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(54) **SYSTEM AND METHOD FOR  
INTEGRATING VOICE WITH A MEDICAL  
DEVICE**

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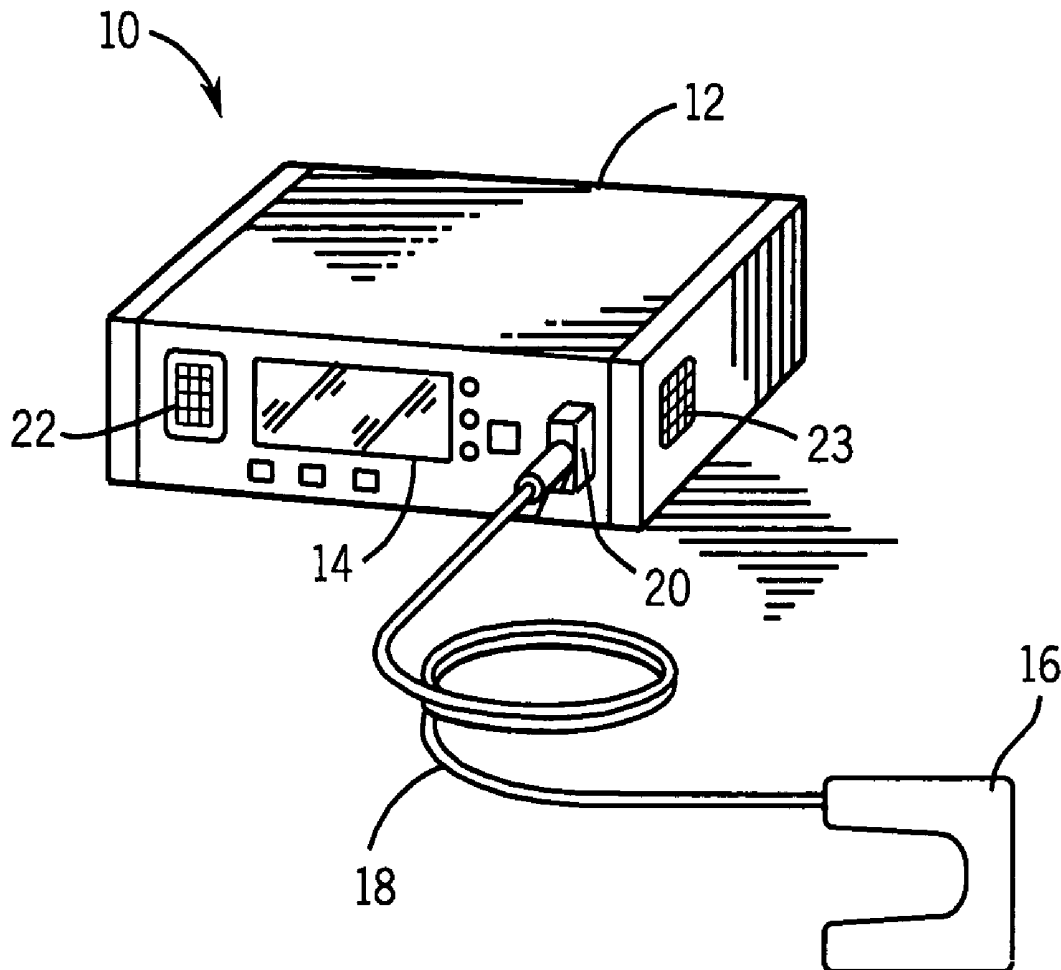
(57) **ABSTRACT**

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There is provided a system and method for integrating voice with a medical device. More specifically, in one embodiment, there is provided a medical device comprising a speech recognition system configured to receive a processed voice, compare the processed voice to a speech database, identify a command for the medical device corresponding to the processed voice based on the comparison, and execute the identified medical device command.

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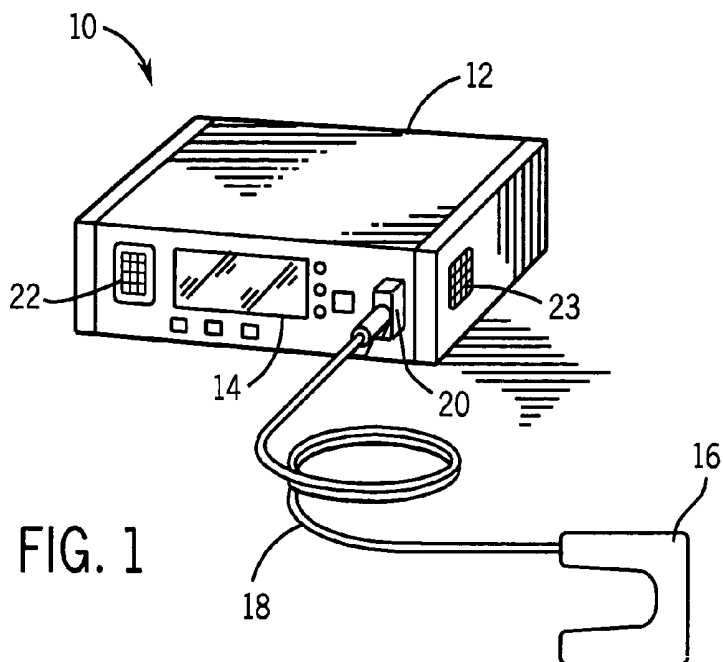


