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1. An alarm installation for supervising or monitoring at least one location, comprising:

a central alarm station and

at least one alarm unit, individual ones of said alarm units being placed at each of said locations which are to be supervised or monitored, for receiving signals from detectors and control devices and for generating an alarm and alarm information therefrom, and

at least one alarm terminal, respective ones of which are placed at a number of monitoring locations or turn-out response locations where supervision or emergency personnel or other persons are present,

characterised in that the alarm units, central alarm station and alarm terminals are interconnected by means of lines on the public telephone network,

that each alarm unit comprises means for dialling up the central alarm station in order to establish a connecting line and for conveying, over an established connecting line on the public telephone network, alarm information, the central alarm station comprising means for

receiving calls on at least one line from the public telephone network and for accepting alarm information,

that the central alarm station comprises means for dialling up alarm terminals and for later establishing a connection with an alarm terminal, means for storing voice messages and means for sending or playing these messages over a connection established to the alarm terminal,

that each alarm terminal comprises a telephone apparatus or set with an audio telephone in which to audibly reproduce voice messages sent from the central alarm station,

that the central alarm station for every connected alarm unit comprises a stored list of attachment numbers or attachment sequences to those alarm terminals to which a voice message shall be conveyed when the central alarm station receives alarm information to the effect that an alarm has been triggered in an alarm unit, and means for dial-up, in sequence, those alarm terminals which correspond to the numbers or sequences in said list.



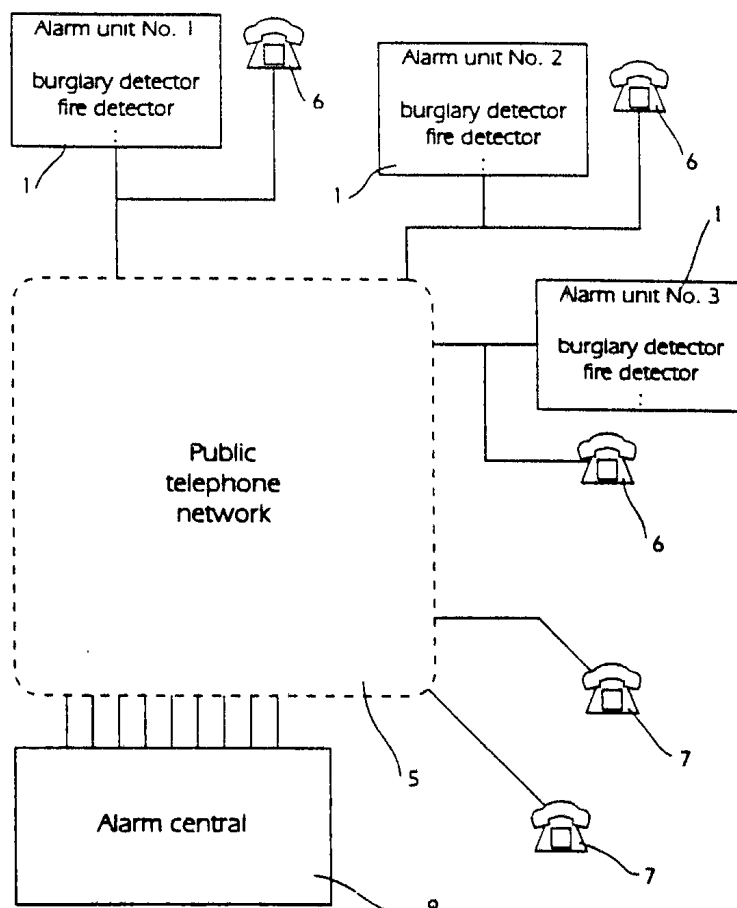
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(54) Title: ALARM INSTALLATION

(57) Abstract

An alarm installation comprises a central alarm station (9) and a number of alarm units (1). The alarm units can send messages to the central alarm station (9) and the central alarm station (9) can send voice messages or recorded spoken messages to a number of alert units. All sending operations are performed on the public telephone network. The central alarm station (9) may have a receipt of played-off messages by means of some simple sending method as by operating the dialling table of a receiving telephone. The alarm units (1) contain at least one detector (29-35) for an emergency situation and will at the activation of such a detector directly or immediately send a message thereof to the central alarm station (9). The latter receives the message and will send a corresponding spoken message to the various alert places, unless another message telling that the alarm should be shut off has arrived from the alerting alarm unit (1) within a predetermined time after the reception of the first, immediately sent message.



