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(54) **Signal station for fire alarm system.**

(57) A signal station for a fire alarm system which is capable of automatically outputting, in the form of voice, messages concerning actions to be taken at the time of fire and capable of outputting, in the form of voice, messages for instruction manual of the fire alarm system etc., messages for operation training and the like, upon request, at the normal time. Where the signal station is connected with an announcing facilities, messages for emergency equipments etc. can be announced. This signal station comprises a storage means storing these messages, a voice synthesizing means and a voice outputting means for outputting the messages in the form of voice, a manual input means for requesting output of the messages and a processing means for processing a fire signal and a message requesting signal to select required messages and control the voice synthesizing means.

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SIGNAL STATION FOR FIRE ALARM SYSTEM

BACKGROUND OF THE INVENTION

Field of the Invention

This invention generally relates to a signal station for a fire alarm system responsive to a fire signal from means for informing fire occurrence such as a fire detector, for actuating an alarm means to give an alarm, and more particularly to a signal station of this type which is capable of outputting messages stored in a storage means concerning actions to be taken when a fire arises, etc. in the form of voice through a voice synthesizing means.

Description of the Prior Art

Fact-finding of fires in buildings, hotels, etc. reveals, that most of conflagrations or tragedies due to a fire can have been prevented if contact is quickly made with a fire station when a fire starts or if people are guided more appropriately to a safe place. The largest reason to cause such serious troubles lies in that janitors of the buildings or employees of hotels have not taken appropriate actions although fire alarm systems have operated properly.

In general, a conventional fire alarm system is comprised of a signal station connected to means for informing fire occurrence such as a fire detector, push button, etc. for receiving a fire signal therefrom, an alarm means including a bell, lamp, etc. and an operating means for operating the fire alarm system and related facilities, if necessary. This conventional signal station raises an alarm by sounding the bell and lighting the lamp upon receipt of the fire signal, but it does not give instructions for actions to be taken at the time of

fire, such as operating procedures of the operating means. Such procedures are usually described in an instruction manual or indicated on a panel. If the janitors or employees are inexperienced or unpracticed to the operation of the signal station, or they are upset, they cannot act quickly and appropriately or cannot take necessary steps, or they operate the signal station wrongly. From this fact, it can be understood that education and training of the actions to be taken at the time of fire and operation training of the facilities related to the fire alarm system are very important. At present, however, there are no measures to easily and effectively educate and practice the actions required at the time of fire. In especial, there is little chance to experience the operations of the equipments and facilities related to the fire alarm system because they are not used daily. Moreover, it is bothersome and therefore slighted to read the instruction manual to memorize the actions to be taken at the time of fire.

OBJECTS OF THE INVENTION

It is a first object of the present invention to provide a signal station for a fire alarm system which is capable of outputting, upon receipt of a fire signal, messages for necessary actions which has been preliminarily stored in a storage means, in the form of voice, to instruct janitors or employees to act quickly and appropriately.

It is a second object of the present invention to provide a signal station for a fire alarm system which is capable of outputting, upon request, messages for instruction manual of the fire alarm system and the related equipments and facilities, if necessary, and messages for necessary action at the time of fire, in the form of voice, to

educate and train janitors or employees.

It is a third object of the present invention to provide a signal station for a fire alarm system equipped with an announcing facility which is capable of announcing messages for guide in an emergency.

SUMMARY OF THE INVENTION

In accordance with the present invention, there is provided a signal station for a fire alarm system for giving an alarm upon receipt of a fire signal from a fire informing means such as detectors or push buttons, which signal station comprises:

a storage means storing messages concerning measures to be taken at the time of fire and/or messages concerning operating and handling method of the fire alarm system and connected equipment or equipments;

a voice synthesizing means for synthesizing a voice signal for the message output from said storage means;

a voice outputting means for outputting said voice signal as a voice;

a manual input means for generating a message output requesting signal for requesting output of the message stored in the storage means; and

a processing means receiving and processing the fire signal and the message output requesting signal to select a requested message from the messages stored in the storage means and control said voice synthesizing means for vocalizing the message.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a first embodiment of a signal station for a fire alarm system according to the present invention;

Fig. 2 is a block diagram of a fire alarm system incorporating the signal station of the present invention and facilities connected thereto;

Fig. 3 is a block diagram of a processing means employed in the embodiment, showing input and output relations thereof;

Fig. 4 is a table showing storage areas and start addresses of messages stored in a storage means employed in the embodiment;

Fig. 5 is a block diagram of one form of a voice synthesizing means employed in the embodiment;

Fig. 6 is a block diagram of one form of a voice synthesizing portion of the voice synthesizing means illustrated in Fig. 5;

Fig. 7 is a block diagram of another form of the voice synthesizing portion;

Fig. 8 is a flowchart showing a main routine to be run by the processing means;

Fig. 9 is a flowchart showing, in detail, a data processing operation in the main routine;

Fig. 10 is a flowchart showing, in detail, a voice control operation in the main routine;

Fig. 11 is a flowchart showing, in detail, an operation for actions to be taken at the time of fire in the voice control operation;

Fig. 12 is a flowchart showing, in detail, a fire information operation in the operation for actions to be taken at the time of fire;

Fig. 13 is a flowchart showing, in detail, an operation at the time of training; and

Fig. 14 is a block diagram of a second embodiment of a signal station for a fire alarm system according to the present invention.

DESCRIPTION OF THE EMBODIMENTS

Fig. 1 is a block diagram of a first preferred embodiment of the present invention. A signal station 10 for a fire alarm system is comprised of a processing means 11 for processing an input signal for controlling various equipments and instructing necessary operations thereto, a storage means 16 storing messages for actions to be taken against a fire, a manual input means 15 for generating a signal for requesting outputting of the messages of the processing means 11, a voice synthesizing means 20 for synthesizing voice signals for messages outputted from the storage means 16, a voice outputting means 18 for outputting voice from the voice signal and a display means 17 for indicating required matters. The signal station 10 further includes a receiving means 12, an alarm means 13 and an operating means 14.

Fig. 2 illustrates one form of a fire alarm system to which the signal station 10 of the present invention is suitably applied. This fire alarm system comprises the signal station 10, a signal line 1 connected to the signal station 10 and wired over various places in a building, connection stations 2 each provided for respective fire blocks and connected to the signal line 1, fire detectors 3a and push buttons manually operable to inform a fire which are connected to each of the connection stations 2 together with identification signal connecting means 4 and alarm bells 5 and a fire door releasing means 6 which are also connected to each of the connecting stations 2. This fire alarm system further comprises, as related facilities, a fireplug 7, a sprinkler 8, etc. operatively connected thereto. An announcing facilities 9 may also be connected to the signal station 10 according to necessity. It is not always necessary to provide all these equipments and facilities, but other equipments or facilities may

further be connected, if necessary.

The processing means 11 is comprised, for example, as illustrated in Fig. 3, of a central processor unit (CPU) 11a, a read-only memory (ROM) 11b whose contents are not lost or erased, a random-access memory (RAM) 11c free to write therein, an input/output port (I/O PORT) 11d and a bus (BUS) 11e for connection therebetween. ROM 11b stores programs for CPU 11a and CPU 11a runs various processing operations according to the programs. RAM 11c is a memory temporarily used for running CPU 11a. I/O PORT 11d is used for connecting various input/output equipments to the processing means 11, and in the embodiment as illustrated, I/O PORT 11d connects the receiving means 12, the manual operating input means 15, the alarm means 13, the operating means 14, the display means 17 and the voice synthesizing means 20 to the processing means 11 through respective interfaces. Other equipments or facilities such as a printer may also be connected.

The receiving means 12 is comprised, as illustrated in Fig. 3, of a receiving circuit 12a connected to the signal line 1 and an interface 12b for inputting an output signal from the receiving circuit 12a to the processing means 11. The receiving means 12 receives a fire signal from the fire detectors 3a etc. indicating fire occurrence and further receives a block name signal and an identification signal from the connection station 2 and the identification signal connecting means 4, respectively, and a trouble signal and a normal signal, etc. The kinds of the signals other than the fire signal depend upon the function of the fire alarm system employed, and it is not always necessary for the receiving means 12 to receive all of these signals. In a fire alarm system of the most simple construction, it will suffice for the receiving means 12 to only receive the fire alarm signal. The receiving means 12 may further have a function to transmit

a signal to the connection station 2, the fire detectors 3a, etc. According to circumstances, the receiving circuit 12a may be omitted. In this case, the interface 12b may be connected directly to the signal line 1.

The manual input means 15 is comprised, for example, as illustrated in Fig. 3, of a switch array 15a and an interface 15b and generates a message output requesting signal for requesting outputting of a message stored in a storage means 16 as will be described in detail later. These messages can be selected and the selection is carried out by a code formed, for example, by on-off combination of the switch arrays. By operating the manual input means 15, messages for necessary actions to be taken at the time of fire or messages for instruction manual of the fire alarm system and equipments connected thereto can be heard and training against a fire can be conducted even at the normal time. The manual input means 15 may alternatively be so formed that the switches 15a are preliminarily combined to correspond respective codes so that the codes may be selected by operating a selector switch or depressing push buttons corresponding to the respective codes. Further alternatively, the manual input means 15 may be formed of a keyboard. In the latter case, input of sham fire data for training can be carried out easily.

The alarm means 13 is comprised of a sound generating means such as a bell and a lamp and adapted to be driven by a signal from the processing means 11 connected through an interface (not shown).

The operating means 14 comprises a circuitry portion, switches for providing instructions to the circuitry portion, a telephone, etc. and is adapted to be manually or automatically operated to stop the sound of the alarm means 14, phone to required places and actuate the relevant equipments such as the sprinkler etc. according to an instruction signal from the processing means 11. This

operating means 14 in the embodiment as illustrated is further adapted to supply to the processing means 11 an operation confirming signal for confirming that required operations are surely carried out in response to the operations of the operating means 14. However, it is not always required for the operating means 14 to have a function to supply the operation confirming signal. The operating means 14 may be provided independently of the processing means 11 without being connected thereto.

The display means 17 is comprised of a combination of a character board and an indicating lamp, a simple display formed of 7-segment light emitting diodes, a liquid crystal display for indicating a block name where a fire occurs, actions to be taken, etc. by letters or marks on a panel of the signal station. Alternatively, a CRT display may be used as the display means 17. In this case, the messages stored in the storage means 16 can be indicated simultaneously with or independently of voice synthesizing by the voice synthesizing means 20. As the case may be, this display means 17 may be omitted from the fire alarm system.

The storage means 16 is formed of one or more non-volatile read-only memories (ROM) of random access type and stores messages for actions to be taken when a fire occurs, instruction manual of the fire alarm system, fire training instructions and messages for guide announcement according to necessity. The storage means 16 may further include RAM, if necessary. Although the storage means 16 is connected to the voice synthesizing means 20 in the embodiment as illustrated, the means 16 may alternatively be provided in the processing means 11.