FIG. 1

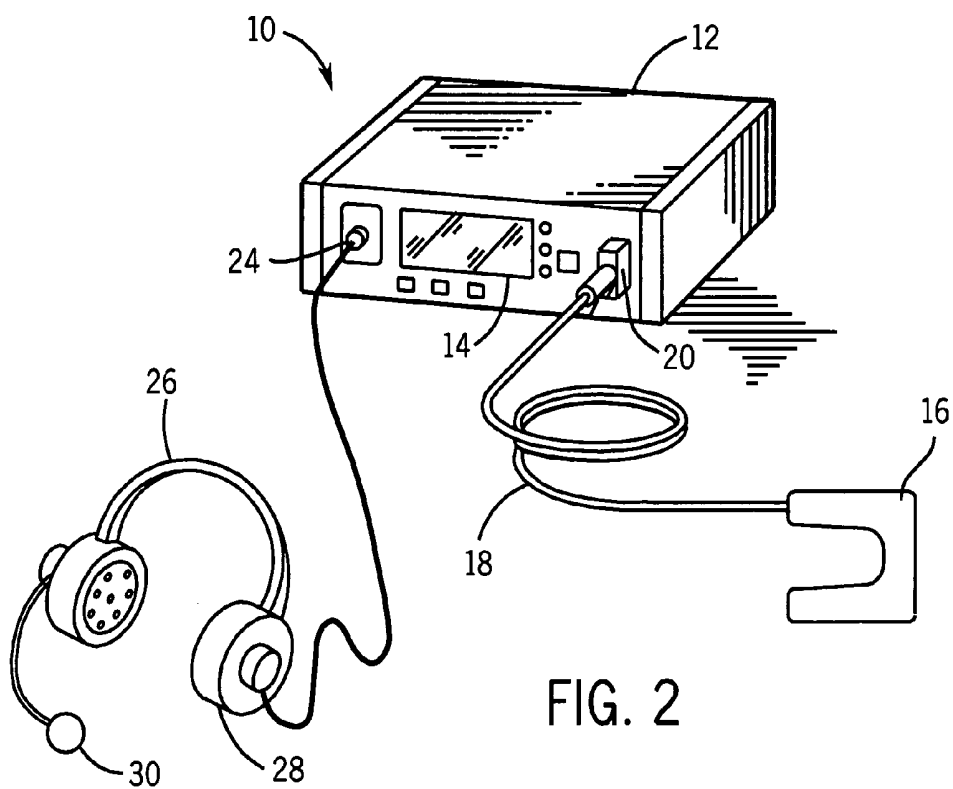


FIG. 2

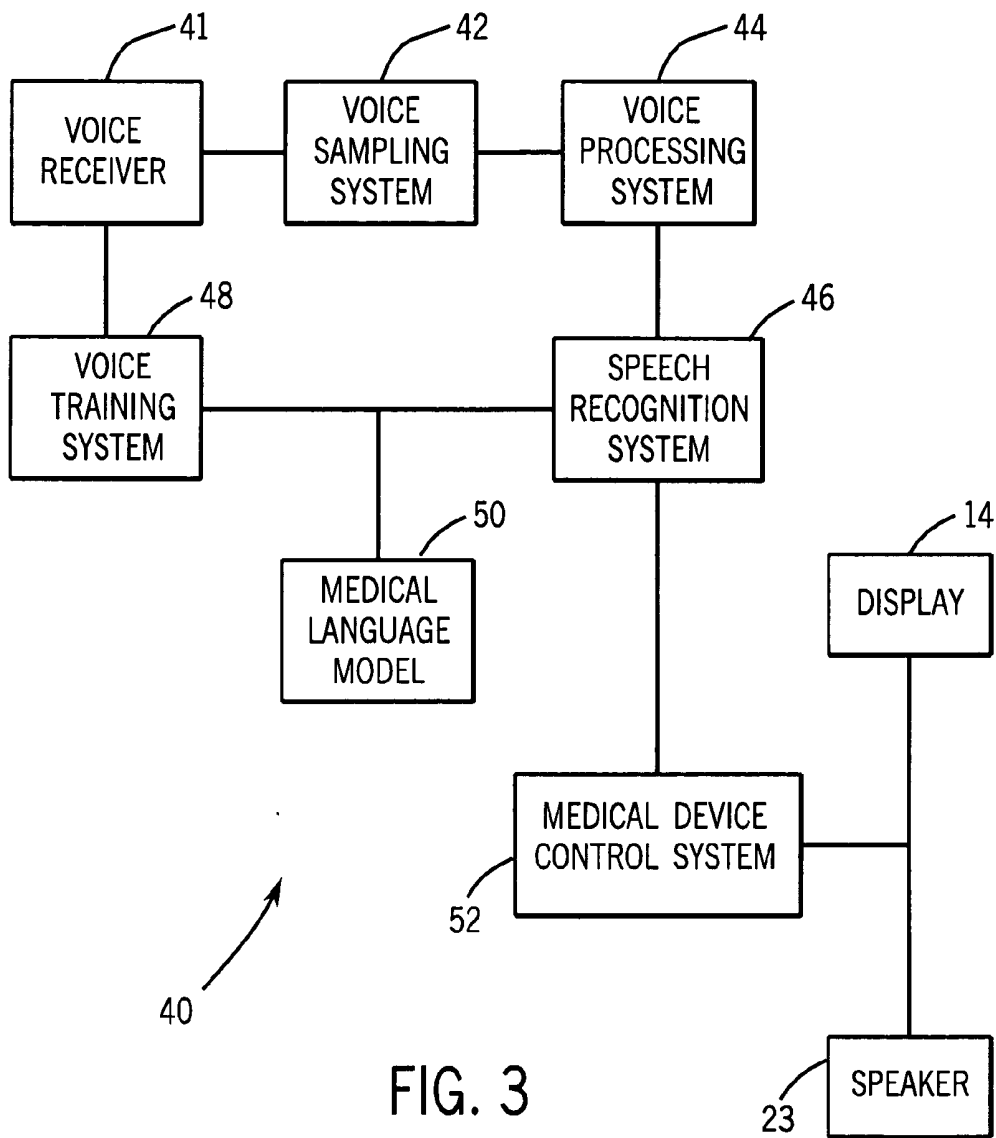


FIG. 3

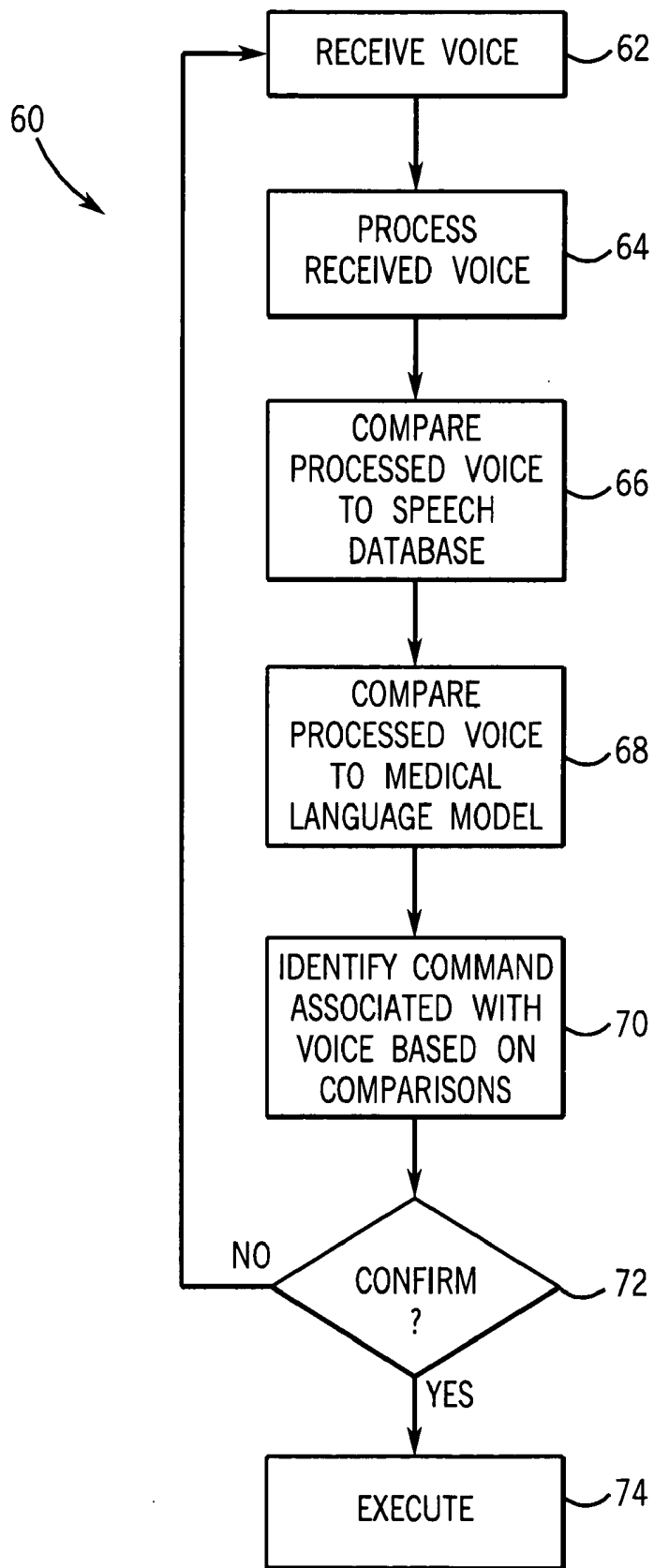


FIG. 4

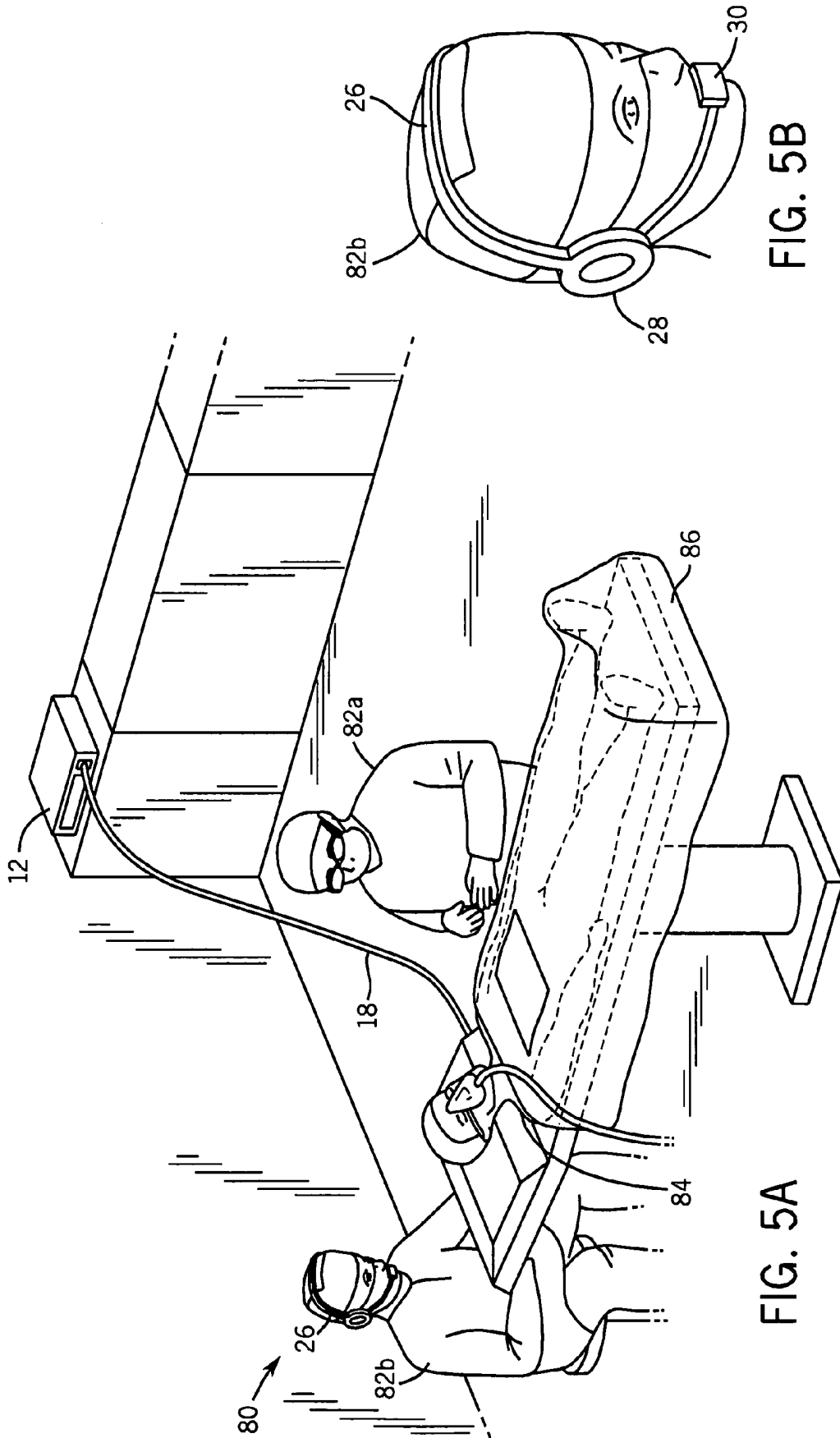


FIG. 5B

FIG. 5A

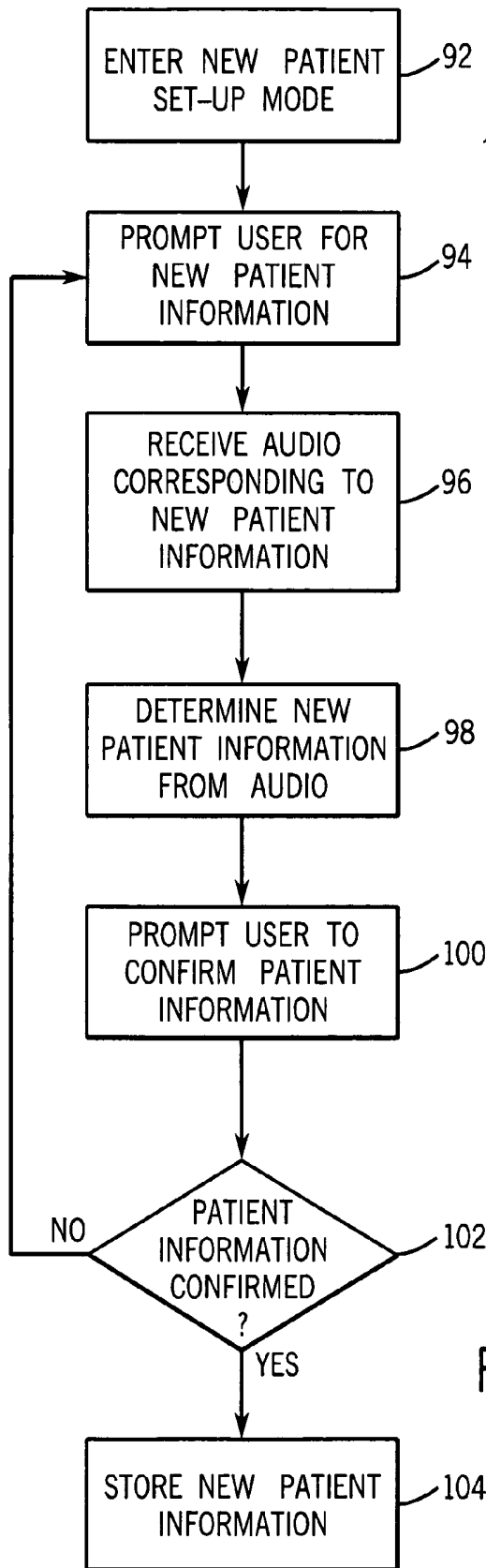


FIG. 6

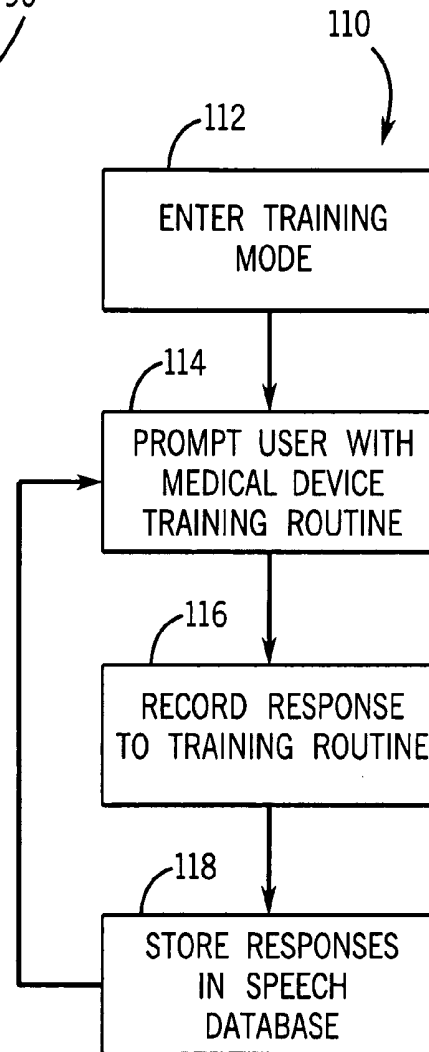


FIG. 7

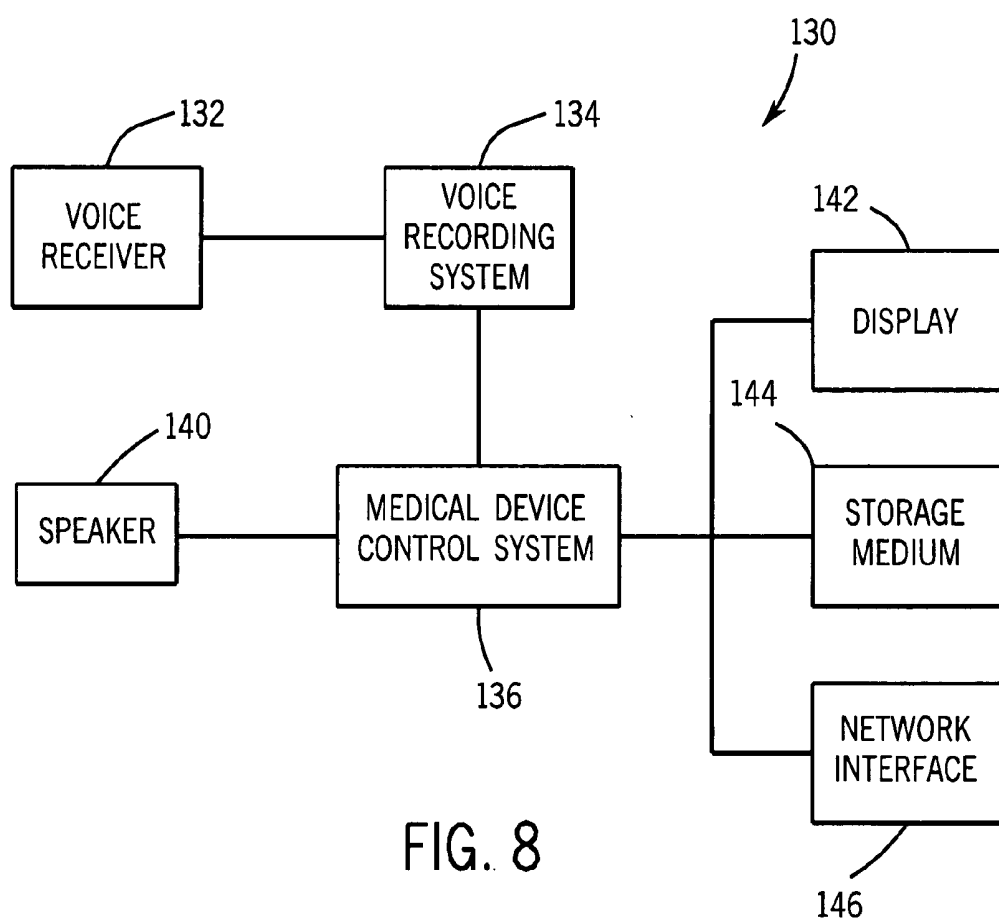


FIG. 8

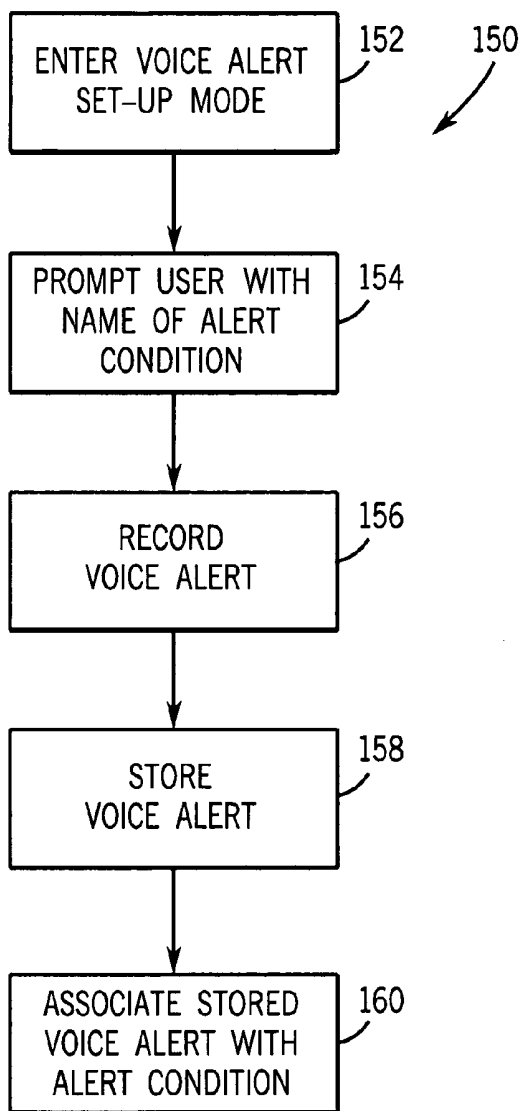


FIG. 9

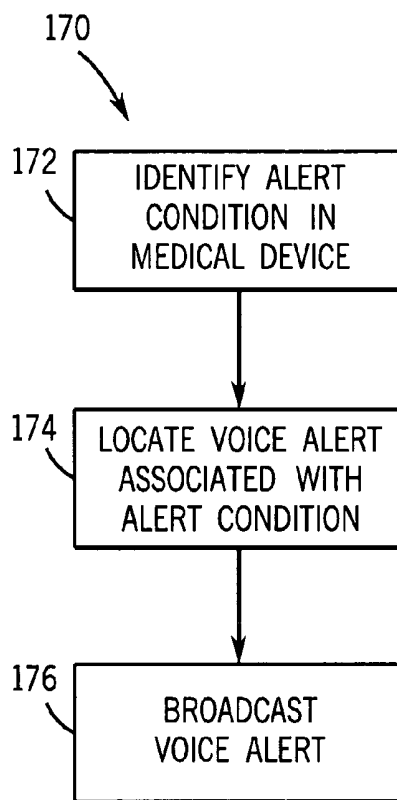


FIG. 10

## SYSTEM AND METHOD FOR INTEGRATING VOICE WITH A MEDICAL DEVICE

### BACKGROUND OF THE INVENTION

**[0001]** 1. Field Of The Invention

**[0002]** The present invention relates generally to medical devices and, more particularly, to integrating voice controls and/or voice alerts into the medical device.

**[0003]** 2. Description Of The Related Art

**[0004]** This section is intended to introduce the reader to various aspects of art that may be related to various aspects of the present invention, which are described and/or claimed below. This discussion is believed to be helpful in providing the reader with background information to facilitate a better understanding of the various aspects of the present invention. Accordingly, it should be understood that these statements are to be read in this light, and not as admissions of prior art.

**[0005]** In the field of medicine, doctors often desire to monitor certain physiological characteristics of their patients. Accordingly, a wide variety of devices have been developed for monitoring physiological characteristics. Such devices provide caregivers, such as doctors, nurses, and/or other healthcare personnel, with the information they need to provide the best possible healthcare for their patients. As a result, such monitoring devices have become an indispensable part of modern medicine.

