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(71) Applicant: I-FLOW CORPORATION [US/US]; 20202 Window Drive, Lake Forest, CA 92630 (US).

(72) Inventors: VASKO, Robert, S.; 20202 Window Drive, Lake Forest, CA 92630 (US). MASSENGALE, Roger; 20202 Window Drive, Lake Forest, CA 92630 (US).

(74) Agent: NATAUPSKY, Steven, J.; Knobbe, Martens, Olson and Bear, LLP, 16th floor, 620 Newport Center Drive, Newport Beach, CA 92660 (US).

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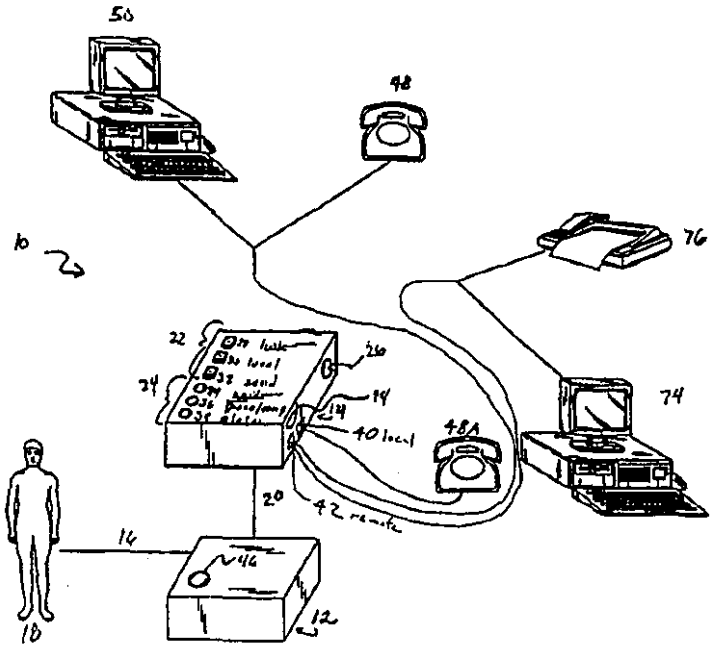

(57) Abstract

A remotely programmable and accessible medical device system (10) including an interface unit (14) and a medical device (12) connected to a patient (18) is disclosed. Through a transceiver, such as a telephone (48) or computer (50), a person may obtain status reports from a remotely located medical device in audible, electronic or paper form. In addition, the person may change a protocol associated with the medical device or be alerted to a remote location of an alarm associated with the medical device.

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METHOD AND APPARATUS FOR MONITORING A PATIENT

Field of the Invention

The present invention relates to a remotely accessible health care system for medical applications. More particularly, the present invention relates to a system associated with a patient medical device which permits a healthcare provider located remote from the patient that permits the provider to monitor the patient's current medical condition status and with the capability of editing the patient's protocol, documents changes to the patient's protocol, and notifies the care provider of alarm conditions.

Background of the Invention

Due to rising health costs, the high costs of hospital rooms, the desire to provide comfort and convenience to patients, the medical industry has promoted in-home care for patients suffering from various maladies. Many patients must be connected to various medical devices. These medical devices frequently monitor certain parameters of the patient's health and have controls which must be adjusted due to changes in the patient's needs. Therapy changes may also require that entire protocols be programmed. In early versions of these medical devices, the physical presence of a care provider was required to adjust the device's protocol. Such reprogramming is costly and time-consuming.

In addition, healthcare providers such as hospitals, and health insurance agencies paying for healthcare now often require documentation supporting all medical procedures. For example, a health insurance agency may require that a patient prove that specific parameters which measure their health are at a certain level in order for the patient to be reimbursed or the agency may require evidence that the equipment is actually being used as intended. Also, patients or their care givers at home often fail to inform the care provider that an alarm associated with a medical device has occurred and, in certain cases patients may tamper with a device in response to an alarm condition.

Therefore, a need exists for a remotely controllable medical device system that can inform care providers of a patient's status by notifying of alarm conditions and sending status reports to a remote fax or computer of the care provider or other health personnel.

Summary of the Invention

The present invention is directed to a remotely programmable medical device system and a method for remotely programming a medical device system via a remote transceiver that accomplishes the above-stated objectives.

The system of the present invention permits a care provider to obtain, from a remotely located medical device associated with a patient, the patient's status, to change the patient's protocol, or to request documentation by a remote transceiver with a touch-tone keypad after receiving voice-synthesized instructions. This method is simple to use and requires no training; it allows a care provider to perform the above functions wherever a phone is located. If the care provider has access to a computer, he has the option of performing the same functions as with the telephone, described above, but may also view the patient's real time status on the computer screen as it changes by either graphic or tabular form or send a file with the desired parameters to the system to program the medical device.

The care provider computer may also instruct the system to automatically send a status report at set time intervals to a specified location and automatically call the care provider to notify of an alarm condition. Additionally, the system may remotely program multiple medical devices connected to one or more patients or remotely program the protocol of multiple patients in a single programming session by accessing a central data storage location.

To achieve these and other advantages, and in accordance with the purpose of the invention as embodied and broadly described therein, the present invention defines a remotely programmable and accessible medical device system having a programmable protocol, the medical device system being remotely programmable by a remote transceiver, such as a touch-tone phone or computer. Alternatively, the medical device may not have a programmable protocol. For instance, the device may monitor a patient's vital signs only. The remotely programmable medical device system of the present invention comprises a memory for storing a programmable protocol or record of activity and a remote communication port for sending a voice signal to the remote transceiver, sending data to a remote fax or computer, and receiving a remote programming signal from the remote transceiver. The system also comprises a voice storage unit for storing a voice signal and a processor, coupled to: (1) the remote communication port, for processing the programmable protocol in response to receiving the remote programming signal; (2) the voice storage unit for accessing the voice signal from the voice storage unit; and (3) the memory for accessing the programmable protocol from the memory.

In an additional aspect, the present invention comprises a medical device system having a programmable alarm routine stored in a memory. The medical device system comprises a medical device which has a data port and an interface unit coupled to or integral with the medical device data port on the medical device via an interface data port. The interface unit further comprises a voice storage unit for storing a voice signal stating that an alarm condition has occurred and remote communication port for automatically sending the voice signal to the remote touch-tone transceiver or automatically sending data regarding the alarm condition to a remote fax or computer. The interface unit also comprises a processor coupled to: (1) the remote communication port, for processing the alarm condition in response to receiving the medical device alarm signals; (2) the voice storage unit for accessing the voice signal from the voice storage unit; and (3) the memory for accessing the alarm routine from the memory. A signal from the alarm on the medical device is relayed to the interface data port via the medical device data port.

In another aspect, the present invention comprises a remotely programmable medical device system having a programmable protocol stored in a protocol memory, the system being programmable by a remote transceiver. The medical device system comprises an interface unit and at least one medical device, each medical device having a data port and an interface unit coupled to or integral with each data port on the respective medical device via an interface data port. The interface unit further comprises a voice storage unit for storing a voice signal and a remote communication port for sending a voice signal to the remote touch-tone transceiver, sending data to a remote fax or computer, and for receiving a remote programming signal (such as a dual-tone multi-frequency signal in the case of a remote telephone) from the remote transceiver. The interface unit also comprises a processor, coupled to: (1) the remote communication port, for processing the programmable protocol in response to receiving the remote programming signal; (2) the voice storage unit for accessing the voice signal from the voice storage unit; and (3) the

memory for accessing the programmable protocol from the memory. The processed programmable protocol is relayed from the processor to the medical device via the interface data port.

In another aspect, the present invention comprises a remotely programmable medical device system having programmable protocols for multiple patients stored in a central memory location, the system being programmable by a remote transceiver. The system comprises a remote central data storage unit, multiple medical devices connectable with multiple patients, an interface unit for each patient, and each medical device having a data port coupled to a data port on its respective interface unit. Each interface unit comprises a voice storage unit for storing a voice signal and a remote communication port for sending a digital signal to the remote central data storage location, sending data to a remote fax or computer, and for sending and receiving a remote programming signal (such as a digital signal in the case of a computer) from the remote touch-tone transceiver. Each interface unit also comprises a processor, coupled to: (1) its remote communication port, for processing the programmable protocol in response to receiving the remote programming signal; (2) its voice storage unit for accessing the voice signal from its voice storage unit; and (3) its memory for accessing the programmable protocol from its memory. The processed programmable protocol is relayed from the processor to the medical device via the interface data port. The remote central data storage unit comprises: a voice storage unit for storing a voice signal; a first communication port for sending the voice signal to the remote touch-tone transceiver, sending data to a remote fax or computer, and for receiving a remote programming signal from the remote touch-tone transceiver; and a second communication port for sending and receiving signals from the data ports of the medical devices. The remote central data storage unit further comprises a processor, coupled to: (1) the first remote communication port, for processing the programmable protocol in response to receiving the remote programming signal; (2) the second remote communication port, for processing the programmable protocol to be sent to the interface unit of a patient; (3) the voice storage unit for accessing the voice signal from the voice storage unit; and (4) the memory for accessing the programmable protocol from the memory. The processed programmable protocol is relayed from the processor of the remote central data storage unit to the processor of an interface unit via the second remote communication port.

Further objects, features, and advantages of the present invention over the prior art will become apparent from the detailed description of the drawings which follows, when considered with the attached figures.

Brief Description of the Drawings

FIGURE 1 schematically illustrates the medical system of the present invention by which a care provider may remotely access and control a medical device associated with a patient;

FIGURE 2 schematically illustrates an interface arrangement of the system illustrated in Figure 1;

FIGURE 3 is a flow diagram illustrating a general control methodology of the interface;

FIGURE 4 is a flow diagram illustrating a computer programming mode of the system;

FIGURE 5 is a flow diagram illustrating an access code menu of the system;

FIGURE 6 is a flow diagram illustrating an alarm control menu of the system;

FIGURE 7 illustrates the relationship of the diagrams in Figures 7A1, 7A2, and 7A3;

FIGURES 7A1-7A3 are flow diagrams illustrating a portion of a main menu of the system illustrated in Figure 3 as adapted to use with a mechanical ventilator;

FIGURE 7B is a flow diagram illustrating a fax report menu of the system as adapted to use with a mechanical ventilator;

FIGURE 7C is a flow diagram illustrating a send file menu of the system as adapted to use with a mechanical ventilator;

FIGURE 7D is a flow diagram illustrating an edit protocol sub-menu of the system as adapted to use with a mechanical ventilator;

FIGURE 8A is a flow diagram illustrating a portion of a main menu of the system illustrated in Figure 3 as adapted to use with a vital signs monitor;

FIGURE 8B is a flow diagram illustrating a fax report menu of the system as adapted to use with a vital signs monitor; and

FIGURE 8C is a flow diagram illustrating a send file menu of the system as adapted to use with a vital signs monitor.

Detailed Description of the Preferred Embodiment

Reference will now be made in detail to the present preferred embodiment of the invention, examples of which are illustrated in the accompanying drawings. Wherever possible, the same reference numbers will be used throughout the drawings to refer to the same or like parts.

In accordance with the present invention, a remotely programmable medical device system is provided that allows remote programming and communication with a medical device from a remotely located transceiver, such as a push-button telephone or computer. The system includes a memory, a voice storage unit, a remote communication port, and a processor that is coupled to the remote communication port, the voice storage, and the memory. It should be understood herein that the terms "programming," "programmable," and "processing" are generalized terms that refer to a host of operations, functions, and data manipulation. Those terms, therefore, are not limited herein to editing and deleting data, parameters, protocol, and codes. For example, programming and processing, as used herein, may encompass editing, changing, erasing, entering, re-entering, viewing, reviewing, locking, and inserting functions.

An exemplary embodiment of the system of the present invention is shown in FIG. 1 and is designated generally by reference numeral 10. As herein embodied and shown in FIG. 1, the remotely programmable medical device system 10 includes a medical device 12 and an interface unit 14. The medical device preferably includes a patient connection 16, such as a wire through which patient data is transmitted, such as from a sensor.

The interface 14 includes a cable 20 for connecting the interface 14 to the medical device 12, controls 22 for controlling operation of the interface 14, display lights 24 for indicating various conditions of the interface 14, and an internal audio device 26 for providing audio alarm signals. As embodied herein, the controls 22 include a link button 28, a local button 30, and a send button 32. Alternatively, the local button 30 may not be present as will be easily understood by those of skill in the art. The display lights 24 include a wait light 34, a

phone/computer light 36, and an alarm light 38. The function of the controls 22 and the display lights 24 will be described in detail below. The interface 14 also preferably includes a remote communication port 40 and a local communication port 42.

In the alternative to being coupled via wiring 20, the interface 14 and medical device 12 may communicate via an interface data port 44 and a medical device data port 46 each comprising a wireless emitter/detector pair. Preferably, data ports 44, 46 each comprise an infra-red or RF emitter/detector, permitting wireless communication between the medical device 12 and the interface 14. Other wireless communications ports may also be used. A power cable 20 is preferably employed to provide power to the medical device 12 via the interface 14. Alternatively, the medical device may have its own power cable coupled directly to the power source (not shown), as opposed to being connected through the interface 14.

As embodied herein, the remote communication port 42 and the local communication port 40 (if present) each comprise a standard modem, as is well known in the art. The modem may operate at 28800 baud or other baud rates. The system may be arranged so that a care provider located close to the patient, such as at a patient station in a hospital when the patient is in the hospital, can access the interface 14 through the local port 40, such as through a hard wire link. On the other hand, if the care provider is at a location remote from the medical device system 10, the system is preferably arranged so that when the link button 28 is pressed, the remote communication port 42 is activated. In this way, the care provider can communicate with the interface 14 via a remote transceiver such as a telephone 48 or a computer 50. It should be understood that the interface 14 may be provided with but a single port through which signals are input and output, instead of having separate local and remote ports.

For convenience, this description refers to a care provider's use of a telephone or personal computer to access the medical device 12 remotely, but it should be understood that any transceiver capable of activation or selection of programming parameters both independently of and in response to various prompts and queries. It should also be understood that the term "remote touch-tone transceiver" is not limited to conventional push-button telephones having a 12 key keypad, with 0-9, *, and # keys. Rather, as defined herein, the term "touch-tone transceiver" refers to any transceiver capable of generating signals via a keyboard or other data entry system and thus is not limited to transceivers that generate DTMF signals, such as conventional telephones. Examples of other types of "touch-tone transceivers" as defined herein include computers having a keyboard and/or cursor-controlling device, conventional push-button telephones, transmitters that convert human voice to pulse or digital or analog signals, and pager transceivers.

With reference to FIG. 2, the elements included in the interface 14 will be described in more detail. As stated above, the interface 14 comprises the remote communication port 42, the local communication port 40, a protocol and event memory 52, a voice storage unit 54, a processor 56, a voice synthesizer 58, and an access code memory 60. Alternatively, the protocol and event memory 52 and the processor 56 may be an integral unit. The protocol memory 52, the voice storage unit 54, and the access code memory 60 may all be contained in the same memory device (such as a random access memory), or in separate memory units. Preferably, the voice storage unit 54 comprises a read-only memory (ROM). The interface 14 also includes the data port 43 for relaying information

between the interface 14 and the medical device 12 (such as through wire 20 or by the emitter/detector 44). The voice synthesizer 58 is preferably an integrated circuit that converts digitized voice signals to a signal that emulates the sound of a human voice. As embodied herein, the voice synthesizer 58 needs only be used to convert the signals outgoing from the interface 14 to the remote telephone 48 and thus is not required for converting incoming signals from the remote telephone 48 or from the remote computer 50 or outgoing signals to a remote computer 50. The voice synthesizer may comprise a commercially available speech synthesis chip.

The remote communication port 42, the local communication port 40, and the interface data port 44 are all coupled to the processor via data buses 62a, 64a, and 66a, respectively. The communication ports 40, 42 receive signals from the transceiver 48, 50 and relay those signals over the buses 62a, 64a, respectively to the processor 56 which in turn processes those signals, performing various operations in response to those signals. If the care provider chooses the remote communications mode from the telephone 48, the processor 56 receives digitized voice signals from the voice storage unit 54 via bus 70a and sends those digitized voice signals to the voice synthesizer 58 via bus 70b, where the signals are converted to human voice emulating signals. Those human voice signals are sent from the voice synthesizer 58 via buses 62b, 64b, 66b to buses 62a, 64a, 66b, which in turn relay those signals to the remote communication port 42, the local communication port 40, and the interface data port 44, respectively.

For example, if it is necessary provide instructions to the care provider operating the remote telephone 48. The processor 56 sends a voice address signal over a data bus 70a coupling the processor 56 to the voice storage unit 54. The voice address signal corresponds to a location in the voice storage unit 54 containing a particular voice signal that is to be sent to the remote transceiver 48. Upon receiving the voice address signal, the particular voice signal is accessed from the voice storage unit 54 and sent, via the data bus 70a, to the processor 56. The processor 56 then relays the voice signal via the data bus 70b to the voice synthesizer 58, which converts the voice signal and sends the converted signal via data buses 62b and 62a to the remote communication port 42, which sends the converted signal to the remote transceiver 48.

The voice signal retrieved from the voice storage unit 54 may be a digitized representation of a person's voice or a computer generated voice signal (both being well known in the art). The digitized voice signal is converted by the voice synthesizer 58 to a signal that emulates the sound of a human voice. The voice signal instructs the care provider on how to respond to the voice signal and what type of information the care provider should send. As the remote transceiver may be a push-button telephone having a keypad with multiple keys, the care provider then presses the appropriate key or keys, thereby sending a DTMF signal back to the remote communication port 42 of the interface 14. It should be understood, however, that the remote transceiver need not be a push-button telephone, but rather any transceiver capable of sending and receiving DTMF or other similar signals. For example, the remote transceiver may be a computer or portable remote controller.

If the DTMF signal sent by the care provider is a remote programming signal which is transmitted from the remote telephone 48 to the remote communication port 42 of the interface 14, the remote communication port 42 then relays the remote programming signal via the data bus 62a to the processor 56. In response to receiving the

remote programming signal, the processor 56 accesses a particular parameter of the programming protocol from the protocol memory 52. To access the parameter, the processor 56 transmits a protocol address signal over the data bus 68 that couples the processor 56 and the protocol memory 52. The protocol address signal corresponds to a location in the protocol memory 52 containing the parameter. The parameter is then sent from the protocol memory 52 to the processor 56 over the data bus 68. Depending on the nature of the remote programming signal, the processor 56 can then perform one of a number of operations on the parameter, including editing, erasing, or sending the parameter back to the remote transceiver 48, 50 for review. Those skilled in the art will recognize that many types of signals or commands can be sent from the remote transceiver 48, 050 to the interface 14 for processing. Examples of such signals, how they are processed, and their effect will be described in detail below in conjunction with the description of the operation of the present invention.

In accordance with the present invention, the medical device system 10 can incorporate various security measures to protect against unwanted access to the interface 14 and the associated medical device 12. Significantly, a user access code can be used to block access except by persons with the user access code, which may be a multi-digit number (preferable a four digit number.) The medical device system 10 can be equipped with one or multiple user access codes, which are stored in the access code memory. To initiate communication with the medical device system 10, a care provider is connected to the medical device system 10 via the remote touch-tone transceiver 48, 50. This connection may be initiated by a call from the care provider to the medical device system 10 (or a patient talking on a telephone located near the medical device system 10), or by a call from the patient to the care provider, Either way the care provider is connected to the medical device system 10. After the connection is made between the care provider and the medical device system 10, the interface 14 is preferably arranged to require care provider to enter a user access code. If the care provider enters a valid user access code (as explained above, there may be several valid codes), the care provider is permitted to access and/or program the programmable protocol.

During a programming session, in certain circumstances (which will be described below), the user access codes can be reviewed, edited, and/or erased entirely and re-entered. To perform any of these functions, a programming signal is sent by the care provider from the remote transceiver 48, 50 to the interface 14. That programming signal is relayed through the remote communication port 42 to the processor 56, which processes the signal and generates an access code address signal. The access code address signal, which corresponds to a memory location in access code memory 60 holding a user access code, is sent over a data bus 72 to the access code memory 60. The particular user access code is then retrieved and sent back of the data bus 72 to the processor 56, which processes the user access code in some manner.

To communicate with the medical device system 10, the interface is equipped with the interface data port 43. The medical device protocol can be sent from the interface 14 to the medical device 12 via the interface data port 43 and the medical device data port 46. Thus, for example, the processor 56 accesses the protocol from the protocol memory 52 and sends the protocol via data bus 66a to the interface data port 43. The interface data port 43 then sends the information to the medical device data port (such as through the wire 20 or the wireless

emitter/transceiver 46), where it is processed by circuitry and/or software in the medical device 12. In this way, the medical device protocol can be programmed (e.g., edited, redone, reviewed, locked, re-entered, etc.).

The send button 32 is designed to permit sending of the medical device data or protocol to a remote location, such as a computer 74 or fax machine 76. In this way, a remote record is maintained, such as at a computer. If the computer 74 is remote from the medical device system 10, a person located at the interface 14 may press the send button 32, which in turn downloads the existing protocol or data to the remote communication port 42. The protocol is then transmitted via the remote communication port 42 to the remote computer 74.

The link button 28 is preferably used to initiate or enter into the remote programming mode of the medical device system 10. When initiating a programming session, the care provider calls the telephone number corresponding to the medical device system 10 (or the patient's home phone). The patient 18 may answer the call with his or her telephone, and the care provider and patient can communicate by standard voice signals. This is known herein as a phone mode or patient conversation mode. The care provider then instructs the patient to depress the link button 28, which disconnects the patient 18 from the telephone line and initiates the programming mode described below with reference to FIGS. 3-8. If, however, the patient 18 does not answer the care provider's call, the interface 14 may be equipped with an internal switching system that directly connects the care provider with the interface 14 and initiates the programming mode. The internal switching may be accomplished with hardware in the interface 14 or with software that controls the processor 56, or with a hardware-software combination. Either way, the care provider may then begin processing the information and protocol stored in the interface 14. (As described above, the call may be initiated by the patient 18 to the care provider.)

The functions of the display lights 24 will now be described. Preferably, the display lights 24 comprise LED's. The wait light 34 indicates when the interface 14 is involved in a programming session or when it is downloading the protocol to a remote location, such as the remote computer 74. Accordingly, the wait light 34 tells the patient 18 not to disturb the interface 14 until the wait light 34 goes off, indicating that internal processing elements of the interface 14 are inactive. The phone light 36 indicates when the care provider and the patient 18 are involved in communication via the remote transceiver 48 or 50 and thus when the internal processing elements of the interface 14 are inactive. The phone light 36 may also indicate when the medical device system 10 is ready.

The alarm light indicates various alarm conditions and functions of the medical device system 10. The medical device 12 sends an alarm signal via the medical device data port to the interface data port 43. The signal is relayed via data bus 66a to the processor 56. Next, the processor 56 sends a voice address signal over data bus 70a coupling the processor 56 to the voice storage unit 54. The voice address signal corresponds to a location in the voice storage unit 54 containing a voice signal pertaining to the alarm condition that is to be sent to a remote location (such as 48, 50, 74, or 76). Upon receiving the alarm address signal, the alarm signal is accessed from the voice storage unit 54 and sent via the data bus 70a to the processor. The processor 56 then relays the voice signal via the data bus 70b to the voice synthesizer 58 which converts the voice signal and sends the converted

signal via data buses 62a, 62b to the remote communication port 42 which sends the converted signal to the remote transceiver.

Remote Access of a Medical Device with the System of the Present Invention

Referring to FIG. 3, the programming mode or sequence of the present invention will be described in detail. A care provider may access and process the protocol of the interface from either the remote telephone 48, remote computer 50 or other transceiver, as described above. The programming mode by remote telephone 48 will first be described. The care provider dials the telephone number corresponding to the medical device (Step 1). A synthesized voice message will ask the care provider whether the care provider wishes to first converse with the patient prior to the remote programming session (Step 2). If the care provider chooses "yes," the care provider and patient communicate by standard voice signals (Step 3). More specifically, the patient would pick up local phone 48A which is in communication with the local port 40 and speak with the care provider who is on the remote phone 48 in communication with the remote port 42. (See Figure 1.) After the conversation is completed, the care provider asks the patient to depress the link button on the interface (Step 4), which connects the care provider with the interface (Step 5), terminates the phone mode, and initiates a remote touch-tone programming session. If the care provider chooses not to talk to the patient before the remote programming session (Step 6), the care provider may choose "no" (Step 6), and is directly connected to the interface 14, thereby directly initiating a remote touch-tone programming session by going to the access code menu (FIG. 5) without entering into conversation mode.

Alternatively, the care provider may access and process the protocol of the interface from a remote computer 50. The care provider may directly initiate programming mode by having the modem of the remote computer 50 dial the number of the medical device system 10. In the event that the device 10 is only monitoring a patients vital signs, the care provider can retrieve the vital signs as will be understood by one of skill in the art. Initially, a message will appear on the care provider's computer screen querying the care provider whether the care provider wishes to view a menu with additional options before going to the main menu. As shown in FIG. 4, such options include, but are not limited to: sending the status of the patient's condition to the care provider's computer (Step 8); loading a new protocol from a file on the provider's computer (Step 9); activating real time monitor mode so that the provider may view the patient's current condition as it changes (Step 10); receiving the PM history of the device (Step 11); and activating the diagnostics mode (Step 12). If the care provider chooses not to go to the special options menu (Step 7), he may go directly to a remote programming session by going to the access code menu (FIG. 5).

Access Code

If the user enters a correct access code (Step 13), the user is preferably allowed to perform certain functions relating to the access code. For example, and referring to FIG. 5, if the care provider has entered a master access code, the interface 14 generates a number of voice queries (for a telephone link; a signal representing alphanumeric text of the same message may be transmitted when a computer 50 is being used), that are transmitted to the care provider and provide the care provider with a number of options. First, in Step 14, the care provider

is asked whether a new master access code is to be entered and is instructed to press a certain button on the touch tone keypad (in this case the number "1") to select this option. If the care provider selects this option, the interface 14 tells the care provider to enter the existing master access code (Step 15) and to enter a new master access code (Step 16). The newly entered master access code is then read back to the care provider by the interface 14 (Step 17), and the interface 14 generates a voice command that tells the care provider to press the "#" key on the keypad to accept this new master access code). If the care provider presses the "#" key, the interface 14 returns (Step 18) the care provider to the access code menu. Those skilled in the are will recognize that the keys to be pressed by the care provider are only exemplary and that other keys could be designated to accept and/or select various options and programming entries.