The storage mode of the messages in the storage means 16 is varied depending upon the type of voice synthesizing and/or amount of messages. For example, in case of voice synthesis by a voice synthesizing portion 22

as will be described in detail later referring to Fig. 5, the messages are sequentially stored in the form of voice parameters and an address table is provided for indicating a start address for every message group or a word group.

Fig. 4 shows one example of the address table, wherein, for example, a common phrase "A fire has started at" is stored in an area a_0 starting from a start address 100, block names such as "a utility room", "a warehouse", "office" etc. are respectively stored in areas a_1 to a_8 starting from starting addresses 200 to 900, respectively. In areas b_0, b_1 and b_2, messages for measures to be taken when a fire occurs are stored, respectively. Similarly, messages for fire training are stored in areas c_0 and c_1 and data for guide announcement is stored in areas d_0 to d_n. The start addresses shown in Fig. 4 are given for the convenience of explanation, but, in fact, they are determined taking the lengths of the messages into consideration. The address table may, alternatively, be provided not in the storage means 16 but in ROM 11b.

The voice synthesizing means 20 is comprised, for example, as illustrated in Fig. 5, of an interface 21 connected to a bus 19 from I/O PORT 11d, the voice synthesizing portion 22 for synthesizing a voice, an audio filter 23 for a voice signal and an amplifier 24. The voice synthesizing means 20 is connected to the storage means 16, the voice outputting means 18 and the processing means 11 so that it reads out messages from the storage means 16 in response to an instruction from the processing means 11 and synthesizes voice signals for the messages for outputting them in the form of voice from the voice outputting means 18.

The voice synthesizing portion 22 comprises, for example, as illustrated in Fig. 6, a voice synthesizer 22a formed in one chip LSI and a controller 22f for controlling the voice synthesizing. The synthesizer 22a is comprised

of a sound source 22b, an interpolation circuit 22c, a digital filter 22d and a D/A converter 22e. In the voice synthesizing portion 22, the controller 22f reads out voice parameters constituting a message from the associated addresses according to an instruction from the processing means 11, the parameters are sequentially input to the voice synthesizer 22a and a voice signal is synthesized based on a pulse supplied from the sound source 22b. This voice signal is supplied to the voice outputting means 18 through the audio filter 23 and the amplifier 24. The controller 22f outputs a busy signal during these operations. This function of the controller 22f may, alternatively, be carried out by the processing means 11. In this case, the controller 22f may be omitted. Further alternatively, the controller 22f may be provided integrally with the voice synthesizer 22a and, if desired, further integrally provided with the storage means 16.

The voice outputting means 18 comprises a speaker 18a provided at the signal station 10 and speakers 18b and 18c disposed at other places for outputting the voice signal as voice. These speakers 18a, 18b and 18c are switcheably connected according to contents of the messages. Of course, the speakers may be switched over by a manual operation. As the case may be, the speakers 18b and 18c may be omitted. In addition to the speaker or speakers, the announcing equipment may be connected to the voice synthesizing means 20 through similar switch means.

Fig. 7 illustrates another form of voice synthesizing portion 22 which includes a microprocessor 22i, ROM 22g, RAM 22h and a D/A converter 22e. In this voice synthesizing portion 22 stores phonemic data of respective phones collected by PCM-recording a natural voice and an editing and synthesizing program in ROM 22g. On the other hand, messages are stored as character information in the storage means 16. The microprocessor 22i reads out a

message from the storage means 16 and corresponding phonemic data from ROM 22g according to an instruction from the processing means 11 and edits the phonemic data according to the editing and synthesizing program to synthesize a voice signal. RAM 22h is a memory temporarily used in the course of these operations by the microprocessor 22i. In the case as illustrated in Fig. 7, the operation of the microprocessor 22i may be imposed on the processing means 11 and the storage means 16 and ROM 22g may be provided integrally.

The method of voice synthesis is not limited to those as described above and another voice synthesizing method may be employed in the present invention. For example, messages may be PCM-recorded, reduced into suitable word or sentence groups to be stored in a storage means, and read out by the processing means 11 or a special-purpose microprocessor to edit and synthesize a speech.

The operation of the signal station for a fire alarm system according to the present invention will now be described.

Fig. 8 is a flowchart of a main routine to be run by the processing means 11 of the signal station of the embodiment as illustrated. To start fire signal monitoring after the fire alarm system has been installed, the processing means 11 is subjected to initialization 30 to clear memories and registers in preparation for running various processing operations. The main routine is circulated at a constant speed.

The first operation is a signal line check 31 in which whether the signal line 1 (Fig. 2) is normally operating or not is checked through the receiving means 12. In a succeeding signal line data inputting operation 32, a signal such as a fire signal and/or a trouble signal, when such a signal is supplied from the signal line 1, or

an operation confirming signal, when such a signal is supplied from the operating means 14, is stored in a buffer means, e.g., a predetermined area of RAM 11c, a buffer register (not shown), etc. In a manual input data inputting operation 33, a message output requesting signal is similarly stored in a predetermined buffer means when such a signal is supplied from the manual input means 15.

A data processing operation 34 is provided for carrying out processing of various input data, and is illustrated in detail in Fig. 9. First, a determination is carried out at 40 as to whether the input data represents a fire signal. If the determination is "yes," a flag representing a fire is set in a flag setting means such as a predetermined area of RAM 11c, a flag flip-flop (not shown), etc. and the block name and the identification signal stored in the buffer means are decoded, converted into the corresponding block name and the identification number, and stored in RAM 11c (as shown at 41 and 42 in Fig. 9). The so stored block name and the identification number may further be converted into start address data of voice parameters for the corresponding block name and identification number stored in the storage means 16.

Then, a determination is carried out at 45 as to whether there is a trouble signal representing a trouble such as disconnection of the signal line, a trouble with a power source for the connecting means, disconnection of the fire detectors. If the determination is "yes," a trouble-indicating flag is set in a flag setting means in a similar manner to the case of determination at 40 and a block name in trouble is decoded and stored in RAM 11c (as shown at 46 in Fig. 9). On the other hand, the determination is "no," a further steps are taken without carrying out the operations as described above.

A further determination is carried out at 47 as to

whether there is a normal signal representing that the related facilities are not in operative states, a patrol confirming signal for a patrol investigation, an operation confirming signal, etc. If the answer is "yes," flags corresponding to the respective normal signals are set in flag setting means, respectively and the contents of the signals are decoded and stored in RAM 11c (as shown at 48 in Fig. 9).

If the answer to the determination at 40 as to whether the input data is a fire signal is "no," a further determination is made at 43 as to whether there is an input signal such as a message output requesting signal etc. from the manual input means 15. If the determination is "yes," a manual input-flag is set in a flag setting means and the content of the input signal is decoded and stored in RAM 11c. Although this step is simply expressed by 44 as one operation in Fig. 9, the step is carried out according to the content of the input, i.e., flags are set in corresponding flag setting means for respective messages requested to be output, such as a message for instruction manual, a message for operation training, guide announcement data, etc. After completion of these operations, the program goes back to the first operation at an END position of this data processing routine. On the other hand, if the determination at 43 is "no," the program is branched to the decision point 45 to make determination as to whether there is a trouble signal.

After the data processing operation 34, a control signal processing operation 35 is carried out according to the main routine. In this step, the respective flag setting means are checked and an actuating signal for the alarm means 13 and a control signal for the related facilities such as the fireplug 7, sprinkler 8, etc. is supplied.

In a display conducting operation 36, the content of the input signal, e.g., a fire signal, a trouble signal, etc. is read out from RAM 11c and indicated in the form of characters and/or marks by the display means 17. In case a CRT display is connected, an operation for indicating the same message as the message synthesized by the voice synthesizing means 20 is also carried out.

In a voice control operation 37, a control operation for synthesizing of a voice for a required message by the voice synthesizing means 20 is carried out. This operation is illustrated in detail in Fig. 10. First, a determination is made at 50 as to whether outputting of the required message is over. This determination is made by checking whether the fire indicating flag and the manual input flag has been set by the operations shown at 41 and 44 in Fig. 9. More specifically, when these flags are in reset positions, namely, when they have never been set or reset after completion of an operation 52 for actions to be taken at the time of fire (hereinafter referred to as "a fire action operation") as will be described in detail later, the answer is "yes" and the program is branched to pass the succeeding voice control operation and the processing means 11 runs a further operation of the main routine. On the other hand, when either one of the flags is in a set position, the answer to the determination is "no" and the succeeding voice control operation is carried out. This determination at 50 may be omitted.

A determination at 51 is made as to whether messages to be output are fire data such as data for actions to be taken when a fire occurs, etc. If the answer is "yes," the fire action operation is conducted, and if the answer is "no," the program is branched to a further determination. At a decision point 51, a determination is made as to whether the messages to be

output are messages for instruction manual and/or messages for operation training. If the answer is "yes," an operation (as shown at 54) for explaining instruction manual for the fire alarm system and the related facilities (in case such facilities are not connected, explanation for them is not necessary as will be described in detail later) and an operation at the time of training are carried out. If the answer is "no," the program is branched to a further determination. At a decision point 56, a determination is made as to whether the messages to be output are for guide announcement, and if the answer is "yes," a guide announcement operation 57 is carried out, whereas if the answer is "no," the program is branched to another step of the main routine.

Among the determinations 51, 53 and 56, the determination 51 as to a fire data is made with priority, so that, when a fire signal is received during the processing of other messages such as messages for instruction manual etc., the fire action operation 52 is carried out through the determination at 51. These determinations at 51, 53 and 56 are made by checking the states of the flags set by the data processing step 34 as in the case of the determination at 50.

In the fire action operation 52, as illustrated in Fig. 11, a determination at 60 as to whether a fire occurrence is already informed is first made. If the determination is "no," a fire information is made. If the determination is "yes," the program proceeds to a further determination at 62. This determination at 60 is made by checking a fire informing flag set in a flag setting means after completion of a common phrase outputting operation 77 as will be described in detail later. Further determinations at 70, 74 and 76 as to whether the block name on fire has been read out, as to whether the common phrase has been uttered and as to whether the block name has been

uttered, respectively, are made in similar manners.

In a fire information 61, as shown in Fig. 12, the determination is made at 70 as to whether a block name on fire has already been read out. If the answer is "no," the block name is read out from the fire data stored in RAM 11c and a start addresses of voice parameters corresponding to the block name stored in the storage means 16 are computed from the read out block name. This computation is carried out referring to the address table provided in the storage means 16 or ROM 11b.