**[0006]** For example, one technique for monitoring certain physiological characteristics of a patient is commonly referred to as pulse oximetry, and the devices built based upon pulse oximetry techniques are commonly referred to as pulse oximeters. Pulse oximetry may be used to measure various blood flow characteristics, such as the blood-oxygen saturation of hemoglobin in arterial blood, the volume of individual blood pulsations supplying the tissue, and/or the rate of blood pulsations corresponding to each heartbeat of a patient.

**[0007]** Pulse oximeters and other medical devices are typically mounted on stands that are positioned around a patient's bed or around an operating room table. When a caregiver desires to command the medical device (e.g., program, configure, and so-forth) they manipulate controls or push buttons on the monitoring device itself. The medical device typically provides results or responses to commands on a liquid crystal display ("LCD") screen mounted in an externally visible position within the monitoring device.

**[0008]** This conventional configuration, however, has several disadvantages. First, as described above, this conventional configuration relies upon physical contact with the monitoring device to input commands (e.g., pushing a button, turning a knob, and the like). Such physical contact, however, raises several concerns. Among these concerns are that in making contact with the medical device, the caregiver may spread illness or disease from room to room. More specifically, a caregiver may accidentally deposit germs (e.g., bacteria, viruses, and so forth) on the medical device while manipulating the device's controls. These germs may then be spread to the patient when a subsequent caregiver touches the medical device and then touches the patient. Moreover, if the medical device is moved from one patient room to another, germs transferred to the medical device via touch may be carried from one patient room to another. Even in operating rooms where medical devices are typically

static, germs may be transferred onto a medical device during one surgery and subsequently transferred off the medical device during a later performed surgery.

**[0009]** Second, beyond contamination, monitoring devices that rely on physical contact for command input may clutter the caregiver's workspace. For example, because the medical device must be within an arm's length of the caregiver, the medical device may crowd the caregiver—potentially even restricting free movement of the caregiver. In addition, caregivers may have difficulty manipulating controls with gloved hands. For example, it may be difficult to grasp a knob or press a small button due to the added encumbrance of a latex glove.

**[0010]** Third, current trends in general medical device design focus on miniaturizing overall medical device size. However, as controls which rely on physical contact must be large enough for most, if not all, caregivers to manipulate with their hands, medical devices that employ these types of controls are limited in their possible miniaturization. For example, even if it were possible to produce a conventional oximeter that was the size of a postage stamp, it would be difficult to control this theoretical postage stamp-sized pulse oximeter with currently available techniques.

**[0011]** In addition, conventional techniques for outputting medical data also have several potential drawbacks. For example, as described above, conventional techniques for displaying outputs rely on LCD screens mounted on the medical device itself. Besides constantly consuming power, these LCD screens must be large enough to be visually accessed by a doctor or nurse. As such, the conventional LCD screens employed in typical medical devices also may be a barrier towards miniaturization of the medical device. Further, conventional screen-based output techniques may be impersonal to the patient and may lack configurability by the caregiver.

**[0012]** For at least the reasons set forth above, an improved system or method for interacting with a medical monitoring device would be desirable.

### BRIEF DESCRIPTION OF THE DRAWINGS

**[0013]** Advantages of the invention may become apparent upon reading the following detailed description and upon reference to the drawings in which:

**[0014]** FIG. 1 is a diagrammatical representation of a pulse oximeter featuring an integral microphone in accordance with one embodiment of the present invention;

**[0015]** FIG. 2 is a diagrammatical representation of a pulse oximeter featuring an external microphone in accordance with one embodiment of the present invention;

**[0016]** FIG. 3 is a block diagram of a medical device configured for voice control in accordance with one embodiment of the present invention;

**[0017]** FIG. 4 is a flow chart illustrating an exemplary technique for processing a voice command in accordance with one embodiment of the present invention;

**[0018]** FIG. 5A illustrates an exemplary operating room employing a medical device configured for voice control in accordance with one embodiment of the present invention;

**[0019]** FIG. 5B illustrates an enlarged view of a caregiver employing a medical device configured for voice control in accordance with one embodiment of the present invention;

[0020] FIG. 6 is a flow chart illustrating an exemplary technique for setting up a patient record in a medical device in accordance with one embodiment of the present invention;

[0021] FIG. 7 is a flow chart illustrating an exemplary technique for training a voice system in a medical device in accordance with one embodiment of the present invention;

[0022] FIG. 8 is a block diagram of a medical device configured to broadcast voice alerts in accordance with one embodiment of the present invention;

[0023] FIG. 9 is a flow chart illustrating an exemplary technique for setting up a voice alert in accordance with one embodiment of the present invention; and

[0024] FIG. 10 is a block diagram illustrating an exemplary technique for broadcasting a voice alert in accordance with one embodiment of the present invention.

#### DETAILED DESCRIPTION OF SPECIFIC EMBODIMENTS

[0025] One or more specific embodiments of the present invention will be described below. In an effort to provide a concise description of these embodiments, not all features of an actual implementation are described in the specification. It should be appreciated that in the development of any such actual implementation, as in any engineering or design project, numerous implementation-specific decisions must be made to achieve the developers' specific goals, such as compliance with system-related and business-related constraints, which may vary from one implementation to another. Moreover, it should be appreciated that such a development effort might be complex and time consuming, but would nevertheless be a routine undertaking of design, fabrication, and manufacture for those of ordinary skill having the benefit of this disclosure.

[0026] Turning initially to FIG. 1, an exemplary pulse oximeter featuring an integral microphone in accordance with one embodiment is illustrated and generally designated by the reference numeral 10. The pulse oximeter 10 may include a main unit 12 that houses hardware and/or software configured to calculate various physiological parameters. As illustrated, the main unit 12 may include a display 14 for displaying the calculated physiological parameters, such as oxygen saturation or pulse rate, to a caregiver or patient. In alternate embodiments, as described in further detail below, the display 14 may be omitted from the main unit 12.

[0027] The pulse oximeter 10 may also include a sensor 16 that may be connected to a body part (e.g., finger, forehead, toe, or earlobe) of a patient or a user. The sensor 16 may be configured to emit signals or waves into the patient's or user's tissue and detect these signals or waves after dispersion and/or reflection by the tissue. For example, the sensor 16 may be configured to emit light from two or more light emitting diodes ("LEDs") into pulsatile tissue (e.g., finger, forehead, toe, or earlobe) and then detect the transmitted light with a light detector (e.g., a photodiode or photo-detector) after the light has passed through the pulsatile tissue.

[0028] As those of ordinary skill in the art will appreciate, the amount of transmitted light that passes through the tissue generally varies in accordance with a changing amount of blood constituent in the tissue and the related light absorption. On a beat-by-beat basis, the heart pumps an incremental amount of arterial blood into the pulsatile tissue, which then drains back through the venous system. The amount of

light that passes through the blood-perfused tissue varies with the cardiac-induced cycling arterial blood volume. For example, when the cardiac cycle causes more light-absorbing blood to be present in the tissue, less light travels through the tissue to strike the sensor's photo-detector. These pulsatile signals allow the pulse oximeter 10 to measure signal continuation caused by the tissue's arterial blood, because light absorption from other tissues remains generally unchanged in the relevant time span.

[0029] In alternate embodiments, the sensor 16 may take other suitable forms beside the form illustrated in FIG. 1. For example, the sensor 16 may be configured to be clipped onto a finger or earlobe or may be configured to be secured with tape or another static mounting technique. The sensor 16 may be connected to the main unit 12 via a cable 18 and a connector 20.

