

If the communication system has greater functionality, more events and states are possible and include for example a meeting invite, a live meeting, an instant message, a shared document, a user joining or leaving a meeting, or an app launch. The peripheral may have default indications for certain events or states, but a user may be able to program indications for tailored events or states, or a combination thereof.

[0013] Some events or states may be considered time dependent; i.e. an indication is provided at the time of an event which has a limited duration. An example is an incoming call, and an indication is generally only of use while the call is incoming. Other events or states, may be more persistent however, and an indication may be desirable for a user after the event has occurred. An example is a missed call or an unread message or voicemail, whereby an indication may be required for hours or days after the event has occurred.

[0014] It may be undesirable for a user terminal to provide an indication, such as an audio or visual indication of such persistent events or states, as it may be annoying in the case of an audio indication, and battery life may be a concern for a visual indication. This is particularly relevant if the visual indication is provided by a screen which typically consumes significant power.

[0015] The indication may be provided by audio means, or visual means, or both in various embodiments. Considering visual means, the peripheral device is preferably provided with one or more lights or light sources, such as lamps or bulbs or more likely LEDs, able to provide a visible light output to a user. For example, the lights may be provided on the surface of the device, recessed into the housing. The lights may also be positioned inside a housing which is at least partially light transitive, to allow the output to be seen through the housing or a part of the housing.

[0016] A light or lights may be provided and/or controlled individually or in groups, or a combination of both. Control may be of one or more light output parameters such as colour, brightness or intensity, saturation, and dynamic effect, such as blinking or pulsing for example. It will therefore be understood that indications of different events or states can be provided with different light output patterns or states.

[0017] It is possible for example to provide a plurality of distinct, individually controllable lights to indicate different states or events. One light may indicate an incoming call, while another light may indicate a voicemail. A single light output may indicate multiple states or events, by changing colour for example or flashing.

[0018] In embodiments however, it has been found advantageous to provide only a single light output. Such an output may be provided with multiple different light sources,

but is typically perceived by a user as a single contiguous output. The light output may take the form of a circle or disc for example, or of a ring extending around the circumference of a device. Multiple different events or states can be indicated by such a single output, by varying combinations of output parameters, such as colour and dynamic state. For example, a light output which is controllable in three different colours, and in a static and a pulsing mode can provide six different outputs. Furthermore, in embodiments the same output can be mapped onto different events or states, where context, such as the status of a call, allows a user to differentiate the indicated event or state.

[0019] Considering audio means, a variety of different sounds or effects can be provided to indicate an event or state, and different sounds can be mapped to represent different indications. The sounds can be provided by a dedicated speaker or speakers in embodiments, or can use a speaker of a speakerphone arrangement in other embodiments.

[0020] The data exchange between the user terminal and the peripheral device may be by Human Interface Device (HID) protocol in embodiments, with the peripheral device acting as the “device” and the user terminal acting as the “host”. In this way dynamic association of the data input/output with device functionality is achieved, for example by using a HID descriptor. Therefore, data packets sent and received by the device can be mapped to output indications from said light and/or said speaker (or conversely to an event or state of the voice or video call service), and this mapping can optionally be performed by the peripheral device. Furthermore, most Operating Systems recognize and can communicate with most HID devices without specific drivers being required.

[0021] It will be understood that other forms of data exchange between the user terminal and the peripheral device may occur, but that HID protocol may be used at least for the purposes of providing output indications.

[0022] According to a further aspect of the invention, there is provided a method comprising receiving, at a peripheral device from a user terminal, a notification from a communication client application running on said user terminal of an event or state in a voice or video call service, and providing, at the peripheral device, to a user an audio and/or visual indication of said event or state; wherein said voice or video call service is conducted over a packet-based network from the user terminal using the communication client application; wherein said indication is provided while the user terminal is in a locked or sleep state.

[0023] In embodiments the notification is received according to Human Interface Device (HID) protocol. This offers the advantage of increased likelihood of compatibility between the peripheral device and the user terminal, as noted above.

5 [0024] The method may further comprise mapping said notification to one of a plurality of audio and/or visual indications in embodiments. This mapping may be performed at the peripheral device, and may for example be performed in conjunction or association with the provision of a HID descriptor.

10 [0025] In embodiments, notification of different states or events are mapped different output patterns or states of a single light output, and in further embodiments said different output patterns or states are provided by controlling at least one of colour, intensity, and dynamic effect of said light output.

15 [0026] According to a yet further aspect there is provided a non-transitory computer readable medium or computer program product comprising computer readable instructions which when run on the relevant computer device or system cause that computer device or system to perform a method substantially as described herein.

[0027] The invention extends to methods, apparatus and/or use substantially as herein described with reference to the accompanying drawings.

20 [0028] Any feature in one aspect of the invention may be applied to other aspects of the invention, in any appropriate combination. In particular, features of method aspects may be applied to apparatus aspects, and vice versa.

[0029] Furthermore, features implemented in hardware may generally be implemented in software, and vice versa. Any reference to software and hardware features herein should be construed accordingly.

BRIEF DESCRIPTION OF THE DRAWINGS

25 [0030] To assist understanding of the present disclosure and to show how embodiments may be put in effect, reference is made by way of example to the accompanying drawings in which:

- Figure 1 is a schematic block diagram of a communication system,
- Figure 2 shows an example design of a docking station,
- 30 • Figure 3 shows a user terminal docked with a docking station,
- Figure 4 shows a user terminal docking with a docking station,
- Figure 5 shows a user pressing a button of a docking station to answer an incoming call,

- Figure 6 gives a schematic side and top view diagrams of an example docking station,
- Figure 7 shows an example of a peripheral connecting to a laptop,
- Figure 8 shows an example of a docking station connected to a laptop,
- 5 • Figure 9 schematically illustrates a peripheral in the form of a stand-alone button unit, and
- Figure 10 schematically illustrates a peripheral in the form of a headset.

DETAILED DESCRIPTION OF EMBODIMENTS

[0031] Figure 1 illustrates an example communication system in accordance with
10 embodiments disclosed herein. The system comprises a user terminal 102 such as a mobile phone, tablet, laptop computer or desktop computer; and a peripheral device 108 configured to connect to the user terminal 102. As will be discussed in more detail later, the peripheral 108 may take any of a variety of forms such as a docking station, headset, earpiece or dedicated button unit. The peripheral device 108 may also be referred to as a hardware
15 accessory in that, while it may in embodiments run embedded firmware, it is a relatively simple device with a dedicated purpose and only a single or a small number of user input controls (e.g. no more than the buttons) and preferably no screen (though in embodiments it is not excluded that the peripheral 108 could have a small screen for some simple or dedicated purpose).

20 [0032] The user terminal 102 comprises an operating system 110, a communication client application 112, and one or more other applications 114 (e.g. in embodiments over one hundred applications, or “apps”, and even up to hundred to three hundred applications or more). The operating system 110, communication client 112 and other application(s) 114 are stored on a storage means of the user terminal 102 and arranged to be run (either
25 executed or interpreted) on a processor of the user terminal 102, and to thereby perform the various operations attributed to them herein. The storage on which the operating system 110, communication client application 112 and other application(s) 114 are stored may comprise any one or more storage media implemented in one or more memory units. E.g. the storage means may comprise an electronic storage medium such as an EEPROM (or
30 “flash” memory) and/or a magnetic storage medium such as a hard disk. Note also that the term “processor” as used herein does not exclude that the processor may comprise multiple processing units. The communication client application 112 and other application(s) 114 are each separate applications from one another, individual applications at least in that they are

scheduled independently by the operating system 110, and/or can be launched, run and closed independently of one another.

[0033] The user terminal 102 also comprises one or more input devices for outputting information to the user 103 and one or more output devices for receiving information from the user 103 (which may be referred to collectively as i/o devices). These include one or more media output devices for outputting audio and visual information from the applications 112, 114 to the user 103, i.e. at least one speaker 126 and a screen 122, respectively. The i/o devices also include one or more media input devices for receiving audio and optionally video information from the user 103, i.e. as a microphone 128 and optionally a camera 125. Furthermore, the i/o devices comprise one or more user input devices enabling the applications 112, 114 to receive user selections from the user 103, such as a mouse or trackpad 123, a set of keys 124 (e.g. a keyboard or keypad), and/or a touchscreen 122 (the screen 122 may or may not be a touchscreen capable of both outputting visual information and receiving inputs from the user 103). The operating system 110 running on the user terminal 102 is an end-user operating system, i.e. designed for user terminals to provide an interface to the end user 103, to present information from applications 112, 114 to a user 103 through a graphical user interface presented on a screen 122, and to receive back inputs to the applications 112, 114 from the user 103 through one or more user input devices 122, 123, 124, 125, 128. As such the user operating system 110 comprises a presentation layer 116. The presentation layer 116 is the layer disposed between the application layer 112, 114 and lower layers (not shown), which formats data from the lower layers to be presented to the application layer 112, 114, and formats data from the application layer 112, 114 to be presented to the lower layers. This includes responsibility for painting graphical user interface on the screen, and receiving inputs from the user selections from the user input devices 122, 124 in relation to the graphical user interface.