Then, a determination is made at 73 as to whether the voice synthesizing means 20 is ready. This is done by checking whether a busy signal is supplied from the voice synthesizing portion 22 through the interface 21 as illustrated in Fig. 5. If the answer is "no (busy)," the program is branched to a further step of the main routine, passing the succeeding voice synthesizing operation. The processing means 11 repeats running of the main routine until the determination becomes "yes (ready)." If the answer is "yes" or the answer becomes "yes" after repition of the main routine, the determination at 74 as to whether the common phrase has already been uttered is made at 74.

If the answer is "no," the start address, for example, #100, of the common phrase "A fire has started at" to be read out from the storage means 16 is applied to the voice synthesizing portion 22 and a start signal is supplied thereto to synthesize a voice signal for vocalizing the common phrase (as shown at 75).

If the common phrase has already been uttered, a determination is made at 76 as to whether the block name has been uttered. If the answer is "no," a start address, for example, #200 of "utility room" to be read out from the storage means 16 is applied to the voice synthesizing portion 22 and a start signal is supplied to synthesize a voice signal for uttering the block name (as shown at 75).

If the block name has already uttered, the processing means proceeds to a further step without carrying out the above-specified operation.

Thereafter, a determination is made at 62 as to whether main and local sounds are stopped as shown in Fig. 11. The main sound is a bell of the alarm means 13 provided in the signal station and local sounds are alarm bells provided in the respective fire blocks. If the answer is "no," an instruction for stopping the main and local sounds is vocalized by the voice synthesizing means 20 by the same procedure as that of the fire information operation 61. This instruction may, for example, be such a message as "put a main sound stopping switch and a local sound stopping switch to a stopping position."

If the determination at 62 is "yes," a further determination as to whether the spot has been confirmed is made at 64. The latter determination is made by checking the status of a predetermined flag of the flag setting means. When the operator has put a spot confirming switch of the operating means 14 provided at the signal station to an "on" position, the predetermined flag has been in "1" position. If the answer is "no," a spot confirming instruction 65 is carried out in a similar manner. This instruction may, for example, be a message "Dial no. ..., or rush to the spot for making confirmation. When confirmed, depress a confirmation switch."

If the determination at 64 is "yes," a further determination as to whether an action after spot confirmation has already been taken is made at 66. This determination is made by checking the position of a corresponding flag of the flag setting means which is in "1" position by an operation confirming signal from the operating means 14 indicating that the sound stopping switch is in the predetermined position. If the answer

is "no," an action instruction 67 after the spot confirmation is carried out in the same manner as described above. This instruction may, for example, be a message "If actual fire, contact the fire station and guide people to a safe place. If not, reset by operating the resetting switch and return the sound stopping switch to the predetermined position."

The fire action operation as described above is carried out in a manner such that whether the operator has carried out required operations or taken required action is determined by the processing means 11 and necessary message or messages selected from the messages concerning measures to be taken when a fire starts are output, in the form of voice, according to the result of the determination. By this operation, the operator can conduct necessary operation and take the necessary action. However, it is possible to employ a system in which the determination is not carried out and all the messages are repeated sequentially. In this case, it suffices to apply only a start address of the messages to be output to the voice synthesizing means 20, so that the program of the processing means 11 can be simplified and the load thereof can be reduced.

The operation 54 for instruction manual is for explaining a method for handling the fire alarm system and the related equipments and facilities. As to the related equipments and facilities, explanation is made only for the equipments and facilities which require manual operations, or the explanation may be omitted. The explanation comprises informations and messages of the status of the fire alarm system and the measures to be taken at the normal time, at the time of power stoppage and at the time of fire. This explanation is output by an instruction manual output requesting signal from the manual input means 15.

An operation 55 for training is carried out following the operation for instruction manual in the embodiment as illustrated, but it may be carried out independently. In this operation, as shown in Fig. 13, a determination is first made at 80 as to whether the training starting message is over. If the answer is "no," a message 81 for starting training such as "Now, operation training starts. A fire alarm is given, so please conduct operations according to the instructions" is uttered. Then, a fire alarm 82 is given. On the other hand, if the determination at 80 is "yes," the program is branched, passing the aforesaid operation. Then, the routine of the fire action operation 52 is called allowing the messages for the measures to be taken at the time of fire to be uttered. Thereafter, a determination as to whether the fire action has been taken is made at 83. If the answer is "yes," such a message as "Now, training is over." is uttered to end the operation (as shown at 84).

In the guide announcement operation 57, emergency equipments of the building, emergency system, caution at the time of fire, etc. are given to the announcing facility in the form of a voice signal. The announcement may be given whenever desired except for at the time of fire or training. For example, in hotel etc., the messages may be broadcast upon request by lodgers. Where a message for guiding people to a safe place is stored in the storage means 16, the guide announcement can be made properly at the time of fire as well as at the time of training.

At the completion of the voice control 37, the processing means 11 resets the flag associated with the voice control which is set in the flag setting means, after giving instructions to utter the last messages in the fire action operation 52, operation 55 for the training and the guide announcement operation 57, respectively.

After completion of the voice control, the main routine of the processing means 11 returns to the signal line check 31. However, if the related equipments and facilities such as an automatic fire testing equipment, an indication testing equipment, a printer, a communication means, announcing means, etc. are connected, the main routine returns to the signal line check 31 after completion of the control operation for these equipments and facilities. Where the printer is connected, not only the fire data but the times when the required operations and actions are taken are printed out, so it becomes easy to know whether such operations and actions have been done properly. To print out the times, a clock must be connected.

The speakers 18a, 18b and 18c of the voice outputting means 18 are switched so that all the speakers 18a, 18b and 18c or at least the speaker 18a may be connected in case of a message, for example, by a fire signal and only the speaker or speakers selected by the manual input means 15 may be connected in the remaining cases, under control of the processing means 11.

Fig. 14 illustrates another embodiment of the signal station for fire alarm system according to the present invention. In this embodiment, the receiving means 12, the alarm means 13 and the operating means 14 are provided separately from the processing means 11. The receiving means 12 is formed of hard-wired logics such as a relay etc. as in an ordinary fire alarm system, and the alarm means 13 is driven by the hard-wired logic. The processing means 11 is connected to the receiving means 12 through an interface (not shown) or includes the interface for connection to the receiving means 12.

The signal station 10 of the present embodiment is suitably employed when it is required to additionally import a function to output, in the form of voice,

messages for the actions to be taken at the time of fire etc. to a conventional signal station for fire alarm system.

The processing means 11 operates and controls voice synthesizing, in substantially the same manner as in the first embodiment, upon receipt of a fire signal. In this embodiment, however, the messages are simply repeated because the operating means 14 is not connected to the processing means 11. Of course, the operating means 14 may be connected to the processing means 11 as in the first embodiment according to necessity, to select the appropriate messages by determining as to whether required operations are carried out. Although the storage means 16 is provided in the processing means 11 in the embodiment as illustrated, it may, of course, be connected to the voice synthesizing means 20.

In the foregoing embodiments, the signal station 10 receives a fire signal etc. through one signal line, but a plurality of signal lines may be connected or different types of fire informing means may be connected to the respective signal lines. In these cases, a program for searching fire data of block names corresponding to the respective signal lines is provided to operate the searching operation by the processing means 11.

As described above, according to the present invention, the messages concerning the measures to be taken at the time of fire can be automatically output in the form of voice, so that it becomes possible to instruct the janitor etc. to act quickly and properly. At the normal time, messages for the instruction manual for the fire alarm system etc., messages for operation training, etc. can be output in the form of voice, upon request, to conduct training of the janitor etc. In addition, if connected to the announcing equipment, explanation of emergency equipments, messages for guiding for leading to a safe place, etc. can be announced.

CLAIMS

1. A signal station for a fire alarm system for giving an alarm upon receipt of a fire signal from a fire informing means such as fire detectors or push buttons, which signal station comprises:

a storage means storing messages concerning actions to be taken at the time of fire and/or messages concerning operating and handling method of the fire alarm system and related facility or facilities;

a voice synthesizing means for synthesizing a voice signal for the message output from said storage means;

a voice outputting means for outputting said voice signal as a voice;

a manual input means for generating a message output requesting signal for requesting output of the message stored in the storage means; and

a processing means receiving and processing the fire signal and the message output requesting signal to select a requested message from the messages stored in the storage means and control said voice synthesizing means for vocalizing the message.

2. A signal station for a fire alarm system according to claim 1, wherein said voice synthesizing means reads out from said storage means the message selected by said processing means for synthesizing a voice signal for the read out message.

3. A signal station for a fire alarm system according to claim 1, wherein said storage means reads out the message selected by said processing means and transfers the read out message to said voice synthesizing means.

4. A signal station for a fire alarm system according to claim 2, wherein said storage means is comprised of a read-only memory storing the messages in the form of voice parameters and said voice synthesizing means is comprised of a voice synthesizer for synthesizing voice for the messages based on the voice parameters and a controller for reading out the messages from the storage means according to instructions from said processing means and controlling the voice synthesizing by said voice synthesizer.

5. A signal station for a fire alarm system according to claim 2, wherein said storage means is comprised of a read-only memory storing the messages as character information and said voice synthesizing means is comprised of a voice synthesizing portion including a read-only memory storing phonemic data and an editing and synthesizing program and a microprocessor for reading out the messages from said storage means in response to instructions from the processing means and editing and synthesizing voice signals for the messages according to the phonemic data and the editing and synthesizing program.

6. A signal station for a fire alarm system according to claim 3, wherein said storage means is comprised of a read-only memory storing the messages in the form of voice parameters and said voice synthesizing means is comprised of a voice synthesizer for synthesizing voice for the messages based on the voice parameters and a controller for reading out the messages from the storage means according to instructions from said processing means and controlling the voice synthesizing by said voice synthesizer.

7. A signal station for a fire alarm system according to claim 3, wherein said storage means is comprised of a read-only memory storing the messages as character information and said voice synthesizing means is comprised of a voice synthesizing portion including a read-only memory storing phonemic data and an editing and synthesizing program and a microprocessor for editing and synthesizing, in response to instructions from the processing means, voice signals for the messages transferred by said processing means, according to the phonemic data and the editing and synthesizing program.

8. A signal station for a fire alarm system according to claim 1, 2, 3, 4, 5, 6 or 7, which further comprises an operating means connected to said processing means for operating said fire alarm system and said related facility or facilities, said processing means receiving operation confirming signals confirming that required operations have been done by said operating means and selecting messages according to the presences of the operation confirming signals.

9. A signal station for a fire alarm system according to claim 1, 2, 3, 4, 5, 6 or 7, wherein said processing means comprises flag setting means for setting flags for respective signals requiring determinations by said processing means such as the fire signal and the message output requesting signal.

10. A signal station for a fire alarm system according to claim 1, 2, 3, 4, 5, 6 or 7, wherein said voice outputting means comprises a plurality of speakers switcheably connected to said voice synthesizing means through switch means, the switching operation being carried out by a signal from said processing means or by a manual operation.