[0030] The pulse oximeter 10 may also include an integral microphone 22. As will be described further below, the integral microphone 22 may be configured to receive voice commands from a caregiver or user that can be processed into commands for the pulse oximeter 10. Although FIG. 1 illustrates the integral microphone 22 as being located on a front facade of the main unit 12, it will be appreciated that in alternate embodiments, the integral microphone 22 may be located at another suitable location on or within the main unit 12.

[0031] The pulse oximeter 10 may also include a speaker 23. As will be described further below, the speaker 23 may be configured to broadcast voice alerts or other suitable types of alerts to a caregiver or user. Although FIG. 1 illustrates the speaker 23 as being located on a side facade of the main unit 12, it will be appreciated that in alternate embodiments, the speaker 23 may be located at another suitable location on or within the main unit 12.

[0032] Turning next to FIG. 2, another embodiment of the exemplary pulse oximeter 10 featuring an external microphone and speaker in accordance with one embodiment is illustrated. For simplicity, like reference numerals have been used to designate those features previously described in regard to FIG. 1. As illustrated, the pulse oximeter 10 of FIG. 2 also includes the main unit 12, the screen 14, the sensor 16, the cable 18, and the connector 20. However, in place of or in addition to the integral microphone 22, the pulse oximeter 10 illustrated in FIG. 2 may also include an audio connector 24 suitable for coupling a headset 26 to the main unit 12.

[0033] As illustrated in FIG. 2, the headset 26 may include one or more speakers 28 and an external microphone 30. As will be described further below, the one or more external speakers 28 may be employed by the pulse oximeter 10 to broadcast voice alerts or other suitable alerts to a caregiver or user. In addition, the external microphone 30 may be employed to receive voice commands for the pulse oximeter 10, as described further below.

[0034] FIG. 3 is a block diagram of an exemplary medical device 40 configured for voice control in accordance with one embodiment. For simplicity, like reference numerals have been used to designate those features previously described with regard to FIGS. 1 and 2. In one embodiment, the pulse oximeter 10 set forth in FIGS. 1 and/or 2 may comprise the medical device 40. As illustrated in FIG. 3, the medical device 40 may include a plurality of modules (blocks 41-52). These modules may be hardware, software, or some combination of hardware and software. Addition-

ally, it will be appreciated that the modules shown in FIG. 3 are merely one exemplary embodiment and other embodiments can be envisaged wherein the module functions are split up differently or wherein some modules are not included or other modules are included.

[0035] As illustrated in FIG. 3, the medical device 40 may include a voice receiver 41. The voice receiver 41 may include any suitable form of microphone or voice recording device, such as the integral microphone 22 (as illustrated in FIG. 1) or the external microphone 30 (as illustrated in FIG. 2). As those of ordinary skill in the art will appreciate, the voice receiver 41 may be configured to receive a voice (i.e., an acoustic wave) and to convert the voice into an electronic analog waveform.

[0036] The voice receiver 41 may be configured to transmit the analog waveform to a voice sampling system 42. The voice sampling system 42 may be configured to sample the analog waveform to create digital voice data. For example, in one embodiment, the voice sampling system 42 may be configured to sample the electronic analog waveform 16,000 times per second to create a digital waveform of pulse amplitudes. In alternate embodiments, other suitable sampling techniques may be employed.

[0037] The voice processing system 44 may be configured to receive the digital waveform from the voice sampling system 42 and to convert the digital waveform into frequencies that can be recognized by a speech recognition system 46. In one embodiment, the voice processing system 44 may be configured to perform a fast fourier transform on the incoming digital waveform to generate a plurality of frequencies. The voice processing system 44 may then transmit the plurality of frequencies to the speech recognition system 46.

[0038] The speech recognition system 46 may be pre-populated or programmed with a plurality of frequency combinations that are associated with commands for the medical device 40. For example, frequency combinations associated with the voice command "turn off alarm" may be associated with a command for the medical device 40 to silence an alarm. As mentioned above, in one embodiment, the particular frequency combinations may be pre-programmed or pre-configured. However, in alternate embodiments, the frequency combinations may be programmed into the speech database via a voice training system 48, which will be described in greater detail below.

[0039] In addition, the speech recognition system 46 may also be coupled to a medical language model 50. The medical language model 50 may be programmed with a plurality of command combinations that are prevalently used in controlling the medical device 40. For example, if the medical device 40 were an oximeter, such as the pulse oximeter 10, the medical language model 50 may store command combinations such as "turn oximeter off," "turn alarm off," "adjust volume," "pause alarms," and so-forth. In this way, the medical language model 50 may assist the speech recognition system 46 in determining the medical command associated with a particular voice command.

[0040] More specifically, in one embodiment, the medical language model 50 may assist the speech recognition system 46 in determining the proper medical command when the speech recognition system 46 is able to recognize some portion but not all of a voice command. For example, if the speech recognition system 46 is able to recognize the first and third words of the medical command "turn off alarms,"

but is unable to recognize the second word, the speech recognition system 46 may search the medical language model 50 for command combinations matching the recognized terms (i.e., "turn" and "alarms"). Because the medical language model 50 may be programmed with only those commands relevant to the operation of the medical device 40, the medical language model 50 enables the successful recognition of medical commands that would otherwise be unrecognizable by conventional, generic voice recognition systems. The medical language model 50 may be pre-programmed, may be programmed through the voice training system 48, or may be programmed via an external computer (not shown).

[0041] Upon recognizing a voice command as a command for the medical device 40, the speech recognition system 44 may be configured to transmit the command to a pulse medical device system 52. As will be appreciated by those with ordinary skill in the art, the medical device control system 52 may be configured to control the medical device. For example, if the medical device 40 were the pulse oximeter 10, the control system 52 would be configured to control the main unit 12 as well as the sensor 16 to produce physiological monitoring results and/or alarms, which may be transmitted to the display 14 or the speaker 23.

[0042] Turning next to FIG. 4, a flow chart illustrating an exemplary technique for processing a voice command in accordance with one embodiment is illustrated and generally designated by a reference numeral 60. In one embodiment, the technique 60 may be employed by the medical device 40 (as illustrated in FIG. 3) or the pulse oximeter 10 (as illustrated in FIGS. 1 and 2). It will be appreciated, however, that the technique 60 may also be employed by any other suitable type of medical device including, but not limited to, other forms of monitors, respirators, or scanners.

[0043] As illustrated by block 62 of FIG. 4, the technique 60 may begin by receiving a voice (i.e., a portion of spoken audio). For example, in one embodiment, the pulse oximeter 10 may receive the voice via the microphone 23 or the microphone 30. After receiving the voice, the technique 60 may include processing the received voice, as indicated in block 64. In one embodiment, processing the received voice may include converting the received voice into one or more frequencies that can be recognized by a speech recognition system, such as the speech recognition system 46 illustrated in FIG. 3.

[0044] The technique 60 may also include comparing the processed voice with a speech database and/or a medical language model, as indicated by blocks 66 and 68, and as described above with regard to FIG. 3. For example, in one embodiment, blocks 66 and 68 may include comparing the processed voice to a speech database within the speech recognition system 46 and/or the medical language model 50.

[0045] After performing one or more of these comparisons, the technique 60 may involve identifying a medical device command associated with the processed voice based upon the one or more of the comparisons, as indicated by block 70. For example, if comparisons to the speech database and/or the medical language model indicate that the processed voice is a command to "turn off alarms," then technique 60 may involve identifying the medical device command as a command to turn off the medical device's alarms.