[0034] Note that each of the i/o devices 122, 123, 124, 125, 126, 128 may be internal or external to the main housing in which the processor running the applications 112, 114 is housed, e.g. as follows. In embodiments the screen 122 may be an integral screen of a smartphone, tablet or laptop or an external screen of a desktop computer. The set of keys 124 may be an integral key set of a smartphone or tablet, an integral keyboard of a laptop or an external keyboard of a desktop computer. The (at least one) speaker 126 may be an internal or external speaker of a smartphone, tablet or laptop, or an external speaker of a desktop computer. The microphone 128 may be an internal or external microphone or a smartphone, tablet or laptop, or an external microphone of a desktop computer. The camera

125 may be an internal camera of a smartphone, tablet or laptop, or an external camera connected to a laptop or desktop computer. If used, a mouse 123 is an external device, but this could instead be an integral trackpad or tracker ball of, say, a laptop computer.

5 **[0035]** The user terminal 102 further comprises a network interface 120 and a peripheral interface 118.

10 **[0036]** The network interface 120 enables the user terminal 102 to connect to a packet-based network 101 comprising one or more constituent networks. E.g. in embodiments the network 101 may comprises a wide area internetwork such as that commonly referred to as the Internet. Alternatively, or additionally, the network 101 may
15 comprise a wireless local area network (WLAN), a wired or wireless private intranet (such as within a company or an academic or state institution), and/or the data channel of a mobile cellular network. To connect to such a network, the network interface 120 may comprise any of a variety of possible wired or wireless means as will be familiar to a person skilled in the art. For example, if the network 101 comprises the Internet, the network interface 120
20 may comprise a wired modem configured to connect to the Internet via a wired connection such as a PSTN phone socket or cable or fibre line, or via an Ethernet connection and a local wired network. Or alternatively the network interface 120 may comprise a wireless interface for connecting to the Internet via a wireless access point or wireless router and a local (short-range) wireless access technology such as Wi-Fi), or a mobile cellular interface for
25 connecting to the Internet via a mobile cellular network.

30 **[0037]** The connection to the network 101 via the network interface 120 allows applications 112, 114 running on the user terminal 102 to conduct communications over the network. This includes enabling the communication client application 112 to conduct a voice or video call with another instance of the client application running on a remote user
35 terminal 106, being used by a remote user 107. As a matter of terminology the user terminal 102 from the perspective of which a given communication scenario is being described may be referred to as the near-end terminal, whilst the other, remote user terminal 106 with which the near-end terminal 102 is communicating may be referred to as the far-end terminal (and similarly for the near-end user 103 and far-end user 107 respectively). Not also that the call
40 could in fact be a conference call conducted with multiple remote user terminals and their respective users. By way of illustration the following will be described in terms of a given remote-user terminal 106, but it will be appreciated that the same teachings can be readily extended to multiple remote user terminals in a similar manner.

[0038] The communication client 112 on the near-end user terminal 102 is configured so as, when run on the near-end user terminal 102, to receive audio data from the microphone 128 and optionally also video data from the camera 125, and to send this data over the network 101, via the network interface 120, to be played out at the far-end terminal as part of a call conducted between the near-end user 103 and far-end user 107. Further, the communication client 112 is configured so as when run on the user terminal 102 to receive via the network interface audio and optionally video data from the client on the far-end terminal 106 to be played out through the speaker 126 and screen 122, respectively, on the near-end terminal 102.

[0039] In embodiments the communication client 112 is a VoIP client configured to conduct the call in the form of a VoIP call (which may also comprise a video element). The VoIP client may optionally also provide additional functionality such as instant messaging (IM). In some embodiments the audio and/or video content of the call may be routed via a server 104 of a provider of a communication service used to conduct the call (where a server as referred to herein may comprise one or more physical server units at one or more geographical sites). Alternatively, some or all of the audio and/or video content of the call may be sent directly over the network 101 between the near-end and far-end user terminals 102, 106, i.e. without being relayed by the server 104. In the latter case the server 104 may nonetheless provide some supporting functions such as: to provide address look up (or this could be done in a P2P fashion); to issue digital authentication certificates by which users 103 and 107 may prove their identities to one another; to store respective contact lists of the users 103 and 107, being a list of other users the respective user has agreed to accept as contacts for communicating with within the communication service; to store profile information of each user which is viewable by other users within the communication service; and/or to maintain presence information indicating to other users whether the respective user's availability to be communicated with within the communication service.

[0040] The communication client may be arranged to conduct a call or meeting using a proprietary internet telephony protocol, such as the Skype protocol, or Microsoft Notification Protocol 24 for example.

[0041] In embodiments, the communication client application (e.g. VoIP application) 112 may be an application other than the native dialler of the operating system 110, i.e. the default dialler user for telephone calls, which is either one of the other applications 114 or an integrated function of the operating system 110 itself.

[0042] As such, the client application may not have access to native notification processes of the user terminal such as audio or video outputs from speaker 126 or touchscreen 122, or a haptic output such as a vibration, which are typically controlled by the OS 110 of the user terminal.

5 [0043] The communication client application 112 is configured so as when run on the near-end user terminal 102 to present the user with a graphical user interface of the client, enabling the user to control various call-related functions, such as to answer an incoming request to establish the call from the client on the far-end user terminal 106 (if it is an incoming call, i.e. initiated by the far-end user), or to send a call establishment request
10 to the client on the far-end user terminal 106 requesting to establish the call (if it is an outgoing call, i.e. initiated by the near-end user). Other examples of call related functions which the user may control through the GUI of the client 112 include muting the transmitted audio of the call (so the near-end user can't be heard by the far-end user), turning the volume of the received audio up or down, or selecting the far-end user 107 from a contact list (to
15 establish the call if it is an outgoing call), or selecting to view profile information of the far-end user 107.

[0044] However, when using the GUI of the communication client application 112 on the user terminal 102, the user 103 typically has to follow several steps in order to perform simple tasks. For example, to join a scheduled meeting, they must first find and
20 navigate to an app, launch the app or bring it to the foreground, then navigate to the screen, locate the next meeting and then select the join meeting item. Any indications such as incoming or missed calls, must also be alerted with the user terminal which may be running other applications or have limited screen space available for example. This can be further complicated if the user's mobile device is in a locked state. This inconveniences the user
25 and gets in the way of them using apps like VoIP applications efficiently and frequently.

[0045] Another possibility is to connect a hardware accessory (a peripheral) to the user terminal 102. Conventionally each of the controls on the peripheral maps directly to a specific function within the application on the user terminal 102. For example, a play button on a Bluetooth speaker may cause music or other audio to start playing on a connected
30 mobile terminal, or a mute. In some cases, the connection of the peripheral to the user terminal 102 may also cause a particular application (e.g. a mobile app) to be launched upon connection (wired or wireless), or else the application may be launched upon activation of an on-screen control on the user terminal 102. However, to have multiple different functions,

the user still has to manually select from amongst multiple different controls, whether on the peripheral or on-screen or a combination of such controls.

[0046] To address such considerations or similar, the following discloses a peripheral 108 that connects to the user terminal 102 (by either a wireless or wired connection) and that can provide an indication of an event or state such as an incoming call or a live meeting. The peripheral can be activated, optionally in response to such an indication, either by a simple gesture such as touching, clicking or waving, or by voice or audio command. When the control is activated, it causes a signal or message to be sent to a particular application 112 or 114 running on the user terminal 102 which then responds by executing a contextual application function or series of functions.

[0047] Thus, rather than having an accessory that simply causes an application to launch or one that has controls that map directly in a one-to-one manner to function within an application, there is provided an accessory control that maps indirectly to functionality within one or more apps that: i) may behave differently in different application states, screens or contexts within the same app; ii) may behave differently in different applications running on the same connected terminal 102 and iii) where the control may be emplaced on a variety of accessory types and connected via wired or wireless methods.

[0048] For example, if a user is not currently using the communications application 112, then activating the accessory control may cause the client 112 to launch or come to the foreground; but if the user is already in the application 112, activating the same control may cause the client application 112 to join a meeting (e.g. by VoIP); whereas if the user 103 is already in a meeting (e.g. VoIP meeting), activating the same control may cause the user to be muted within the meeting. This thus provides a smart control accessory that serves as a smart application shortcut.