Second, in Step 19, the care provider is asked whether a new user access code is to be entered and is instructed to press a certain button on the touch tone keypad (in this case the number "2") to select this option. If the care provider selects this option, the interface 14 tells the care provider to enter a new user access code (Step 20). If the entered new user access code already exists, the program loops around and asks the care provider to enter a new master access code again (not shown). If the newly entered user access code does not already exist, the new user access code is then read back to the care provider by the interface 14 (Step 21), and the interface 14 generates a voice command that tells the care provider to press the "#" key on the keypad to accept this new user access code. If the care provider presses the "#" key, the interface 14 returns (Step 22) the care provider to the access code menu.

Third, in Step 23, the care provider is asked whether he or she would like to query the user access codes and is instructed to press a certain button on the touch tone keypad (in this case the number "3") to select this option. If the care provider selects this option, the interface 14 tells the care provider in Step 24 that there are a certain number of user access codes (depending on how many there are). In Step 25, the interface 14 recites the user access codes to the care provider and continues reciting the user access codes until all are recited. After completing reciting the user access codes, the interface 14 returns (Step 26) the care provider to the access code menu.

Fourth, in Step 27, the care provider is asked whether he or she would like to erase the user access codes and is instructed to press a certain button on the touch tone keypad (in this case the number "4") to select this option. If the care provider selects this option, the interface 14 asks the care provider to select one of two options: (1) to erase specific user codes, press a certain button on the touch-tone keypad (in this case the number "1") (see Step 28); or (2) to erase all user access codes, press a different button (in this case the number "2") (see Step 33). If the care provider selects Step 28, the care provider is asked to enter the specific user access code to be deleted (Step 29), and the interface 14 reads back that specific user access code in Step 30. The interface 14 then asks the care provider to press the "#" button on the touch-tone keypad to accept deletion of that user access code and is returned to the access code menu. If the care provider selects Step 33 (global deletion), the interface 14 warns the care provider that he or she is about to erase all the user access codes and asks for the care provider to press the "#" button to accept (Step 34). The interface then returns (Step 35) to the access code menu.

Fifth, in Step 36, the care provider is asked to press a certain number (in this case "5") to exit the access code menu. If the care provider selects this option, the interface 14 returns (via Step 37) to the access code prompt.

The interface 14 may also be programmed so that access is prevented without entry of an access or security code (not shown).

Main Menu

If the care provider has entered a correct user access code and has either by-passed the above functions relating to the access code or has completed them, the processor 56 accesses from the voice storage unit 54 (or by a signal representing alphanumeric characters transmitted to a computer) a number of voice queries comprising a main menu. Referring to FIG. 3, a number of options are presented to the care provider through the main menu. The particular items presented may vary depending upon the particular medical device with which the system is being used, the number of medical devices being used with the system (as described below), or the number of patients that are connected to the system (as described below).

The main menu of FIG. 3 illustrates a menu which is generally useful with a wide range of medical devices and which presents a number of advantageous procedures of the system of the present invention. It should be understood that other menu features may be provided. As illustrated, the care provider is asked to select among several options by pressing a key on the touch-tone keypad (or on a computer keypad).

Certain options will be applicable for every medical device such as talking to the patient (Step 38) and the alarm review mode (Step 39). If the care provider selects direct conversation with the patient, the connection is switched to a phone mode (Step 40). In the phone mode, the care provider can talk with the patient to verify programming changes (Step 41). The care provider can then hang up the remote telephone 48 after completing conversation with the patient (Step 42). If the care provider selects the alarm review mode in Step 39, the interface generates voice queries that are transmitted to the care provider. As illustrated in FIG. 6, the care provider has the option of reviewing the fax or phone number(s) that will be automatically dialed in the case of an alarm condition. For example, the synthesized voice will state,"alarm notification number one is 123456790; alarm notification number two is 2345678" (Step 43). In Step 44, the care provider has the option of deleting an existing number by entering in the number to be deleted through the transceiver (Step 45). The care provider may choose to delete additional numbers (Step 46), or go to the add alarm notification option (Step 47). If the care provider selects the option of adding additional alarm notification numbers in Step 48, the care provider may add an additional number by entering in the number to be added through the transceiver. In Step 49, the care provider is asked to either add another number or go to the main menu.

Options such as faxing a report or sending a file are also applicable for every medical device, but the type of report or file will vary depending on the medical device. Other options may be applicable to some medical devices, such as editing or creating a protocol, but not others. Therefore, these non-universal options are discussed below (refer to step or circle "D") as related to specific medical devices.

Adaption of the System of the Present Invention to

Multiple Medical Devices and/or Multiple Patients

In a variation of the present invention, the system may be arranged to permit access to and control over multiple medical devices. In this arrangement, multiple medical devices are preferably arranged to communicate with a single interface. In a method of accessing and controlling these multiple devices, after entering the access code, the care provider will be prompted to enter the device number of the particular device which the care provider wants to access.

Another embodiment functions in the same manner as the embodiment described above. However, this embodiment may be used for multiple patients and comprises multiple medical devices connectable with multiple patients, an interface unit coupled with the medical devices of each patient, and a central data storage unit. The central data storage unit performs the same function as an interface unit, but acts as a central storage location for the protocols of multiple patients. This embodiment allows the care provider the option of calling one number from the remote transceiver, the number of the central data storage unit, to program the protocols of multiple patients instead of calling the number of each patient; however, the care provider still retains the option of calling the interface unit of a particular patient if the care provider wishes to program the protocol of a single patient. The remote central data storage unit comprises two remote communication ports, a protocol and event memory, a voice storage unit, a processor, a voice synthesizer, and an access code memory. The protocol memory, the voice storage unit, the voice synthesizer, and the access code memory are the same as those for the interface units. Each of the two remote communication ports is coupled to the processor via data buses. The first remote communication port receives signals from a remote transceiver and relays those signals over the buses to the processor which performs various operations in response to those signals. Next, the signals are sent by a data bus to the second remote communication port which then relays the signals to the specified interface unit via the remote communication port of the interface unit. The signals are then processed in the same manner as the interface unit processor without a central data storage unit processes the signals it receives from the remote touch-tone transceiver.

It should be understood that the above programming and functions described above provide only examples of how the care provider, interface unit, and central data storage unit may interact via a remote touch-tone transceiver. Therefore, additional or alternative steps and procedures can be designed and implemented for remote programming of the present invention. Accordingly, only some of the steps described above need be included in the invention; the steps may be conducted in a different order; additional or fewer protocol parameters may be controlled by the care provider; and different operational modes may be chosen.

Furthermore, the present invention can be used with a variety of medical devices. As discussed below, the present invention is used for reviewing and programming the protocol of a mechanical ventilator and a vital signs monitor. It will be apparent to those skilled in the art that various modifications and variations can be made in the apparatus and method of the present invention without departing from the spirit or scope of the invention. Thus, it is intended that the present invention cover any modifications and variations of this invention.

Adaptation of the System of the Present Invention for
Use with a Mechanical Ventilator

Referring to FIG. 7A1, step "D," examples of specific main menu options for a mechanical ventilator will be described. If the care provider has selected review of the current protocol in Step 50, the interface 14 provides the care provider with a variety of information (Fig 7A2). The care provider is told tidal volume (Step 51); the breath rate (Step 52); the high pressure setting (Step 53); the mode (Step 54); the peak flow (Step 55); the low pressure setting (Step 56); the PEEP level (Step 57); the elapsed time (Step 58); and the last alarm (Step 59). After providing this information to the care provider, the interface 14 in Step 60 returns to the main menu as FIG. 3.

With reference to FIG. 7A2, the edit mode will be described in detail. If the care provider has selected the edit mode in Step 61, the interface 14 permits the care provider to edit the current protocol. In this mode, some parameters may be maintained while others may be edited. The care provider is requested to enter the serial number of the mechanical ventilator (Step 62), the care provider identification number (Step 63), and the patient's identification number (Step 64). These numbers are for record keeping purposes, and are included in any report or file requested by the care provider. In Step 65 the care provider is told the current tidal volume. The care provider is then asked to enter a new rate, or press the # button on the keypad to accept the new rate (Step 66). Similar operations are performed on the breath rate, the high pressure setting, mode, current peak flow, low pressure setting, and PEEP level (Steps 67 - 78). After editing, the interface 14 transfers to the sub-menus of FIG. 7D (Circle G).

Referring now to FIG. 7D, the edit mode sub-menus provide the care provider with several options after editing the protocol. The first edit mode sub-menu allows the care provider to send (i.e., save) the edits to the ventilator by pressing a certain key on the keypad (Step 79), to review the edits by pressing a different key on the keypad (Step 80), and to cancel the edits by pressing still a different number on the keypad (Step 81). If the care provider selects sending the edits (Step 79), the new protocol is sent to the respirator (Step 82), and the care provider is told goodbye. The care provider is then transferred to patient conversation mode (Step 83), and the care provider is put in connection with the patient to verify the programming (Step 84). After verifying the programming changes with the patient, the care provider hangs up the remote telephone 48 (Step 85), and the programming session is completed.

If the care provider selects reviewing the edits (Step 80), the interface 14 reports the new parameters of the protocol to the care provider (Step 86). After reporting, the care provider is taken to the second edit mode sub-menu which permits the care provider to select: (1) send the edits (Step 87), (2) edit the edits (Step 88), or (3) cancel the edits (Step 89). If the care provider selects sending the amended protocol (Step 87), the new protocol is sent to the respirator (Step 90), and the care provider is told goodbye. The care provider is then transferred to patient conversation mode (Step 91), and the care provider is put in connection with the patient to verify the programming (Step 92). After verifying the programming changes with the patient, the care provider hangs up the remote telephone (Step 93) and the programming session is terminated.

If the care provider selects the create mode in Step 94 (see FIG. 7A1), the care provider is asked to program various parameters for the new protocol. As illustrated in FIG. 7A2, the care provider is asked to enter

the tidal volume (Step 95) after which the entered tidal volume is read back, and the care provider is asked to press the # button to accept this rate. The care provider follows the same procedure for entering breath rate, high pressure setting, mode, peak flow, low pressure setting, and PEEP level (Steps 96 - 101), and then the same control menu as illustrated in FIG. 7D.

If the care provider selects the fax report mode in Step 102, the interface 14 generates a number of queries that are transmitted to the care provider and provide the care provider with a number of options. Referring now to FIG. 7B, Step 103, the care provider has the option of selecting a flow report, a pressure report (Step 104), or a full report (Step 105). If the care provider enters a number which is not an option (Step 106) the interface unit returns to Circle E. Next, the care provider is asked in Step 107 to enter the fax number of the location where the report is to be sent. In Step 108, the care provider may select a text report by pressing a certain button on the keypad or a graphics report by pressing a different button (Step 109). If the care provider selects the text report, in Step 108 the care provider may then select to have the text report sent to the fax number on a daily basis by pressing a button on the keypad (Step 110). If the care provider chooses to request that the medical device remote system send a daily report to the fax number, the care provider then enters the time via the touch-tone keypad that the report will be sent to the number (e.g., 1430 for 2:30 PM) (Step 111). If the care provider selects a graphics report (Step 109), the interface 14 asks the care provider to select a sample time interval (in seconds) from 1 - 300 seconds (Step 112). If the care provider chooses to request that the medical device remote system send a daily graphics report to the fax number (Step 113), the care provider then enters the time via the touch-tone keypad that the report will be sent to the number (e.g., 1430 for 2:30 PM) (Step 114). If the care provider chooses not to have a daily report, then the care provider will return to the main menu (Step 115) whereby the graphics report will be sent to the fax number after the session is completed.

If the care provider selects the send file mode in Step 116, the care provider is transferred to the send file menu (Circle F) in FIG 7C. Steps 117 - 124 are similar to the steps above for faxing a report except that the computer phone number is entered (Step 121) instead of a fax number so that the report file is sent to a computer instead of a fax. The care provider also has the option of having the medical device remote system send the file to a remote computer on a daily basis (Steps 122 - 123).

Adaptation of the System of the Present Invention For Use With a Vital Signs Monitor

Referring to FIG. 8A, Circle D, examples of the specific main menu options when the medical device comprises a vital signs monitor will be described. Such a monitor generally obtains patient data such as blood pressure, temperature, pulse rate, O_2 saturation, CO_2 level, weight and/or respiration rate. If the care provider has selected review of the current protocol in Step 125, the interface 14 provides the care provider with a variety of information. The care provider is told the blood pressure (Step 126); the temperature (Step 127); the pulse (Step 128); the 02 saturation (Step 129); the carbon dioxide level (Step 130); the weight (Step 131); and the respiration rate (Step 132). After providing this information to the care provider, the interface 14 in Step 133 returns to the main menu.

If the care provider selects the fax report mode in Step 134, the care provider is transferred to the fax report menu as illustrated in FIG. 8B. Upon accessing this menu, the interface 14 generates a number of voice queries that are transmitted to the care provider and provide the care provider with a number of options. The care provider has the option of selecting a: (1) blood pressure report, (2) temperature report, (3) pulse report, (4) O_2 saturation report, (5) carbon dioxide report, (6) weight report; (7) respiration report, or (8) full report, by pressing 1-8, respectively on the touch-tone keypad (Steps 135 - 142). Next, the care provider is asked in Step 143 to enter the fax number of the location where the report is to be sent. In Step 144, the care provider may select a text report by pressing a certain button on the touch-tone keypad or a graphics report by pressing a different button (Step 145). If the care provider selects a text report, interface 14 tells the care provider to enter a certain number on the touch tone keypad to hang up and end the session (Step 146) whereby the text report will be sent to the fax number or enter a different number if the care provider wants to return to the main menu (Step 147) whereby the text report will be sent to the fax number after the session is completed. If the care provider selects a graphics report (Step 145), the interface 14 asks the care provider to select a sample time interval (in seconds) from 1 - 300 seconds (Step 148). If an invalid number is selected (Step 149), the interface 14 returns to Step 148. The care provider then enters a certain number on the touch tone keypad to hang up and end the session whereby the graphics report will be sent to the fax number (Step 150) or enter a different number (in this case the number "2") if the care provider wants to return to the main menu whereby the graphics report will be sent to the fax number after the session is completed (Step 147).

Alternatively, the device 10 may store a fax number and the device could be programmed to send faxes including desired information at specific times.

If the care provider selects the send file mode in Step 151, the care provider is transferred to the send file menu (Circle F) illustrated in FIG. 8C. Steps 152 - 163 are similar to Steps 135 - 147 above except that the care provider must enter a sample time interval (Step 160) and the computer phone number is entered instead of a fax number (Step 161) so that the report file is sent to a computer instead of a fax. Further, the device 10 may be programmed to send e-mails via a communication network such as the Internet. In this feature of the invention, the device would be programmed to log onto the communication network, enter a password stored in memory and send an e-mail report.

In another aspect of the present invention, the device may be programmed to ask a patient questions regarding how they feel, how much pain they are experiencing, etc. The answers to these questions may be accessed by a care provider to assist the care provider in programming the protocol of the device as will be understood by those of skill in the art. For example, if a patient indicates that he or she is feeling good, the care provider may not edit the protocol. This feature of the invention permits the care provider to access more information and better treat the patient. A patient may input their data through the device 10 itself, through the local phone 48A or in other ways such as through a computer, etc. The patient could enter this data whenever the patient's condition changes or be prompted, i.e., by a telephone call or an alarm on the device 10, to enter the information at fixed intervals.

In accordance with the present invention, there is provided a medical system which permits the remote access and control of a medical device. The system is arranged to permit a caregiver to control the medical device from a remote phone, computer or other transceiver. The caregiver may obtain date from the medical device, such as in the form of a written report (such as by facsimile), by voice data, or by graphical or alphanumeric data provided to a computer (which may be presented as graphs or other data on a screen and/or stored in a computer memory). The caregiver may also program the medical device if the device stores a programmable protocol. In addition, the system is arranged to that an alarm signalled by the medical device is then triggered remotely as well.

Specific examples of the adaptation of the system of the invention to specific medical devices are described above. Those of skill in the art will appreciate the adaptation of the system to a wide variety of other medical devices.

Of course, the foregoing description is that of preferred embodiments of the invention, and various changes and modifications may be made without departing from the spirit and scope of the invention, as defined by the appended claims.

WHAT IS CLAIMED IS:

1. A remotely accessible medical device system having a programmable protocol and storing patient data, the medical device system being programmable by a remote transceiver and capable of sending patient data to a remote location, the medical device system comprising:

an electronically controllable medical device connected to a patient and having a protocol or patient data associated therewith;

a memory for storing a programmable protocol or patient data;

a data storage unit for storing a data signal;

a communication port for connection to the remote transceiver for sending a data signal to a remote location and for receiving a signal from the remote transceiver;

a processor arranged to manipulate the programmable protocol in said memory in response to receiving a remote programming signal or to send said data signal including patient data from the data storage unit in response to a remote data access signal.

2. A method for accessing a medical device from a transceiver positioned remote from said medical device, including a control associated with said medical device, said control having a programmable protocol or patient data associated therewith, comprising the steps of:

establishing a connection between the medical device and the remote transceiver;

sending a signal from the remote transceiver to said control;

processing said signal and manipulating said programmable protocol if said signal is a programming signal from said remote transceiver and sending said patient data to said transceiver or a secondary location if said signal is a data transfer signal.

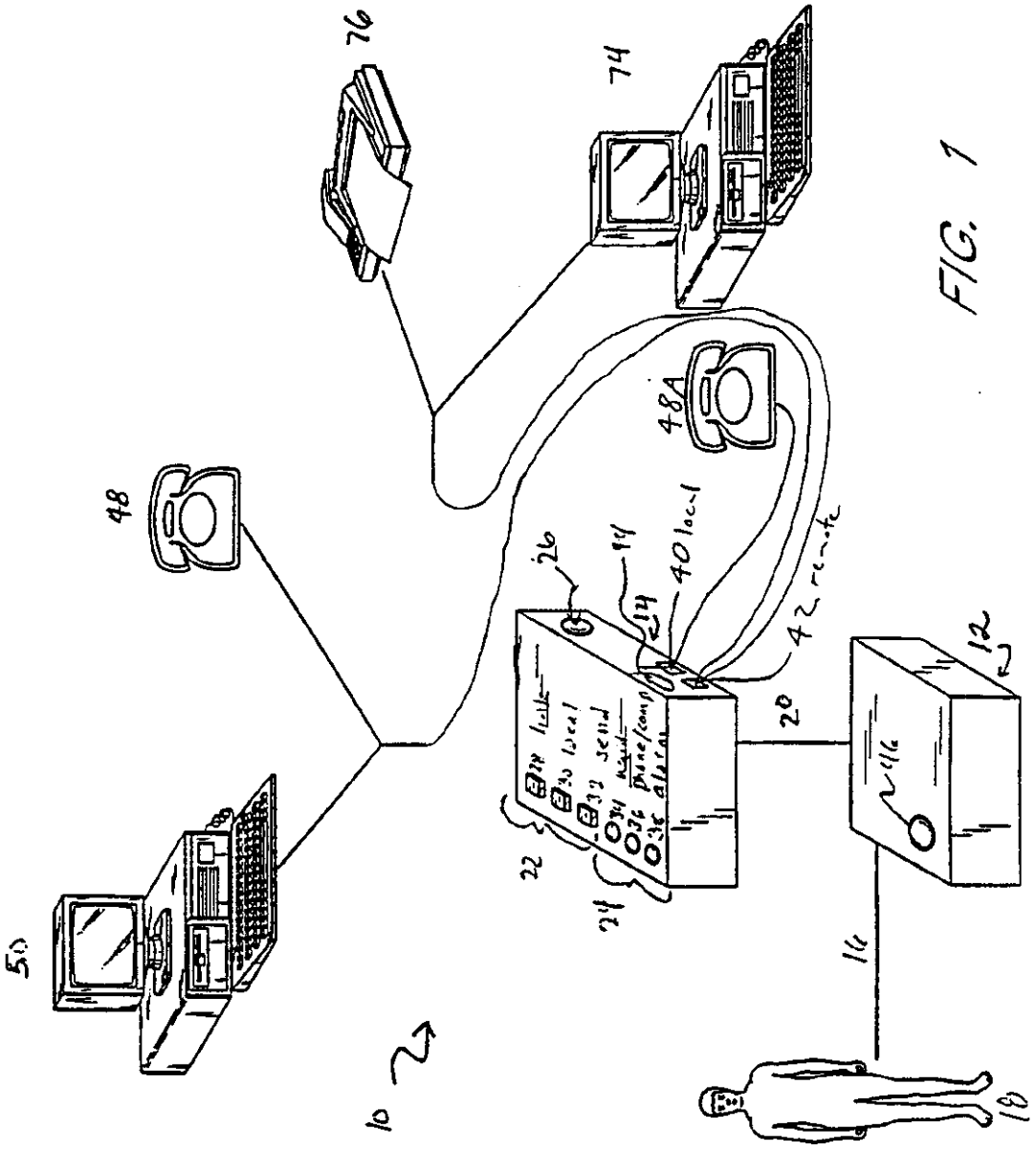


FIG. 1

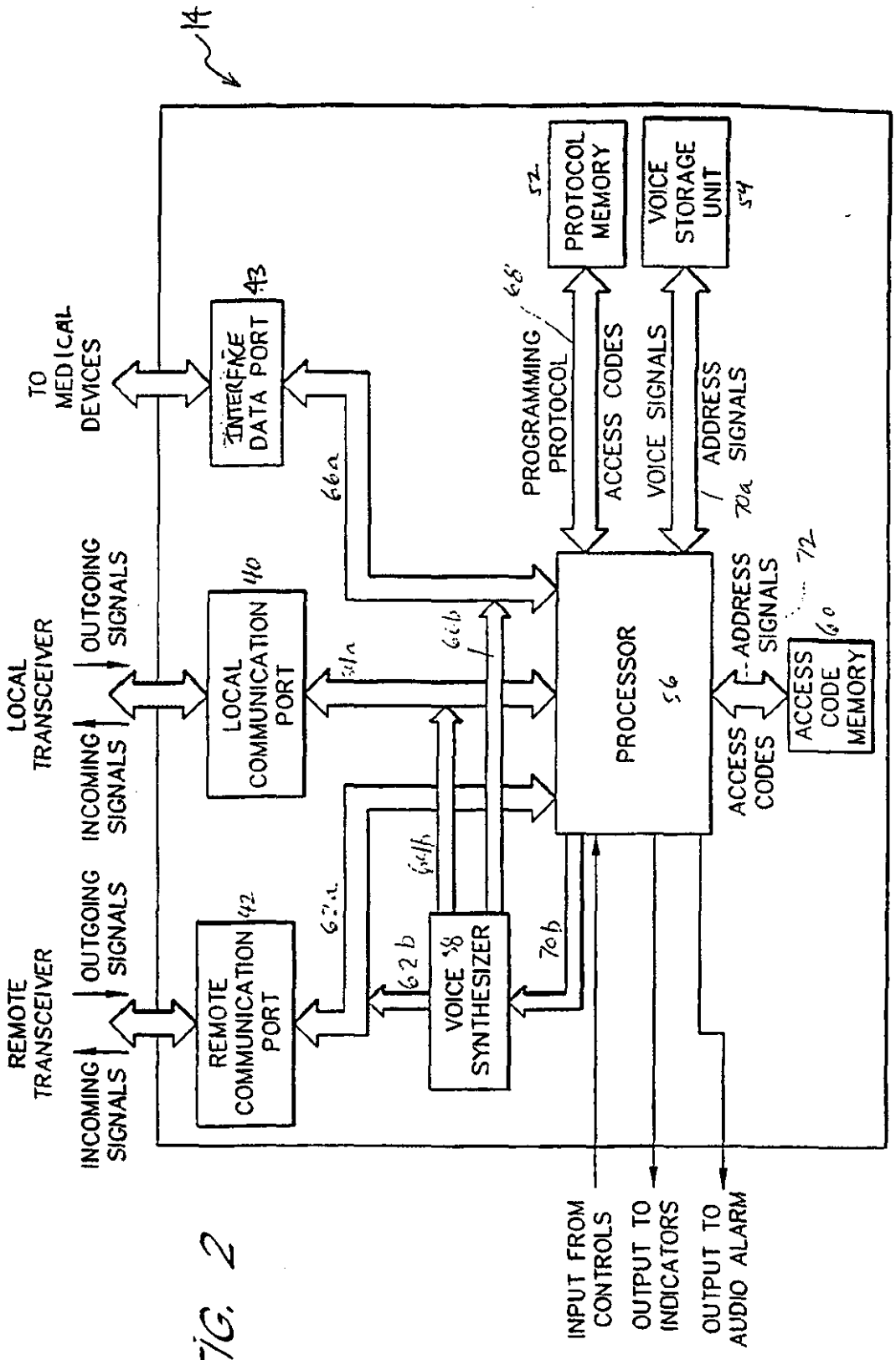

14
TO MEDICAL DEVICES
INTERFACE DATA PORT
43
LOCAL TRANSCEIVER
OUTGOING SIGNALS
INCOMING SIGNALS
LOCAL COMMUNICATION PORT
40
REMOTE TRANSCEIVER
OUTGOING SIGNALS
INCOMING SIGNALS
REMOTE COMMUNICATION PORT
42
VOICE SYNTHESIZER
PROTOCOL MEMORY
52
VOICE STORAGE UNIT
54
PROGRAMMING PROTOCOL
ACCESS CODES
VOICE SIGNALS
ADDRESS SIGNALS
PROCESSOR
56
ACCESS CODES
ADDRESS SIGNALS
ACCESS CODE MEMORY
60
72
INPUT FROM CONTROLS
OUTPUT TO INDICATORS
OUTPUT TO AUDIO ALARM