11. A signal station for a fire alarm system according to claim 1, 2, 3, 4, 5, 6 or 7, which further comprises an announcing facility switcheably connected to said voice synthesizing means.

12. A signal station for a fire alarm system according to claim 1, 2, 3, 4, 5, 6 or 7, which further comprises a display means connected to said processing means.

Fig. 1

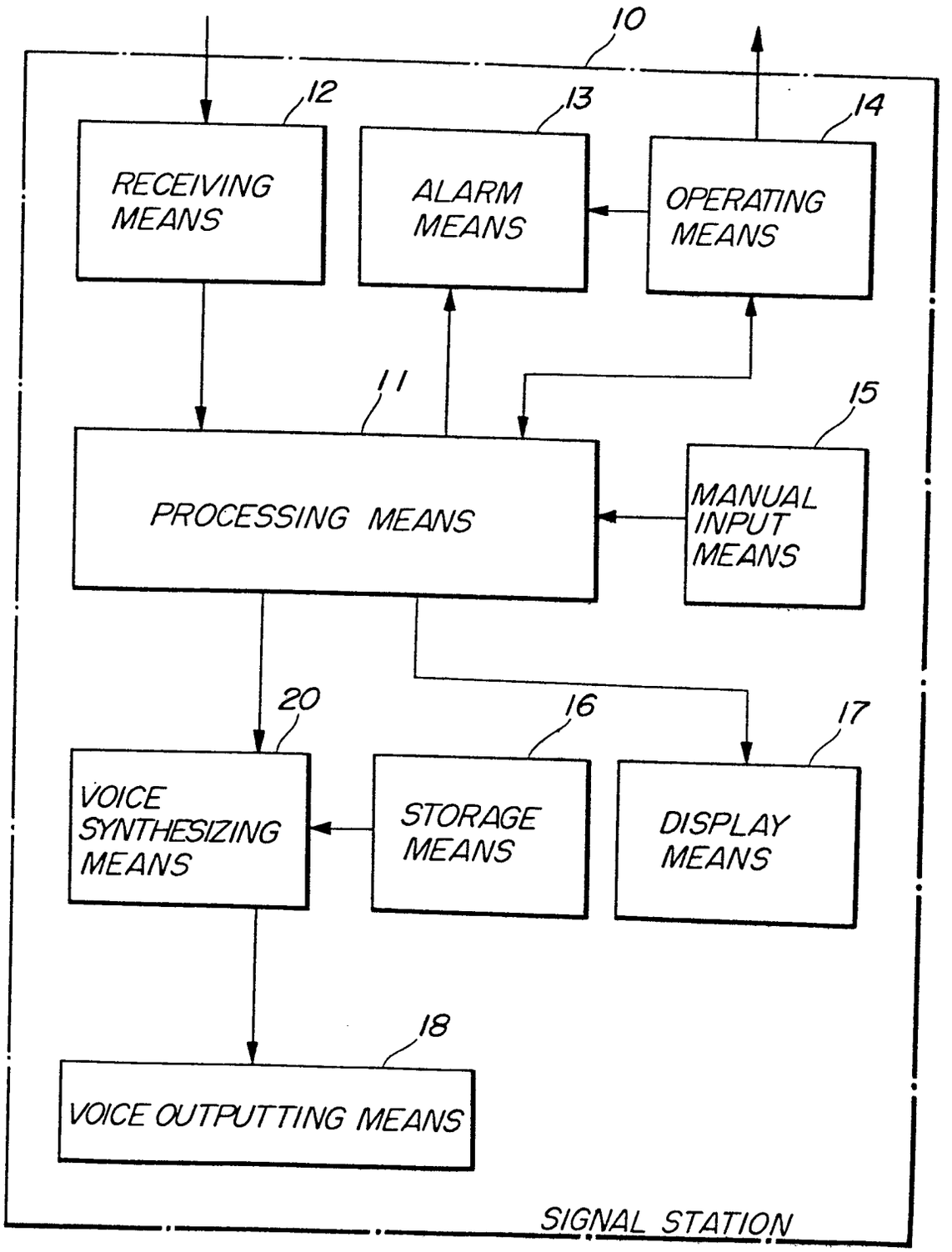

10
12
13
14
RECEIVING MEANS
ALARM MEANS
OPERATING MEANS
11
15
PROCESSING MEANS
MANUAL INPUT MEANS
20
16
17
VOICE SYNTHESIZING MEANS
STORAGE MEANS
DISPLAY MEANS
18
VOICE OUTPUTTING MEANS
SIGNAL STATION

Fig. 2

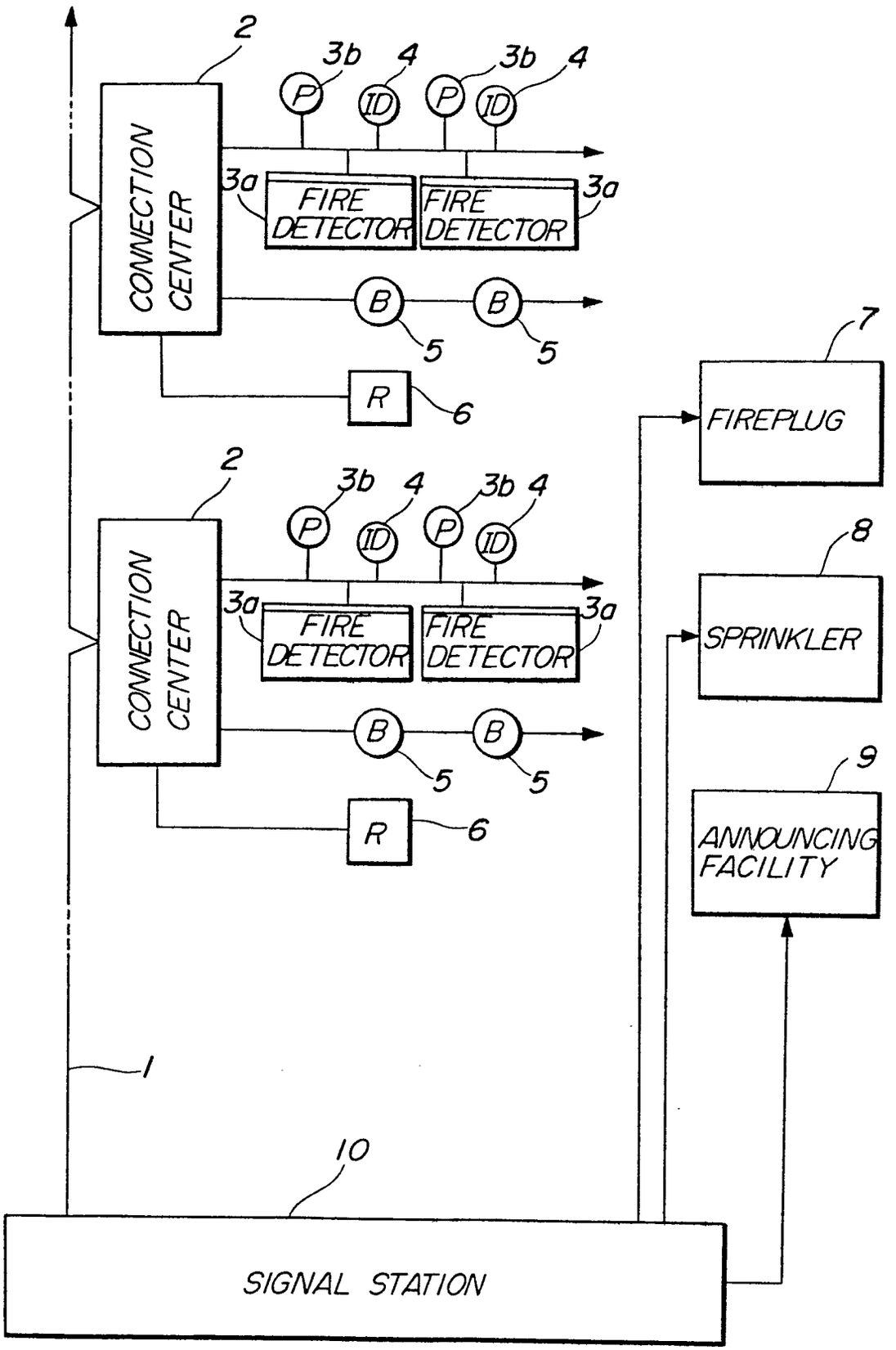

2
3b
4
3b
4
P
ID
P
ID
CONNECTION CENTER
3a
FIRE DETECTOR
FIRE DETECTOR
3a
B
B
5
5
R
6
7
FIREPLUG
2
3b
4
3b
4
P
ID
P
ID
CONNECTION CENTER
8
SPRINKLER
3a
FIRE DETECTOR
FIRE DETECTOR
3a
B
B
5
5
9
ANNOUNCING FACILITY
R
6
1
10
SIGNAL STATION