[0049] The GUI of the communication client application 112 on the user terminal 102 may also be used to provide user indication of a voice and/or video call event or state. For example, an indication may be provided of an incoming call, a live meeting or conference call in progress, a missed call, a voicemail or voice message, a text message or instant message, a mute state or an app launch.

[0050] The user terminal will typically provide native notification or indication functions, such as audio alert such as a ring or other tone, or a haptic output such as a vibrate function. This is typically accompanied with a graphical indication displayed on screen, which can provide further information regarding the nature of the event or state, such as the sender of an incoming message.

[0051] These native functions are typically controlled by the OS 110 of the user terminal. While these functions may be accessed by, and designed in conjunction with the native dialler or communication service of the user terminal, an application such as the client application 112 may not be able to access or control these functions freely. This may particularly be the case if the client application is not active, or is running in the background.

[0052] Therefore, indications relating to a communication service provided or enabled by client application 112, such as an internet telephony service (e.g. VoIP) may, in embodiments, not be able to be provided by such native functions and may need to rely on other means. One example is an on-screen notification, such as an icon or message in a header or a banner message. This is intended to alert the user and permit him or her to enter an application within a particular context by selecting the notification on screen. However, the user still has to manually handle the user terminal 102, which is not necessarily desirable, e.g. for a complete hands free experience. For instance, the user still has to approach the user terminal 102 to see the notification and discern its content, and select a small and potentially fiddly on-screen control to accept the notification.

[0053] It may therefore be desirable for a hardware accessory (a peripheral 108), such as that described above for example, to be able to provide an indication of a communication service event or state, based on a notification received from a communication client application 112 for example.

[0054] An example implementation of the peripheral device 108 is illustrated in Figure 1. As shown, the user terminal 102 comprises a peripheral interface 118, and the peripheral device 108 comprises a user terminal interface 134, for connecting the peripheral 108 to the peripheral interface 118 of the user terminal; thus enabling the peripheral device 108 and the communication client application 112 running on the user terminal 102 to exchange control commands. This connection could be any suitable wired or wireless means. For instance, the peripheral interface 118 may comprise a physical port comprising a mechanical connector for forming a wired connection with the user terminal interface 134 on the peripheral device 108 (the user terminal interface 134 on the peripheral 108 comprising the complimentary mechanical connector). E.g. the peripheral interface 118 may comprise a USB port, mini USB port, or micro USB port, and the user terminal interface 134 may comprise the corresponding USB plug. A further example is a so-called "Lightening" port or connector, which is a proprietary computer bus and power connector created by Apple Inc. As another example, the connection may be by any of a variety of wireless means. For instance, the peripheral interface 118 and corresponding user terminal

interface 134 may comprise a pair of wireless interfaces arranged to connect together via a local RF technology such as Wi-Fi, Bluetooth, ZigBee, or Thread. Note also that in the case where both the peripheral interface 118 and network interface 120 comprise a wireless interface, these may or may not comprise the same physical interface. For example, these
5 may comprise the same physical wireless interface using the same wireless access technology (e.g. Wi-Fi) and simply comprise different logic (e.g. software) for interfacing with the peripheral 108 and network 101 respectively. Alternatively, the peripheral interface 118 and network interface 120 may comprise different physical interfaces arranged to use different wireless access technologies, e.g. the peripheral interface 118 may be a Bluetooth
10 interface whilst the network interface 120 may be a Wi-Fi interface.

[0055] The peripheral device 108 comprises control logic in the form of an embedded companion application running on an embedded operating system 130 on the peripheral, to act as a companion to the communication client application 112. The embedded operating system 130 and companion application 132 are stored on a storage
15 means of the peripheral device 108 and arranged to be run (either executed or interpreted) on a processor of the user peripheral device 108, and to thereby perform the various operations attributed to them herein. The storage on which the embedded operating system 130 and companion application 132 are stored may comprise any one or more storage media implemented in one or more memory units. E.g. the storage means may comprise an
20 electronic storage medium such as an EEPROM (or “flash” memory) and/or a magnetic storage medium such as a hard disk. Also, not again that the term “processor” as used herein does not exclude that the processor may comprise multiple processing units.

[0056] As an alternative (or in addition) to the embedded companion application 132, the control logic may be implemented (or partially so) in the form of dedicated
25 hardware circuitry, or configurable or reconfigurable hardware circuitry such as a programmable gate array (PGA) or field programmable gate array (FPGA).

[0057] Either way, whether implemented in software, hardware circuitry or a combination of the two, the peripheral 108 may be described as a “hardware accessory” in that it is a simple, low-level peripheral device that cannot be used as a standalone user
30 terminal without being connected as a peripheral to a user terminal 102. For example, in embodiments the operating system on the peripheral 108 does not comprise a user operating system designed to provide a graphical user interface to the user 103, but instead comprises an embedded operating system that does not comprise a presentation layer. Furthermore, preferably the peripheral device 108 does not comprise any display screen.

[0058] In embodiments the peripheral 108 may optionally comprise one or more lights 150 (e.g. LEDs) which are arranged to provide an indication to the near-end user 103 of a certain state or event of the communication client application 112 (e.g. VoIP application) or a certain predefined event occurring within the communication service (e.g. VoIP service).

[0059] Considering a light or lights, these may be mounted in or on the peripheral device to emit light output visible to a user. A light may refer to a single light emitting element, or to a group of elements grouped to provide a single light output which is controllable between different states. For example, a combination of coloured LEDs can be grouped (optionally with a dedicated driver or control electronics) as a single light source to provide a plurality of different colour outputs in response to a control signal. Furthermore, one or more separate lights or light sources, even if spaced apart from one another, can be provided with a cover or diffuser, to provide an output which is perceived substantially as a single light output.

[0060] Thus it will be understood that the light or lights can provide a variety of different light outputs in terms of different light parameters such as colour, brightness, and dynamic effects (such as flashing or pulsing for example). Different light outputs can be used to indicate different events or states accordingly.

[0061] Separate light outputs, physically distinguishable from one another can be used to indicate different states. For example, one light in a first position on the device can indicate an incoming call, and another light in a different position can indicate a live meeting pending.

[0062] However, this may lead to a cluttered appearance, particularly on a device with a small form factor, and may cause confusion. Therefore, it may be desirable to use only a small number, or only a single light output, and to use different light parameters to indicate different events or states. Furthermore, a single output may indicate a different event or state depending on the status of a call or communication event. The table below provides an example of a light output, which has variable parameters of colour and dynamic effect, and the events or states indicated:

Colour	Solid (static)	Pulsing/Flashing
None (off)	Not connected	N/A

White	Connected	Incoming call, Live meeting, Missed call, Voicemail, App launch
Blue	In call	In call with audio muted

[0063] Additionally, or alternatively, the indication can be provided by audio means, output from a speaker or speakers 138 for example. In an analogous fashion different sounds can be assigned different states or events.

5 **[0064]** The peripheral device 108 may comprise at least one actuator 136, arranged to be simply and accessibly actuated by the near-end user 103. In embodiments the actuator 136 takes the form of a button arranged to be actuated by being pressed or touched by the user 103. Note that the term “button” does not necessarily limit to a mechanical mechanism with a moving or parts (though that is certainly one possibility for the actuator). In
10 embodiments the button may comprise a mechanical button such as a push button, slide switch, rotational switch or toggle switch. Alternatively, the button may take the form of a touch sensor such as a capacitive touch sensor, which is actuated when it senses the touch of user’s finger against an exterior surface of the touch sensor. In other alternative
15 embodiments, the actuator may not be button, but rather a motion sensor comprising one or more motion sensor elements (e.g. one or more accelerometers, motion sensors and/or tilt switches) arranged to be actuated when it/they sense the peripheral device 108 being moved by the user 103, or when a particular predefined motion is sensed. As yet another alternative, the actuator 136 comprises a microphone and voice recognition algorithm arranged to be
20 actuated in response to detecting a predetermined voice command from the user, or more generally an audio recognition algorithm arranged to detect a predetermined audio command (e.g. the user clapping his or her hands, clicking his or her fingers, or whistling).

25 **[0065]** Preferably the peripheral device comprises very few buttons, e.g. no more than three buttons. In embodiments the actuator 136 is the only user-operable button on the whole peripheral 108, or in embodiments that use motion or audio actuation, then the peripheral 108 could even comprise no buttons.

30 **[0066]** In some embodiments the peripheral 108 may additionally be configured to provide the function of a speaker phone, comprising at least one integrated speaker 138 and/or at least one integrated microphone 140. Thus the peripheral may be configured such that when connected to the user terminal 102, one or both of: (a) the received audio of the call from the far-end user 107 can be played out through the speaker 138 of the peripheral

108 instead of the speaker 126 of the user terminal 102, and/or the audio of the call captured from the near-end user 103 to be transmitted to be played out to the far-end user 107 is a captured through the microphone 140 on the peripheral 108 instead of the microphone 128 of the user terminal 102. The peripheral may further comprise one or more lights or light
5 sources 150.