FIG. 2

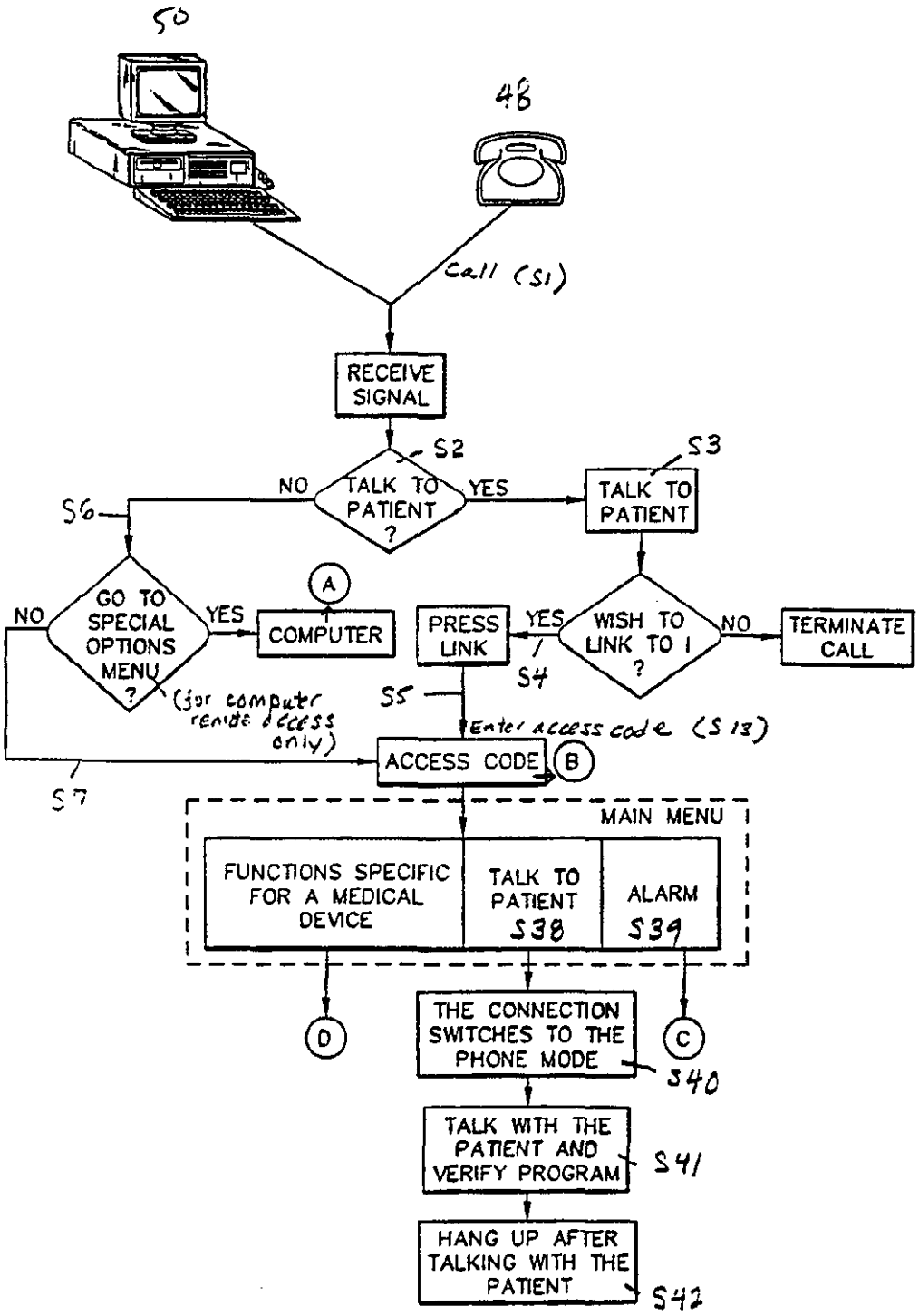

50
48
Call (S1)
RECEIVE SIGNAL
S2
TALK TO PATIENT ?
NO
YES
S3
TALK TO PATIENT
S6
GO TO SPECIAL OPTIONS MENU ?
NO
YES
A
COMPUTER
(for computer remote access only)
PRESS LINK
YES
S4
WISH TO LINK TO I ?
NO
TERMINATE CALL
S5
Enter access code (S13)
S7
ACCESS CODE
B
MAIN MENU
FUNCTIONS SPECIFIC FOR A MEDICAL DEVICE
TALK TO PATIENT S38
ALARM S39
D
THE CONNECTION SWITCHES TO THE PHONE MODE
C
S40
TALK WITH THE PATIENT AND VERIFY PROGRAM
S41
HANG UP AFTER TALKING WITH THE PATIENT
S42

FIG. 3

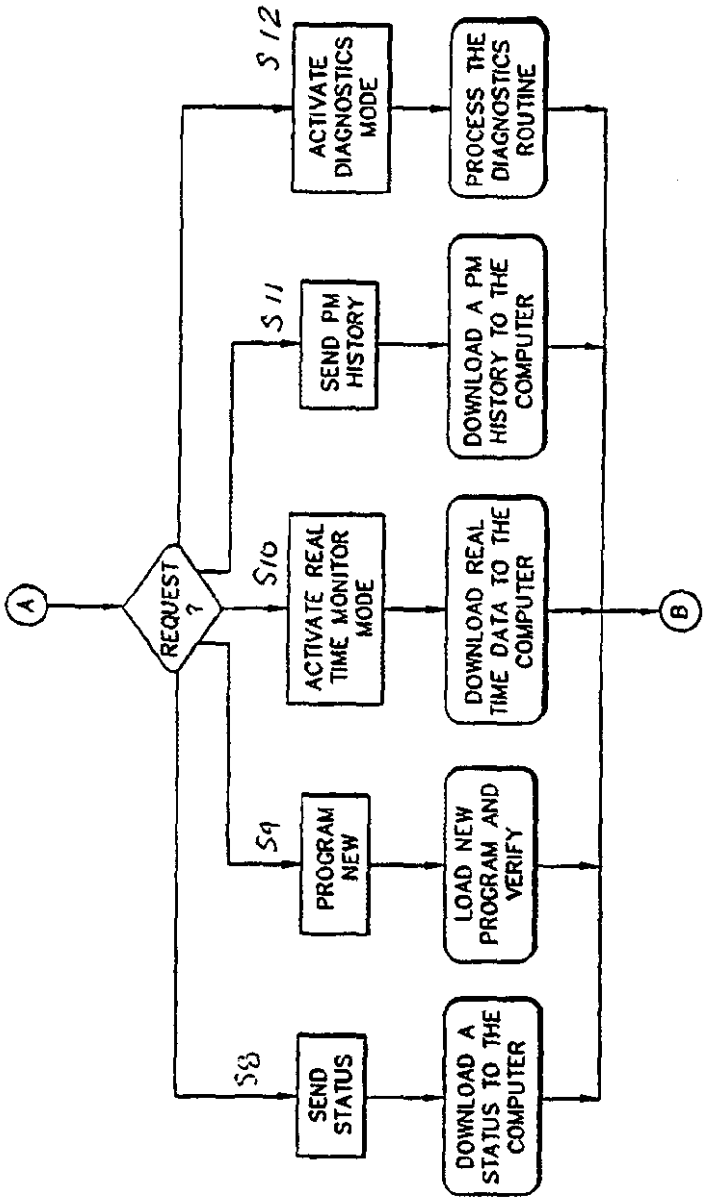

A
REQUEST ?
S8
SEND STATUS
DOWNLOAD A STATUS TO THE COMPUTER
S9
PROGRAM NEW
LOAD NEW PROGRAM AND VERIFY
S10
ACTIVATE REAL TIME MONITOR MODE
DOWNLOAD REAL TIME DATA TO THE COMPUTER
S11
SEND PM HISTORY
DOWNLOAD A PM HISTORY TO THE COMPUTER
S12
ACTIVATE DIAGNOSTICS MODE
PROCESS THE DIAGNOSTICS ROUTINE
B

FIG. 4

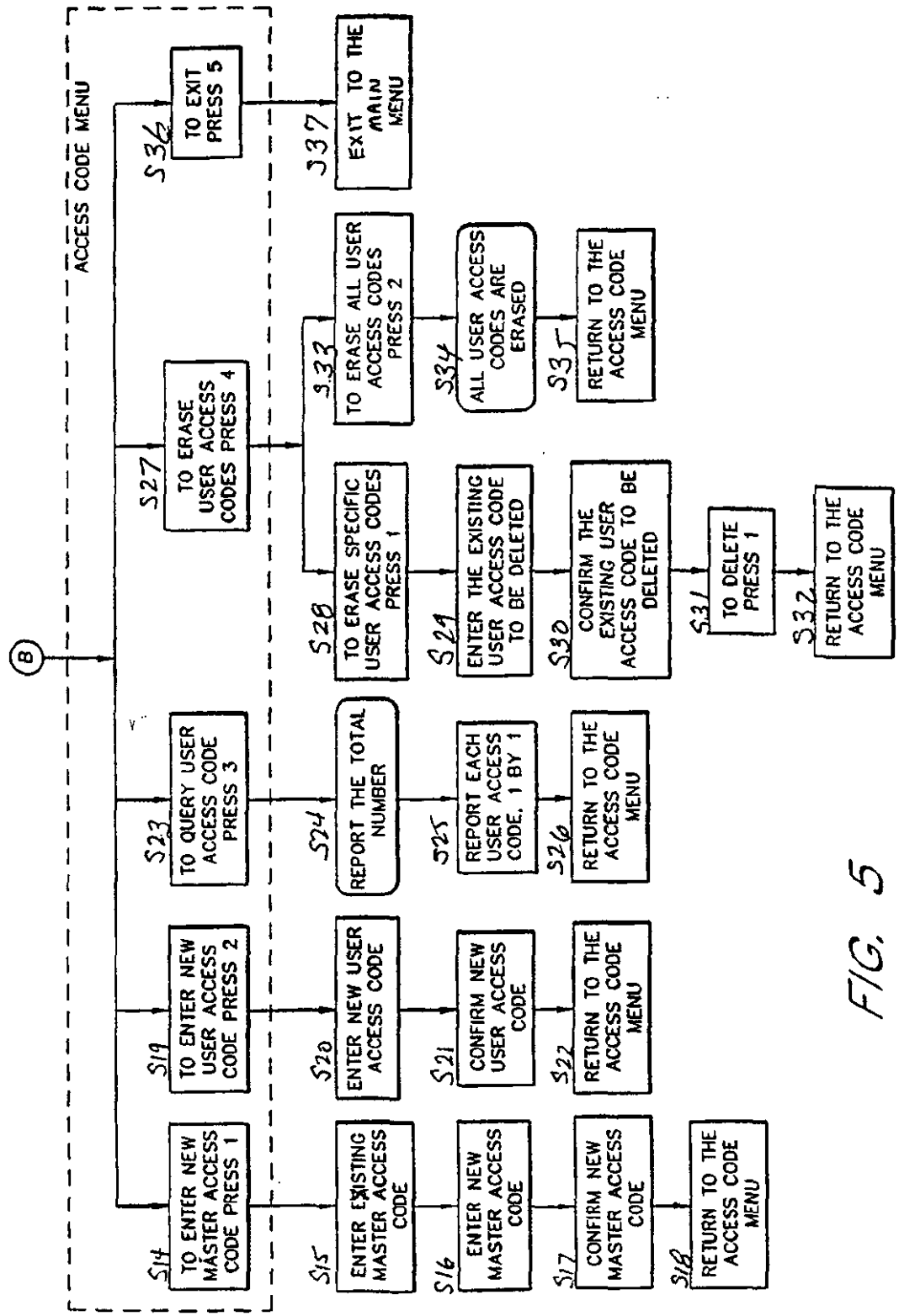

ACCESS CODE MENU
B
S14
TO ENTER NEW MASTER ACCESS CODE PRESS 1
S15
ENTER EXISTING MASTER ACCESS CODE
S16
ENTER NEW MASTER ACCESS CODE
S17
CONFIRM NEW MASTER ACCESS CODE
S18
RETURN TO THE ACCESS CODE MENU
S19
TO ENTER NEW USER ACCESS CODE PRESS 2
S20
ENTER NEW USER ACCESS CODE
S21
CONFIRM NEW USER ACCESS CODE
S22
RETURN TO THE ACCESS CODE MENU
S23
TO QUERY USER ACCESS CODE PRESS 3
S24
REPORT THE TOTAL NUMBER
S25
REPORT EACH USER ACCESS CODE, 1 BY 1
S26
RETURN TO THE ACCESS CODE MENU
S27
TO ERASE USER ACCESS CODES PRESS 4
S28
TO ERASE SPECIFIC USER ACCESS CODES PRESS 1
S29
ENTER THE EXISTING USER ACCESS CODE TO BE DELETED
S30
CONFIRM THE EXISTING USER ACCESS CODE TO BE DELETED
S31
TO DELETE PRESS 1
S32
RETURN TO THE ACCESS CODE MENU
S33
TO ERASE ALL USER ACCESS CODES PRESS 2
S34
ALL USER ACCESS CODES ARE ERASED
S35
RETURN TO THE ACCESS CODE MENU
S36
TO EXIT PRESS 5
S37
EXIT TO THE MAIN MENU

FIG. 5

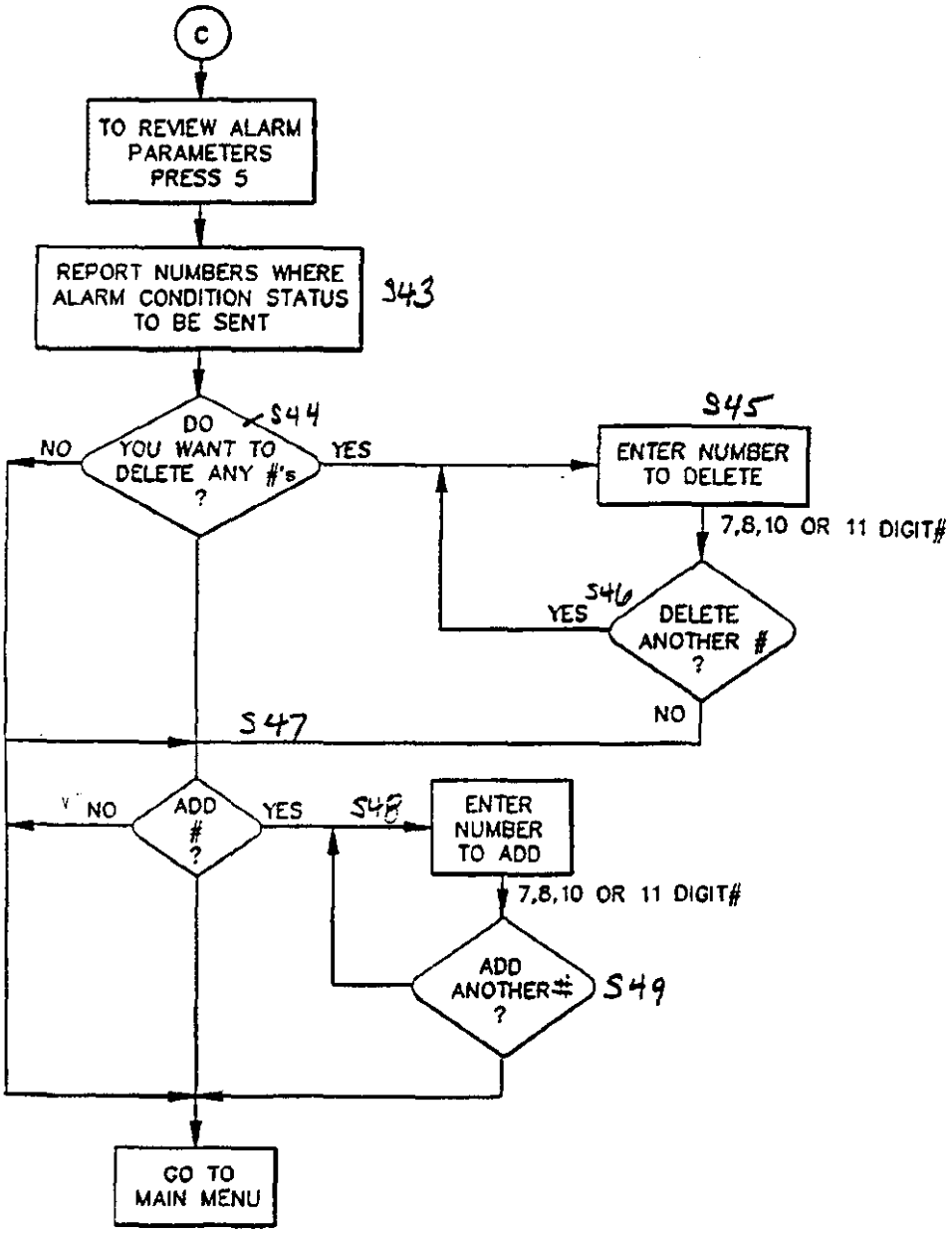

C
TO REVIEW ALARM PARAMETERS PRESS 5
REPORT NUMBERS WHERE ALARM CONDITION STATUS TO BE SENT
S43
DO YOU WANT TO DELETE ANY #'s ?
S44
NO
YES
S45
ENTER NUMBER TO DELETE
7,8,10 OR 11 DIGIT#
DELETE ANOTHER # ?
S46
YES
NO
S47
ADD # ?
NO
YES
S48
ENTER NUMBER TO ADD
7,8,10 OR 11 DIGIT#
ADD ANOTHER # ?
S49
GO TO MAIN MENU

FIG. 6

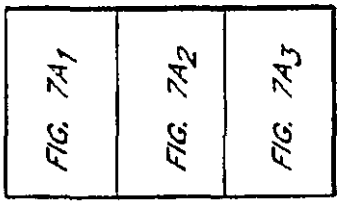


FIG. 7A1
FIG. 7A2
FIG. 7A3

FIG. 7

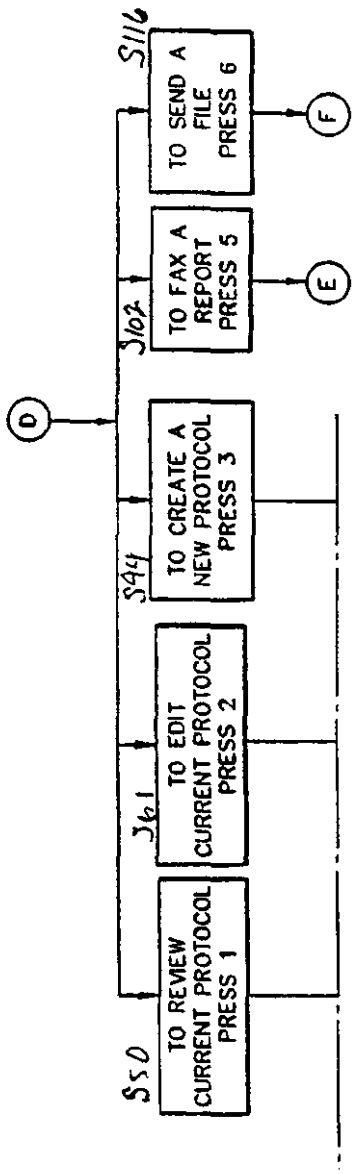

S50
TO REVIEW CURRENT PROTOCOL PRESS 1
S61
TO EDIT CURRENT PROTOCOL PRESS 2
S94
TO CREATE A NEW PROTOCOL PRESS 3
S102
TO FAX A REPORT PRESS 5
S116
TO SEND A FILE PRESS 6
D
E
F

FIG. 7A1

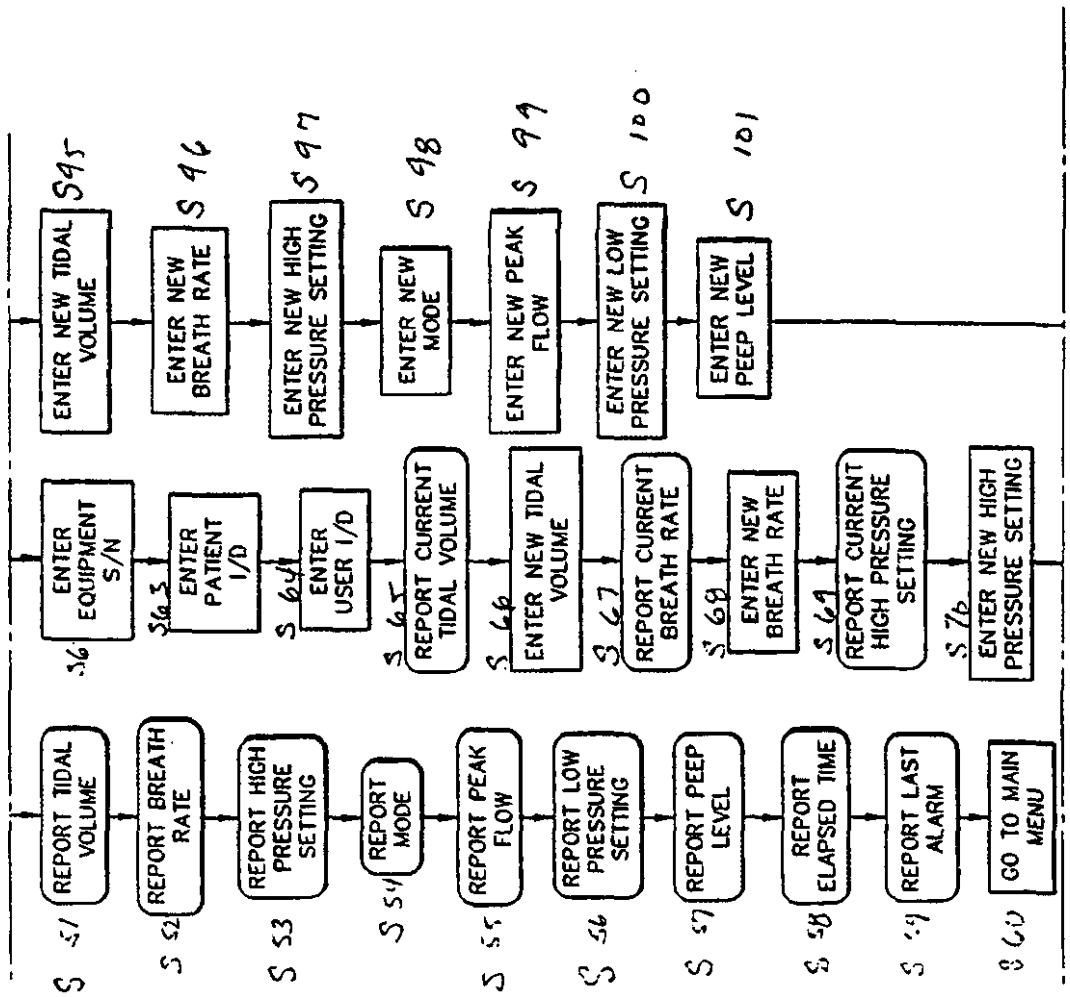
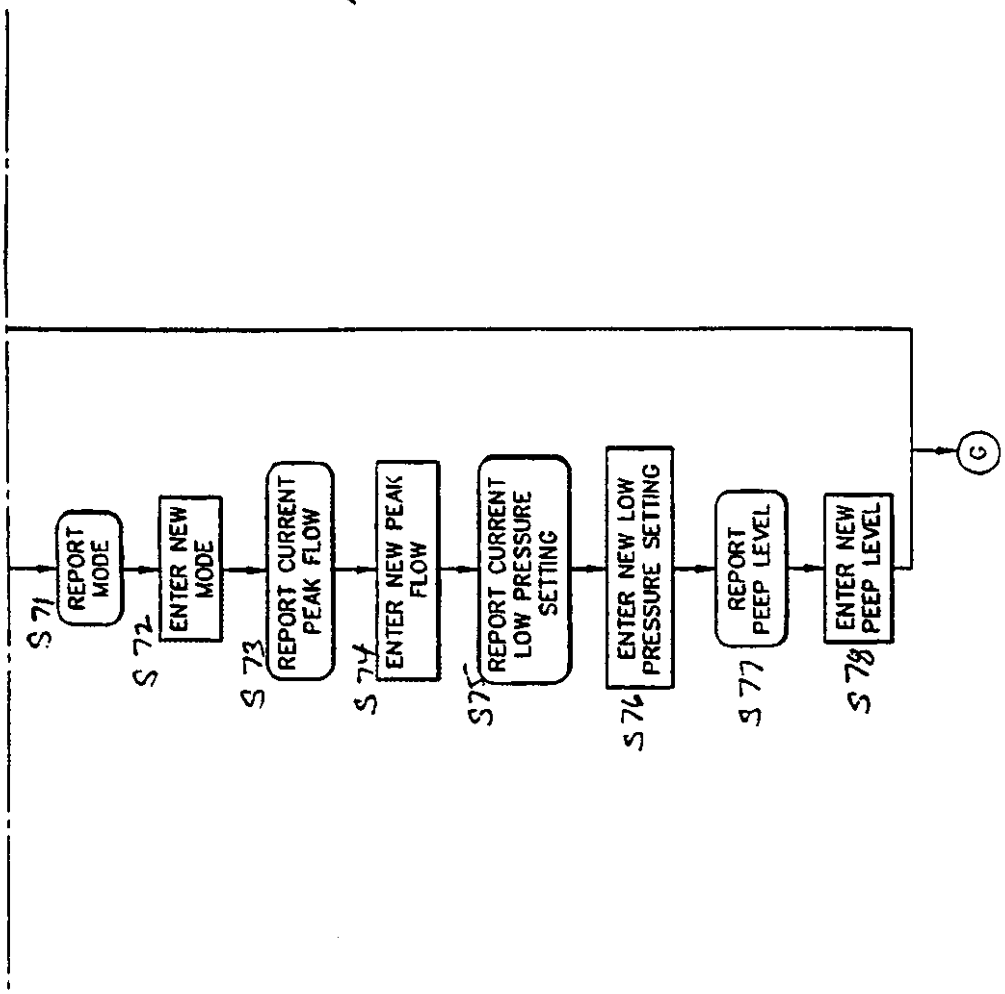

S 51
REPORT TIDAL VOLUME
S 52
REPORT BREATH RATE
S 53
REPORT HIGH PRESSURE SETTING
S 54
REPORT MODE
S 55
REPORT PEAK FLOW
S 56
REPORT LOW PRESSURE SETTING
S 57
REPORT PEEP LEVEL
S 58
REPORT ELAPSED TIME
S 59
REPORT LAST ALARM
S 60
GO TO MAIN MENU
S 61
ENTER EQUIPMENT S/N
S 62
ENTER PATIENT I/D
S 63
ENTER USER I/D
S 64
REPORT CURRENT TIDAL VOLUME
S 65
ENTER NEW TIDAL VOLUME
S 66
REPORT CURRENT BREATH RATE
S 67
ENTER NEW BREATH RATE
S 68
REPORT CURRENT HIGH PRESSURE SETTING
S 69
ENTER NEW HIGH PRESSURE SETTING
S 70
ENTER NEW TIDAL VOLUME
S 95
ENTER NEW BREATH RATE
S 96
ENTER NEW HIGH PRESSURE SETTING
S 97
ENTER NEW MODE
S 98
ENTER NEW PEAK FLOW
S 99
ENTER NEW LOW PRESSURE SETTING
S 100
ENTER NEW PEEP LEVEL
S 101