Alarm installation

The present invention relates to an alarm system or alarm installation designed to connect a number of alarm units located in homes or other buildings with an central alarm station via the public telephone system, that is, by means of common telephone communication.

Background of the invention

In order to protect homes against different types of threats such as burglary or break-ins, fire, etc., various kinds of alarm installations are employed which, in the simplest case, only activate an audible siren when an alarm is triggered, while more advanced alarm installations can perform a dialling of a central alarm station where emergency personnel are present. There are also installations that can dial a number of telephone numbers sequentially. These advanced systems are, however, expensive, since enough processor power must be present in every home from which an alarm shall be able to be triggered.

There is thus a need for an alarm installation with inexpensive apparatus which can be placed in every home and which are easily installed. Such a system shall also be able to execute an automatic dial-up of various freely chosen telephone numbers, for example to homes or apartments situated nearby the place from which the alarm is triggered.

Prior art

From U.S. Patent No. 3,492,426 a telephone based alarm system is previously known having alarm locations from which an alarm can be triggered; a central alarm station connected thereto through lines of the public telephone network; and permanent lines from the central alarm station to various locations, where supervising or emergency turn-out persons are present for various kinds of alarms, e.g. to a police station, the fire department, health service. When an alarm is triggered at an alarm location, a message is sent from the alarm location by means of telephone circuits over a telephone line with a code for the type of alarm to the central alarm station, which contains suitable telephone circuits for automatic reception of telephone messages and decoding circuits for these messages. Guided by the sent code the central alarm station chooses the alerting locations, which shall receive the alarm, and sends a

recorded voice message to that alerting or guard location. There is no possibility here to sequentially or simultaneously dial a number of equivalent subscribers on the public telephone network from the central alarm station upon reception of an alarm from an alarm location.

From the European patent application EP A1 0 051 383 a telephone alarm system is previously known having an alarm location in which a person residing at the alarm location can trigger an alarm. At the alarm location a central alarm device is installed which is provided with telephone circuits and is connected to the public telephone network. Upon the triggering of an alarm the central alarm device sequentially dials a number of telephone numbers which are stored in the central alarm device. When a call is successful, a recorded voice message is played over the telephone line, after which the next telephone number in the sequence is dialled. Certain set time periods in the central alarm device can be changed by a call to the central alarm device over the telephone network and entry of a special access code plus codes for these times by means of key depressions on a normal keypad telephone. The central alarm device can also activate an audioalarm audible at the alarm location, resulting in dialling the stored telephone numbers, provided that the alarm is not deactivated by a manual intercession at the alarm location.

From U.S. Patent No. 4,482,785 a system for monitoring freezers is previously known, which includes alarm sensors at the freezers, and an alarm centre connected to said sensors. Upon reception of an alarm telephone circuits in the alarm centre dial the first telephone number in a list which is stored in the alarm centre. If the call is answered, a voice message is played up over the telephone line over and over again. At this the answering party is expected to use a push-button telephone keypad to enter a particular code. At this, touch-tone signals are sent, which are received and decoded by the alarm centre, which compares the received code to a previously stored code in the alarm centre. If agreement is reached, the alarm message is considered as received, and then no more calls to telephone numbers in the list are made. If the call does not succeed, the next number in the list is taken.