[0067] As will now be exemplified with reference to Figures 2 to 10, the peripheral device 108 may take any of a variety of different forms. Note that the particular aesthetic design of the user terminal 102 and its GUI shown in Figures 3, 4, 5, 7, and 8 is purely an example for illustrative purposes and does not form part of any subject matter to be claimed
10 herein.

[0068] In embodiments the user terminal may take the form of a mobile user terminal such as a smartphone, tablet or laptop, and the peripheral device 108 may take the form of a docking station into which the mobile terminal 102 can be docked in order to form said connection between the peripheral interface 118 of the mobile terminal 102 and the
15 user terminal interface 134 of the peripheral 108. The docking station may also be configured to charge a battery of the mobile terminal 102 when so docked.

[0069] An example of this is illustrated in Figures 2 to 6. In this example the docking station 108 is also arranged to act as a speaker phone (see above) when the mobile terminal 102 is docked with the docking station 108. Figures 2 to 6 show different views of the same
20 example design. As illustrated in Figures 2 and 5, the docking station 108 may comprise a base segment 601 and a cover segment 602, movably connected via a movable joining element 603 such as a hinge so that the cover segment 602 can be opened to reveal the port 134 for connecting to the mobile terminal 102 (e.g. this may comprise a mechanical port such as a USB port, mini USB port, or micro USB port). Thus when the cover 602 is opened,
25 the mobile terminal 102 can be docked with the docking station in order to provide the various functionality described herein.

[0070] In such embodiments, one or more lighting devices are preferably provided on the base segment 601. In one embodiment one or more light sources are provided inside the base segment, and the top surface of the segment is translucent, allowing the output of
30 such light sources to be viewed through the casing of the base segment. The casing may act as a diffuser, giving the effect of a portion of the casing indicated by dashed line 152 acting as a single light source. In this way the light output can be viewed when a user terminal such as a mobile phone is docked in port 134.

[0071] It is desirable for the light output to be visible also when the docking station is in a closed state, as shown in the upper portion of Figure 6. To this extent, the sides, or a portion of the sides of the base segment 601 may also be translucent, to allow light output from these portions, which are not obscured when in a closed state. A further possibility is
5 for a small separation to remain between the base segment 601 and cover segment 602 in the closed configuration, at least at the perimeter of the device, so that light emanating from the top surface of the base section can “leak” out, providing a “ring” or “halo” effect around the perimeter of the device.

[0072] In such embodiments, the actuator 136 preferably takes the form of a single
10 button on the top surface of the base segment 601, e.g. a button in the form of a touch sensor element or possibly a mechanical push button. In embodiments the button is a touch sensor and appears outwardly to the user 103 (i.e. aesthetically) to be continuous with the rest of the base segment 601. Preferably this is the only user input control on the exterior of the docking station 108, or at least other than on its underside which is not visible to the user
15 103 when placed in the intended orientation on a supporting surface such as a table.

[0073] In embodiments the speaker (or speakers) 138 may be incorporated in the cover segment 602 while the microphone (or microphones) 140 may be incorporated in the base segment 601.

[0074] In embodiments the docking station 108 may optionally comprise one or
20 more further components, for example the docking station may comprise an additional audio input such as a jack socket 610 (e.g. a 3.5mm jack socket) allowing the user 103 to plug an audio device other than the mobile terminal 102 (e.g. a dedicated music player) into the docking station and have audio played out from the audio device through the speaker(s) 138 of the docking station 108. Further, in embodiments, the control logic 132 (e.g. the
25 embedded memory storing the embedded operating system 130 and companion application 132) may be mounted on a printed circuit board incorporated inside the housing of the base segment 601.

[0075] Referring to Figure 7, in some embodiments the docking station 108 may further be configured so that it can be connected to another type of user terminal 102 such
30 as a laptop or desktop computer via a cable connection 700 or similarly by a wireless connection such as a Wi-Fi or Bluetooth connection. Or the peripheral 108 may not take the form of a docking station but rather a unit for connecting to a laptop, desktop computer, or even a smartphone or tablet via such a wireless or cable connection 700. Either way, the peripheral 108 may be configured such that it can provide any of the above-described

functionality via this connection 700, with the laptop, desktop, or other device as the user terminal 102. In some embodiments, as shown in Figure 8, the peripheral 108 may take the form of a docking station 108 that can simultaneously both connect to a larger user terminal such as a laptop or desktop via a wireless or wired connection 700 and also receive a smaller
5 docked mobile user terminal such as a smartphone or tablet into its docking port. In this case the call functionality may be provided via a combination of a first near-side instance of the client application 112 running on the smaller user terminal and a second instance of the client application 112 running on the larger user terminal. In embodiments the control logic 132 on the peripheral can control one or both of them in order to control the relevant function
10 of the call.

[0076] An alternative form for the peripheral device 108 is illustrated in Figure 9. Here the peripheral 108 takes the form of a dedicated, stand-alone button unit, e.g. about the size of a large coin or not much larger. In this embodiment the button unit 108 preferably comprises only a single button (i.e. the actuator 136) and no other user input control, at least
15 not on its exterior surface. The actuator 136 takes the form of a button on the upper surface of the button unit, e.g. a touch sensor element or a mechanical push button. On the underside of the button unit 108 is a magnetic or adhesive layer 900 for affixing the button unit to another, external surface, e.g. a surface of the user terminal 102 on which the client application 112 to be controlled is installed. In such embodiments the user terminal interface
20 134 comprises a wireless interface such as a Bluetooth or Wi-Fi interface so the button unit 108 can communicate with and control the client application 112 for any of the above-described purposes.

[0077] In some particular embodiments, the button unit 108 may take the form of a refrigerator magnet, the layer 900 being a magnetic layer (N.B. the “layer” need not be of
25 any specific width, depth or other dimensions as long the magnetism is sufficient to support the weight of the button unit 108). In this embodiment the user terminal 102 may be the refrigerator itself if it is a smart refrigerator with embedded communications functionality. Alternatively, the user terminal 102 may be another device such as a smart phone, tablet, laptop, or desktop within range of the refrigerator magnet’s wireless interface 134.

[0078] An alternative form for the peripheral device 108 is illustrated in Figure 10. Here the peripheral 108 takes the form of a headset, e.g. a Bluetooth headset. The headset comprises one or a pair earphones which provide the speakers 138 of the peripheral 108, and a microphone arm 1000 on the end of which the microphone 140 of the peripheral 108
30 is mounted; the microphone arm 1000 being arranged to hold the microphone 140 near the

user's mouth. In this example the actuator 136 may take the form of a button such as a touch sensor element or mechanical push button placed on the exterior of the headset, e.g. on the microphone arm 1000 or on the outer casing of one of the speakers 138. In another somewhat similar embodiment, the peripheral device may take the form of an earpiece such as a Bluetooth earpiece.

[0079] Note that as shown in Figure 5, in embodiments the system is arranged such that the near-end user 103 can answer an incoming call from the far-end user even when it the near-end user terminal 102 is in a locked mode, e.g. even when the touchscreen 122 of the near-end user terminal 102 is locked. As will be familiar to a person skilled in the art, the operating system 110 on the user terminal 102 typically has an unlocked mode and a locked mode, wherein in the locked mode the operating system 110 will only allow the user terminal 102 to react to user inputs (e.g. via the touch screen) in specific circumstances more limited than in the unlocked mode, but not otherwise. These circumstances may include that the user 103 has entered a secret code such as a personal identification number (PIN) or secret pattern required to return the operating system 110 back to the unlocked mode, or that an application 112, 114 on the user terminal 102 has received a push notification from an external entity (e.g. a server or another user terminal) over the network 101. The operating system 110 may be configured to automatically fall into the locked mode after a certain predetermined time period has elapsed since a user input was last received by the user terminal 102, and/or may be configured such that the user 103 can manually place it into the locked mode.

[0080] Similarly, an indication of said incoming call, or of another communication event or state notified by the communication client application can be provided by the peripheral device which the user terminal is in the locked state. By providing a visual output such as a light output, and/or an audio output, a user can be alerted even if certain functions of the user terminal are not enabled in a locked state. This may also be true of a sleep mode, where the screen of a user terminal and possibly other functions are powered down. Even if native notifications are available to a default messaging or call service (e.g. a native communication application) in a locked or sleep state, the same may not be true for all applications, such as a third party communication client application.

[0081] This may be particularly useful for indicating a missed call or a voicemail, which for certain user terminals are only indicated on a display screen, which in turn can only be activated by a button press or other physical interaction with the user terminal.