FIG. 7A2

FIG. 7A3


S71
REPORT MODE
S72
ENTER NEW MODE
S73
REPORT CURRENT PEAK FLOW
S74
ENTER NEW PEAK FLOW
S75
REPORT CURRENT LOW PRESSURE SETTING
S76
ENTER NEW LOW PRESSURE SETTING
S77
REPORT PEEP LEVEL
S78
ENTER NEW PEEP LEVEL
G

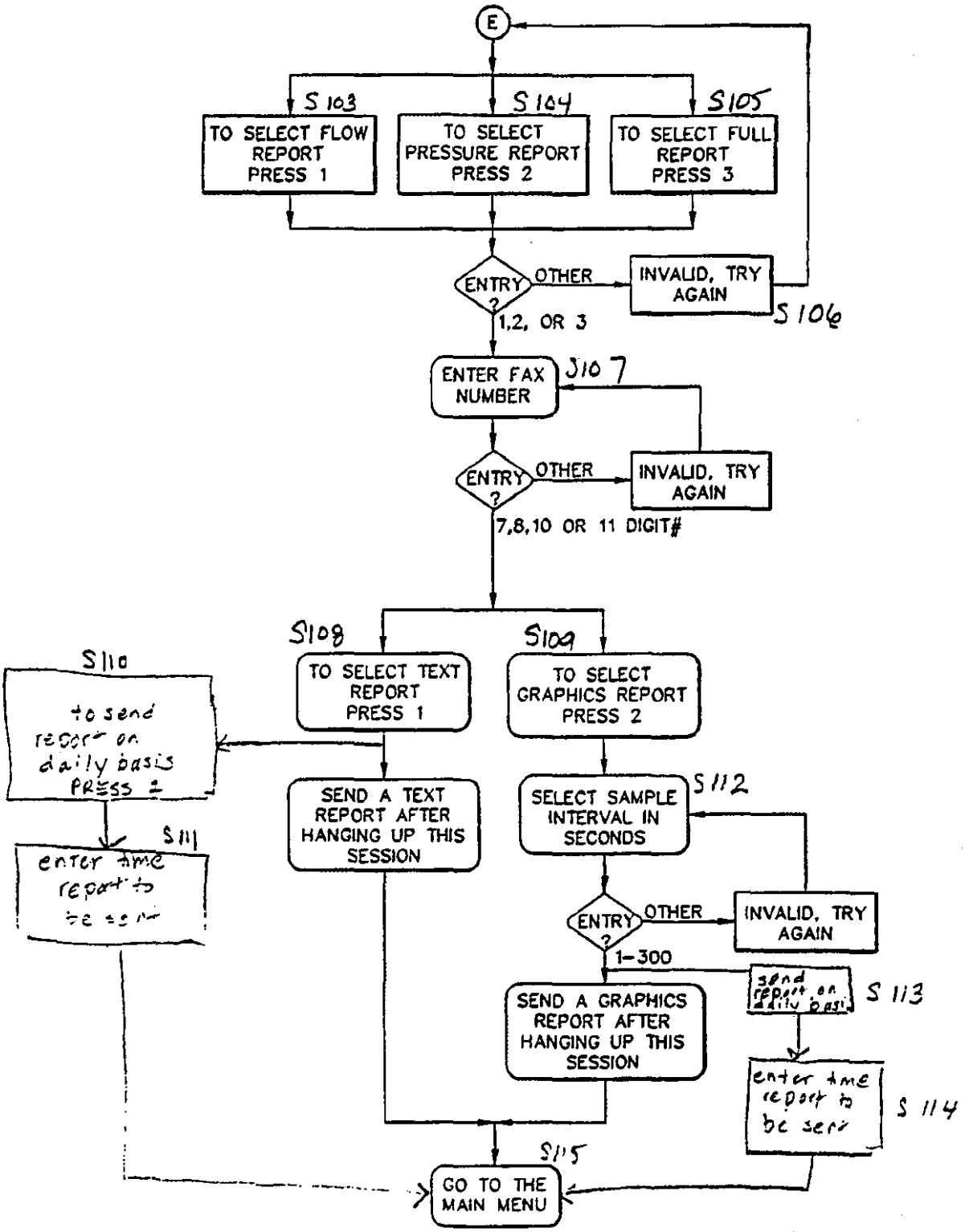

E
S 103
TO SELECT FLOW REPORT PRESS 1
S 104
TO SELECT PRESSURE REPORT PRESS 2
S105
TO SELECT FULL REPORT PRESS 3
ENTRY ?
OTHER
INVALID, TRY AGAIN
S 106
1,2, OR 3
ENTER FAX NUMBER
S107
ENTRY ?
OTHER
INVALID, TRY AGAIN
7,8,10 OR 11 DIGIT#
S108
TO SELECT TEXT REPORT PRESS 1
S109
TO SELECT GRAPHICS REPORT PRESS 2
S110
to send report on daily basis PRESS 2
S111
enter time report to be sent
SEND A TEXT REPORT AFTER HANGING UP THIS SESSION
S112
SELECT SAMPLE INTERVAL IN SECONDS
ENTRY ?
OTHER
INVALID, TRY AGAIN
1-300
send report on daily basis
S 113
SEND A GRAPHICS REPORT AFTER HANGING UP THIS SESSION
enter time report to be sent
S 114
S115
GO TO THE MAIN MENU

FIG. 7B

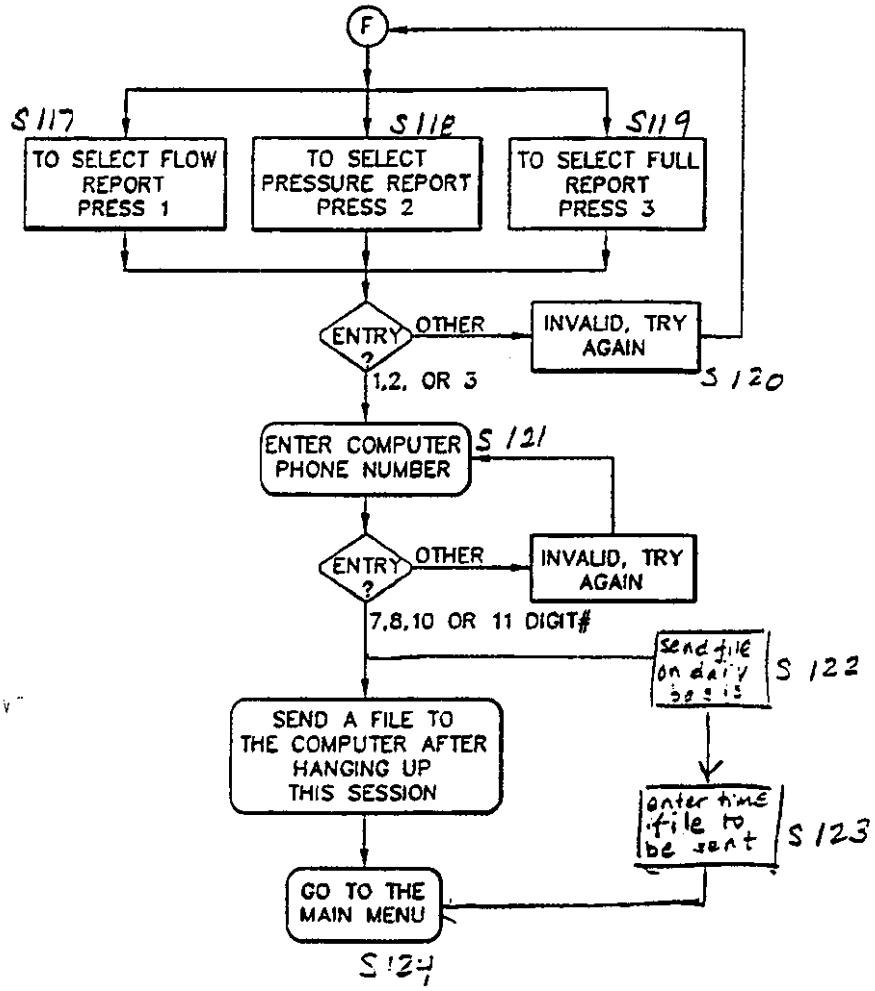

F
S117
TO SELECT FLOW REPORT PRESS 1
S118
TO SELECT PRESSURE REPORT PRESS 2
S119
TO SELECT FULL REPORT PRESS 3
ENTRY ?
OTHER
INVALID, TRY AGAIN
S120
1,2, OR 3
ENTER COMPUTER PHONE NUMBER
S121
ENTRY ?
OTHER
INVALID, TRY AGAIN
7,8,10 OR 11 DIGIT#
send file on daily basis
S122
SEND A FILE TO THE COMPUTER AFTER HANGING UP THIS SESSION
enter time file to be sent
S123
GO TO THE MAIN MENU
S124

FIG. 7C

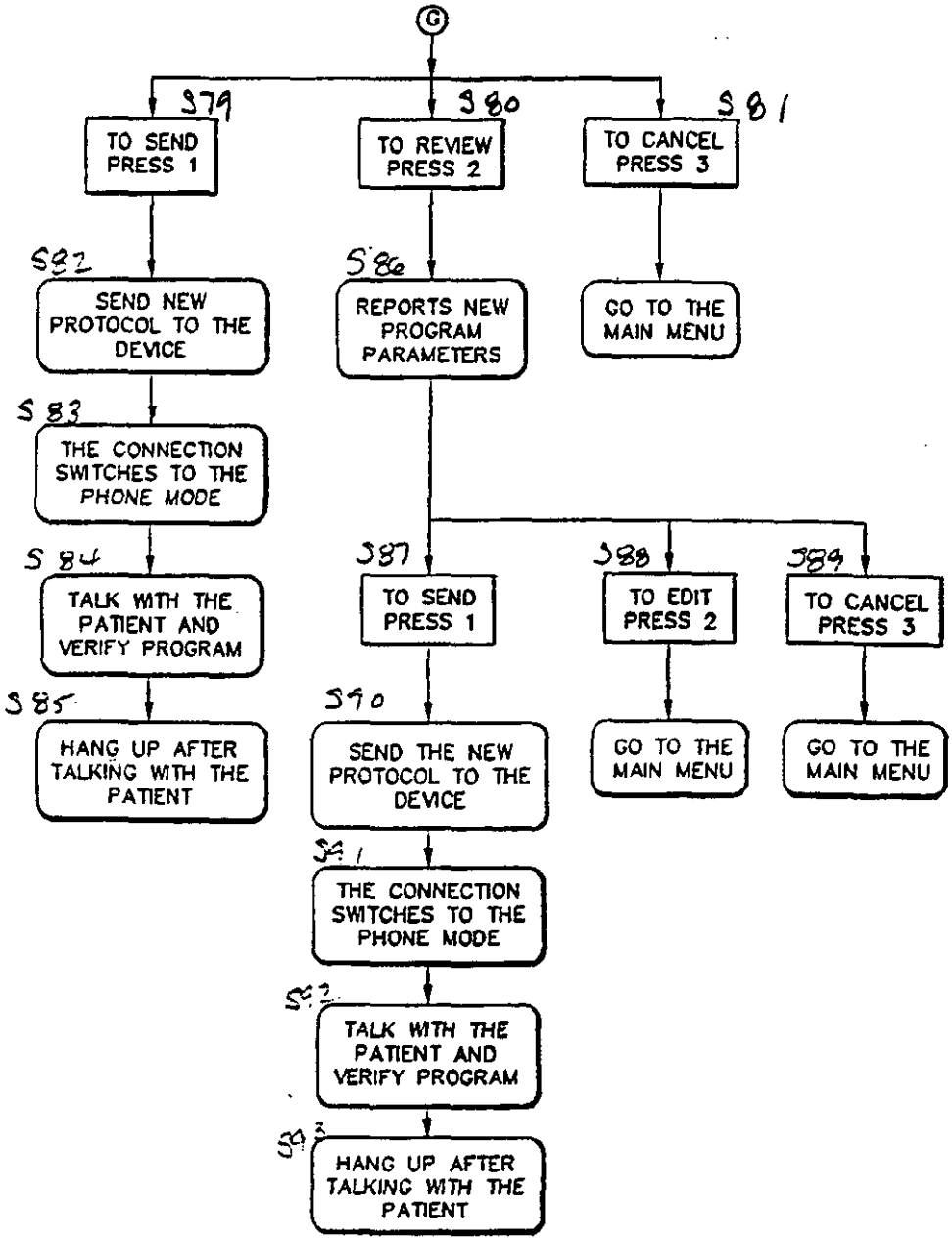

G
S79
S80
S81
TO SEND PRESS 1
TO REVIEW PRESS 2
TO CANCEL PRESS 3
S82
S86
SEND NEW PROTOCOL TO THE DEVICE
REPORTS NEW PROGRAM PARAMETERS
GO TO THE MAIN MENU
S83
THE CONNECTION SWITCHES TO THE PHONE MODE
S84
TALK WITH THE PATIENT AND VERIFY PROGRAM
S85
HANG UP AFTER TALKING WITH THE PATIENT
S87
S88
S89
TO SEND PRESS 1
TO EDIT PRESS 2
TO CANCEL PRESS 3
S90
SEND THE NEW PROTOCOL TO THE DEVICE
GO TO THE MAIN MENU
GO TO THE MAIN MENU
S91
THE CONNECTION SWITCHES TO THE PHONE MODE
S92
TALK WITH THE PATIENT AND VERIFY PROGRAM
S93
HANG UP AFTER TALKING WITH THE PATIENT

FIG. 7D

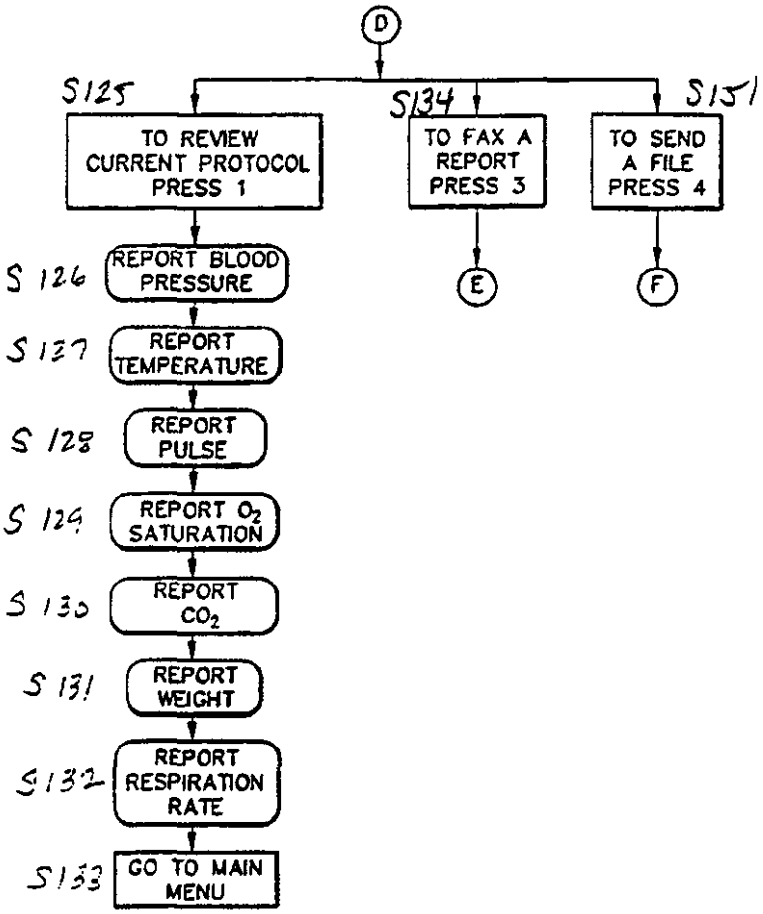

D
S125
TO REVIEW CURRENT PROTOCOL PRESS 1
S134
TO FAX A REPORT PRESS 3
S151
TO SEND A FILE PRESS 4
E
F
S 126
REPORT BLOOD PRESSURE
S 127
REPORT TEMPERATURE
S 128
REPORT PULSE
S 129
REPORT O_2 SATURATION
S 130
REPORT CO_2
S 131
REPORT WEIGHT
S 132
REPORT RESPIRATION RATE
S 133
GO TO MAIN MENU

FIG. 8A

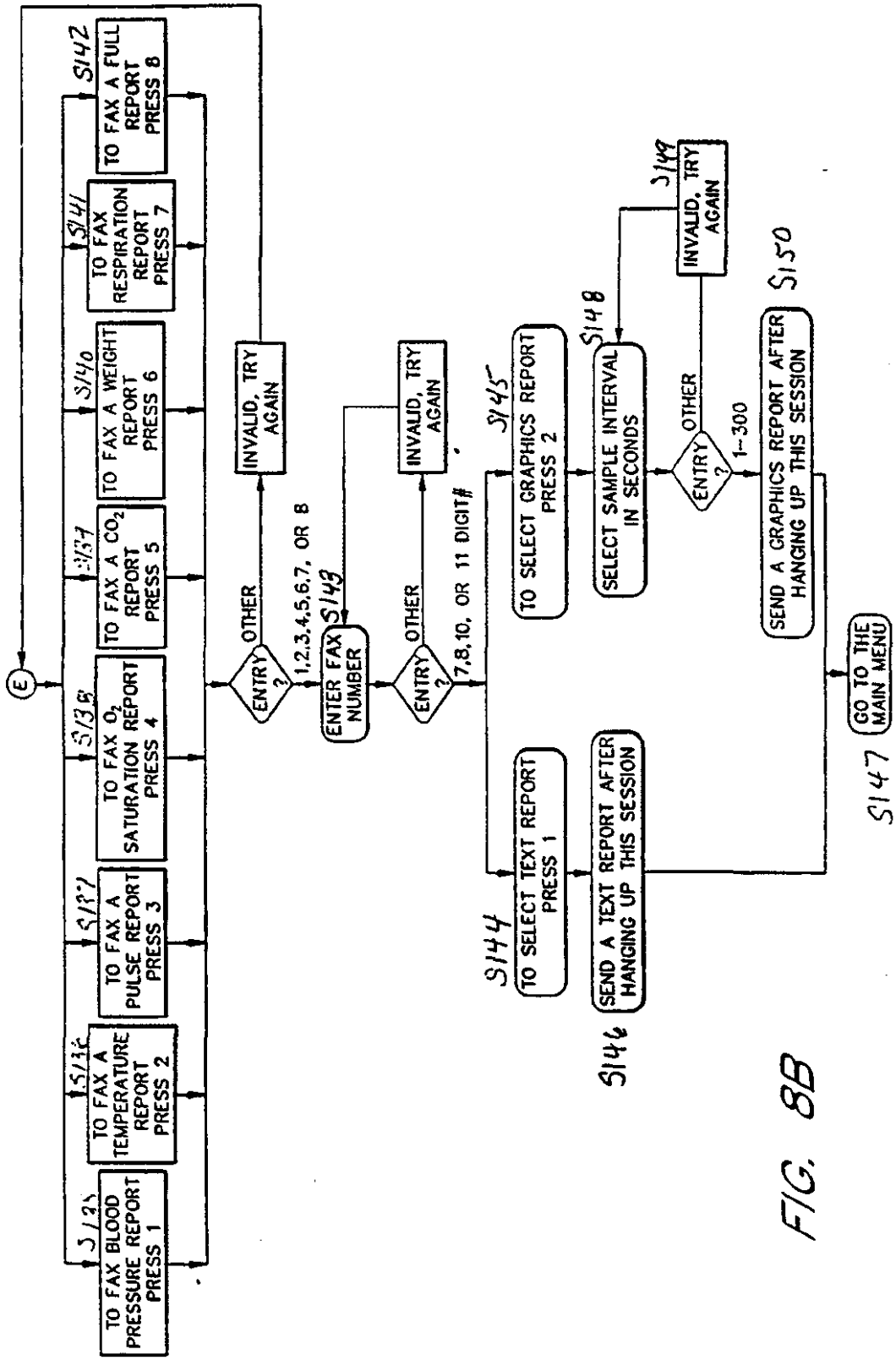

E
TO FAX BLOOD PRESSURE REPORT PRESS 1
S132
TO FAX A TEMPERATURE REPORT PRESS 2
S136
TO FAX A PULSE REPORT PRESS 3
S137
TO FAX O_2 SATURATION REPORT PRESS 4
S138
TO FAX A CO_2 REPORT PRESS 5
S139
TO FAX A WEIGHT REPORT PRESS 6
S140
TO FAX RESPIRATION REPORT PRESS 7
S141
TO FAX A FULL REPORT PRESS 8
S142
ENTRY ?
OTHER
INVALID, TRY AGAIN
1,2,3,4,5,6,7, OR 8
S143
ENTER FAX NUMBER
ENTRY ?
OTHER
INVALID, TRY AGAIN
7,8,10, OR 11 DIGIT#
S144
TO SELECT TEXT REPORT PRESS 1
S145
TO SELECT GRAPHICS REPORT PRESS 2
S146
SEND A TEXT REPORT AFTER HANGING UP THIS SESSION
S148
SELECT SAMPLE INTERVAL IN SECONDS
ENTRY ?
OTHER
INVALID, TRY AGAIN
S149
1-300
S150
SEND A GRAPHICS REPORT AFTER HANGING UP THIS SESSION
S147
GO TO THE MAIN MENU

FIG. 8B

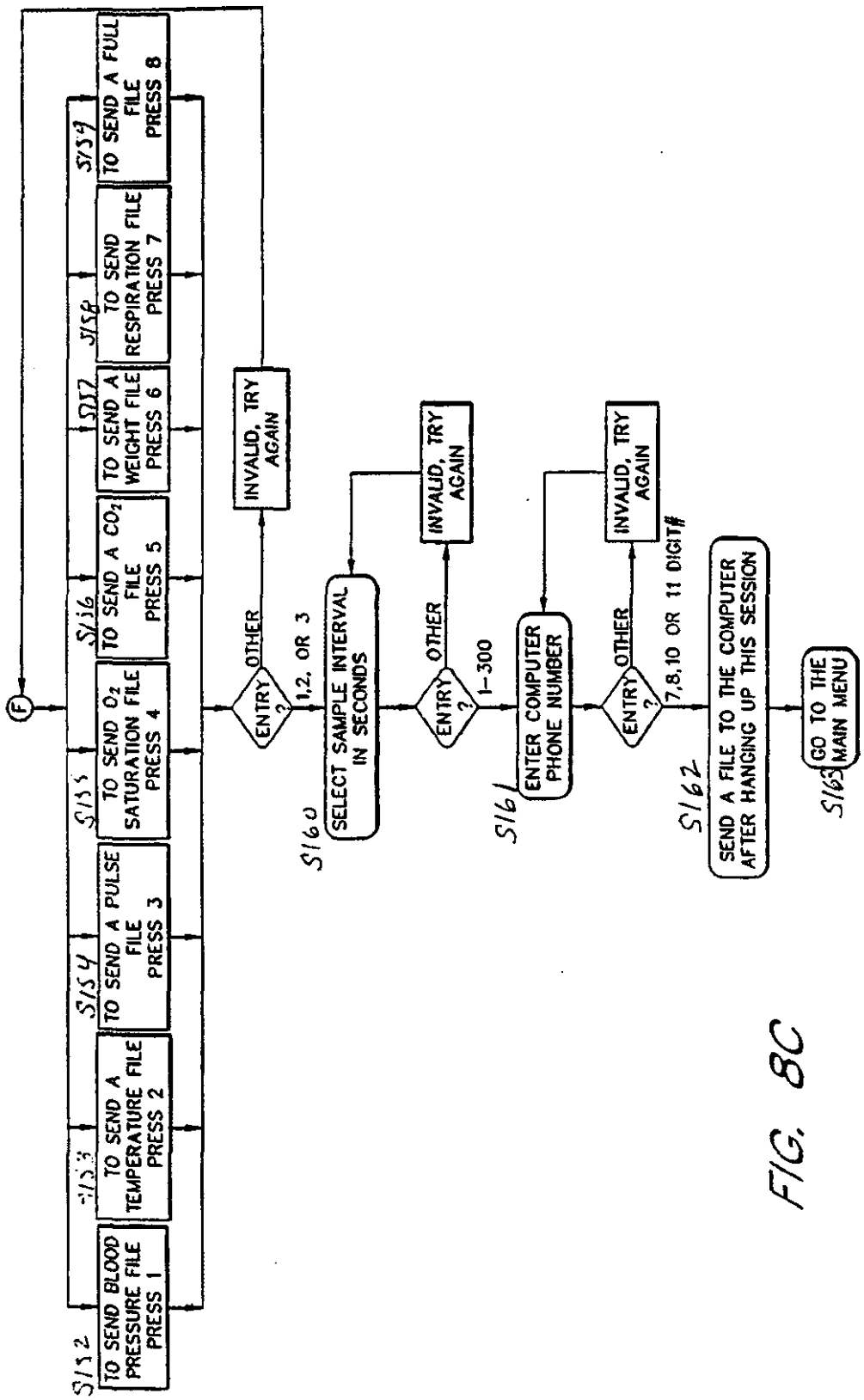

F
S152
TO SEND BLOOD PRESSURE FILE PRESS 1
S153
TO SEND A TEMPERATURE FILE PRESS 2
S154
TO SEND A PULSE FILE PRESS 3
S155
TO SEND O_2 SATURATION FILE PRESS 4
S156
TO SEND A CO_2 FILE PRESS 5
S157
TO SEND A WEIGHT FILE PRESS 6
S158
TO SEND RESPIRATION FILE PRESS 7
S159
TO SEND A FULL FILE PRESS 8
ENTRY ?
OTHER
INVALID, TRY AGAIN
1,2, OR 3
S160
SELECT SAMPLE INTERVAL IN SECONDS
ENTRY ?
OTHER
INVALID, TRY AGAIN
1-300
S161
ENTER COMPUTER PHONE NUMBER
ENTRY ?
OTHER
INVALID, TRY AGAIN
7,8,10 OR 11 DIGIT#
S162
SEND A FILE TO THE COMPUTER AFTER HANGING UP THIS SESSION
S163
GO TO THE MAIN MENU

FIG. 8C

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[71]申请人 I-弗琉公司
地址 美国加尼福尼亚州
[72]发明人 R·S·瓦斯科 R·马森加勒