From U.S. Patent No. 4,652,859 an alarm system is previously known, in which an alarm centre, upon reception of an alarm signal from some alarm sensor, sends a wireless signal to a distantly placed portable unit. If an answer or acknowledgment is not received from the portable unit within a previously determined time, telephone and logic circuits are used to dial a telephone number, decode an access code received from this connection and compare with a reference in the alarm centre, and lastly play up an audible message.

SUMMARY OF THE INVENTION

According to the present invention there is provided an alarm installation for supervising or monitoring at least one location, comprising:

15 a central alarm station and
at least one alarm unit, individual ones of said alarm units being placed at each of said locations which are to be supervised or monitored, for receiving signals from detectors and control devices and for generating an alarm and alarm information therefrom, and

20 at least one alarm terminal, respective ones of which are placed at a number of monitoring locations or turn-out response locations where supervision or emergency personnel or other persons are present,

25 characterised in that the alarm units, central alarm station and alarm terminals are interconnected by means of lines on the public telephone network,

30 that each alarm unit comprises means for dialling up the central alarm station in order to establish a connecting line and for conveying, over an established connecting line on the public telephone network, alarm information, the central alarm station comprising means for receiving calls on at least one line from the public telephone network and for accepting alarm information,

35 that the central alarm station comprises means



for dialling up alarm terminals and for later establishing a connection with an alarm terminal, means for storing voice messages and means for sending or playing these messages over a connection established to the alarm terminal,

that each alarm terminal comprises a telephone apparatus or set with an audio telephone in which to audibly reproduce voice messages sent from the central alarm station,

that the central alarm station for every connected alarm unit comprises a stored list of attachment numbers or attachment sequences to those alarm terminals to which a voice message shall be conveyed when the central alarm station receives alarm information to the effect that an alarm has been triggered in an alarm unit, and means for dial-up, in sequence, those alarm terminals which correspond to the numbers or sequences in said list.

By the invention an inexpensive alarm installation is attained, which is at the same time very easily installed.

Preferably alarm centre is attached to a generally large number of telephone lines and comprises a computer of suitable type, e.g. a microcomputer or personal computer, which is provided with circuitry for communication over the telephone lines and with a permanent mass memory, e.g. a hard disk.

Preferably central alarm station can, if desired, also be provided with circuitry to store, for example in the mass memory, recorded voice messages, and has circuitry to play back, that is, send on a telephone line, these messages, and/or is provided with circuitry to play up synthesised speech on a telephone line.

Preferably telephone circuitry can also perform telephone number dialling; automatic answer upon call reception, that is, simulate that off-hook, etc.; send and receive dialling or touchpad signals of DTMF type; send and receive voice messages; detect that a line is in use or



5 busy, etc. The circuitry can advantageously in addition be configured so that a number of different telephone connections can be established by the central alarm station, and thus, with a simultaneous transmission of recorded messages.

10 Advantageously central alarm station also contains a control program to perform all of these functions. The central alarm station is normally unmanned, but an operator can of course directly control it via the keyboard attached to the computer.

The alarm units have considerably less expensively built control centres. These include, as is conventional, a controller_____



such as a microprocessor having a suitable control program; and with for example a control panel with a keyboard of essentially telephone type having keys for digits and some control characters and indicator lamps, a small non-volatile memory; additionally with an interface, drive circuits, and terminals for different detectors as for burglary or break-in, fire, overflow, temperature; for sirens, for example located both inside and outside the house; telephone circuitry for sending alarm messages to the central alarm station, a receiver for signals from a hand-held transmitter producing signals for activating and turning off the alarm. All of these different apparatus need not exist, but a control unit with a memory, at least some detector for an emergency condition, and means for sending messages to the central alarm station are required. The expensive and more delicate circuitry for speech synthesis and for the storing/replaying of voice messages thus are arranged only in the central alarm station.

The alarm installation thus comprises a central alarm station and a number of alarm units, said alarm units being arranged to send messages to the central alarm station, said central alarm station being able to send voice messages or recorded messages to a number of alerting or monitoring locations. All sending is performed on the public telephone network, wherein the mobile telephone system is included. The central alarm station can get confirmation of reception of played up messages by means of some simple sending method such as by means of signals from the keypad of a receiving telephone set.