Fig.3

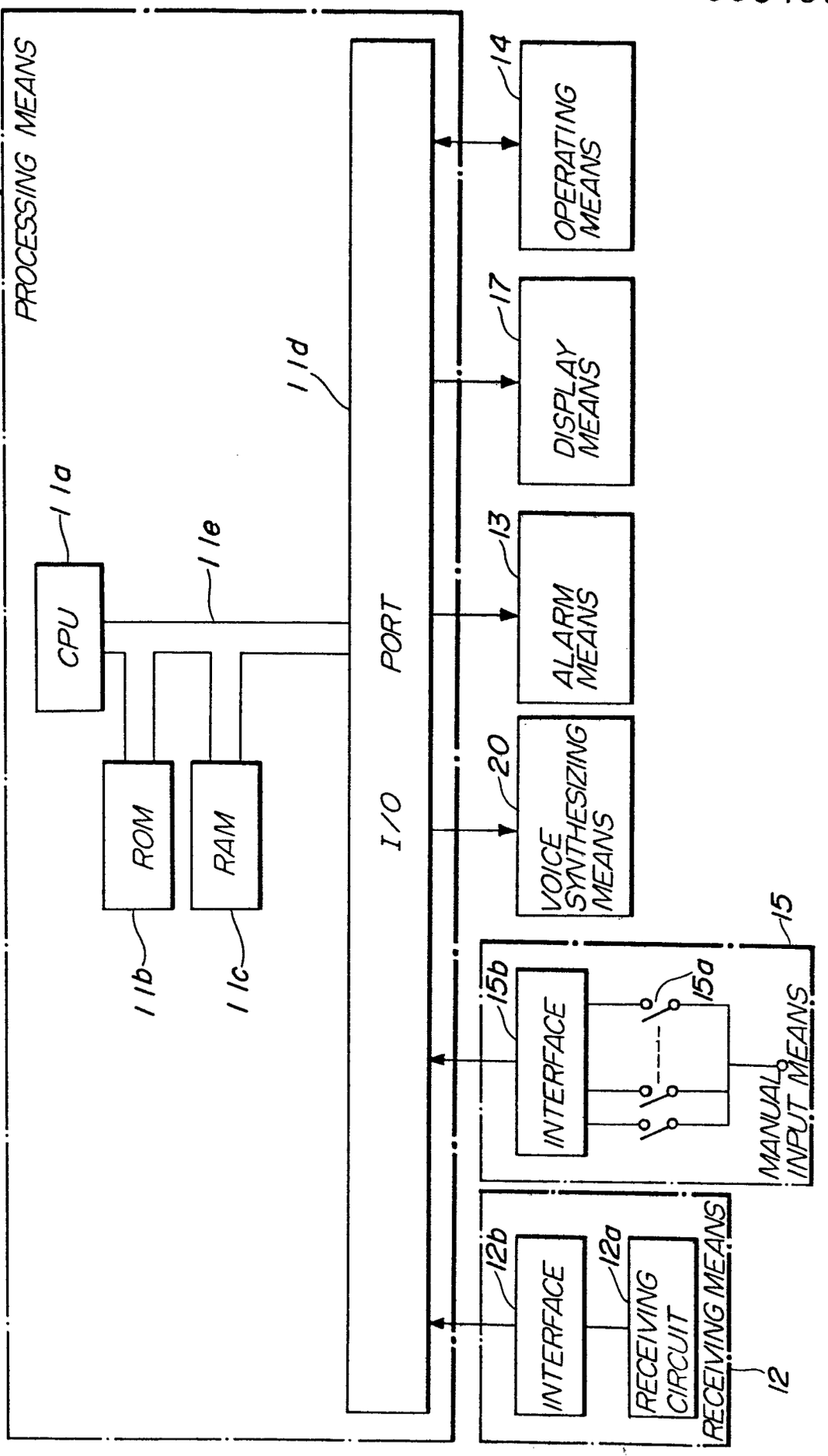

11
PROCESSING MEANS
11a
CPU
11e
11d
PORT
I/O
11b
ROM
11c
RAM
14
OPERATING MEANS
17
DISPLAY MEANS
13
ALARM MEANS
20
VOICE SYNTHESIZING MEANS
15
15b
INTERFACE
15a
MANUAL INPUT MEANS
12b
INTERFACE
12a
RECEIVING CIRCUIT
RECEIVING MEANS
12

Fig.4

START ADDRESS	MESSAGE
100	a_0
200	a_1
300	a_2
400	a_3
500	a_4
⋮	⋮
900	a_8
⋮	⋮
1000	b_0
1100	b_1
1200	b_2
1300	c_0
1400	c_1
1500	d_0
⋮	⋮
N	d_n

Fig.8

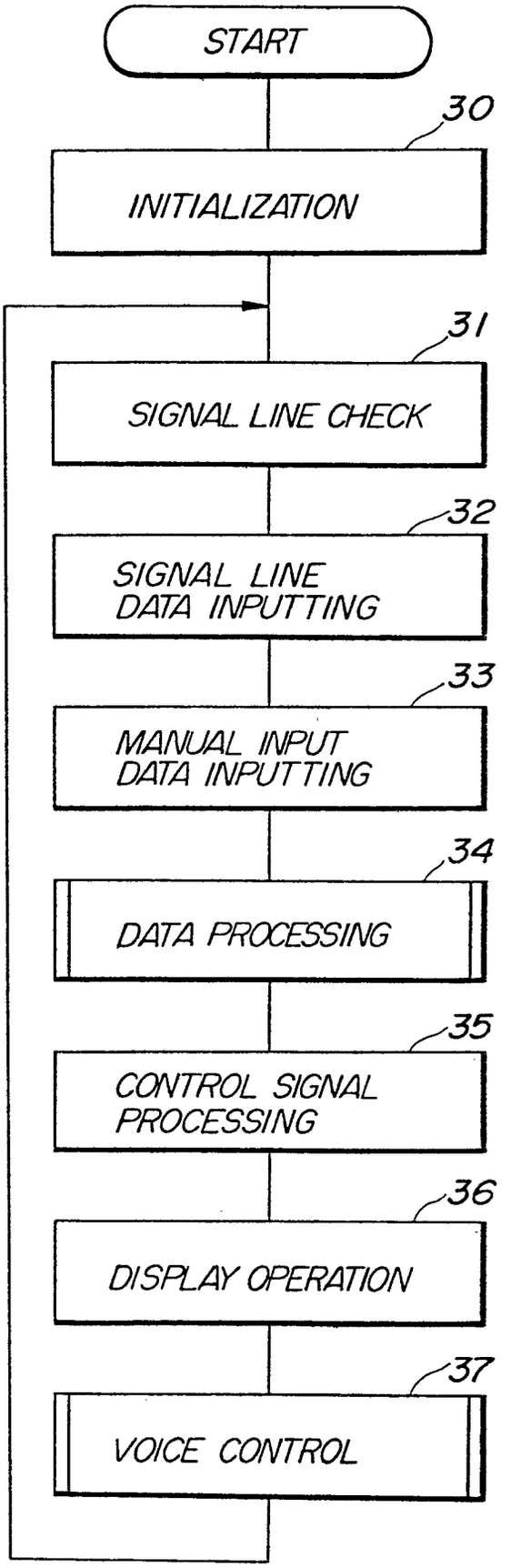
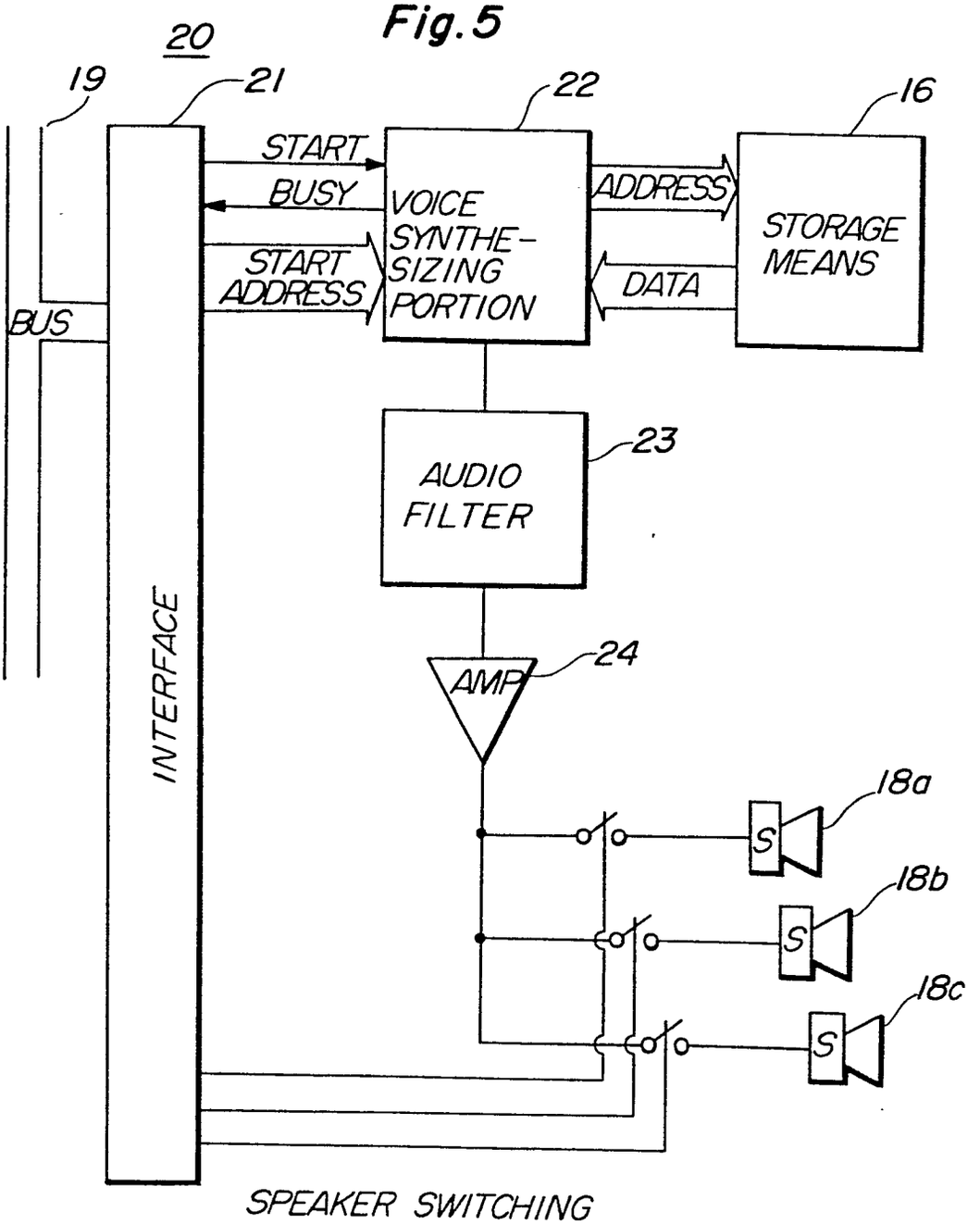