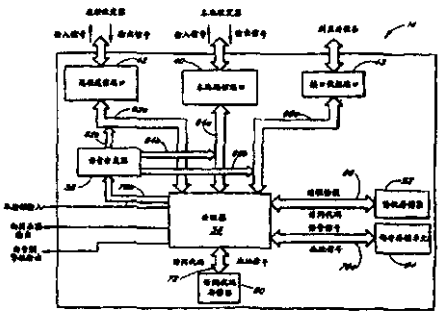
[74]专利代理机构 中国专利代理(香港)有限公司
代理人 罗 朋 张志醒

权利要求书1页 说明书19页 附图页数15页

[54]发明名称 用于监控病人的方法和装置

[57]摘要

一个远程可编程并可访问的医疗设备系统(10)被公开,该系统包括一个接口单元(14),以及连接到病人(18)的医疗设备(12)。通过一个收发器,诸如电话(48)或计算机(50),人们可以以语音的、电子的或纸张的形式获得来自位于远处的医疗设备的状态报告。此外,人们可以改变与医疗设备联系的协议,或被位于远处与该医疗设备相联系的警报警告。



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权 利 要 求 书

1. 一远程可访问的医疗设备系统，具有可编程的协议并保存病人数据，该医疗设备系统通过一个远程收发器成为可编程，并且能够向远程地点发送病人数据，该医疗设备系统包括：

一连接到病人的可电子控制的医疗设备，并具有与之联系的协议或病人数据；

一用于存储可编程协议或病人数据的存储器；

一用于存储数据信号的数据存储单元；

一通信端口，用于连接远程收发器，该收发器用于向远程地点发送数据信号，并用于接收来自远程收发器的信号；

一处理器，用于操纵在所说的存储器中的可编程协议以响应对远程编程信号的接收，或用于所说的数据信号，包括来自数据存储单元的病人数据，以响应远程数据访问信号。

2. 用于通过放置在远离所说的医疗设备的收发器来访问医疗设备的方法，包括与所说的医疗设备相联系的控制，所说的控制具有与之相联系的可编程协议或病人数据，包括如下步骤：

建立医疗设备与远程收发器之间的连接；

从远程收发器向所说的控制发送一个信号；

处理所说的信号，如果所说的信号是一来自所说的远程收发器的编程信号，操纵所说可编程协议，而如果所说的信号是一数据传输信号，向所说的收发器或其它地点发送所说的病人数据。

00.07.12

说　明　书

用于监控病人的方法和装置

发明领域

本发明涉及远程可访问的用于医疗应用的健康护理系统．本发明特别涉及病人的医疗设备，该设备允许远离病人的健康护理提供者监控病人的医疗状态，并能够编辑病人的协议，记录病人协议的改变，以及在警报条件时通知护理提供者．

发明背景

由于保健费用的不断升高，医院床位的高费用，为病人提供舒适和方便的要求，医疗工业已经提出了对患有各种疾病的病人的在家护理．许多病人必须连接各种医疗设备．这些医疗设备时常监控关于病人健康的某些参数，并具有控制，这些控制由于病人需要的改变而必须被调节．治疗方法的改变也会要求整个协议被编程．在这些医疗设备的早期版本中，护理提供者被要求在现场出现以调节设备的协议．这样的重编程是昂贵并费时的．

此外，健康护理提供者，诸如医院，支付健康护理的健康保险机构，现在常常要求所有医疗过程的证明．举例来说，一家健康保险机构可能需要病人证明衡量其健康的特定参数达到一定程度以使病人得到补偿，或该机构可能需要设备确实被使用的证据．而且，病人或其在家中的护理提供者常常不能通知护理提供者与医疗设备相联系的报警的发生，并且在某些情况下病人可能响应于报警情况而乱弄设备．

因此，需要远程可控制的医疗设备系统，该系统能够通过向护理提供者的远程传真机或计算机或其它保健人员报告报警情况并发送状态报告通知护理提供者．

发明概述

本发明导出实现上述目标的一种远程可编程的医疗设备系统以及通过远程收发器远程编程医疗设备系统的方法．

本发明的系统允许一个护理提供者从位于远处与病人相连的医疗系统获得病人的状态，改变病人的协议，或通过具有按键式小键盘

的远程收发器在收到语音合成的指令后请求证明文档．该方法使用简单，无须培训；无论电话位于何地，它允许一护理提供者执行上述功能．如果该护理提供者能够访问计算机，他可以象使用电话一样执行上述功能，还可以在计算机屏幕上浏览病人的实时状态，该状态通过图象或表格形式改变或向系统发送具有想要的参数的文件以编程该医疗设备．

护理提供者计算机也可以指示该系统以每隔设定的时间间隔向指定地点自动地发送状态报告，并自动地召唤护理提供者报告一个警报情形．此外，该系统可以通过访问中央数据存储器在单个编程会话中远程地编程连接到一个或多个病人的多个医疗设备或远程地编程多个病人的协议．

为获得这些或其它好处，并根据这里包含并广泛地描述的本发明的目的，本发明定义了具有可编程协议的远程可编程并可访问的医疗设备系统，该医疗设备系统通过一远程收发器，诸如按键式电话或计算机，成为远程可编程的．可替换地，该医疗设备可以不具有可编程协议．例如，该设备可以只监控病人的生命信号．本发明的远程可编程医疗设备系统包括用于存储可编程协议或活动记录的存储器以及一远程通讯端口，该端口用于向远程收发器发送语音信号，向远程传真机或计算机发送数据，并接收来自远程收发器的远程编程信号．该系统还包括一用于存储语音信号的语音存储单元，以及处理器，连接到（1）远程通讯端口，用于处理可编程协议以响应远程编程信号的接收；（2）语音存储单元，用于存取来自语音存储单元的语音信号；以及（3）存储器，用于存取来自存储器的可编程协议．

在一个附加的方面， 本发明包含一个医疗设备系统，该系统具有存储在存储器中的可编程报警例程．该医疗设备系统包含一个具有数据端口的医疗设备，以及在医疗设备上通过一个接口数据端口连接到或集成在医疗设备数据端口的接口单元．该接口单元进一步包括一个语音存储单元，用于存储语音信号，该语音信号表示警报情形已经发生，以及一个远程通讯端口，用于自动地向远程按键式收发器发送语音信号，或自动地向远程传真机或计算机发送关于报警情形的数据．该接口单元还包含一处理器，连接到（1）远程通讯端口，用于

处理报警情形以响应医疗设备报警信号的接收；（2）语音存储单元，用于存取来自语音存储单元的语音信号；以及（3）存储器，用于存取来自存储器的报警例程。来自医疗设备上警报器的信号经由医疗设备数据端口转换到接口数据端口。

在另一方面，本发明包含一个远程可编程医疗设备系统，该系统具有存储在协议存储器中的可编程协议，该系统通过远程收发器成为可编程。该医疗设备系统包含一个接口单元以及至少一个医疗设备，每个医疗设备具有一个数据端口和一个接口单元，该接口单元通过一个接口数据端口连接到或集成在各自医疗设备上的每个数据端口。该接口单元进一步包含一个语音存储单元，用于存储语音信号，以及一个远程通讯端口，用于自动地向远程按键式收发器发送语音信号，向远程传真机或计算机发送数据，以及用于接收来自远程收发器的远程编程信号（诸如在远程电话的情形下，双音频多频率信号）。该接口单元还包含一处理器，连接到（1）远程通讯端口，用于处理可编程协议以响应远程编程信号的接收；（2）语音存储单元，用于存取来自语音存储单元的语音信号；以及（3）存储器，用于存取来自存储器的可编程协议。被处理的可编程协议经由接口数据端口从处理器转换到医疗设备。

在另一方面，本发明包含一个远程可编程医疗设备系统，该系统具有存储在一个中央存储器中多个病人的可编程协议，该系统通过一个远程收发器成为可编程。该系统包含一个远程中央数据存储单元，可连接到多个病人的多个医疗设备，每个病人一个接口单元，以及每个医疗设备具有连接到其相应接口单元上的数据端口的数据端口。每个接口单元包含一个语音存储单元，用于存储语音信号，以及一个远程通讯端口，用于向远程中央数据存储器发送数字信号，向远程传真机或计算机发送数据，以及用于接收来自远程按键式收发器的远程编程信号（诸如在计算机的情形下，数字信号）。每个接口单元还包含一处理器，连接到（1）其远程通讯端口，用于处理可编程协议以响应远程编程信号的接收；（2）其语音存储单元，用于存取来自其语音存储单元的语音信号；以及（3）其存储器，用于存取来自其存储器的可编程协议。被处理的可编程协议经由接口数据端口从处理器转

换到医疗设备．远程中央数据存储单元包含：一个语音存储单元，用于存储语音信号；第一通讯端口，用于向远程按键式收发器发送语音信号，向远程传真机或计算机发送数据，以及用于接收来自远程按键式收发器的远程编程信号；以及第二通讯端口，用于向医疗设备的数据端口发送信号，或接收来自医疗设备的数据端口的信号．远程中央数据存储单元进一步包含一处理器，连接到（1）第一远程通讯端口，用于处理可编程协议以响应远程编程信号的接收；（2）第二远程通讯端口，用于处理将被发送给病人的接口单元的可编程协议；（3）语音存储单元，用于存取来自语音存储单元的语音信号；以及（4）存储器，用于存取来自存储器的可编程协议．被处理的可编程协议经由第二远程通讯端口从远程中央数据存储单元转换到接口单元的处理器．

当前技术下，本发明的进一步的目标，特性，以及好处参考附图根据后面的详细描述将变得显而易见．

附图简述

图 1 概要地演示了本发明的医疗系统，通过该系统，护理提供者可以远程地访问并控制与病人相联系的医疗设备；

图 2 概要地演示了图 1 中演示的系统的一个接口安排；

图 3 是演示该接口的通用控制机制的流程图；

图 4 是演示该系统的一种计算机编程模式的流程图；

图 5 是演示该系统一个访问代码菜单的流程图；

图 6 是演示该系统的一个警报控制菜单的流程图；

图 7 演示了图 7A1，7A2，和 7A3 中的图表之间的关系；

图 7A1 至 7A3 是演示在图 3 中演示的适于使用机械式呼吸机的系统的部分主菜单的流程图；

图 7B 是演示适于使用机械式呼吸机的系统的传真报告菜单的流程图；

图 7C 是演示适于使用机械式呼吸机的系统的发送文件菜单的流程图；

图 7D 是演示适于使用机械式呼吸机的系统的编辑协议子菜单的流程图；

图 8A 是演示在图 3 中演示的适于使用生命信号监视器的系统的部分主菜单的流程图；

图 8B 是演示适于使用生命信号监视器的系统的传真报告菜单的流程图；以及

图 8C 是演示适于使用生命信号监视器的系统的发送文件菜单的流程图.

优选实施例详述

现在详细参考本发明的优选实施例，例子在附图中被演示. 在任何可能的地方，在所有附图中相同的数字将被用于指示相同的或相似的部分.

根据本发明，远程可编程的医疗设备系统被提供，该系统允许从一个位于远处的收发器，诸如一按键式电话机或计算机与医疗设备通讯及对其编程. 该系统包括一存储器，一语音存储单元，一远程通讯端口，以及一连接到远程通讯端口、语音存储单元和存储器的处理器. 应当理解，在这里术语“编程”，“可编程”，以及“处理”是普及化的术语，指一组操作、功能，以及数据操纵. 因而，这些术语在这里不限于编辑和删除数据，参数，以及代码. 举例来说，在这里使用的编程和处理可以包括编辑，改变，删除，输入，重新输入，浏览，检查，加锁，以及插入功能.

本发明的系统的一个示例性的实施例在图 1 中显示，通常被引用数字 10 指示. 如这里实施的及在图 1 中所示的，该远程可编程医疗设备系统 10 包括医疗设备 12 以及接口单元 14. 该医疗设备优选地包括一病人连接 16，诸如一电线，通过该电线病人数据，例如来自传感器，被发送.

接口 14 包括用于将接口 14 连接到医疗设备 12 的电缆 20，用于控制接口 14 的操作的控制 22，用于指示接口 14 的各种状态的指示灯 24，以及用于提供语音警告信号的内部语音设备. 如这里实施的，控制 22 包括一连接按钮 28，一本地按钮 30， 一发送按钮 32. 可替换地，如本领域的技术人员容易理解的，本地按钮 30 可以不出现. 指示灯 24 包括一等待指示灯 34，一电话/计算机指示灯 36，一警报指示灯 38. 控制 22 和指示灯 24 的功能将在下面详细描述. 接口 14 还

优选的包括一远程通讯端口 40 以及一本地通讯端口 42.

作为通过电线 20 连接的一个替换，接口 14 与医疗设备 12 可以通过接口数据端口 44 和医疗设备数据端口 46 通讯，其中每个端口包括一无线发射器/检测器对．优选地，数据端口 44 和 46 中每个包括一红外或射频发射器/检测器，允许在医疗设备 12 和接口 14 之间无线通讯．其它无线通讯端口也可以被使用．一电源电缆 20 被优选地使用来通过接口 14 向医疗设备 12 提供电源．可替换地，医疗设备可以具有其自己的电源电缆，不通过接口 14 连接，而直接连接到电源（未显示）．

如同这里实施的，远程通讯端口 42 和本地通讯端口 40（如果存在），每个包括一本领域技术人员熟知的标准调制解调器．该调制解调器可以工作在 28800 波特或其它波特率．该系统可以被这样安排，使位于病人附近的，如当病人在医院时在病房的，护理提供者，能够通过本地端口 40 访问接口 14．在另一方面，如果护理提供者远离医疗设备系统 10，该系统优选地被如此安排，当连接按钮 28 被按下，远程通讯端口 42 被激活．以这种方式，护理提供者能够通过一远程收发器，诸如电话 48 或计算机 50 与接口 14 通讯．应当理解，接口 14 可以只包含单个端口来代替分开的本地和远程端口，信号通过该端口被输入和输出．

为方便起见，这里的描述参照一护理提供者使用电话或个人计算机来远程地访问医疗设备 12 的情况，但是应当理解，任何收发器能够独立地以及响应各种提示和问询激活或选择可编程参数．还应当理解，术语“远程按键式收发器”不限于传统的具有 12 键小键盘包括 0—9，*，和#键，的按键式电话机．更确切地，如在此定义的，术语“远程按键式收发器”指能够通过键盘或其它数据输入系统产生信号的任何收发器，因此不限于产生 DTMF 信号的收发器，诸如传统电话机．如这里定义的其它类型的“按键式收发器”的例子包括具有键盘和/或光标控制设备的计算机，传统的按键式电话机，将人声转换为脉冲或数字或模拟信号的发射器，以及寻呼机收发器．

参考图 2，包括在接口 14 中的元件将被更详细地描述．如同前面陈述的，接口 14 包含远程通讯端口 42，本地通讯端口 40，一协议和

事件存储器 52，一语音存储单元 54，一处理器 56，一语音合成器 58，以及一访问代码存储器 60．可替换地，协议和事件存储器 52 与处理器 56 可以是一集成单元．协议存储器 52，语音存储单元 54，以及访问代码存储器 60 可以被包含在同一个存储器设备（诸如随机访问存储器）中，或在分开的存储单元中．优选地，语音存储单元 54 包括一只读存储器（ROM）．接口 14 还包括数据端口 43，用于在接口 14 与医疗设备 12 之间（例如通过电线 20 或通过发射器/检测器 44）传递信息．语音合成器 58 优选地是一集成电路，将数字化语音信号转换为模拟人类语音的信号．如同这里实施的，语音合成器 58 只需要被用于转换从接口 14 到远程电话 48 的输出信号，而不要求转换来自远程电话 48 或来自远程计算机 50 的输入信号或到远程计算机 50 的输出信号．语音合成器可以包括可商业地获得的语音合成芯片．

远程通讯端口 42，本地通讯端口 40，以及接口数据端口 44 分别通过数据总线 62a，64a，和 66a 都与处理器连接．通讯端口 40，42 从收发器 48，50 接收信号并通过总线 62a，64a 将这些信号分别传递给处理器 56，处理器 56 处理这些信号，执行各种操作以响应这些信号．如果护理提供者选择来自电话 48 的远程方式，处理器 56 经由总线 70a 接收来自语音存储单元 54 的数字化语音信号并经由总线 70b 向语音合成器 58 发送这些数字化信号，在语音合成器 58，这些信号被转换为人声模拟信号．这些人声模拟信号经由总线 62b，64b，和 66b 被从语音合成器 58 发送给总线 62a，64a，和 66a，这些总线分别将这些信号传递给远程通讯端口 42，本地通讯端口 40 以及接口数据端口 44．

举例来说，如果需要向护理提供者提供操作远程电话 48 的指示．处理器 56 通过与其相连的数据总线 70a 向语音存储单元 54 发送一语音地址信号．该语音地址信号与语音存储单元 54 中包含特定语音信号的位置相对应，其中该特定语音信号将被发送给远程收发器 48．一旦接收到语音地址信号，该特定语音信号被存取并被从语音存储单元 54 经由数据总线 70a 发送到处理器 56．然后处理器 56 将语音信号经由数据总线 70b 传递给语音合成器 58，该合成器转换语音信号并将转换后的信号经由数据总线 62b 和 62a 发送给远程通讯端口 42，该端口

将转换后的信号发送给远程收发器 48.

从语音存储单元 54 取回的语音信号可以是数字化的人的语音或计算机生成的语音信号（两者为本领域技术人员熟知）. 该数字化的语音信号被语音合成器 58 转换为模仿人声的信号. 该语音信号指示护理提供者如何响应该语音信号，以及应当发送何种信息. 由于远程收发器可以是具有有多个按键的小键盘的按键式电话机，护理提供者按下适当的按键，由此向接口 14 的远程通讯端口发回一 DTMF 信号. 但是，应当理解，远程收发器不必是一按键式电话机，而可以是任何能够发送和接收 DTMF 或其它类似信号的收发器. 举例来说，远程收发器可以是计算机或便携式控制器.

如果被护理提供者发送的 DTMF 信号是从远程电话 48 发送给接口 14 的远程通讯端口 42 的一远程编程信号，远程通讯端口 42 然后经由数据总线 62a 将远程编程信号传递给处理器 56. 响应对远程编程信号的接收，处理器 56 从协议存储器 52 访问编程协议的一特定参数. 为访问该参数，处理器 56 通过连接处理器 56 与协议存储器 52 的数据总线 68 发送一协议地址信号. 该协议地址信号与协议存储器 52 中包含该参数的位置相对应. 该参数然后被从协议存储器 52 通过数据总线 68 发送给处理器 56. 根据远程编程信号的性质，处理器 56 然后能够对该参数执行一系列操作，包括编辑，删除，或将该参数发送回远程收发器 48，050 用于检查. 本领域的技术人员将认识到，许多种类的信号或命令可以被从远程收发器 48，050 发送给接口 14 用于处理. 这样的信号的例子，它们如何被处理，以及它们的影响将随着本发明的功能的描述而在后面被详细描述.

根据本发明，医疗设备系统 10 可以结合各种安全装置以防止对接口 14 以及相应的医疗设备 12 不希望的访问. 明显地，一用户访问代码可以被用于阻止除具有用户访问代码的个人的访问，该用户访问代码可以是一多个十进制数字的数（优选地，四个十进制数字）. 医疗设备系统可以被装备一个或多个用户访问代码，这些代码被存储于访问代码存储器. 为开始与医疗设备系统 10 的通讯，一护理提供者经由远程按键式收发器 48，50 与医疗设备系统连接. 这连接可以通过从护理提供者向医疗设备系统 10(或与接近医疗设备系统的电话交

谈的病人）的呼叫开始，或通过从病人向护理提供者的呼叫开始，两种方法中护理提供者都与医疗设备系统 10 连接．在护理提供者与医疗设备系统 10 之间的连接建立后，接口 14 被优选地设定为要求护理提供者输入用户访问代码．如果护理提供者输入了有效用户访问代码（如前面解释的，可以有多个有效代码），护理提供者被允许访问和/或编程可编程协议．

在一编程会话过程中，在一定情况（将在下面描述）下，用户访问代码可以被检查，编辑，和/或完全删除及重新输入．为执行这些功能中的任一功能，编程信号被护理提供者从远程收发器 48，50 发送给接口 14．该编程信号通过远程通讯端口 42 被传递给处理器 56，而处理器 56 处理这些信号并产生一访问代码地址信号．该访问代码地址信号与访问代码存储器 60 中保存用户访问代码的存储位置相对应，该信号被通过数据总线 72 发送给访问代码存储器 60．该特定的用户访问代码然后被取得并通过数据总线 72 发送回处理器 56，该处理器以某种方式处理该用户访问代码．

为与医疗设备系统 10 通讯，该接口被装备了接口数据端口 43．医疗设备协议可以经由接口数据端口 43 和医疗设备数据端口 46 被从接口 14 发送给医疗设备 12．因此，举例来说，处理器 56 从协议存储器 52 访问该协议并经由数据总线 66a 发送该协议到接口数据端口 43．该接口数据端口 43 然后向医疗设备数据端口发送信息（诸如通过电线 20 或无线发射器/收发器 46），其中该信息通过电路及/或软件在医疗设备 12 中被处理．以这种方式，该医疗设备协议可以被编程（例如，被编辑，重建，检查，加锁，重新输入，等）．

发送按钮 32 被设计为允许向一远程位置，诸如计算机 74 或传真机 76，发送医疗设备数据或协议．以这种方式，一远程记录被维护，诸如在一台计算机上．如果计算机 74 远离医疗设备系统 10，位于接口 14 的人可以按下发送按钮 32，下载存在的协议或数据到远程通讯端口 42．该协议然后经由远程通讯端口 42 被发送到远程计算机 74．

连接按钮 28 优选地被用于开始或进入医疗设备系统 10 的远程编程模式．在开始一编程会话时，护理提供者呼叫与医疗设备系统 10 对应的电话号码（或病人的家庭电话）．病人 18 可以用他或她的电

话应答该呼叫，护理提供者与病人可以通过标准话音信号通讯．这里称为电话模式或病人对话模式．然后护理提供者指示病人按下连接按钮 28，这断开了病人 18 与电话线的连接并开始编程模式，该模式参考图 3-8 在下面描述．但是，如果病人 18 不回答护理提供者的呼叫，接口 14 可以被装备一内部切换系统，直接将护理提供者与接口 14 连接并开始编程模式．该内部切换可以用接口 14 中的硬件，或控制处理器 56 的软件，或软硬件的结合来实现．任一方式中，护理提供者然后可以开始处理存储在接口 14 中的信息和协议．（如同前面描述的，该呼叫可以由病人 18 向护理提供者发出．）

现在描述指示灯 24 的功能．优选地，指示灯 24 包括 LED．等待灯 34 指示何时接口 14 处于编程会话中或何时它正下载协议到一远程位置，诸如远程计算机 74．相应地，等待灯 34 告诉病人 18 不要打扰接口 14，指导等待灯 34 熄灭，指示接口 14 的内部处理元件被激活．电话灯 36 指示何时护理提供者和病人 18 正通过远程收发器 48，50 通讯，以及因此，何时接口 14 的内部处理元件被激活．电话灯 36 也可以指示何时医疗设备系统 10 就绪．

警报灯指示各种警告情况以及医疗设备系统 10 的功能．医疗设备 12 经由医疗设备数据端口发送到接口数据端口 43．该信号经由总线 66a 被传递到处理器 56．紧接着，处理器 56 通过与处理器 56 相连的数据总线 70a 发送一语音地址信号到语音存储单元 54．该语音地址信号与在语音存储单元 54 中包含属于该警告情况的语音信号的位置相对应，该语音信号将被发送给远程地点（诸如 48，50，74，或 76）．一旦接收到警告地址信号，该警告信号从语音存储单元 54 被访问并经由数据总线 70a 被发送到处理器．处理器 56 然后经由数据总线 70b 传递该语音信号到语音合成器 58，而语音合成器 58 转换语音信号并经由数据总线 62a，62b 发送转换后的信号到远程通讯端口 42，远程通讯端口发送该转换后的信号到远程收发器．

<u>对本发明的系统的医疗设备的远程访问</u>

参考图 3，编程模式或本发明的次序将被详细描述．一护理提供者可以从远程电话 48，远程计算机 50 或其它收发器之一访问并处理接口的协议，如前面所描述．通过远程电话 48 的编程模式将首先被

描述．护理提供者拨出与医疗设备相对应的电话号码（步骤 1）．一合成的语音消息将询问护理提供者是否要在远程编程会话前先与病人交谈（步骤 2）．如果护理提供者选择“是”，护理提供者与病人通过标准语音信号通讯（步骤 3）．更明确地，病人将提起与本地端口 40 通讯的本地电话 48A，并和在与远程端口 42 通讯的远程电话 48 上的护理提供者交谈．（见图 1）当交谈结束，护理提供者要求病人按下接口上的连接按钮（步骤 4），由此将护理提供者与接口连接（步骤 5），结束电话模式，并开始远程按键编程会话．如果护理提供者选择在远程编程会话前不与病人交谈（步骤 6），护理提供者可以选择“否”（步骤 6），并被直接连接到接口 14，由此不进入交谈模式而通过进入访问代码菜单（图 5）直接开始一远程按键编程会话．

可替换地，护理提供者可以从远程计算机 50 访问并处理接口的协议．护理提供者可以通过使远程计算机 50 的调制解调器拨出医疗设备系统 10 的电话号码．在该设备只监视病人的生命信号的情况下，本领域的技术人员可以理解，护理提供者可以得到生命信号．一开始，一个消息将出现在护理提供者的计算机屏幕上，该消息询问护理提供者是否希望在进入主菜单前浏览包含额外选项的菜单．如图 4 所示，这些选项包括，但不限于：向护理提供者的计算机发送病人的状态（步骤 8）；在护理提供者的计算机上从文件中装入新协议（步骤 9）；激活实时监控模式以使护理提供者可以在病人的状态改变时浏览病人的当前状态（步骤 10）；接收设备的 PM 历史（步骤 11）；以及激活诊断模式（步骤 12）．如果护理提供者选择不进入特殊选项菜单（步骤 7），他可以通过进入访问代码菜单（图 5）直接地进入一远程编程会话．

访问代码

如果用户输入正确访问代码（步骤 13），该用户优选地被允许执行与访问代码相关的一定功能．举例来说，并参考图 5，如果护理提供者已经输入一主访问代码，接口 14 产生一些语音问询（对于一电话链接，当计算机 50 被使用时，代表相同消息的数字字母文本的信号可以被发送），这些问询被发送给护理提供者，并为护理提供者提