The alarm units comprise at least one detector for an emergency situation and will immediately, upon activation of such a detector, send a message thereof to the central alarm station. The station receives the message and ^{in a preferred embodiment} will send a corresponding voice message to the various monitoring stations, only in the case where an additional message that the alarm should be turned off has not arrived to the central alarm station within a predetermined time period after the reception of the first, immediately sent message.

^{preferred} This function, that alarm units at the monitored locations directly send an alarm message to a centre, which later in turn alarms guard personal, emergency personal or police, if a new



message has not arrived to the central alarm station within a certain time period, said message meaning that the alarm was actually a false alarm, does not itself presuppose a central alarm station of the type described above; the central alarm station can thus, for example, be a conventional type, constantly manned guard centre.

^{Preferably}
X detectors in the alarm units can be provided with a transmitting device for wireless connection, for example by means of radio frequency signals, to the central unit, which includes a corresponding receiver unit. When a condition monitored by a detector changes, the detector sends identifying signals which unambiguously inform which detector is sending the message, and information that said condition has changed. The control unit of central alarm station compares the received signals with information stored in the memory of the control unit in order to determine from which detector a received message originates, and with knowledge of this performs a previously determined function, e.g., to activate an alarm, ignore the message, or store it for later use, for example when the alarm is activated.

In the detector a battery for power supply thereof is provided and a sensor circuit for checking or testing the battery voltage. Every time the detector sends a message about a condition change, information about battery voltage is also sent, particularly if said condition is the fact that the battery voltage is too low.

The control device of the alarm unit derives that part of such wirelessly received messages which refers to the battery voltage of a detector and, with guidance thereby, performs a previously determined function, for example, activates some indicator or saves the received message for later use.

For a simple way to register connection of such a detector the control device of the alarm unit has a particular connection or reception mode, wherein the control device can wirelessly receive information sent from a detector which is activated only for this purpose, and which for example, on this occasion, is held or placed next to the receiver section of the control device. The control unit of alarm unit stores the identifying signals contained in this information for a later identification



of the detector upon reception of the wirelessly transmitted signals.

Brief description of drawings

The invention shall now be described in more detail with reference to the attached diagrams, in which:

Fig. 1 schematically shows the general configuration of the alarm installation,

Fig. 2 shows a block diagram of an alarm unit,

Fig. 3 shows a block diagram of a central alarm station,

Fig. 4 shows a block diagram of a break-in detector,

Fig. 5 shows a block diagram of a hand held transmitter.

Detailed description of the invention

In Fig. 1 a number of alarm units are shown, which are generally indicated by the numeral 1, and which by means of connecting wires are linked with the public telephone network 5. The alarm units 1 include a number of different detectors for different emergency situations, e.g., break-in detectors, fire detectors, etc. The alarm units 1 are also in general connected to a common telephone line, to which a common private telephone 6 also is connected. Common telephone apparatus 7 are also of course connected to the public telephone network 5. A central alarm station, generally indicated at 9, is also connected to the public telephone network 5 by means of several lines 11.

In Fig. 2 a block diagram of an alarm unit 1 is shown. The central part thereof is of a control unit 13 in the shape of a simple processor. Belonging to it are, among other things, a non-volatile memory 15. The latter has a permanent portion, in which of course the program for the control unit is stored along with certain data. In a writable part of the memory 15 other data are stored, which are variable but may not be lost when power to the alarm unit fails. In the permanent section of the non-volatile memory 15 is in this way stored for example the serial number of the alarm unit, a particular code number or identification number for the alarm unit 1 and the telephone number to the central alarm station 9. In the writable portion the user's authorization code, identification number, and channels for connected detectors and other devices are stored.

The control unit 13 is, via telephone circuitry 17, connected to the line 3 to the public telephone network.