Fig.5



SPEAKER SWITCHING

Fig.6

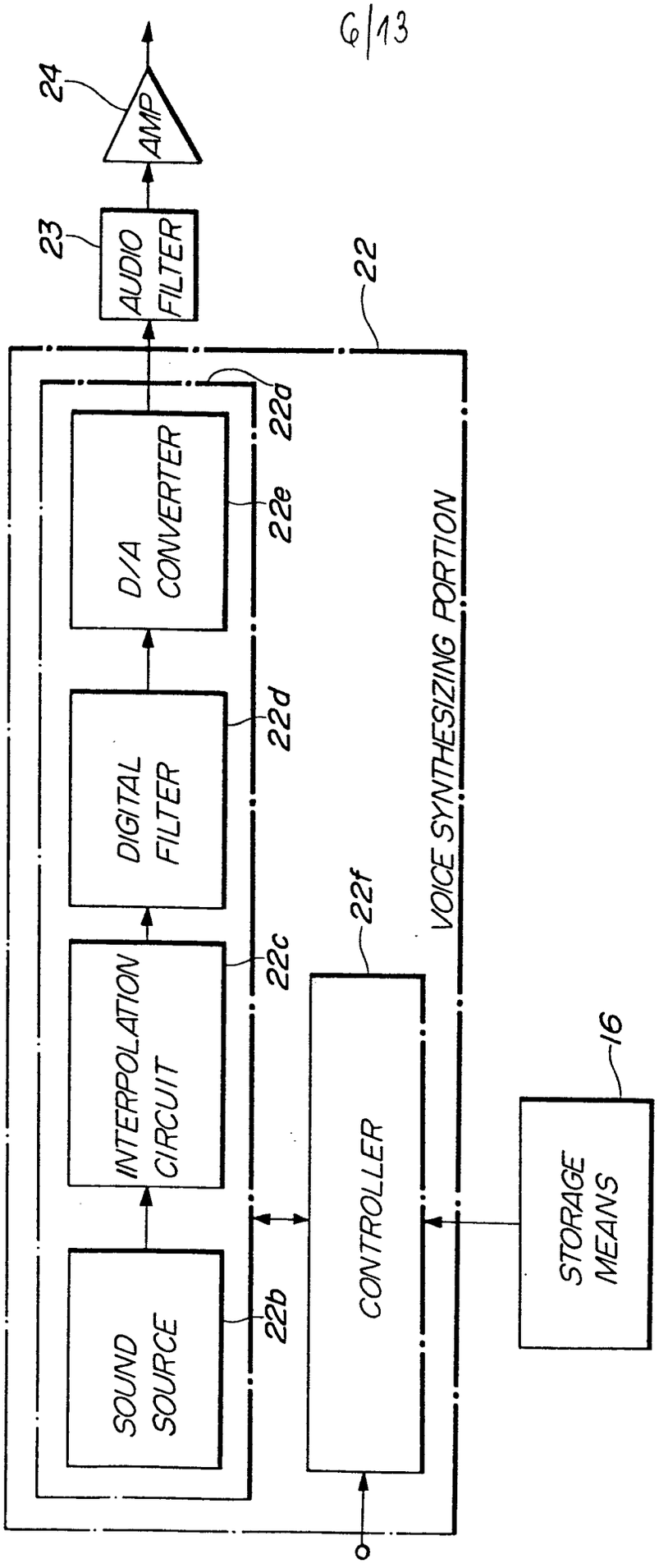

24
AMP
23
AUDIO FILTER
22
22d
D/A CONVERTER
22e
DIGITAL FILTER
22d
INTERPOLATION CIRCUIT
22c
22f
VOICE SYNTHESIZING PORTION
SOUND SOURCE
22b
CONTROLLER
STORAGE MEANS
16

Fig.7

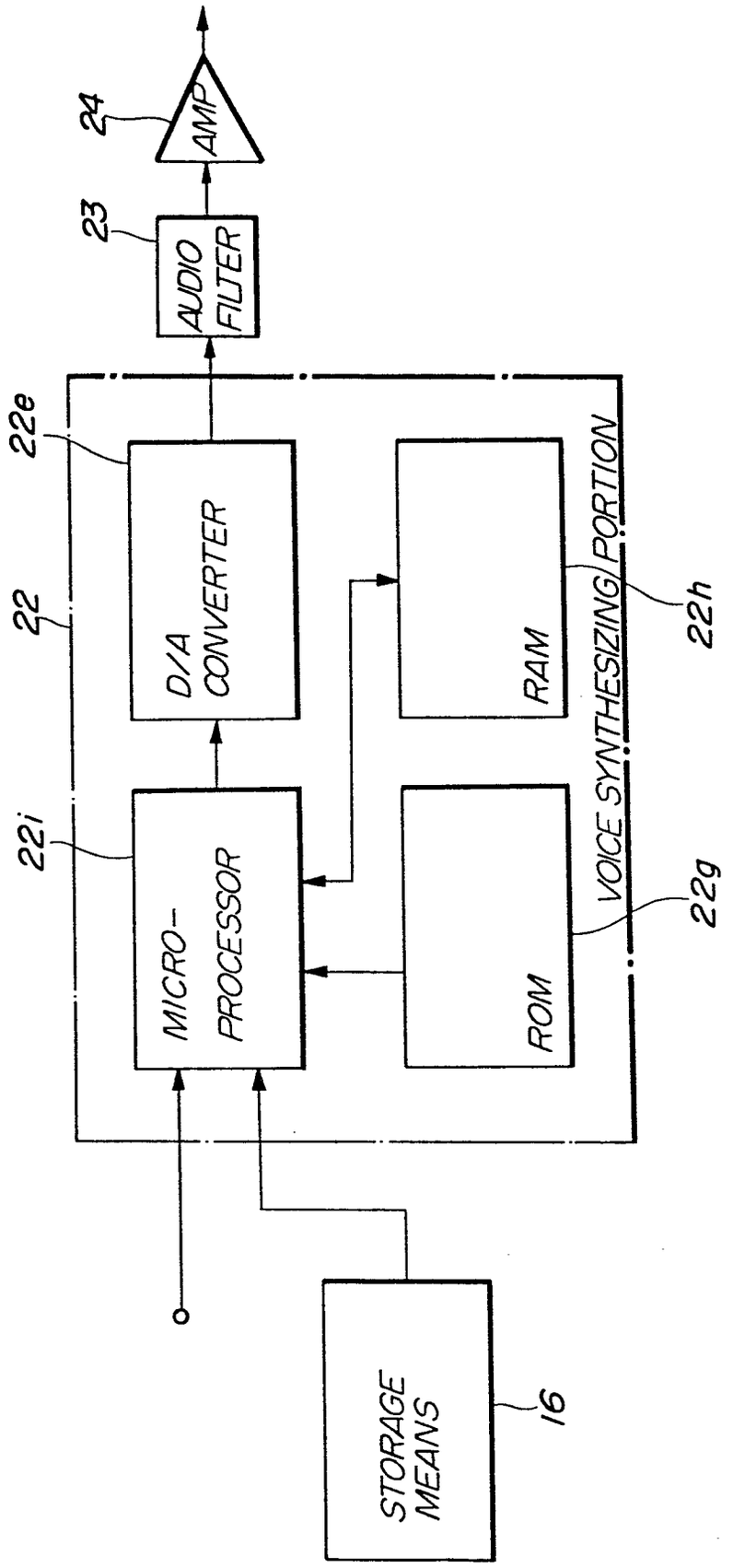

24
AMP
23
AUDIO FILTER
22e
22
D/A CONVERTER
RAM
22h
VOICE SYNTHESIZING PORTION
22i
MICRO-PROCESSOR
ROM
22g
STORAGE MEANS
16

Fig.9

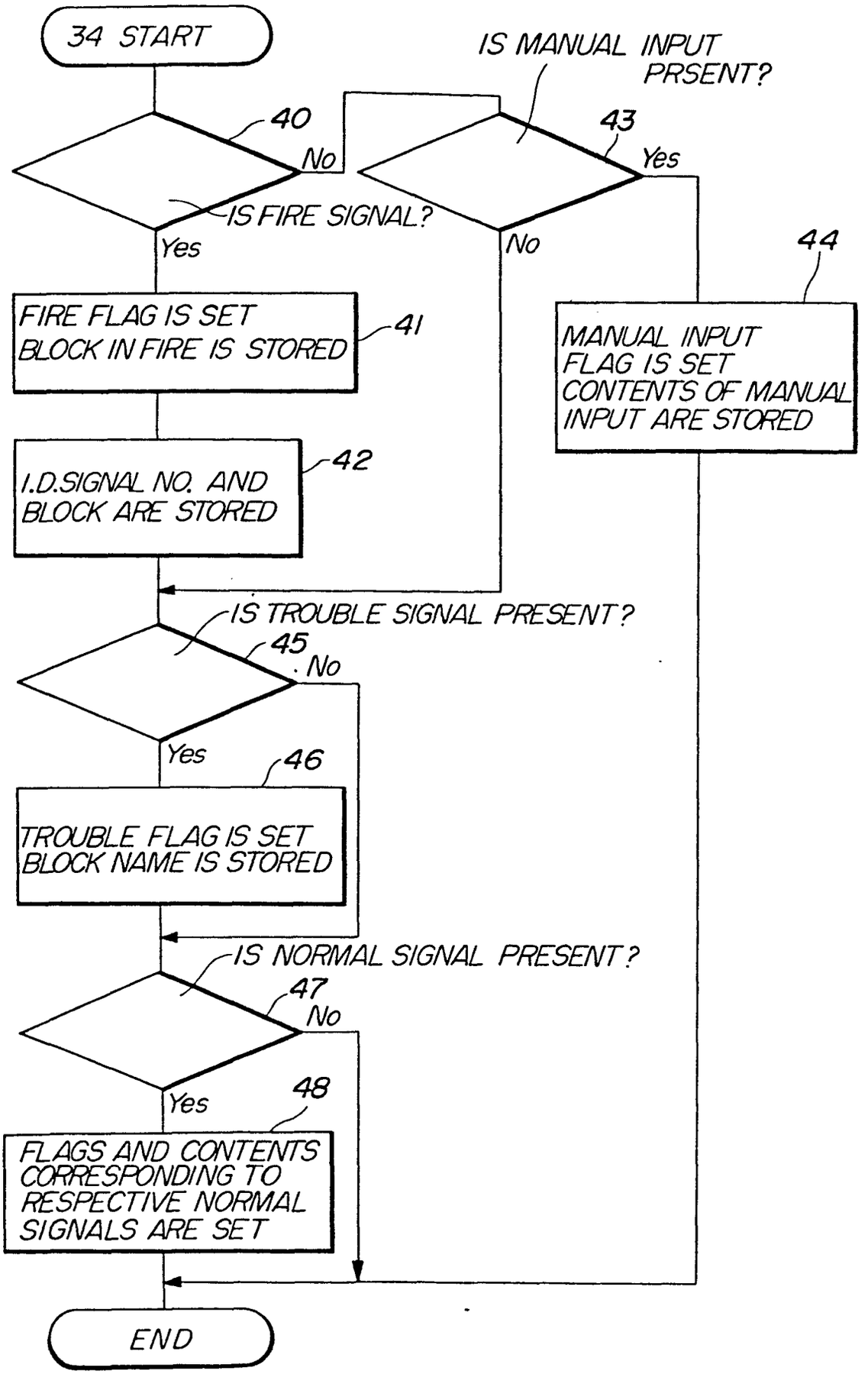

34 START
IS MANUAL INPUT PRSENT?
40
No
43
Yes
IS FIRE SIGNAL?
Yes
No
44
FIRE FLAG IS SET
BLOCK IN FIRE IS STORED
41
MANUAL INPUT
FLAG IS SET
CONTENTS OF MANUAL
INPUT ARE STORED
I.D.SIGNAL NO. AND
BLOCK ARE STORED
42
IS TROUBLE SIGNAL PRESENT?
45
No
Yes
46
TROUBLE FLAG IS SET
BLOCK NAME IS STORED
IS NORMAL SIGNAL PRESENT?
47
No
Yes
48
FLAGS AND CONTENTS
CORRESPONDING TO
RESPECTIVE NORMAL
SIGNALS ARE SET
END