[0046] Next, after identifying the medical device command, the technique 60 may include prompting a user (e.g., the caregiver ) to confirm the new patient information was correctly determined, as indicated by block 72. For example, in one embodiment, the pulse oximeter 10 may display the identified command on the display 14 and prompt the user to confirm the correctness of the identified command. If the user does not confirm the command (block 72), the technique 60 may cycle back to block 62 (see above) and re-prompt the user for the new patient information. If, however, the user confirms the command, the technique may execute the command, as indicated by block 74. For example, in one embodiment, the user may confirm the command by speaking the word “yes” or the word “execute” in response to the displayed command.

[0047] As described above, the pulse oximeter 10 and/or the medical device 40 may be employed in a variety of suitable medical procedures and/or environments. For example, FIG. 5A illustrates an exemplary operating room setting 80 employing the pulse oximeter 10 in accordance with one embodiment. As illustrated in FIG. 5A, the operating room 80 may include a first caregiver 82a, a second caregiver 82b, and a patient 84. In addition, the operating room 80 may also include an operating table 86 and the pulse oximeter 10.

[0048] As illustrated, the caregiver 82b may employ and/or interact with the pulse oximeter 10 by wearing the headset 26. As highlighted in FIG. 5B, which illustrates an enlarged view of the caregiver 82b, the caregiver 82b may place the speaker 28 over his or her ear and place the external microphone 30 over his or her mouth. In this way, the caregiver 82b may receive alerts and issue commands from and to the main unit 12 via the headset 26. Advantageously, the functionality enables the main unit 12 to be placed at a remote location in the operating room 80 such that the main unit 12 does not crowd the medical procedure taking place in the operating room 80. However, those with ordinary skill in the art will appreciate that the embodiment set forth in FIGS. 5A and 5B is merely exemplary, and, as such, not intended to be exclusive. Accordingly, in alternate embodiments, the pulse oximeter 10 and/or the medical device 40 may be employed in any one of a number of suitable medical environments.

[0049] As described above, the pulse oximeter 10 and/or the medical device 40 may be configured to receive voice commands. Additionally, however, the pulse oximeter 10 and/or the medical device 40 may also be configured to enable entry of patient information by voice. For example, FIG. 6 is a flow chart illustrating an exemplary technique 90 for setting up a patient record in a medical device in accordance with one embodiment. In one embodiment, the technique 90 may be executed by the pulse oximeter 10 and/or the medical device 40.

[0050] As indicated by block 92 of FIG. 6, the technique 90 may begin by entering a new patient setup mode, as indicated by block 92. Next, the technique 90 may involve prompting a user for new patient information, as indicated by block 94. In one embodiment, prompting the user for new patient information may include displaying a message to the user on the display 14 (see FIGS. 1-3). Alternatively, prompting the user may involve an audio or voice prompt, as described further below, or another suitable form of user notification.

[0051] Next, the technique 90 may include receiving audio corresponding to the new patient information, as indicated by block 96. In one embodiment, audio corresponding to the new patient information may be received over the internal microphone 22 and/or the external microphone 30. For example, the external microphone 30 may receive patient information, such as patient name, age, and so-forth from the caregiver 82b wearing the headset 26. After receiving the audio corresponding to the new patient information, the technique 90 may involve determining the new patient information from the received audio, as indicated by block 98. In one embodiment, determining the new patient information may include processing the received audio and comparing the received audio to a speech database and/or medical language model, as described above with regard to FIGS. 3 and 4.

[0052] After determining the new patient information from the received audio, the technique 90 may include prompting a user (e.g., the caregiver 82b) to confirm the new patient information was correctly determined, as indicated by block 100. For example, in one embodiment, the pulse oximeter 10 may display the determined patient information on the display 14 and prompt the user to confirm the correctness of the determined patient information with a voice command (e.g., “correct,” “yes,” and so-forth). If the user does not confirm the new patient information (block 102), the technique 90 may cycle back to block 94 (see above) and re-prompt the user for the new patient information.

[0053] Alternatively, if the user does confirm the determined new patient information, the technique 90 may include storing the new patient information, as indicated by block 104. For example, in one embodiment, storing the new patient information may include storing the patient’s name, age, and so-forth in a memory located within the pulse oximeter 10 and/or the medical device 40.

[0054] As described above, one or more embodiments described herein is directed towards a medical device configured to receive voice commands. Accordingly, FIG. 7 illustrates a technique 110 that may be employed to train a voice system in a medical device in accordance with one embodiment. In one embodiment, the technique 110 may be employed by the pulse oximeter 10 and/or the medical device 40. More specifically, in one embodiment, the technique 110 may be executed by the voice training system 48 of FIG. 3. However, it will be appreciated, that in alternate embodiments, other suitable medical devices may employ the technique 110.

[0055] As illustrated by block 112 of FIG. 7, the technique 110 may begin by entering a training mode. In one embodiment, the medical device 40 may be configured to enter a training mode in response to a depressed button or a sequence of depressed buttons on the medical device 40. Alternatively, in other embodiments, the pulse oximeter 10 and/or the medical device 40 may be configured to enter the training mode in response to a voice command and/or other suitable form of command or instruction.

[0056] After entering the training mode, the technique 110 may include prompting a user with a medical device training routine, as indicated by block 114. The medical device training routine may involve displaying one or more medical device specific words, phrases, or commands on the display 14. For example, the pulse oximeter 10 may be configured

to display commands such as “turn off alarms,” “turn down volume,” “show pleth,” or any other suitable voice command or instruction.

[0057] After prompting the user, as described above, the technique 110 may include recording a response to the training routine, as indicated by block 116. For example, the pulse oximeter 10 and/or the medical device 40 may be configured to record the response to the training routine via the external microphone 30. After recording the response to the training routine, the technique 110 may include storing the response in a speech database, such as the speech database within the speech recognition system 46. After storing the response in the speech database, the technique 110 may cycle back to block 114 and repeat the training routine with additional words, phrases, or comments. In one embodiment, medical device 40 may be configured to cycle through blocks 114, 116, and 118 for each of a predefined group of words and instructions stored within the voice training system 48.

[0058] Turning next to another embodiment, FIG. 8 is a block diagram of a medical device 130 configured to broadcast voice alerts in accordance with one embodiment. As those of ordinary skill in the art will appreciate, conventional medical devices are configured to use buzzes and/or beeps to indicate medical alerts or alarms (hereafter referred to collectively as “alerts”). In addition to disturbing patients and medical practitioners (and possibly breaking a medical professional’s concentration), these buzzes and beeps typically provide no other useful information to a listener other than indicating the presence of an alert condition. Advantageously, the medical device 130 illustrated in FIG. 8 is configured to produce custom voice alerts that can advantageously provide detailed information about the alert conditions while at the same time being less jarring and/or abrasive than traditional medical device alerts.

[0059] The medical device 130 may include a voice receiver 132, such as the microphone 22 or the microphone 30 (FIGS. 1-2). As will be appreciated, the voice receiver 132 may be configured to receive audio patterns that may be employed to create voice alerts. The medical device 130 may also include a voice recording system 134 that may be configured to receive audio from the voice receiver 132 and to record the received audio.

[0060] The voice recording system 134 may be coupled to a medical device control system 136 that may be configured to receive the recorded audio and to store or play it when appropriate, to produce voice alerts. For example, the medical device control system 136 may be configured to play an appropriate voice alert over a speaker 140. In addition, the medical device control system 136 may be coupled to a display 142. As will be appreciated, the display 142 may be configured to display instructions to a user during setup of the voice alerts as well as for other suitable user notifications.