[0082] Thus, in embodiments a mechanism is put in place whereby the near-end user 103 can answer an incoming call from the far-end user 107 by actuating the actuator 136 on the peripheral device 108 despite the operating system 110 on the user terminal being in the locked state. To enable this, the operating system 110 is configured to still allow a peripheral
5 to communicate with an application 112, 114 when the operating system 110 is in the locked or sleep state.

[0083] When the communication client application (e.g. VoIP application) 112 is first installed on the user terminal 102 it registers with a push notification service provided by the server 104 of the communication service provider. Subsequently, when the far-end
10 user 107 attempts to make a call to the near-end user 103 using the communication service (e.g. VoIP service) provided by that communication service provider, and the operating system 110 on the near-end user's terminal 102 is in the locked state, then the push notification service on the server 104 sends a push notification to the near-end user terminal 102 via the network (e.g. Internet) 101 notifying the operating system 110 on the near-end
15 terminal 102 that there is an incoming communication destined for the communication client application (e.g. VoIP application) 112. In response the operating system 110 notifies the control logic (e.g. embedded application) 132 of this via the interface 118, 134 between the user terminal 102 and peripheral 108, to allow the peripheral to provide a user indication, as discussed above. Alternatively or additionally, the operating system 110 may output some
20 notification via the speaker(s) 126 and/or screen 122 of the user terminal 102.

[0084] Such communication between the user terminal and the peripheral may use Human Interface Device (HID) protocol. Such protocol is typically used for control of audio commands between a user terminal and a peripheral, such as play or pause or volume controls. Here however, HID messages can be mapped to received notifications from said
25 communication client application to provide user indications such as light outputs for example.

[0085] If the user 103 then actuates the actuator 136 on the peripheral 108 (e.g. presses the touch sensor or push button on the base of the docking station) then the control logic 132 on the peripheral sends a signal back to the operating system 110 via the interface
30 134 between the peripheral 108 and the user terminal 102. The operating system 110 then allows the call to be answered and conducted using either the speaker 126 on the user terminal 102 or the speaker 138 on the peripheral 108, and either the microphone 128 on the user terminal 102 or the microphone 140 on the peripheral 108, but in embodiments while still keeping the screen 122 of the user terminal 102 locked.

[0086] Note: while Figure 5 illustrates the case of a locked screen 122 when the peripheral 108 is a docking station, the above mechanism can apply to other forms of peripheral as well, e.g. those of Figures 7, 9 or 10 or others (e.g. an earpiece).

[0087] It will be understood that the present invention has been described above
5 purely by way of example, and modification of detail can be made within the scope of the invention. Each feature disclosed in the description and (where appropriate) the claims and drawings may be provided independently or in any appropriate combination.

[0088] The various illustrative logical blocks, functional blocks, modules, and
10 circuits described in connection with the present disclosure may be implemented or performed with a general purpose processor, a digital signal processor (DSP), an application specific integrated circuit (ASIC), a field programmable gate array (FPGA) or other programmable logic device (PLD), discrete gate or transistor logic, discrete hardware components, or any combination thereof designed to perform the function or functions described herein, optionally in combination with instructions stored in a memory or storage
15 medium. A processor may also be implemented as a one or a combination of computing devices, e.g., a combination of a DSP and a microprocessor, or a plurality of microprocessors for example. Conversely, separately described functional blocks or modules may be integrated into a single processor. The steps of a method or algorithm described in connection with the present disclosure may be embodied directly in hardware,
20 in a software module executed by a processor, or in a combination of the two. A software module may reside in any form of storage medium that is known in the art. Some examples of storage media that may be used include random access memory (RAM), read only memory (ROM), flash memory, EPROM memory, EEPROM memory, registers, a hard disk, a removable disk, and a CD-ROM.

CLAIMS

1. A peripheral device for use with a user terminal, said peripheral device comprising:

an interface for connecting with said user terminal;

at least one of a light and/or a speaker;

control logic for interfacing with the user terminal via said interface, in order to interact with a communication client application running on the user terminal, said communication client application operable to enable a voice or video call service that is conducted over a packet-based network from the user terminal using the communication client application;

wherein the control logic is configured to receive a notification from said communication client application of an event or state in the voice or video call service, and to provide to a user an indication of said event or state by providing an output from said light and/or said speaker; and

wherein the peripheral is adapted to provide said user indication while the user terminal is in a locked or sleep state.

2. The peripheral device according to claim 1, wherein the peripheral device does not comprise any display screen.

3. The peripheral device according to claim 1, wherein the peripheral cannot be used as a standalone user terminal without being connected as a peripheral to a user terminal.

4. The peripheral device according to claim 1, wherein the event or state in the voice or video call service is at least one of an incoming call, an active call, a live meeting, a missed call, a voicemail, a mute state, or an app launch.

5. The peripheral device according to claim 1, wherein the control logic is configured to map said notification to one of a plurality of audio and/or visual indications.

6. The peripheral device of claim 5, wherein said mapping comprises mapping notifications of different states or events to different output patterns or states of a single light output.

7. The peripheral device according to claim 1, wherein the voice or video call service is not the native calling service of the user terminal.

8. The peripheral device according to claim 1, wherein the voice or video call service uses a proprietary Internet Telephony protocol.

9. The peripheral device according to claim 8, wherein said peripheral does not provide said user indication of an event or state of other voice or video call services on the user terminal

10. The peripheral device according to claim 1, wherein said peripheral is adapted to map received Human Interface Device (HID) protocol control messages from said communication client application to output indications from said light and/or said speaker.

11. The peripheral device according to claim 1, wherein the peripheral device comprises a docking station, said interface being arranged to form said connection with the user terminal when the user terminal is docked with the docking station.

12. The peripheral device according to claim 1, wherein said peripheral is moveable between at least two physical configurations, and wherein said light is operable to provide a user indication in said at least two configurations.

13. A system comprising the peripheral device according to claim 1, and the user terminal, the user terminal comprising an interface connected to the interface of the peripheral.

14. A method comprising:

receiving, at a peripheral device from a user terminal, a notification from a communication client application running on said user terminal of an event or state in a voice or video call service; and

providing, at the peripheral device, to a user, an audio and/or visual indication of said event or state;

wherein said voice or video call service is conducted over a packet-based network from the user terminal using the communication client application; and

wherein said indication is provided while the user terminal is in a locked or sleep state.

15. A computer readable medium comprising computer readable instructions which when run on a peripheral device cause the peripheral device to perform a method comprising:

receiving, at the peripheral device from a user terminal, a notification from a communication client application running on said user terminal of an event or state in a voice or video call service, and

providing, at the peripheral device, to a user, an audio and/or visual indication of said event or state;

wherein said voice or video call service is conducted over a packet-based network from the user terminal using the communication client application; and

wherein said indication is provided while the user terminal is in a locked or sleep state.