Fig.10

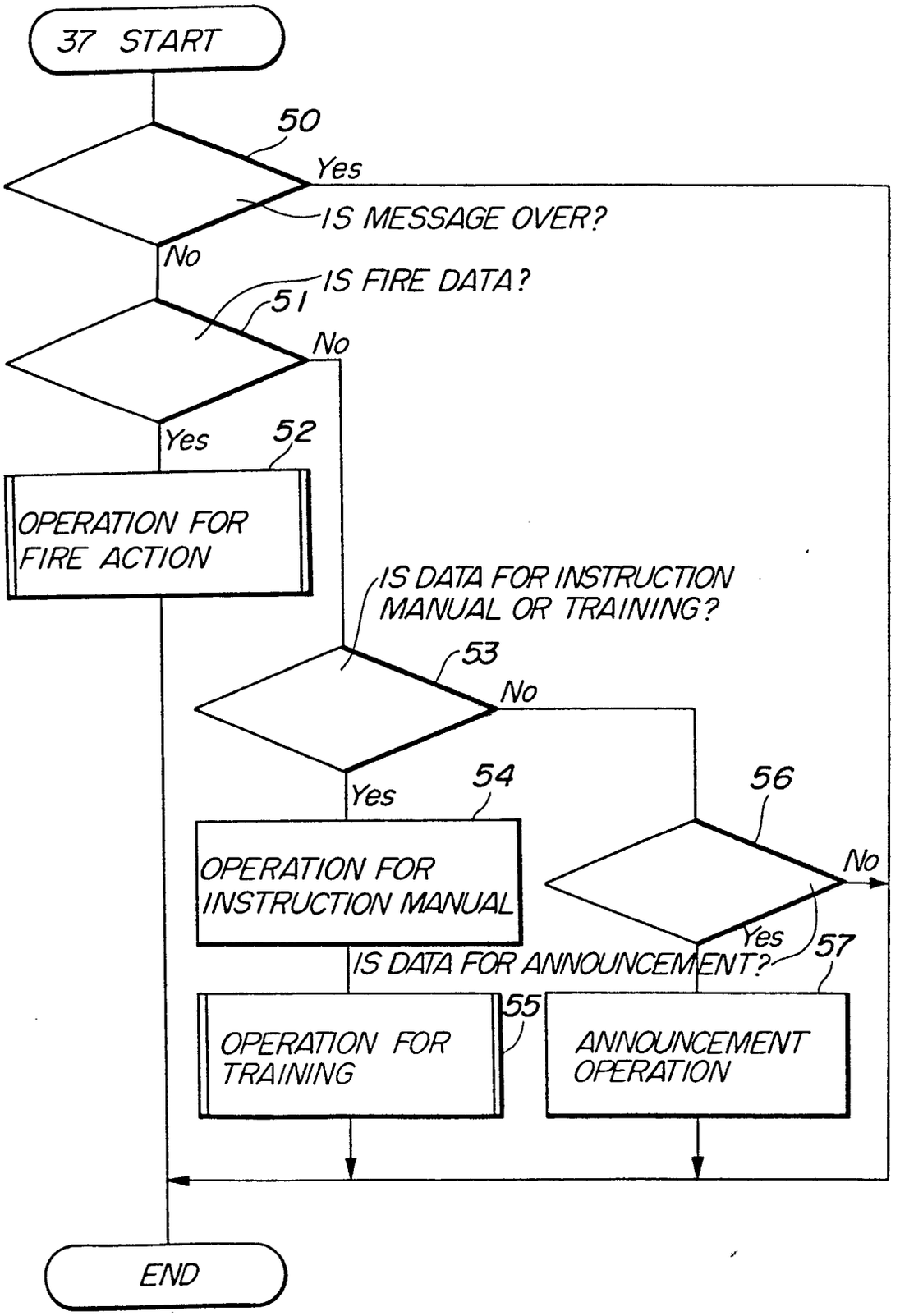

37 START
50
Yes
IS MESSAGE OVER?
No
IS FIRE DATA?
51
No
Yes
52
OPERATION FOR FIRE ACTION
IS DATA FOR INSTRUCTION MANUAL OR TRAINING?
53
No
Yes
54
OPERATION FOR INSTRUCTION MANUAL
56
No
Yes
IS DATA FOR ANNOUNCEMENT?
57
55
OPERATION FOR TRAINING
ANNOUNCEMENT OPERATION
END

Fig.11

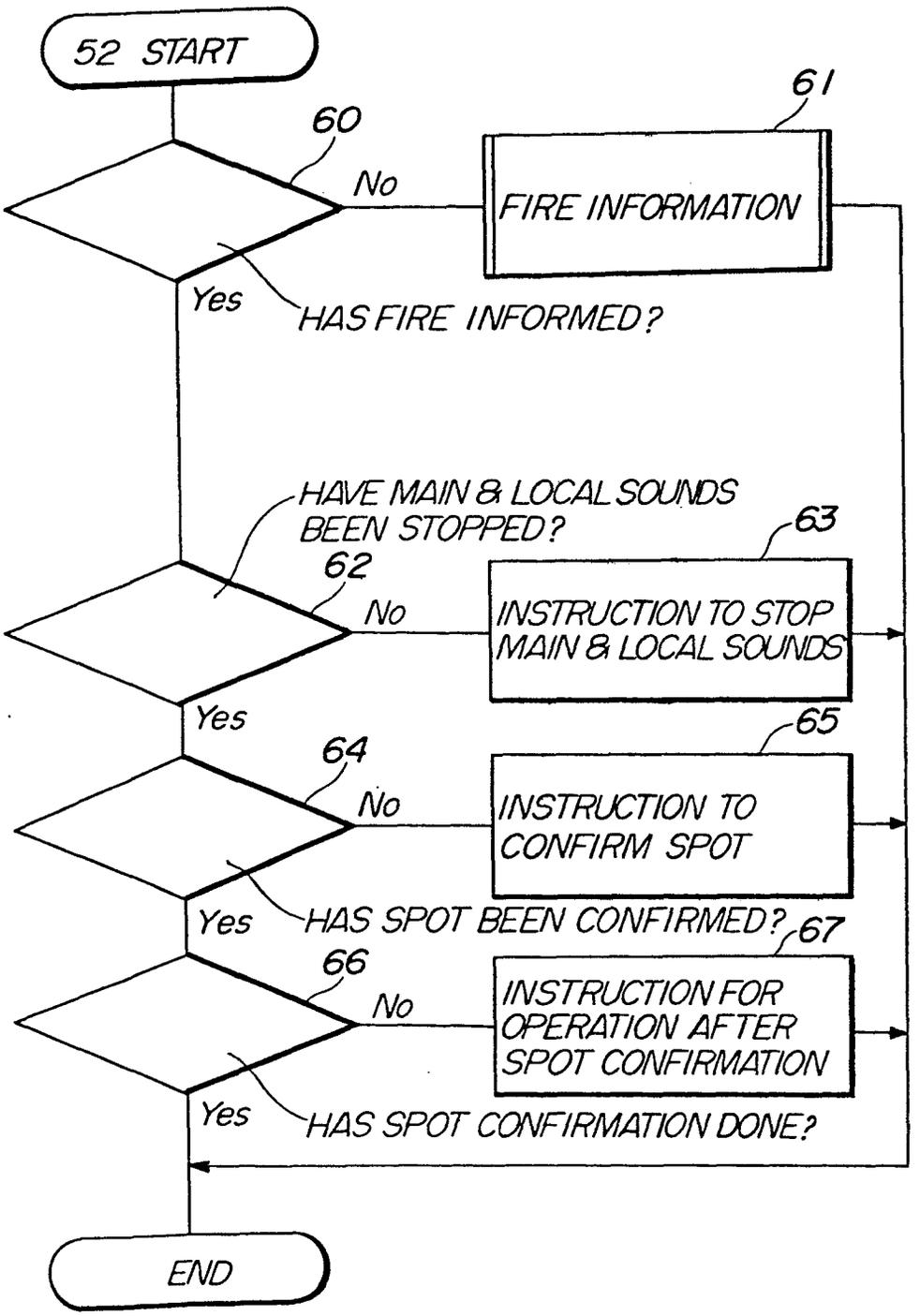

52 START
60
No
61
FIRE INFORMATION
Yes
HAS FIRE INFORMED?
HAVE MAIN & LOCAL SOUNDS BEEN STOPPED?
62
No
63
INSTRUCTION TO STOP MAIN & LOCAL SOUNDS
Yes
64
No
65
INSTRUCTION TO CONFIRM SPOT
Yes
HAS SPOT BEEN CONFIRMED?
66
No
67
INSTRUCTION FOR OPERATION AFTER SPOT CONFIRMATION
Yes
HAS SPOT CONFIRMATION DONE?
END