[0061] Further, the medical device control system 136 may also be coupled to a storage medium 144. In one embodiment, the storage medium 144 is configured to store the recorded audio in an indexed format, such as a look-up table, link list, and so-forth, such that a portion of recorded audio may be associated with one or more alert conditions. As such, in this embodiment, the medical device control system 136, upon detecting an alert condition, may access

the stored portion of recorded audio corresponding to the alert condition and then broadcast the portion of audio over the speaker 130.

[0062] As illustrated, the medical device 130 may also include a network interface 146. The network interface 146 may be configured to enable the medical device control system 136 to communicate with other computers or computerized devices over a network. In this capacity, the network interface 146 may allow the medical device control system 136 to download and/or upload portions of audio for use as voice alerts.

[0063] As described above, one or more of the embodiments set forth herein may be directed towards a medical device configured to produce voice alerts. Accordingly, FIG. 8 is a flow chart illustrating an exemplary technique 150 for setting up a voice alert in accordance with one embodiment. As such, in one embodiment, the technique 150 may be executed by the medical device 130.

[0064] As illustrated by block 152 of FIG. 9, the technique 150 may begin by entering a voice alert setup mode. In various embodiments, entering a voice alert setup mode may be triggered by a voice command to the medical device 130, by physically manipulating one or more buttons on the medical device 130, or by another suitable technique. After entering the voice alert setup mode, the technique 150 may include prompting a user with a name of an alert condition. In one embodiment, the medical device 130 may prompt a user with a name of the alert condition by displaying the name of the alert condition on the display 142.

[0065] Next, the technique 150 may include recording a voice alert corresponding to the prompted alert condition. More specifically, in response to the prompt on the display 142, a user would speak the voice alert, which would subsequently be recorded as part of the technique 150. After recording the voice alert, technique 150 may include storing the voice alert (block 158) and associating the stored voice alert with the alert condition (block 160). For example, in one embodiment, the voice alert may be stored in the storage medium 144 and the medical device control system 136 may be configured to associate the stored voice alert with one or more of its alert conditions.

[0066] As described above, medical device 130 may be configured to broadcast voice alerts. Accordingly, FIG. 10 is a flow chart illustrating an exemplary technique 170 for broadcasting a voice alert in accordance with one embodiment. As shown, the technique 170 may begin by identifying an alert condition in the medical device 130. For example, in one embodiment, the medical device control system 136 may be configured to identify an alert condition, such as signal or power loss, as indicated by block 172.

[0067] Upon identifying the alert condition, the technique 170 may include locating a voice alert associated with the alert condition. For example, in one embodiment, the medical device control system 136 may locate a voice alert stored in the storage medium 144 that is associated with the alert condition. Lastly, the technique 170 may include broadcasting the voice alert, as indicated by block 176. For example, in one embodiment, the medical device control system 136 may be configured to broadcast the voice alert over the speaker 140.

[0068] While the invention may be susceptible to various modifications and alternative forms, specific embodiments have been shown by way of example in the drawings and have been described in detail herein. However, it should be

understood that the invention is not intended to be limited to the particular forms disclosed. Rather, the invention is to cover all modifications, equivalents, and alternatives falling within the spirit and scope of the invention as defined by the following appended claims. Indeed, the present techniques may not only be applied to pulse oximeters, but also to other suitable medical devices. For example, the embodiments set forth herein may also be employed in respirators, ventilators, EEGs, medical cutting devices, and so-forth.

What is claimed is:

1. A medical device comprising:
  - a speech recognition system configured to:
    - receive a processed voice;
    - compare the processed voice to a speech database;
    - identify a command for the medical device corresponding to the processed voice based on the comparison; and
    - execute the identified medical device command.
2. The medical device, as set forth in claim 1, comprising a tangible machine readable medium comprising a medical language model, wherein the speech recognition system is configured to identify the command based on the medical language model.
3. The medical device, as set forth in claim 2, wherein the medical language model comprises a plurality of commands for the medical device.
4. The medical device, as set forth in claim 2, wherein the medical device comprises a pulse oximeter and the medical language model comprises a plurality of pulse oximeter commands.
5. The medical device, as set forth in claim 1, comprising a voice training system configured to populate the speech database.
6. The medical device, as set forth in claim 1, comprising a voice processing system configured to process a received voice to create the processed voice.
7. The medical device, as set forth in claim 6, comprising a headset, wherein the voice processing system is configured to receive the voice from the headset.
8. The medical device, as set forth in claim 6, comprising an integral microphone, wherein the voice processing system is configured to receive the voice from the integral microphone.
9. A method comprising:
  - receiving a processed voice;
  - comparing the processed voice to a speech database;
  - identifying a command for the medical device corresponding to the processed voice based on the comparison; and
  - executing the identified medical device command.
10. The method, as set forth in claim 9, comprising comparing the received voice to a medical language model.
11. The method, as set forth in claim 10, wherein comparing the received voice comprises comparing the received voice to an oximeter language model.
12. A medical device comprising:
  - a control system configured to:
    - identify an alert condition for the medical device;
    - locate a voice alert corresponding to the alert condition; and
    - broadcast the voice alert over a speaker.

13. The medical device, as set forth in claim 12, comprising a voice recording system configured to record a voice alert.

14. The medical device, as set forth in claim 13, comprising a storage medium, wherein the control system is configured to store the recorded voice alert on the storage medium.

15. The medical device, as set forth in claim 12, comprising a network interface, wherein the control system is configured to download the voice alert over the network interface.

16. The medical device, as set forth in claim 12, wherein the medical device comprises a pulse oximeter.

17. A method of broadcasting voice alerts from a medical device, the method comprising:

- prompting a user with a name of a medical alert condition;
- recording a voice alert;
- associating the recorded voice alert with the alert condition; and
- broadcasting the recorded voice alert when the alert condition is detected.

18. The method, as set forth in claim 16, comprising storing the voice alert in a memory.

19. The method, as set forth in claim 16, wherein prompting the user comprises prompting the user with a pulse oximeter alert condition.

20. A method for broadcasting a voice alert from a medical device, the method comprising:

- identifying an alert condition for the medical device;
- locating a voice alert corresponding to the alert condition; and
- broadcasting the voice alert over a speaker.

21. The method, as set forth in claim 20, wherein identifying the alert condition comprises identifying a pulse oximeter alert condition.

22. The method, as set forth in claim 20, wherein locating the voice alert comprises locating a recorded voice alert in a storage medium coupled to the medical device.

23. The method, as set forth in claim 20, wherein locating the voice alert comprises locating a record voice alert on a network via a network interface.

24. The method, as set forth in claim 20, wherein identifying the alert condition comprises identifying a loss of signal from a sensor.

25. A method for programming a medical device with patient information, the method comprising:

- prompting a user for new patient information;
- receiving audio corresponding to the new patient information; and
- determining the new patient information from the audio.

26. The method, as set forth in claim 25, comprising:
 

- prompting the user to confirm the determined new patient information; and
- if the user confirms the new patient information, storing the new patient information in the medical device.

专利名称(译)	用于将语音与医疗设备集成的系统和方法		
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摘要(译)

提供了一种用于将语音与医疗设备集成的系统和方法。更具体地，在一个实施例中，提供了一种医疗设备，包括：语音识别系统，被配置为接收处理后的语音，将处理后的语音与语音数据库进行比较，基于比较识别与处理后的语音对应的医疗设备的命令。并执行识别的医疗设备命令。