The telephone circuitry 17 comprises normal functions for performing automatic dialling, which for example are found in conventional fax machines and telephone modems. These functions include, for example, automatic answering ("Off-hook"), conversion of a digital number sequence to dual-tone (DTMF) signals and the transmission of these signals, and detecting establishment of a connection to the telephone number with which one will communicate. The telephone circuits 17 also include functions for reception of DTMF signals and conversion thereof to suitable digital signals.

A control panel 19 is connected to the control unit 13 and comprises a simple keyboard for telephone communication, with the digits 0 - 9 and two control keys. Additionally, there are indicator lamps, for example 4 in number, for signalling the status of the alarm unit 1.

The control unit 13 is via a device 21, which generally can include different types of interfaces, drive circuits, and radio frequency receivers, connected to the various detectors, actuating devices, and signalling devices which can be placed at the location which shall be monitored, and at which generally the control unit plus accessories also are installed. When the device 21 includes rf-receivers it also has an antenna 23 connected thereto.

The various actuating means or detector means include a hand actuated remote control 25 or hand held transmitter of the same type as is used for steering automobile alarms. It comprises a radio frequency transmitter and two operating buttons, one for OFF and one for ON.

Additionally, a key-switch 27 can be connected, for example via a permanent cable, to the interface and drive unit 21.

Additionally, break-in detectors such as 29 and 31 of magnetic type and IR type respectively are arranged, for detection of different movements within a certain volume, for example also communicating with the interface and driver unit 21 via a radio frequency transmitter.

Other detectors for emergency situations can include smoke detectors 33, thermometers 35, etc. Other control devices such as a unit for signalling an assault or an alarm for the handicapped can of course also be arranged. Additionally a siren

37 in connected via a permanent cable to the interface and driver unit 21.

In Fig. 3 a block diagram of the central alarm station 9 is shown. It comprises as its main component a computer 39, for example a common personal computer with an monitor or display 41 and keyboard 43. The computer 39 has a permanent mass memory 45, for example a hard diskdrive, which is suited for permanent storage of a large amount of information. Further, the computer 39 is connected to lines 11 to the public telephone network via voice or speech processors 47 and line interface units 49. The speech processors 47 convert information received from the computer 39 to audible speech. The line units 49 are arranged to perform principally the same functions as the telephone circuitry 17 in the alarm units (Fig. 1), that is, be able to establish telephone connections, send and receive, encode and decode DTMF signals, etc.

The operation of the alarm installation will now be described.

When a new alarm unit 1 shall be connected to the central alarm station 9, the owner, operator of the alarm unit, or the person responsible thereof is given an authorization code consisting of a number combination. By means of the keyboard of the control panel 19 various control codes or programming codes and information are fed in. With a certain programming code plus the authorization code the alarm unit 1 thus enters programming mode. Another programming code causes the alarm unit to dial up the central alarm station 9. At this the alarm unit retrieves the correct telephone number out of its non-volatile memory 15 and performs the dialup. When the connection with the central alarm station later is established, it is indicated in a suitable way, for example by lighting or blinking an indicator lamp on the control panel 19. After entry of another programming code the personal authorization code can be changed. A list of important functions is given below:

code + authorization code	alarm unit in programming mode
code	dial up central alarm station
code + own telephone no.	alarm unit telephone number placed into alarm unit
code + new authorization code	new authorization code stored in

	alarm unit and central alarm station
code + list position number + telephone number	telephone number to designated receiving station is placed in central alarm station
code + list position number	corresponding telephone number to designated alarm receiving station removed from central alarm station
code	exit programming mode and return to normal mode