Fig. 12

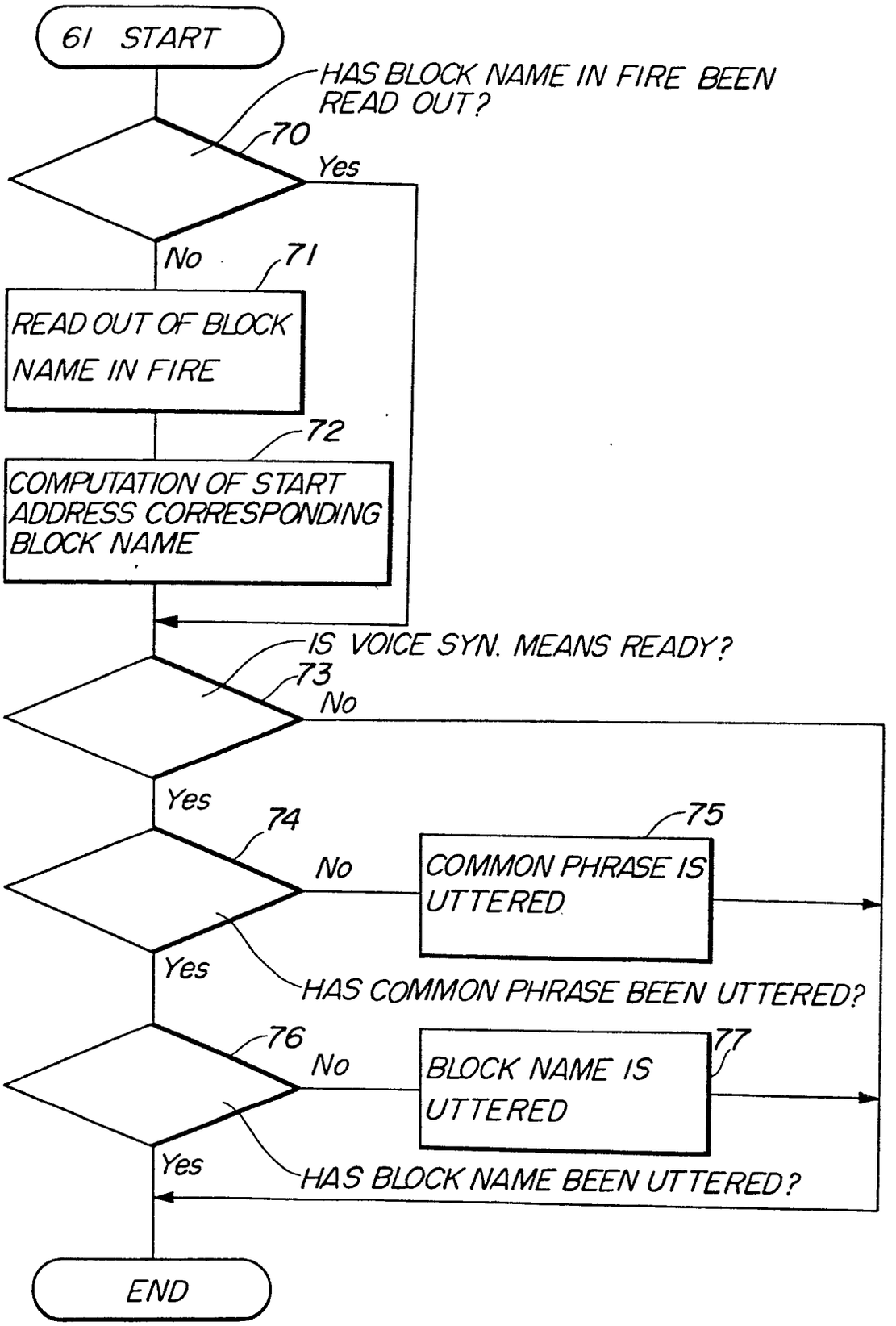

61 START
HAS BLOCK NAME IN FIRE BEEN READ OUT?
70
Yes
No
71
READ OUT OF BLOCK NAME IN FIRE
72
COMPUTATION OF START ADDRESS CORRESPONDING BLOCK NAME
IS VOICE SYN. MEANS READY?
73
No
Yes
74
75
No
COMMON PHRASE IS UTTERED
Yes
HAS COMMON PHRASE BEEN UTTERED?
76
77
No
BLOCK NAME IS UTTERED
Yes
HAS BLOCK NAME BEEN UTTERED?
END

Fig. 13

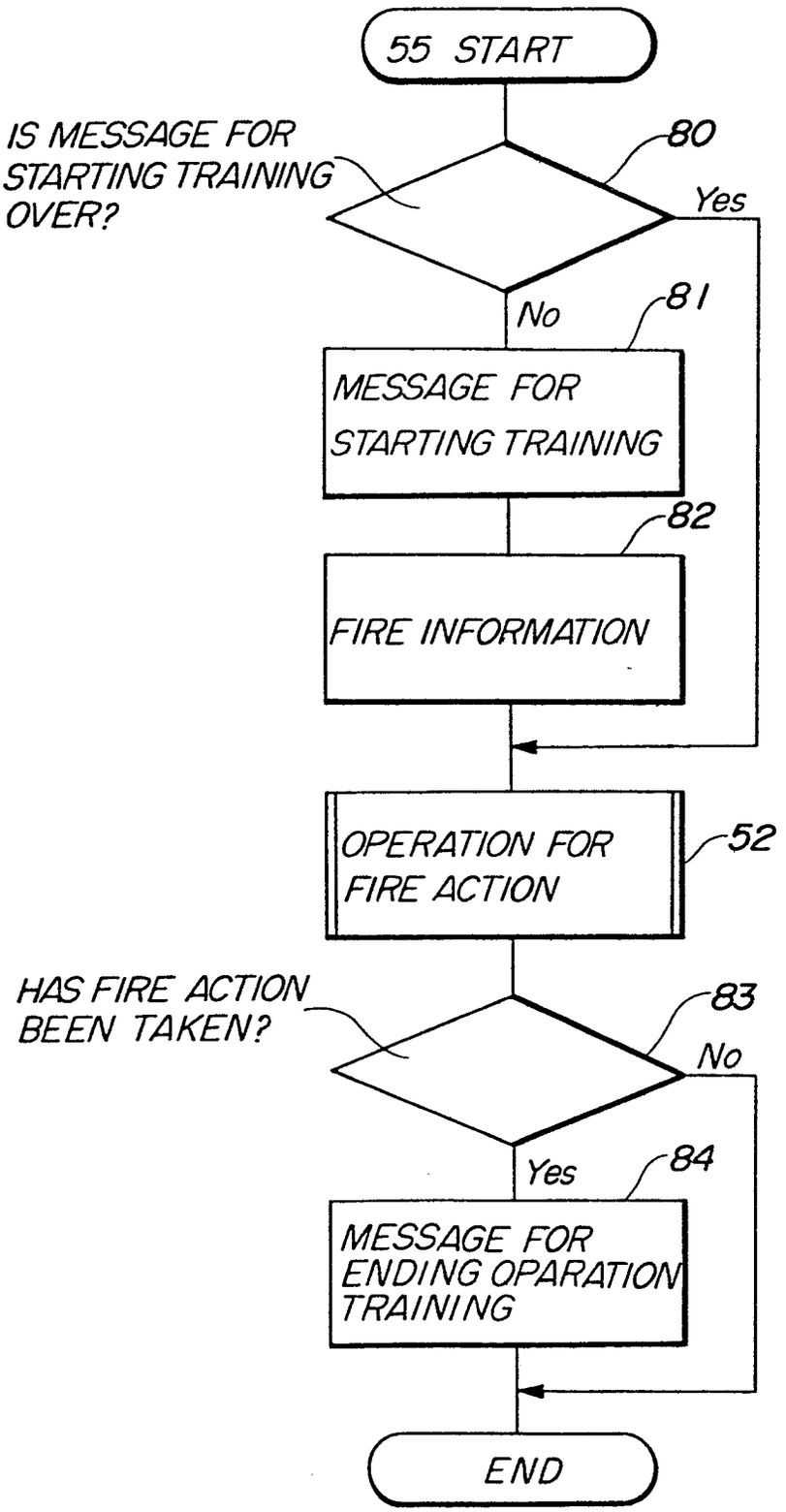
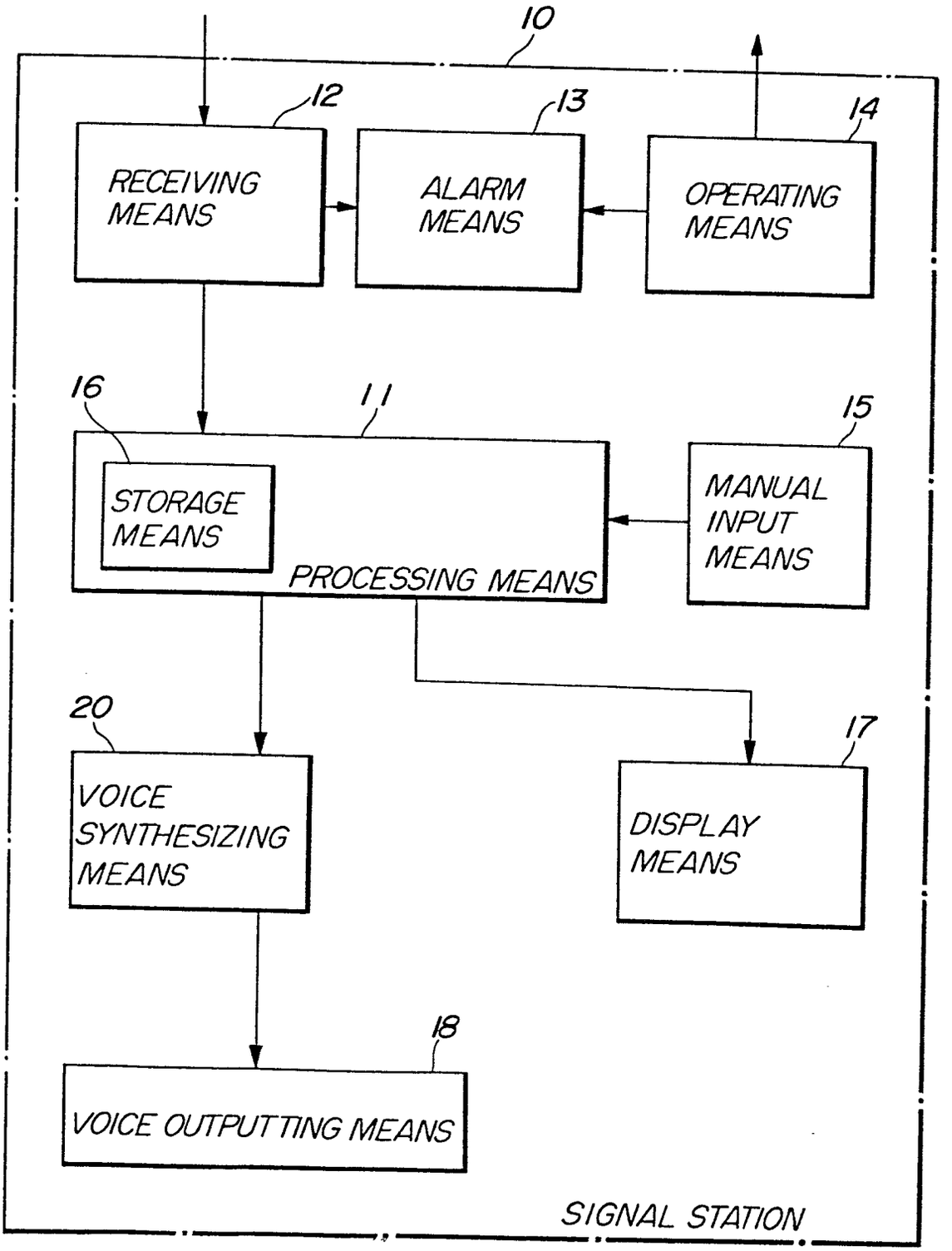

55 START
IS MESSAGE FOR STARTING TRAINING OVER?
80
Yes
No
81
MESSAGE FOR STARTING TRAINING
82
FIRE INFORMATION
OPERATION FOR FIRE ACTION
52
HAS FIRE ACTION BEEN TAKEN?
83
No
Yes
84
MESSAGE FOR ENDING OPARATION TRAINING
END

Fig.14


10
12
13
14
RECEIVING MEANS
ALARM MEANS
OPERATING MEANS
16
11
15
STORAGE MEANS
PROCESSING MEANS
MANUAL INPUT MEANS
20
17
VOICE SYNTHESIZING MEANS
DISPLAY MEANS
18
VOICE OUTPUTTING MEANS
SIGNAL STATION