供一些选项．首先，在步骤 14，该护理提供者被询问是否将输入一新的主访问代码，并被指示按下按键式小键盘上一特定按钮（在本例中为数字“1”）以选择该选项．如果护理提供者选择该选项，接口 14 告诉护理提供者输入现有的主访问代码（步骤 15），并输入一新主访问代码（步骤 16）．新输入的主访问代码然后被接口 14 反馈给护理提供者（步骤 17），接口 14 产生一语音命令告诉护理提供者按下小键盘上的“#”键以确认该新主访问代码．如果护理提供者按下“#”键，接口 14 返回访问代码菜单（步骤 18）．本领域的技术人员将认识到这里护理提供者按下的键只是示例，其它键可以被指定为确认和/或选择各种选项和编程输入．

第二，在步骤 19，护理提供者被询问是否将输入一新的用户访问代码，并被指示按下按键式小键盘上一特定按钮（在本例中为数字“2”）以选择此选项．如果护理提供者选择该选项，接口 14 告诉护理提供者输入一新的用户访问代码（步骤 20）．如果输入的新用户访问代码已经存在，程序循环，要求护理提供者再次输入一新的主访问代码（未显示）．如果新输入的用户访问代码不存在，该新用户访问代码被接口 14 反馈给护理提供者（步骤 21），接口 14 产生一语音命令告诉护理提供者按下小键盘上的“#”键以确认该新用户访问代码．如果护理提供者按下“#”键，接口 14 返回访问代码菜单（步骤 22）．

第三，在步骤 23，护理提供者被询问他或她是否将查询用户访问代码，并被指示按下按键式小键盘上一特定按钮（在本例中为数字“3”）以选择此选项．如果护理提供者选择该选项，接口 14 在步骤 24 告诉护理提供者有一定数目的用户访问代码（依赖于存在多少）．在步骤 25，接口 14 向护理提供者列举用户访问代码，并连续列举用户访问代码直到所有代码都被列举．在列举完用户访问代码后，接口 14 返回访问代码菜单（步骤 26）．

第四，在步骤 27，护理提供者被询问他或她是否将删除用户访问代码，并被指示按下按键式小键盘上一特定按钮（在本例中为数字“4”）以选择此选项．如果护理提供者选择该选项，接口 14 要求护理提供者选择下面两选项之一：（1）删除特定的用户代码，按下按键式小键盘上一特定按钮（在本例中为数字“1”）（见步骤 28）；

或（2）删除所有用户代码，按下另一按钮（在本例中为数字“2”）（见步骤 33）。如果护理提供者选择步骤 28，该护理提供者被要求输入将被删除的特定用户访问代码（步骤 29），接口 14 在步骤 30 反馈该特定用户访问代码。然后接口 14 要求护理提供者按下在按键式小键盘上的“#”键以确认对该用户访问代码的删除并返回访问代码菜单。如果护理提供者选择步骤 33（全局删除），接口 14 警告护理提供者他或她将删除所有用户访问代码并要求护理提供者按下“#”键以确认（步骤 34）。然后接口返回访问代码菜单（步骤 35）。

第五，在步骤 36，护理提供者被要求按下一特定数字（在此例中“5”）来退出访问代码菜单。如果护理提供者选择此选项，接口 14 返回（经步骤 37）到访问代码提示符。

接口 14 也可以被编程，使访问被阻止而不用输入访问代码或安全代码（未显示）。

主菜单

如果护理提供者已经输入了正确的用户访问代码并已经跳过或完成了上述与访问代码相关的功能，处理器 56 从语音存储单元（或通过传送给一计算机的表示字母数字字符的信号）访问包含主菜单的一组语音问询。参考图 3，一组选项通过主菜单被提供给该护理提供者。提供的特别的项目可以根据系统使用的特别的医疗设备，使用的医疗设备的数目（如下面描述），或连接到系统的病人的数目（如下面描述）而改变。

图 3 的主菜单演示了一个菜单，该菜单通常对于众多的医疗设备有用，并提供了本发明的系统的一组有益的过程。应当理解，其它菜单特性可以被提供。如所演示的，护理提供者被要求通过按下按键式小键盘上（或计算机键盘上）的一个键从若干选项中选择。

某些选项将被应用于每种医疗设备，诸如与病人交谈（步骤 38）以及警告检查模式（步骤 39）。如果护理提供者选择直接与病人交谈，连接被切换到电话模式（步骤 40）。在电话模式，护理提供者可以与病人交谈以验证编程的改变（步骤 41）。然后护理提供者可以在结束与病人对话后挂起远程电话 48（步骤 42）。如果护理提供者在步骤

39 选择警告检查模式，接口产生发送给护理提供者的语音问询．如图 6 中演示，护理提供者有检查在警告条件下可以被自动拨出的传真或电话号码的选择．举例来说，合成的语音将提示，“警告通知号 1 是 123456790; 警告通知号 2 是 2345678”（步骤 43）．在步骤 44，护理提供者有通过收发器输入将被删除的号码（步骤 45）来删除一个存在的号码的选择．护理提供者可以选择删除额外的号码（步骤 46），或转向增加警告通知选项（步骤 47）．如果护理提供者在步骤 48 选择增加额外的警告通知号码，护理提供者可以通过收发器输入将被增加的号码增加一额外号码．在步骤 49，护理提供者被要求或者增加另一号码，或者转向主菜单．

诸如传真一个报告或发送一个文件的选项也可以被应用于任何医疗设备，但是报告或文件的类型将根据医疗设备而改变．其它选项可以被应用于一些医疗设备，诸如编辑或创建协议，但不能应用于其它设备．因此，这些不通用的选项将与特定的医疗设备相联系在下面讨论（参考步骤或圆圈“D”）．

适于多个医疗设备与/或多个病人的本发明的系统

在本发明的一个变例中，系统可以被安排为允许对多个医疗设备的访问和控制．在此安排中，多个医疗设备优选地被安排为与单个接口通讯．在一种访问和控制这些设备的方法中，在输入访问代码后，护理提供者将被提示输入护理提供者想要访问的特定设备的设备号．

另一个实施例，以与上面描述的实施例相同的方式工作．但是，此实施例可以被用于多个病人，并包含可与多个病人连接的多个医疗设备，与每个病人的医疗设备连接的一接口单元，以及一中央数据存储单元．该中央数据存储单元执行与一个接口单元相同的功能，但是用作多个病人的协议的中央存储地点．本实施例允许护理提供者选择从远程收发器呼叫一个号码，中央数据存储单元的号码，来代替呼叫每个病人的号码，以对多个病人的协议进行编程；但是，如果护理提供者愿意对单个病人的协议进行编程，护理提供者仍然保留呼叫特定病人的接口单元的选择．该远程中央数据存储单元包括两个远程通讯

端口，一协议和事件存储器，一语音存储单元，一处理器，一语音合成器，以及一访问代码存储器．协议存储器，语音存储单元，语音合成器，以及访问代码存储器与接口单元的相应部分相同．两个远程通讯端口的每一个经由数据总线与处理器连接．第一个远程通讯端口从一个远程收发器接收信号并通过数据总线传递这些信号到处理器，其中该处理器执行各种操作以响应这些信号．接着，信号经由数据总线被发送到第二远程通讯端口，该端口然后经由接口单元的远程通讯端口传递这些信号到指定的接口单元．这些信号然后以在没有中央数据存储单元时接口单元处理器处理来自远程按键式收发器的信号同样的方式被处理，

应当理解，上面描述的编程和功能只提供了护理提供者，接口单元，以及中央数据存储单元如何通过一远程按键式收发器交互的例子．因此，附加的或备选的步骤和过程可以被设计和实现，以用于本发明的远程编程．从而，只有一部分上面描述的步骤需要被包含在本发明中；这些步骤可以以不同的次序被实施；额外的或较少的协议参数可以由护理提供者控制；不同的操作模式可以被选择．

此外，本发明可以被用于各种医疗设备．如下面所述，本发明被用来检查和编程机械式呼吸机和生命信号监视器的协议．对于本领域的技术人员显而易见的是，在不偏离本发明的精神和范围的前提下可以对本发明的装置和方法作各种修改和变化．因此，本发明覆盖了对本发明的任何修改和变化．

适于使用机械式呼吸机的本发明的系统

参考图 7A1，步骤“D”，用于一机械式呼吸机的特定的主菜单选项的例子将被描述．如果护理提供者在步骤 50 已经选择了检查当前协议，接口 14 向护理提供者提供各种信息（图 7A2）．护理提供者被告知潮气量（tidal volume）（步骤 51）；呼吸率（步骤 52）；设定的高压（步骤 53）；模式（步骤 54）；峰值流量（步骤 55）；设定的低压（步骤 56）；PEEP 水平（步骤 57）；经过的时间（步骤 58）；上次报警（步骤 59）．在向护理提供者提供这些信息后，步骤 14 在步骤 60 返回主菜单，如图 3 所示．

参考图 7A2，编辑模式将被详细描述．如果护理提供者在步骤 61 已经选择了编辑模式，接口 14 允许护理提供者编辑当前协议．在此模式中，一些参数可以被保持而另一些可以被编辑．护理提供者被要求输入该机械式呼吸机的序列号（步骤 62），护理提供者身份号码（步骤 63），以及病人的身份号码（步骤 64）．这些号码是用于保存记录的目的，并被包含在护理提供者要求的任何报告和文件中．在步骤 65 护理提供者被告知当前的 tidal volume．护理提供者然后被要求输入新的比率，或按下小键盘上的“#”键确认该新比率（步骤 66）．相似的操作被实施于呼吸率，设定的高压，模式，当前峰值流量，设定的低压，以及 PEEP 水平（步骤 67—78）．完成编辑后，接口 14 转向图 7D（圆圈 G）的子菜单．

参考图 7D，编辑模式子菜单在编辑协议后向护理提供者提供一些选项．第一编辑模式子菜单允许护理提供者通过按下小键盘上一特定键发送（即保存）该编辑到呼吸机（步骤 79），通过按下小键盘上一不同的键检查该编辑（步骤 80），以及按下小键盘上又一不同键取消该编辑（步骤 81）．如果护理提供者选择发送该编辑（步骤 79），新的协议被发送给呼吸器（步骤 82），护理提供者被退出．护理提供者然后被转到病人交谈模式（步骤 83），护理提供者与病人连接以验证该编程（步骤 84）．在与病人验证编程改变后，护理提供者挂起远程电话（步骤 85），编程会话结束．

如果护理提供者选择检查该编辑（步骤 80），接口 14 向护理提供者报告协议的新参数（步骤 86）．在报告后，护理提供者被带到第二编辑模式子菜单，该菜单原许护理提供者选择：（1）发送该编辑（步骤 87），（2）编辑该编辑（步骤 88），或（3）取消该编辑（步骤 89）．如果护理提供者选择发送修改后的协议（步骤 87），新的协议被发送给呼吸器（步骤 90），护理提供者被退出．护理提供者然后被转到病人交谈模式（步骤 91），护理提供者与病人连接以验证该编程（步骤 92）．在与病人验证编程改变后，护理提供者挂起远程电话（步骤 93），编程会话结束．

如果护理提供者在步骤 94 选择创建模式（见图 7A1），护理提供者被要求为新协议安排各种参数．如图 7A2 所示，护理提供者被要求

输入 tidal volume（步骤 95），在输入的 tidal volume 被反馈后，护理提供者被要求按下“#”键确认．护理提供者遵循相同的过程输入呼吸率，设定的高压，模式，峰值流量，设定的低压，以及 PEEP 水平（步骤 96—101），并然后返回如图 7D 演示的相同的控制菜单．

如果护理提供者在步骤 102 选择了传真报告模式，接口 14 产生一组语音问询，这些语音问询被发送给护理提供者，并向护理提供者提供一些选项．参考图 7B，步骤 103，护理提供者可以选择流量报告，压力报告（步骤 104），或所有报告（步骤 105）．如果护理提供者输入的数字不是一选项（步骤 106），接口单元返回圆圈 E．接着，护理提供者在步骤 107 被要求输入报告将被发送到的地点的传真号．在步骤 108，护理提供者可以通过按下按键式小键盘上的一定按钮选择文本报告，或通过按下另一不同按钮选择图形化报告（步骤 109）．如果护理提供者选择文本报告，在步骤 108 护理提供者可以接着可以通过按下按键式小键盘上一个按钮来选择每天向该传真号发送文本报告（步骤 110）．如果护理提供者选择要求该医疗设备远程系统向该传真号每日发送一文本报告，护理提供者然后经由按键式小键盘输入发送报告的时间（例如 1430 代表下午 2: 30）（步骤 111）．如果护理提供者选择图形化报告（步骤 109），接口 14 要求护理提供者选择从 1 至 300 秒的样本时间间隔（以秒计）（步骤 112）．如果护理提供者选择要求该医疗设备远程系统向该传真号每日发送一图形化报告（步骤 113），护理提供者然后经由按键式小键盘输入发送报告的时间（例如 1430 代表下午 2: 30）（步骤 114）．如果护理提供者选择不需要每日报告，护理提供者将返回主菜单（步骤 115），由此图形化报告将在会话结束后被发送到该传真号．

如果护理提供者在步骤 116 选择发送文件模式，护理提供者被转到如图 7C 中的发送文件菜单（圆圈 F）．步骤 117—124 与上面用于传真一报告的步骤类似，除了计算机电话号码百输入以替代传真号（步骤 121），由此报告文件被发送给计算机而不是传真．护理提供者同样具有使该医疗设备远程系统每日向远程计算机发送文件（步骤 122—123）的选择．

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适于使用生命信号监视器的本发明的系统

参考图 8A，圆圈 D，当医疗设备包括一生命信号监视器时特定的主菜单选项的例子将被详细描述．这样一个监视器通常获取病人的数据，诸如血压，体温，心率，氧饱和度，二氧化碳水平，体重，和/或呼吸频率．如果护理提供者在步骤 125 已经选择了检查当前协议，接口 14 向护理提供者提供各种信息．护理提供者被告知血压（步骤 126），体温（步骤 127），心率（步骤 128），氧饱和度（步骤 129），二氧化碳水平（步骤 130），体重（步骤 131），以及呼吸频率（步骤 132）．在向护理提供者提供这些信息后，接口 14 在步骤 133 返回主菜单．

如果护理提供者在步骤 134 选择了传真报告模式，护理提供者被转到如图 8B 演示的传真报告菜单．访问此菜单时，接口 14 产生一组语音问询，这些语音问询被发送给护理提供者，并向护理提供者提供一些选项．护理提供者可以通过按下按键式小键盘上的 1—8（步骤 135—142）分别选择：（1）血压报告，（2）体温报告，（3）心率报告，（4）氧饱和度报告，（5）二氧化碳水平报告，（6）体重报告，（7）呼吸频率报告，或（8）所有报告．接着，护理提供者在步骤 143 被要求输入报告将被发送到的地点的传真号．在步骤 144，护理提供者可以通过按下按键式小键盘上的一定按钮选择文本报告，或通过按下另一不同按钮选择图形化报告（步骤 145）．如果护理提供者选择文本报告，接口 14 告诉护理提供者在按键式小键盘上输入一定的数字以挂起和结束会话（步骤 146），由此文本报告将被发送到该传真号，或者如果护理提供者希望返回主菜单，则输入不同的数字（步骤 147），由此文本报告将在会话结束后被发送到该传真号．如果护理提供者选择图形化报告（步骤 145），接口 14 要求护理提供者选择从 1 至 300 秒的样本时间间隔（以秒计）．如果无效的数字被选择（步骤 149），接口 14 返回步骤 148．护理提供者然后在按键式小键盘上输入一定的数字以挂起和结束会话（步骤 150），由此图形化报告将被发送到该传真号，或者如果护理提供者希望返回主菜单，则输入不同的数字（在本例中，“2”），由此图形化报告将在会话结

束后被发送到该传真号（步骤 147）。

可替换地，设备 10 可以保存一传真号，并且该设备可以被编程以在指定时间发送包括想要的信息的传真。

如果护理提供者在步骤 151 选择发送文件模式，护理提供者被转到如图 8C 所示的发送文件菜单（圆圈 F）。步骤 152—163 与上面描述的步骤 135—147 类似，除了护理提供者必须输入样本时间间隔（步骤 160），并输入计算机电话号码以替代传真号（步骤 161），由此报告文件被发送给计算机而不是传真。此外，设备 10 可以被编程以经由一通讯网络，诸如因特网，发送电子邮件。在本发明的这个特性中，该设备将被编程以在通讯网络上记录，输入存储在内存中的通行字，并发送一电子邮件报告。

在本发明的另一方面，如本领域的技术人员可以理解的，该设备可以被编程以询问病人有关他们感觉如何，有多痛苦，等的问题。对这些问题的回答可以被护理提供者访问以帮助护理提供者编程该设备的协议。举例来说，如果病人指出他或她感觉好，护理提供者可以不编辑协议。本发明的这个特性允许护理提供者访问更多信息并更好地护理病人。病人可以通过设备 10 本身，通过本地电话 48A，或以其它方式，诸如通过一计算机等，输入他们的数据。病人可以在状态改变或被提示的任何时候输入这数据，即通过电话呼叫或设备 10 上的警报，以固定的时间间隔输入信息。

根据本发明，被提供的医疗系统允许对医疗设备的远程访问和控制。该系统被设定允许护理提供者从一远程电话，计算机或其它收发器来控制医疗设备。护理提供者可以从医疗设备获得数据，诸如以书面报告（如通过传真）的形式，通过语音数据，或通过提供给计算机的图形或数字数据（它们可以表现为屏幕上以及/或存储在计算机存储器中的的图形或其它数据）。如果该设备存储有可编程协议，护理提供者还可以编程该医疗设备。此外，该系统被设定为医疗设备发出的警告信号也在远程被触发。

上面描述了本发明的适应特定医疗设备的系统的特定例子。本领域的技术人员应当理解适应各种其它医疗设备的系统。

当然，前面描述的是本发明的优选实施例，可以进行不偏离如所附的权利要求定义的本发明的精神和范围的改变和修正。

说 明 书 附 图

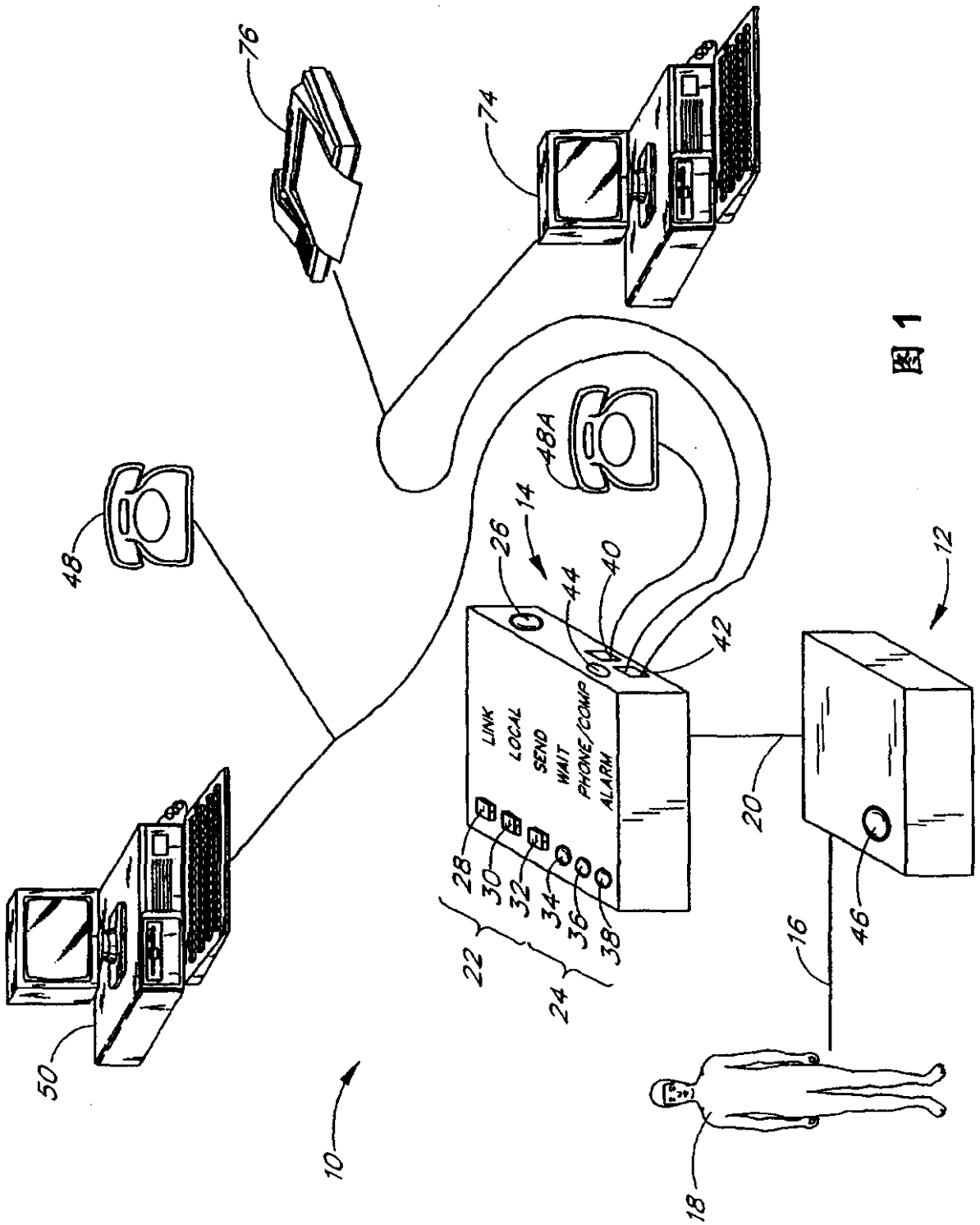
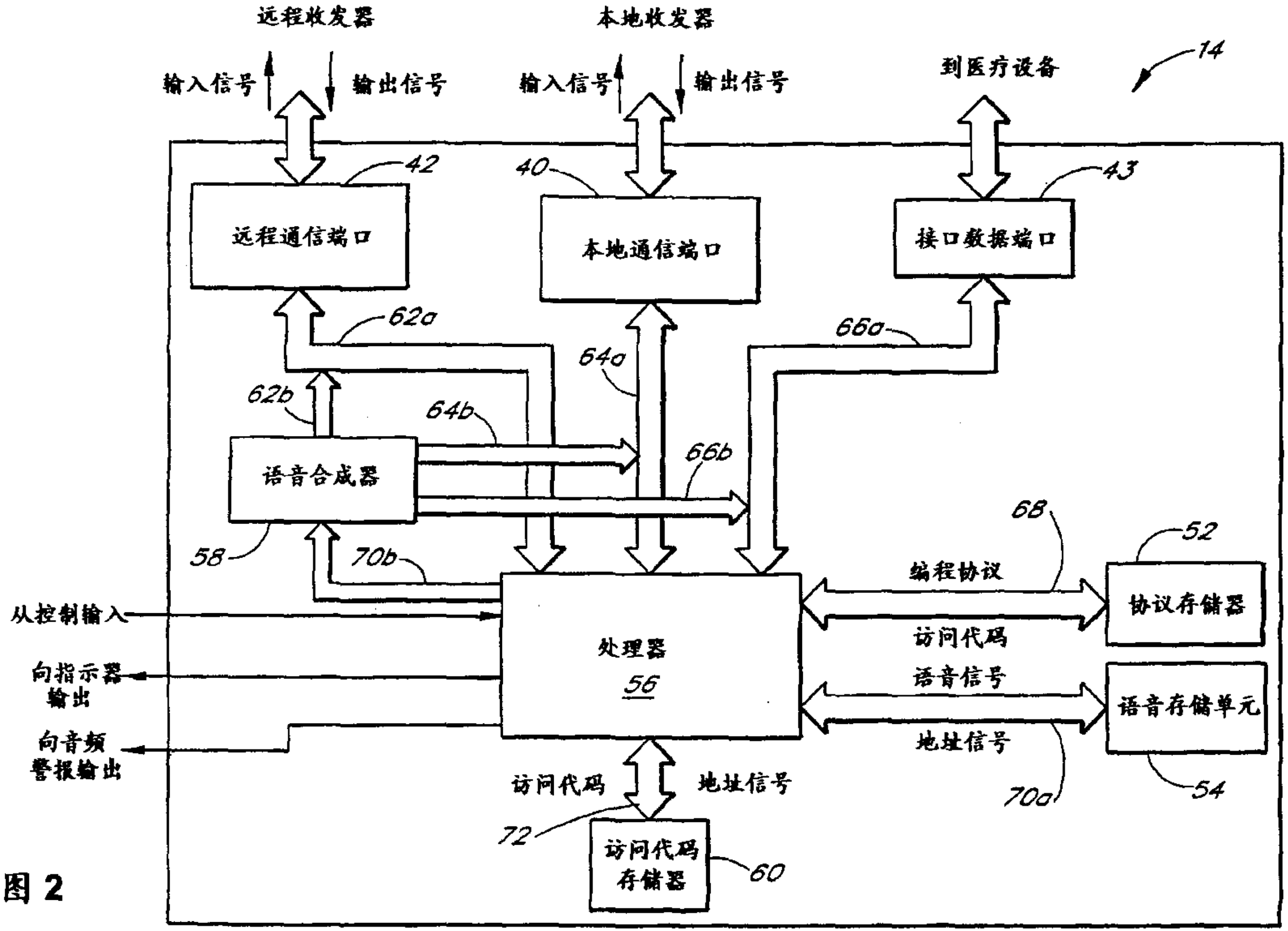

76
74
48A
48
14
26
44
40
42
12
LINK
LOCAL
SEND
WAIT
PHONE/COMP
ALARM
28
30
32
34
36
38
22
24
20
16
46
50
10
18

图 1

00.07.12



14
远程收发器
输入信号
输出信号
本地收发器
输入信号
输出信号
到医疗设备
42
远程通信端口
40
本地通信端口
43
接口数据端口
62a
64a
66a
62b
64b
66b
语音合成器
58
70b
从控制输入
向指示器输出
向音频警报输出
处理器
56
68
编程协议
访问代码
52
协议存储器
语音信号
地址信号
语音存储单元
70a
54
访问代码
地址信号
72
访问代码存储器
60