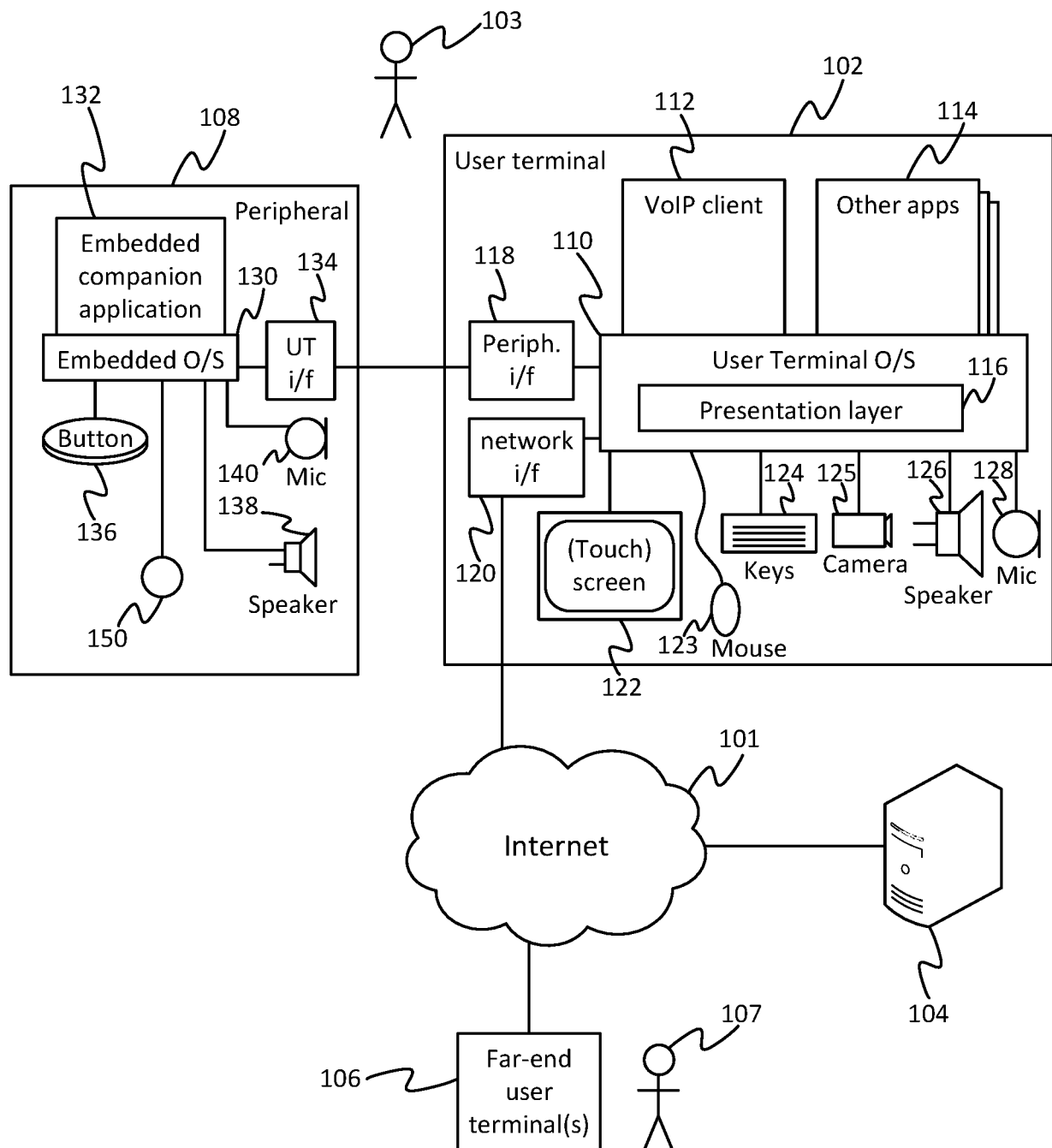
FIG 1

FIG 2

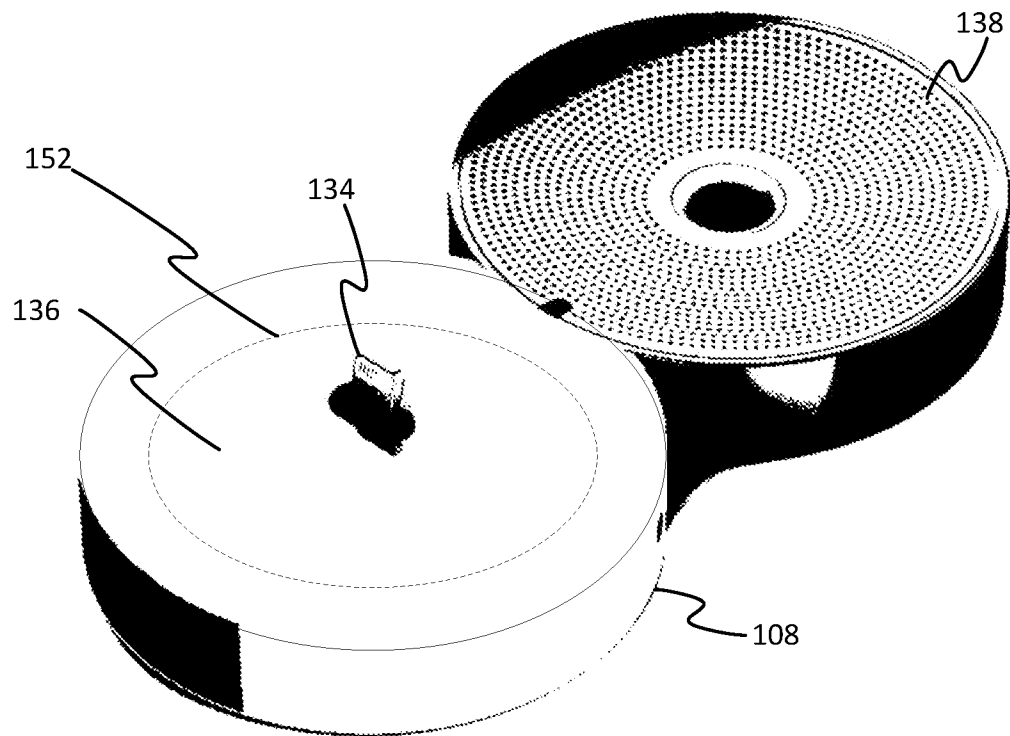


FIG 3

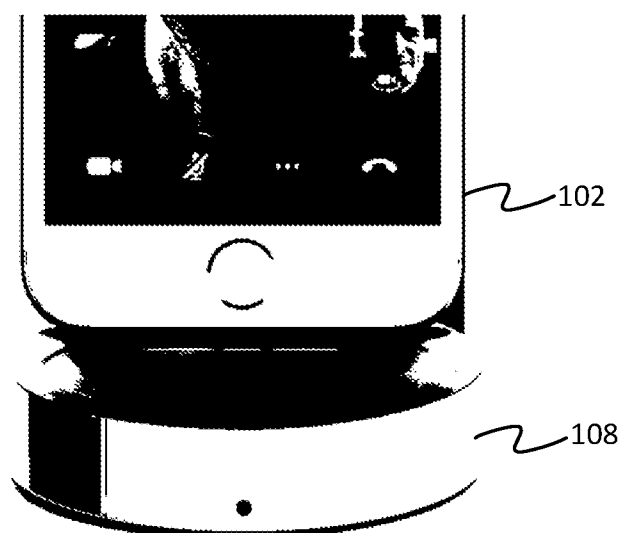


FIG 4

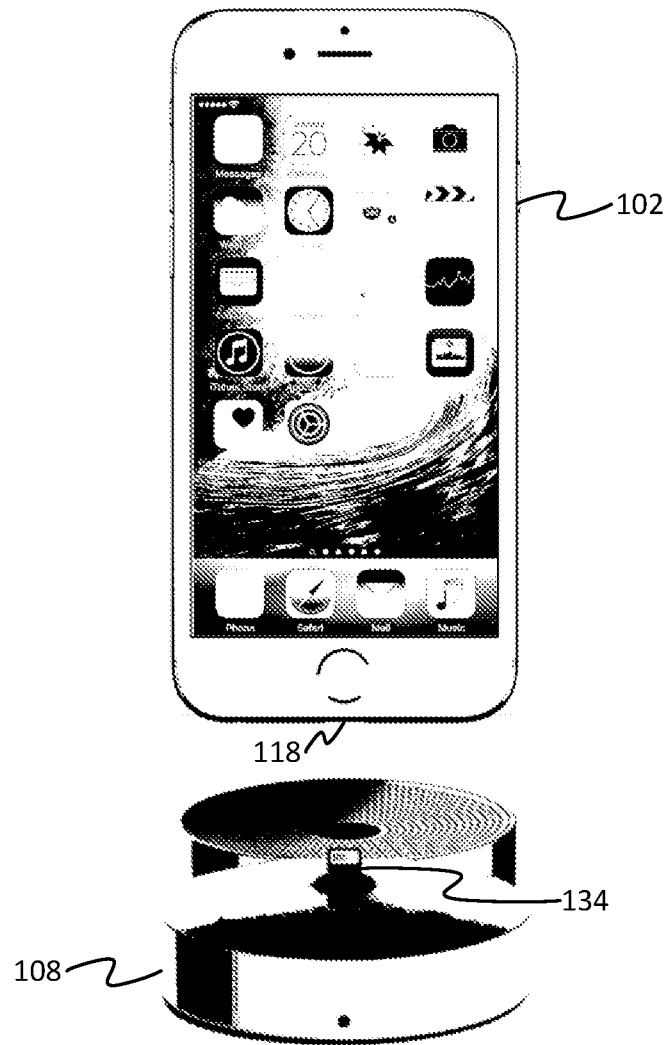


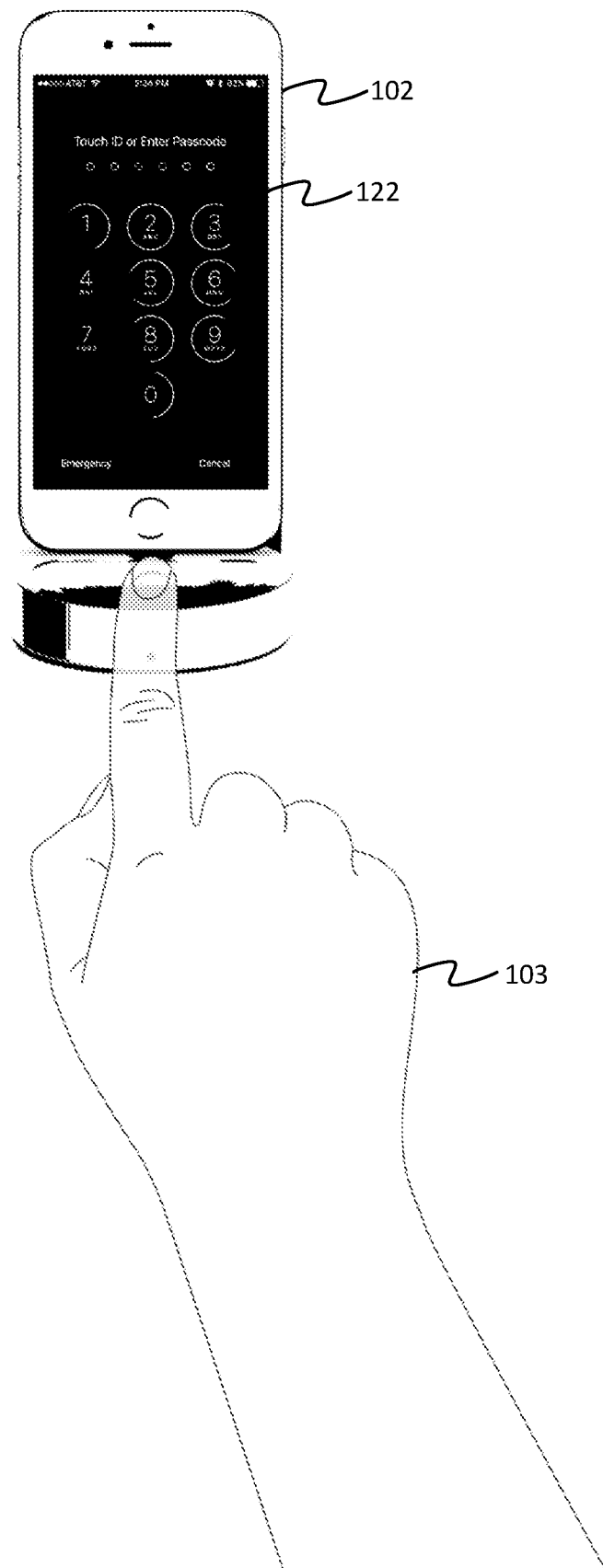
FIG 5

FIG 6

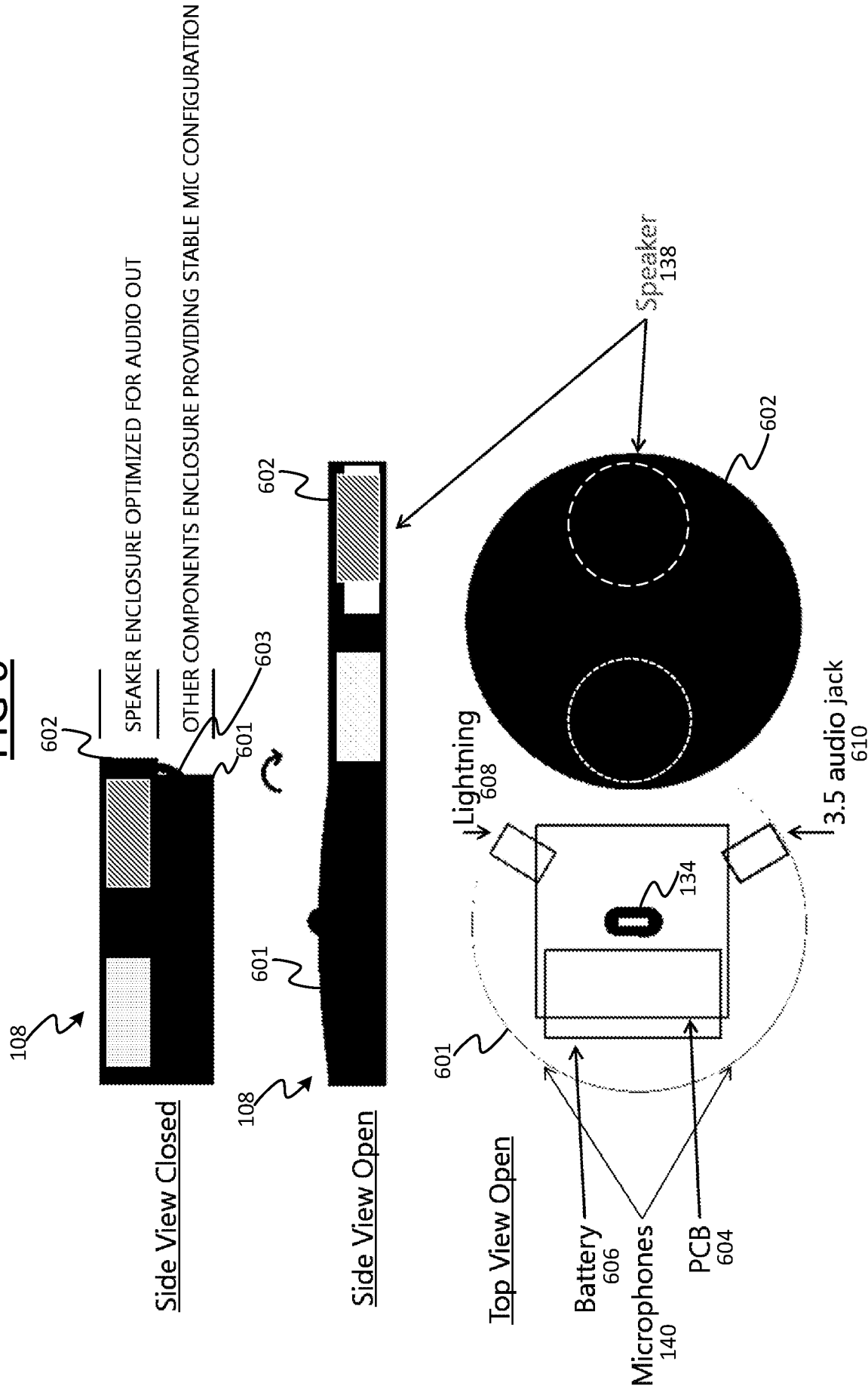


FIG 7

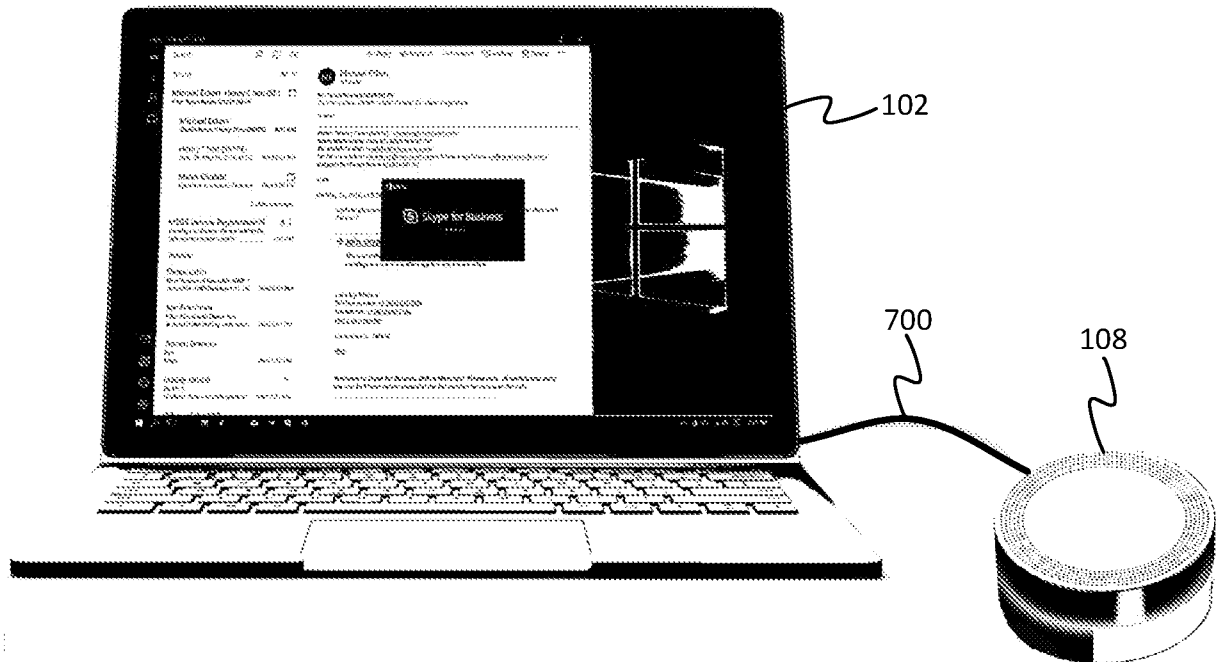


FIG 8

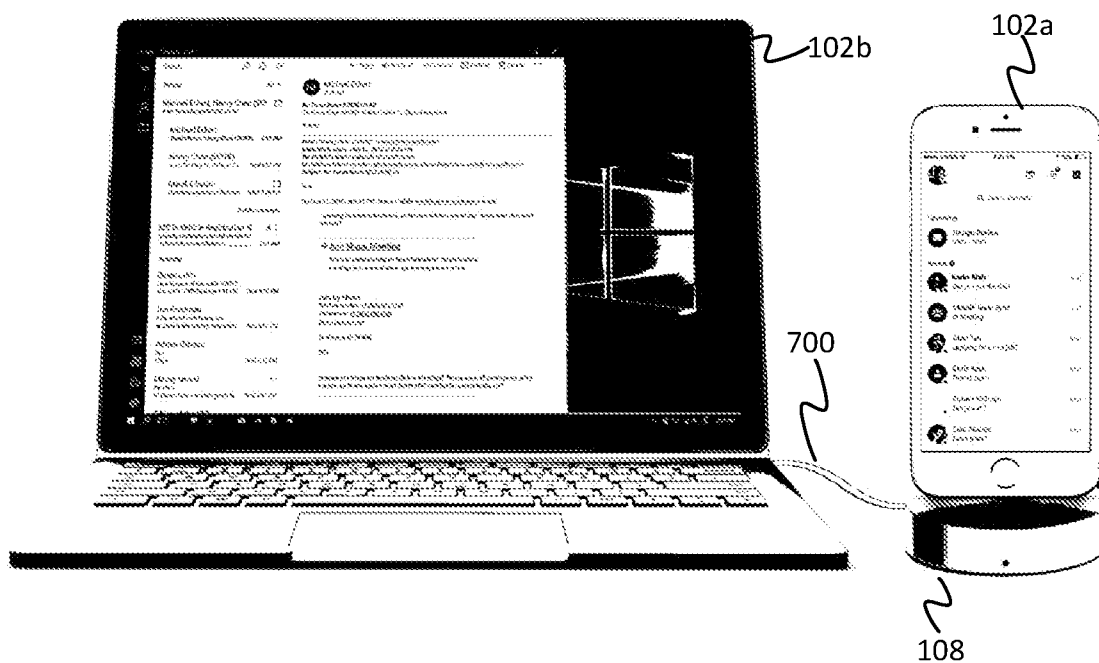


FIG 9

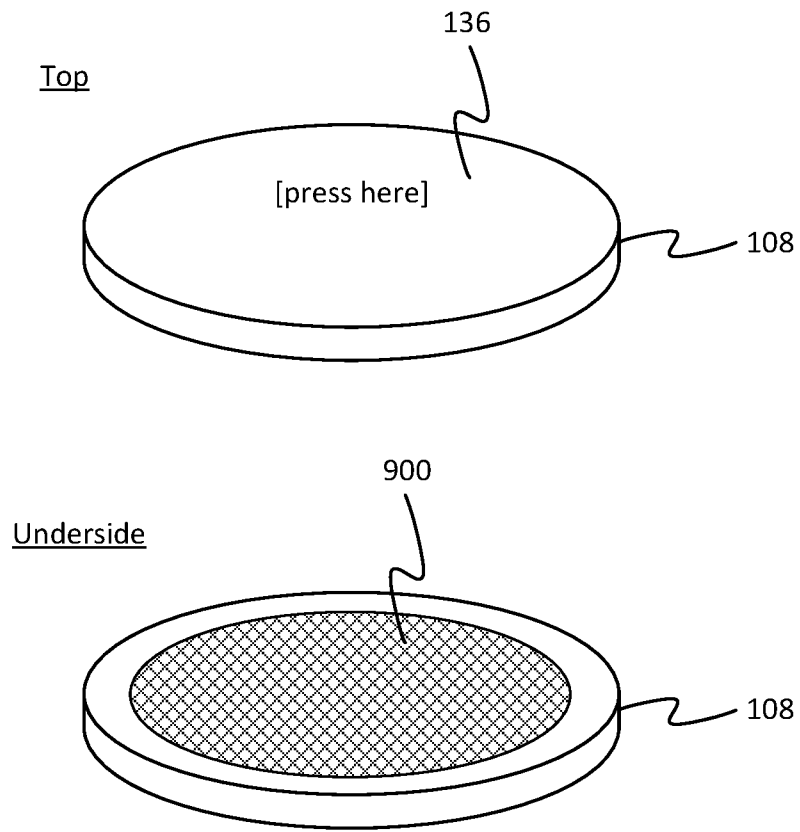
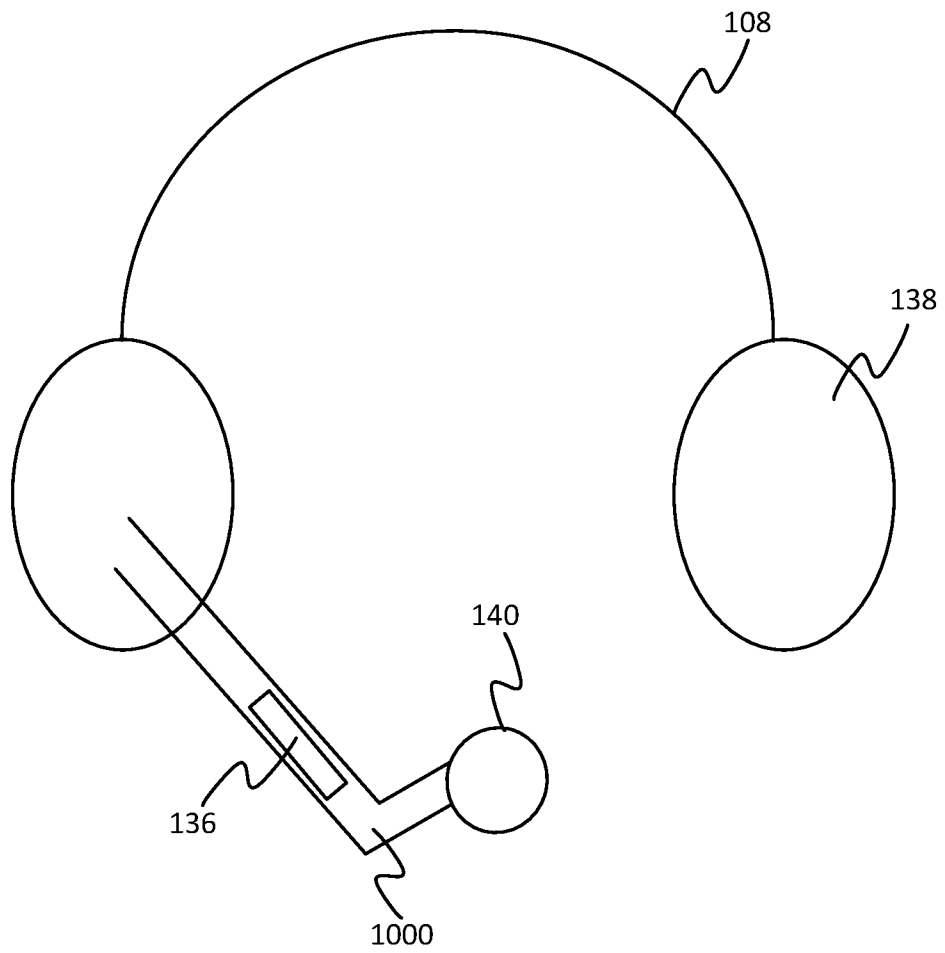


FIG 10



INTERNATIONAL SEARCH REPORT

International application No

PCT/US2017/038065

A. CLASSIFICATION OF SUBJECT MATTER

INV. H04M1/04 H04M1/253 H04M1/60
ADD.

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)

H04M G06F H04B H02J B60R H04L H04W H04N

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

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

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	US 2005/286453 A1 (GADAMSETTY UMA M [US] ET AL) 29 December 2005 (2005-12-29) paragraph [0010] paragraph [0013] - paragraph [0017] paragraph [0020] paragraph [0023] paragraph [0031] - paragraph [0033] figures 1,5	1-4,7-9, 13-15 5,6, 10-12
Y	----- EP 2 712 156 A1 (LG ELECTRONICS INC [KR]) 26 March 2014 (2014-03-26) paragraph [0144] ----- -/-	5,6

☒ 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

4 August 2017

Date of mailing of the international search report

11/08/2017

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

Authorized officer

Banerjea, Robin

INTERNATIONAL SEARCH REPORT

International application No

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