图 2

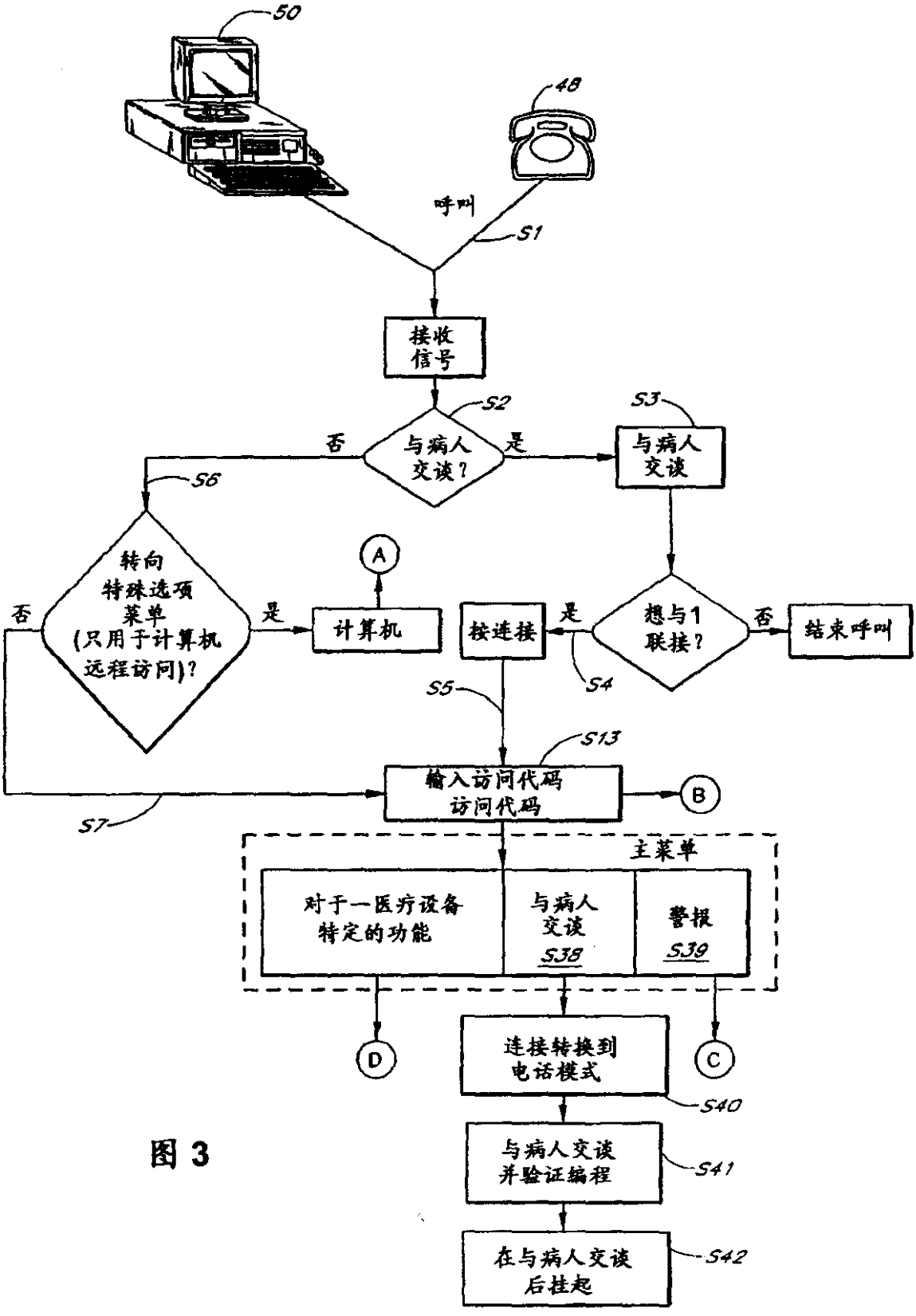

50
48
呼叫
S1
接收信号
S2
与病人交谈?
否
是
S3
与病人交谈
S6
转向特殊选项菜单(只用于计算机远程访问)?
否
是
A
计算机
按连接
是
想与1联接?
否
结束呼叫
S4
S5
S13
输入访问代码访问代码
B
S7
主菜单
对于一医疗设备特定的功能
与病人交谈 S38
警报 S39
D
C
连接转换到电话模式
S40
与病人交谈并验证编程
S41
在与病人交谈后挂起
S42

图 3

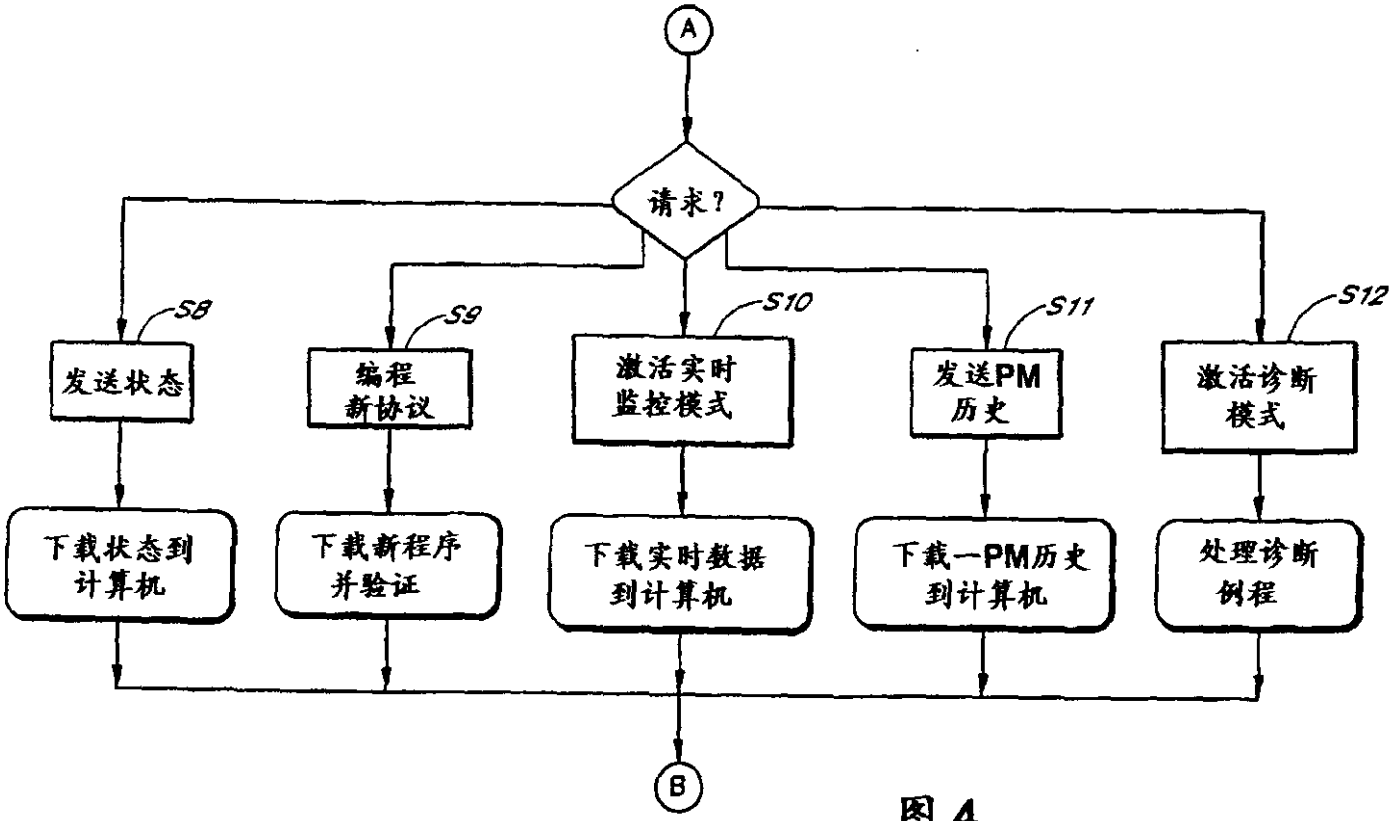

A
请求?
S8
发送状态
下载状态到计算机
S9
编程新协议
下载新程序并验证
S10
激活实时监控模式
下载实时数据到计算机
S11
发送PM历史
下载一PM历史到计算机
S12
激活诊断模式
处理诊断例程
B

图 4

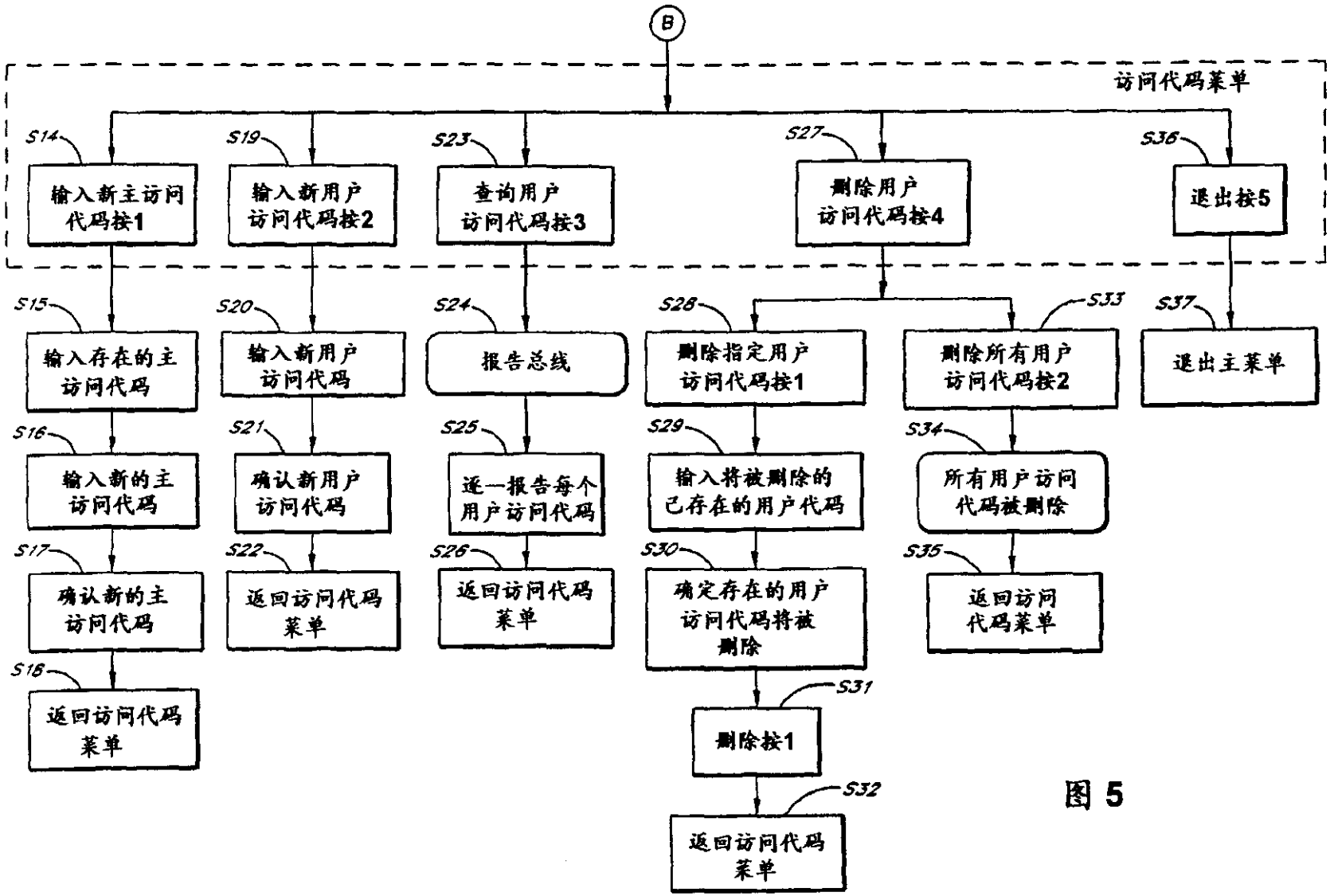

B
访问代码菜单
S14
输入新主访问代码按1
S19
输入新用户访问代码按2
S23
查询用户访问代码按3
S27
删除用户访问代码按4
S36
退出按5
S15
输入存在的主访问代码
S16
输入新的主访问代码
S17
确认新的主访问代码
S18
返回访问代码菜单
S20
输入新用户访问代码
S21
确认新用户访问代码
S22
返回访问代码菜单
S24
报告总线
S25
逐一报告每个用户访问代码
S26
返回访问代码菜单
S28
删除指定用户访问代码按1
S29
输入将被删除的已存在的用户代码
S30
确定存在的用户访问代码将被删除
S31
删除按1
S32
返回访问代码菜单
S33
删除所有用户访问代码按2
S34
所有用户访问代码被删除
S35
返回访问代码菜单
S37
退出主菜单

图 5

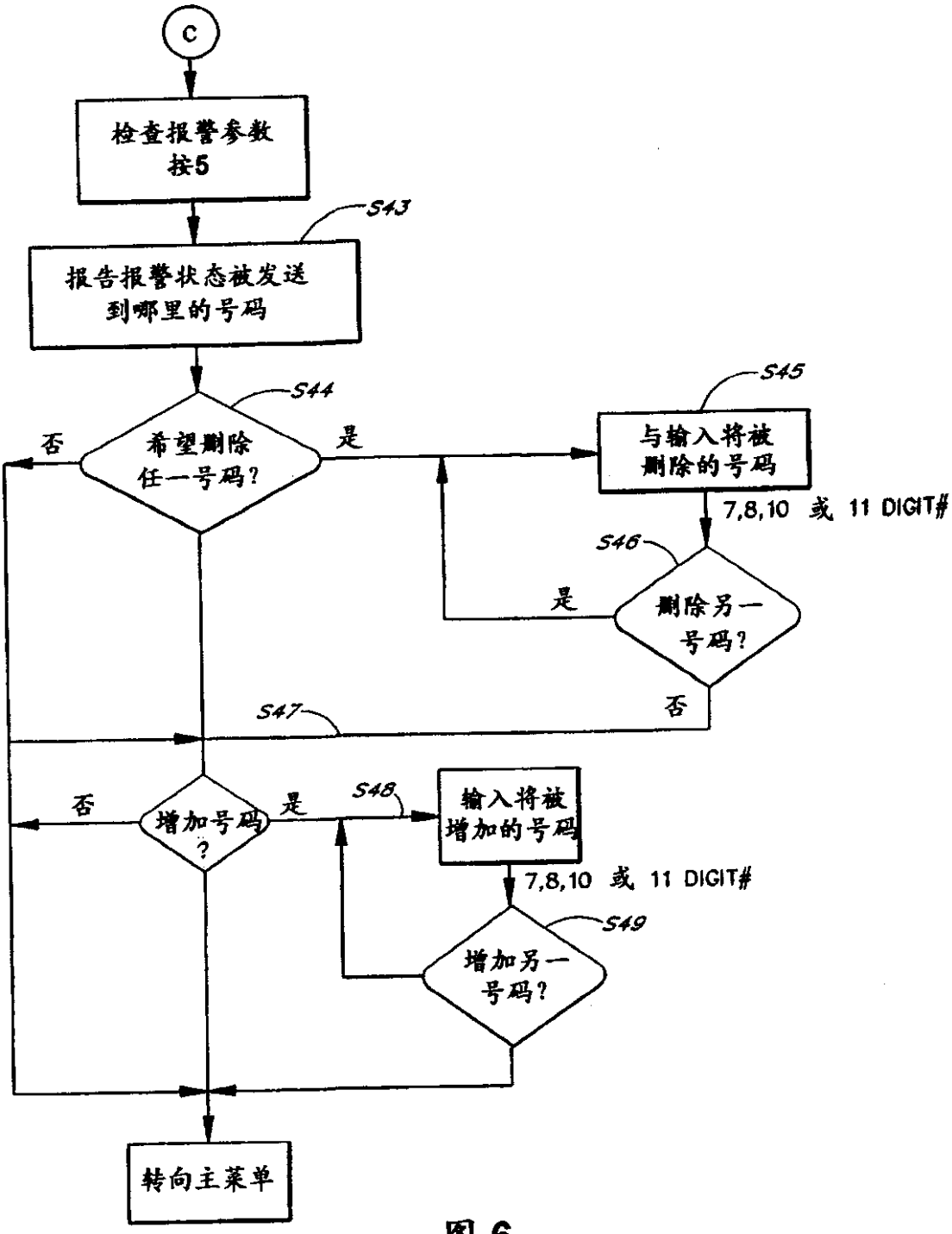

C
检查报警参数
按5
S43
报告报警状态被发送
到哪里的号码
S44
希望删除
任一号码?
否
是
S45
与输入将被
删除的号码
7,8,10 或 11 DIGIT#
S46
删除另一
号码?
是
否
S47
否
增加号码
?
是
S48
输入将被
增加的号码
7,8,10 或 11 DIGIT#
S49
增加另一
号码?
转向主菜单

图 6

图 7

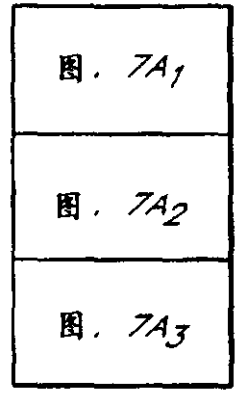


图. 7A1
图. 7A2
图. 7A3

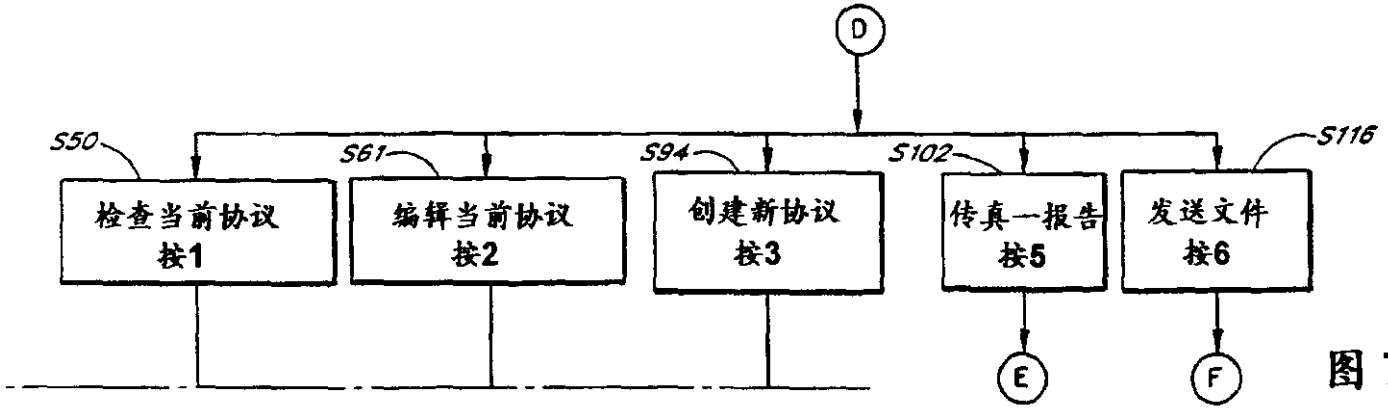

D
S50
S61
S94
S102
S116
检查当前协议
按1
编辑当前协议
按2
创建新协议
按3
传真一报告
按5
发送文件
按6
E
F

图 7A1

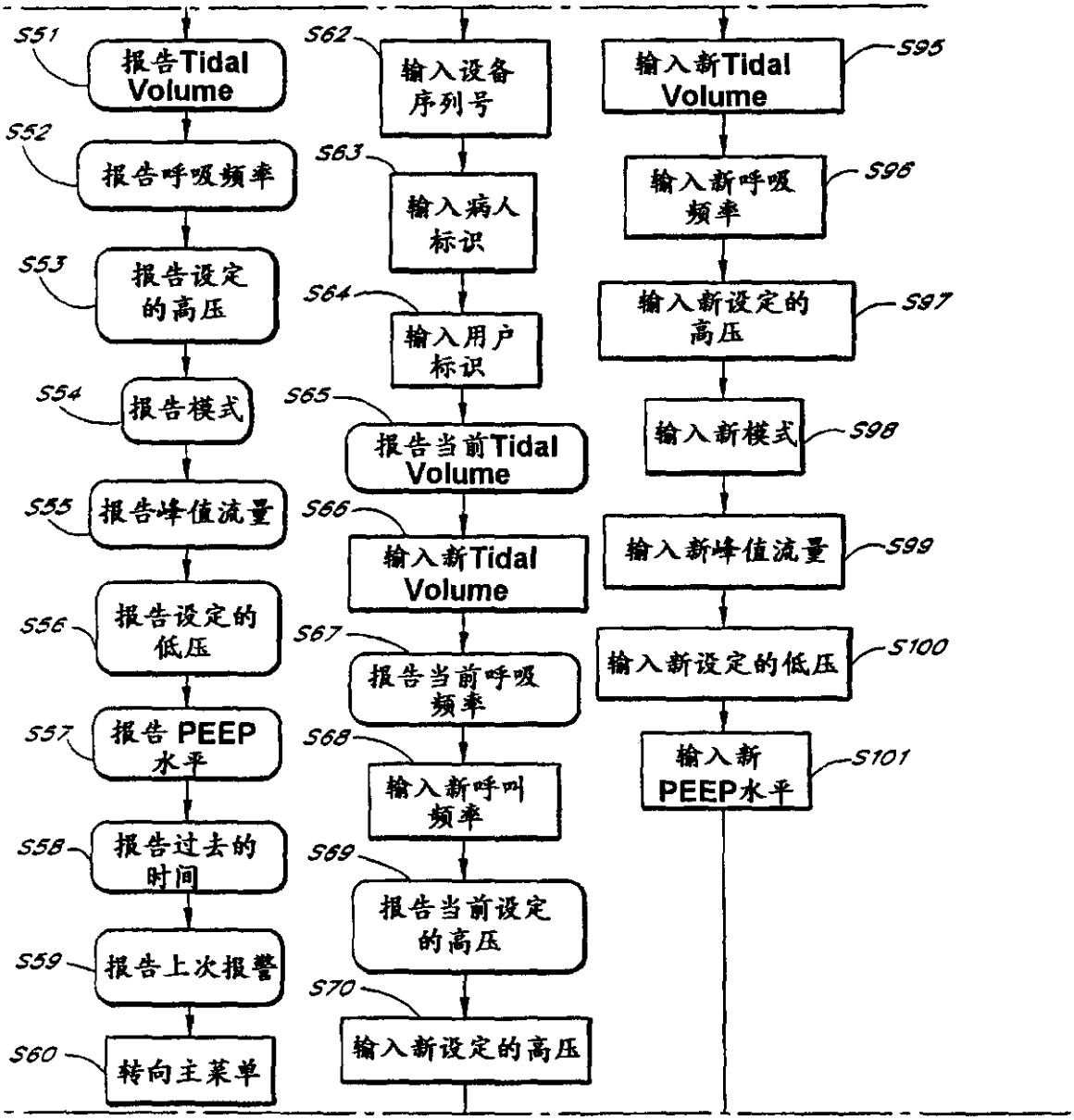

S51
报告Tidal Volume
S52
报告呼吸频率
S53
报告设定的高压
S54
报告模式
S55
报告峰值流量
S56
报告设定的低压
S57
报告 PEEP 水平
S58
报告过去的时间
S59
报告上次报警
S60
转向主菜单
S62
输入设备序列号
S63
输入病人标识
S64
输入用户标识
S65
报告当前Tidal Volume
S66
输入新Tidal Volume
S67
报告当前呼吸频率
S68
输入新呼叫频率
S69
报告当前设定的高压
S70
输入新设定的高压
S95
输入新Tidal Volume
S96
输入新呼吸频率
S97
输入新设定的高压
S98
输入新模式
S99
输入新峰值流量
S100
输入新设定的低压
S101
输入新PEEP水平

图 7A$_2$

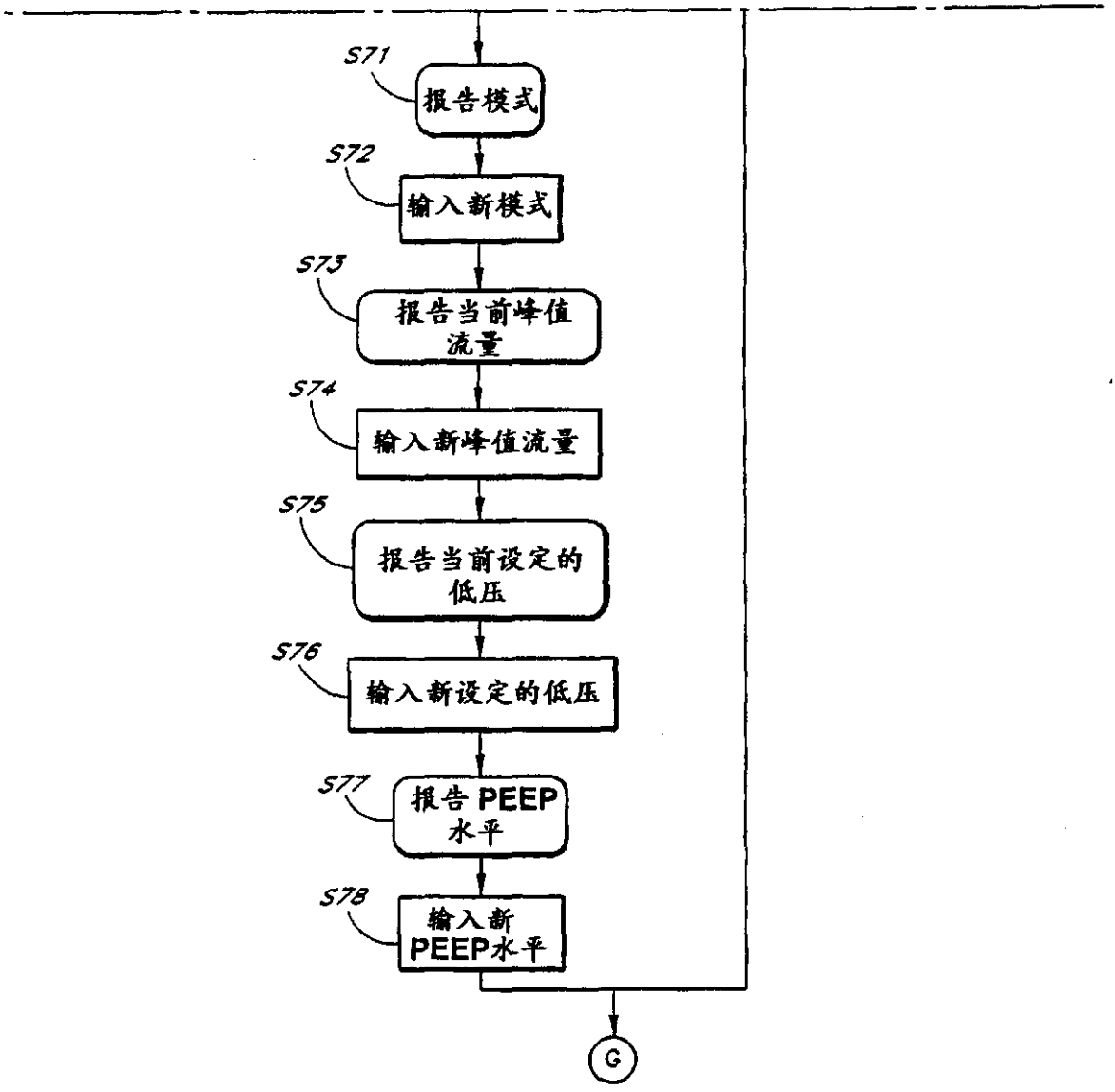

S71
报告模式
S72
输入新模式
S73
报告当前峰值流量
S74
输入新峰值流量
S75
报告当前设定的低压
S76
输入新设定的低压
S77
报告 PEEP 水平
S78
输入新 PEEP水平
G

图 $7A_3$

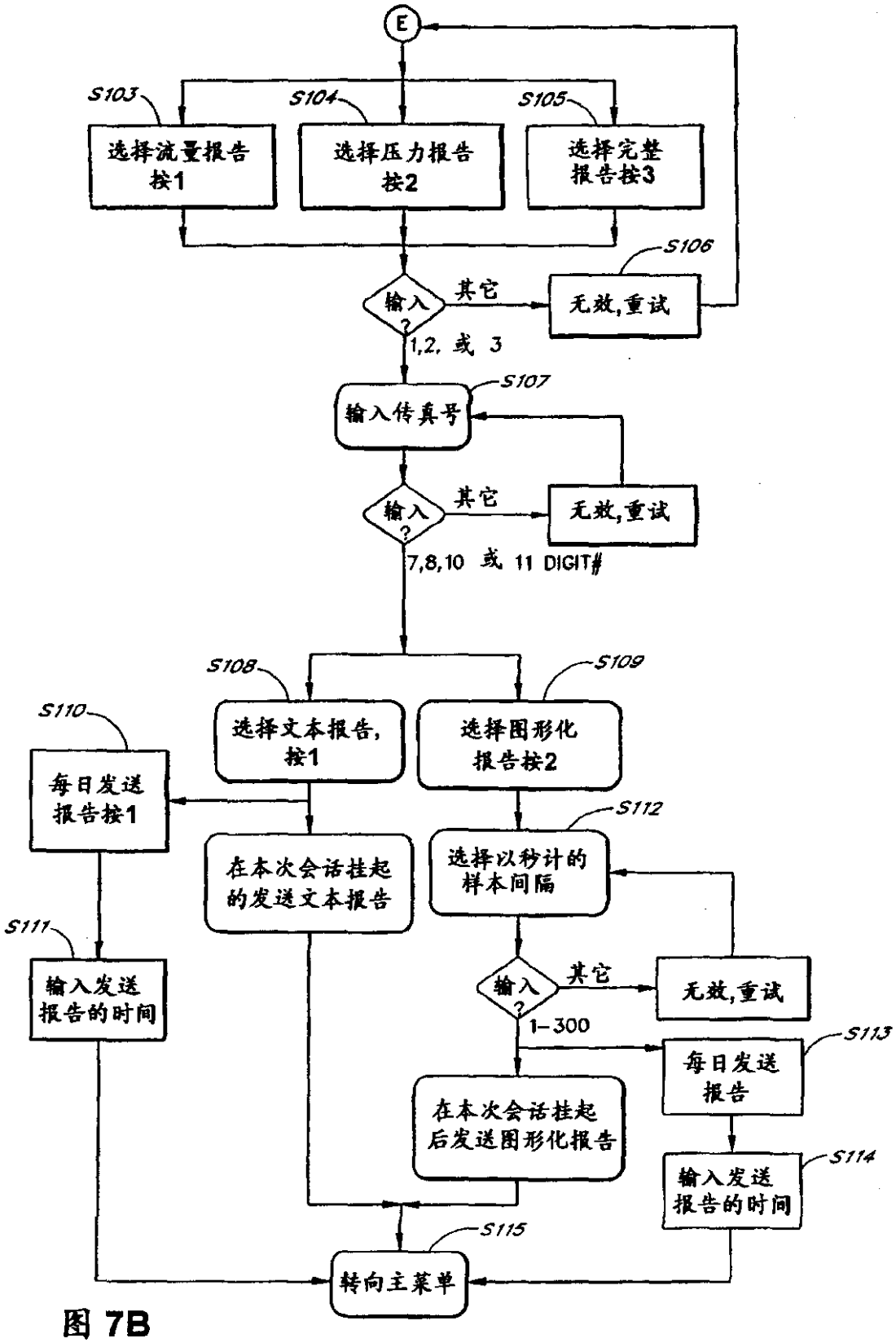

E
S103
选择流量报告按1
S104
选择压力报告按2
S105
选择完整报告按3
S106
输入?
其它
无效,重试
1,2, 或 3
S107
输入传真号
输入?
其它
无效,重试
7,8,10 或 11 DIGIT#
S108
选择文本报告,按1
S109
选择图形化报告按2
S110
每日发送报告按1
在本次会话挂起的发送文本报告
S112
选择以秒计的样本间隔
S111
输入发送报告的时间
输入?
其它
无效,重试
1-300
S113
每日发送报告
在本次会话挂起后发送图形化报告
S114
输入发送报告的时间
S115
转向主菜单

图 7B

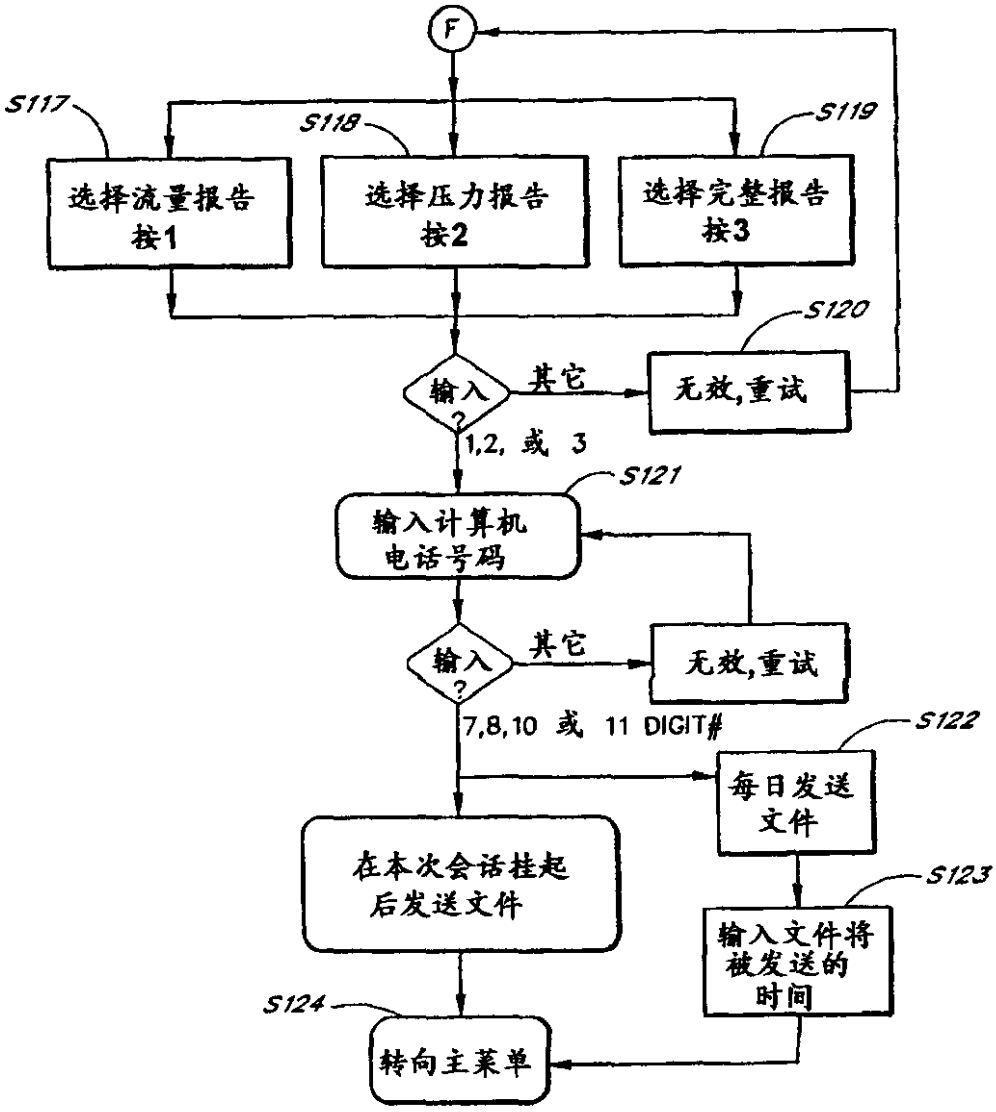

F
S117
S118
S119
选择流量报告
按1
选择压力报告
按2
选择完整报告
按3
S120
输入
?
其它
无效,重试
1,2, 或 3
S121
输入计算机
电话号码
输入
?
其它
无效,重试
7,8,10 或 11 DIGIT#
S122
每日发送
文件
在本次会话挂起
后发送文件
S123
输入文件将
被发送的
时间
S124
转向主菜单

图 7C

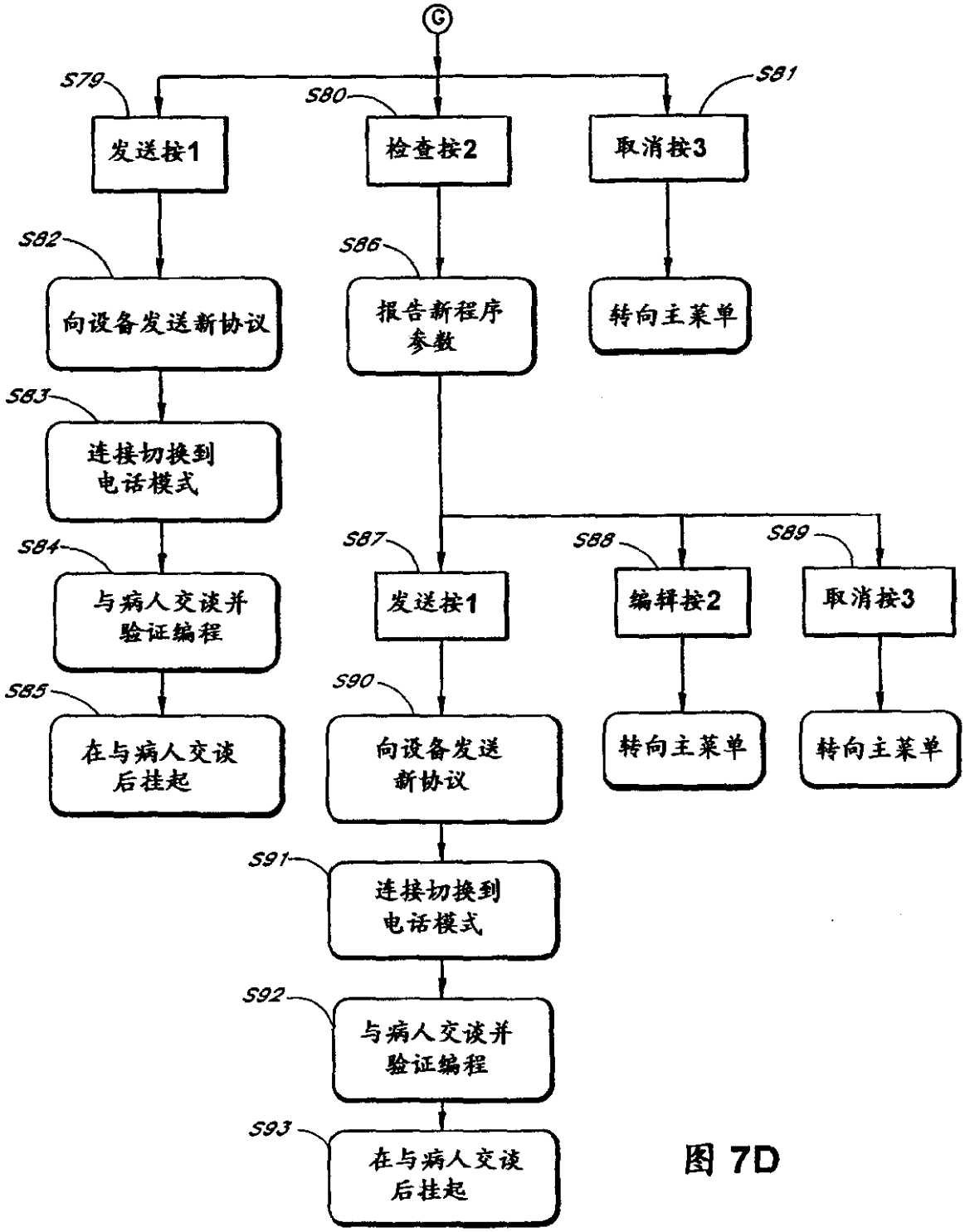

C
S79
发送按1
S80
检查按2
S81
取消按3
S82
向设备发送新协议
S86
报告新程序参数
转向主菜单
S83
连接切换到电话模式
S84
与病人交谈并验证编程
S85
在与病人交谈后挂起
S87
发送按1
S88
编辑按2
S89
取消按3
S90
向设备发送新协议
转向主菜单
转向主菜单
S91
连接切换到电话模式
S92
与病人交谈并验证编程
S93
在与病人交谈后挂起

图 7D

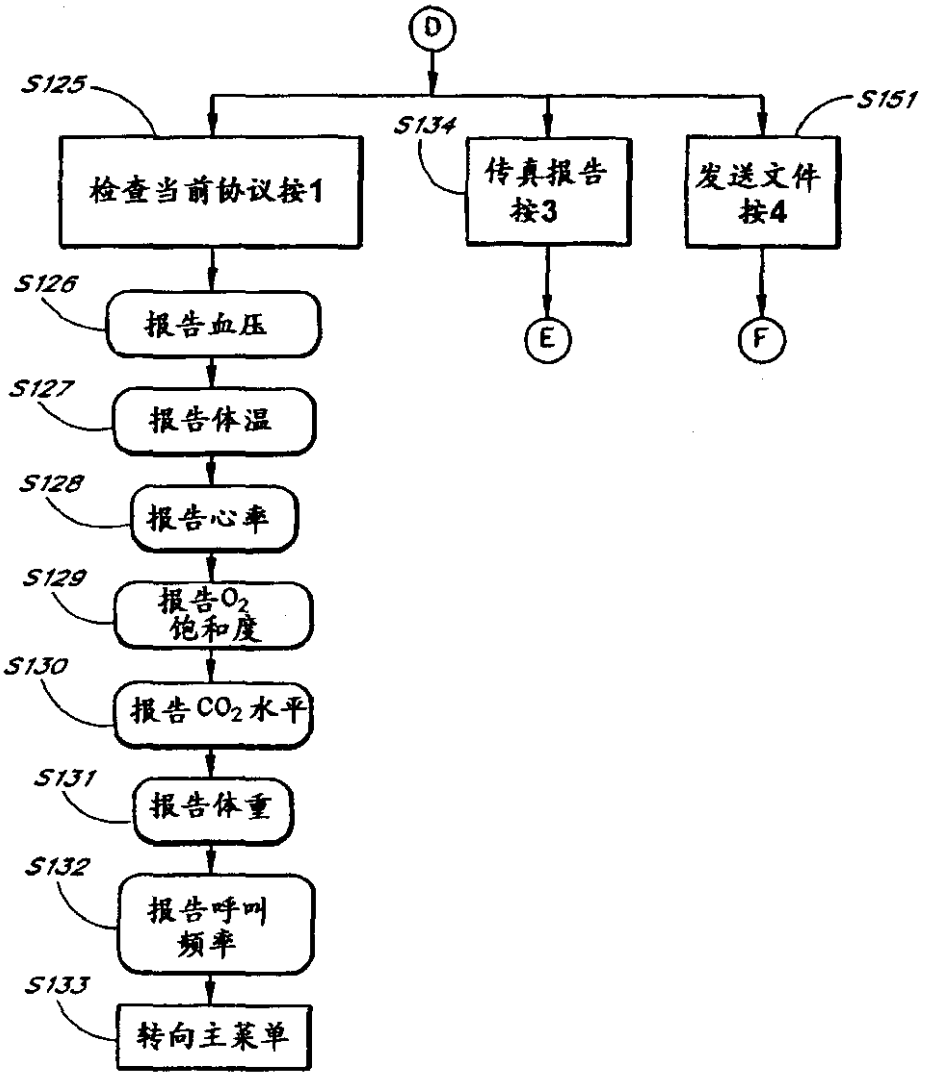

D
S125
检查当前协议按1
S134
传真报告按3
S151
发送文件按4
E
F
S126
报告血压
S127
报告体温
S128
报告心率
S129
报告O_2饱和度
S130
报告CO_2水平
S131
报告体重
S132
报告呼叫频率
S133
转向主菜单

图 8A

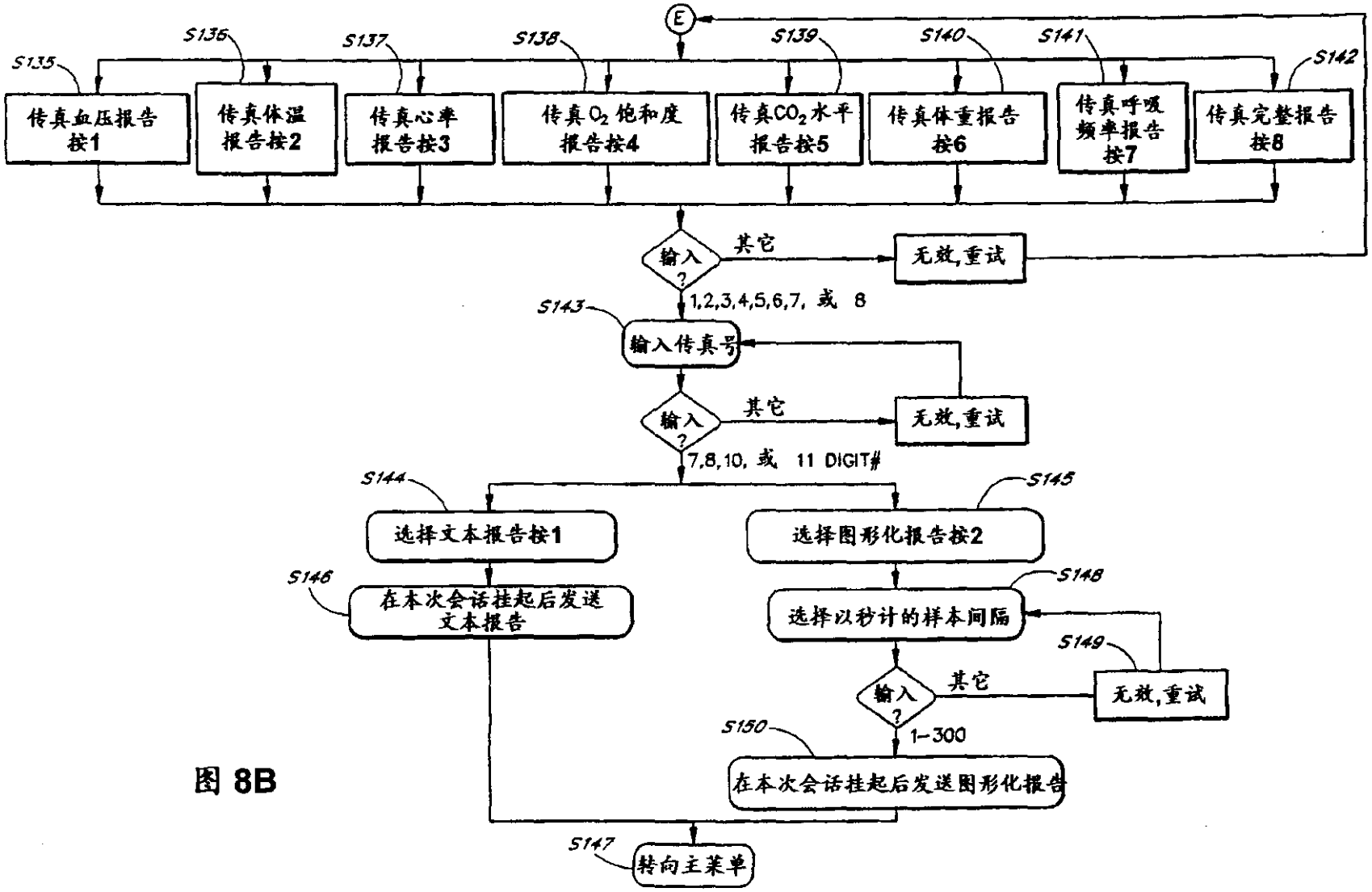

E
S135
传真血压报告按1
S136
传真体温报告按2
S137
传真心率报告按3
S138
传真O_2饱和度报告按4
S139
传真CO_2水平报告按5
S140
传真体重报告按6
S141
传真呼吸频率报告按7
S142
传真完整报告按8
输入?
其它
无效,重试
1,2,3,4,5,6,7, 或 8
S143
输入传真号
输入?
其它
无效,重试
7,8,10, 或 11 DIGIT#
S144
选择文本报告按1
S145
选择图形化报告按2
S146
在本次会话挂起后发送文本报告
S148
选择以秒计的样本间隔
S149
输入?
其它
无效,重试
1-300
S150
在本次会话挂起后发送图形化报告
S147
转向主菜单

图 8B

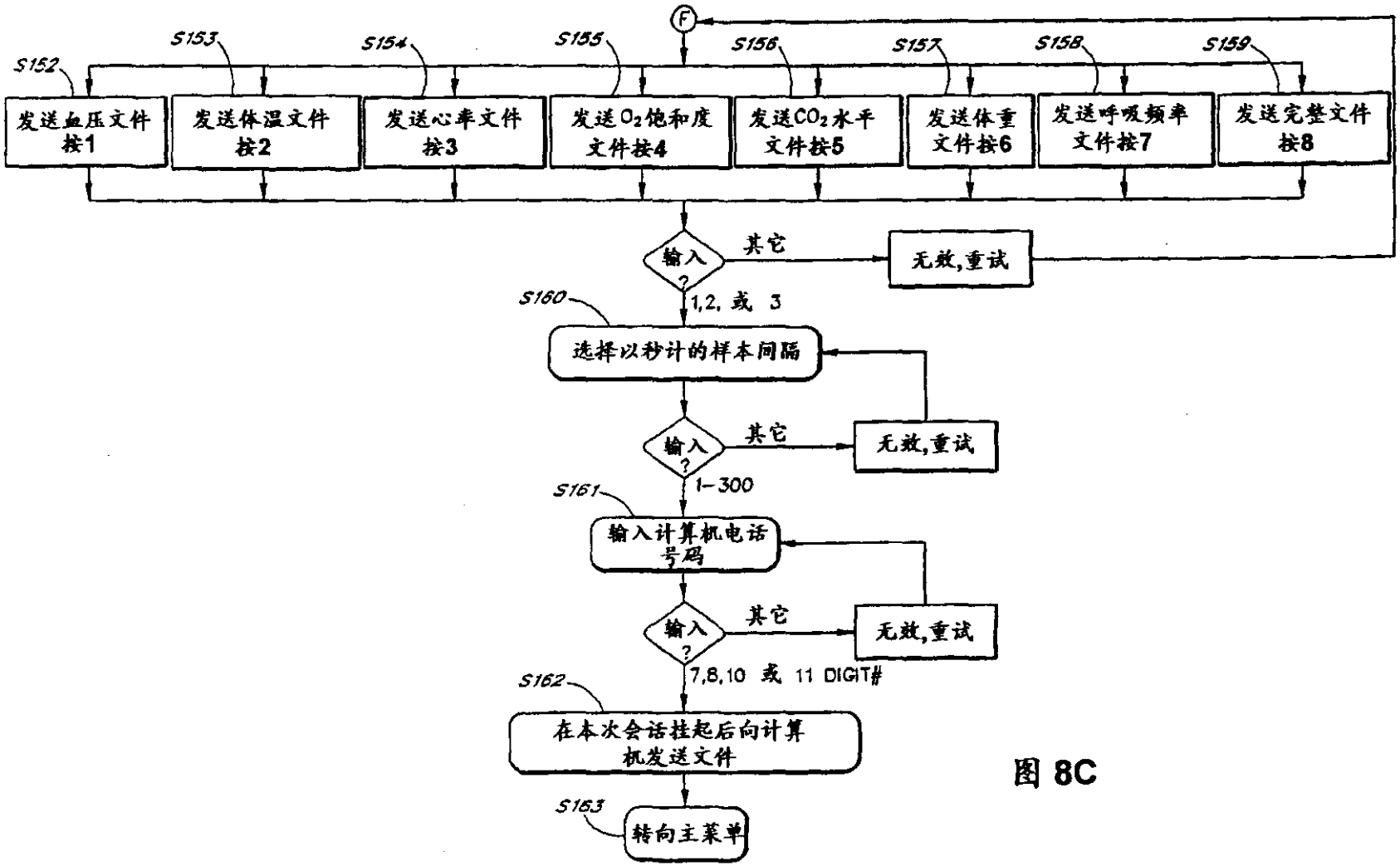

F
S152
S153
S154
S155
S156
S157
S158
S159
发送血压文件按1
发送体温文件按2
发送心率文件按3
发送O2饱和度文件按4
发送CO2水平文件按5
发送体重文件按6
发送呼吸频率文件按7
发送完整文件按8
输入?
其它
无效,重试
1,2, 或 3
S160
选择以秒计的样本间隔
输入?
其它
无效,重试
1-300
S161
输入计算机电话号码
输入?
其它
无效,重试
7,8,10 或 11 DIGIT#
S162
在本次会话挂起后向计算机发送文件
S163
转向主菜单

图 8C