When establishing telephone contact with the central alarm station 9, the telephone circuits of the alarm unit themselves perform dialling, and checks that the telephone connection is established, performing as usual a number of re-dials if the connection can not be made. When a telephone connection is established, the alarm unit sends, by means of DTMF signals or more generally, by means of dialling signals, identifying information such as the production or serial number of the alarm unit, a particular code number or authorization number for the alarm unit 1 and the user's authorization code. It waits thereafter for a signal from the central alarm station 9, this also being a DTMF signal or a single frequency signal, for confirmation of the authorization of the alarm unit. When such signals arrive on the telephone line 3, they are decoded to appropriate digital signals and are forwarded to the control unit 13, which performs the suitable logical choices. If a confirmation signal is not received within a predetermined time period, the identification information is sent in the usual fashion once again. When confirmation is received, that the connection is established and that the alarm unit is authorized, it is indicated suitably by means of the visual indicators of the alarm unit on its control panel 19 and/or the siren 37. In the latter case, the siren 37 should naturally be placed inside the premises.

When other information shall be stored or changed in the central alarm station 9 from the alarm unit 1, a suitable code is sent as above, which identifies the type of information which shall be added or changed, and thereafter the information

itself. The alarm unit 1 waits for confirmation that the information is received, as described above, and produces a suitable visual and/or audible signal after received confirmation.

The user of the alarm unit 1 thus himself enters those telephone numbers which shall be dialled when an alarm is triggered. These numbers can also easily be removed or changed.

Of the information mentioned above, only the user's authorization code is stored in the individual alarm units 1. This code and all the other information is stored centrally in the mass memory 45 of the central alarm station 9.

Several of the above given particulars can also be stored and changed from a common telephone set or apparatus. Therefor the user of course then requires knowledge of a suitable telephone number to the central alarm station 9, which can be intended only for this type of communication. The user dials this number on his telephone apparatus and when the connection has come through to the central alarm station, he will hear a spoken message, synthetically produced or previously stored, at the original installation programming of the central alarm station, for example, "Welcome to central alarm station XX. Please identify yourself by entering your authorization code on the keypad of your telephone set." The authorization code functions here both as identification of the alarm unit with which this call is concerned, and as a security code so that no unauthorized person will enter the system.

When the caller later has entered his authorization code, for example on the nowadays common type of dialling equipment having pushbuttons and DTMF signalling, it is received by the DTMF circuitry arranged in the central alarm station 9, and is checked against a list which is stored in the memory 45 of the central alarm station control unit 39. When authorization is established, the control unit 39 produces new voice messages that provide different alternatives which the caller can choose by the depression of suitable keys on the telephone equipment. These can for example be

"Add telephone number to the monitor stations list": The caller can here add telephone numbers which shall be dialled when an alarm has been triggered in the caller's alarm unit.

These telephone numbers are inserted by the control unit 39 of the central alarm station into a list for said alarm unit that is held in the memory 45 of the central alarm station.

"Remove telephone number from monitor stations list": It may be necessary to remove telephone numbers from the monitor stations list stored in the memory 45 of the central alarm station.

"Record the alarm message which shall be sent to the members of your monitor stations list upon alarm. Begin after the tone heard soon!" The caller can himself here store the voice message, which will be played back on a telephone 7 when the central alarm station 9 has received an alarm from the alarm unit 1 and has dialled the number to a member of the monitor stations list, and the connection has been established. Such a message might be, "This is Carl Andersson's alarm system on 26 Mainstreet. An alarm has been triggered in my apartment. Hurry there! Confirm reception of this message by pressing key 8." Different messages can here be stored for alarms from different connected detectors 29 - 35, and then of course the instruction to speak in the message is formulated accordingly.

The alarm unit 1 is activated or deactivated either through operating a suitable push button on a remote control 25 or through operating a key-switch and/or by typing in a particular code on the control panel 19 of the alarm unit 1 along with the authorization code. When the alarm unit is deactivated, normal alarms can not be triggered, with the exception of fire alarms which can be programmed to always give alarm, both audibly with the siren 37 and by means of a call to the central alarm station 9. In the deactivated state the control unit 13 however always receives signals from the attached detectors and stores their last received status. In the activated state naturally all types of alarms are triggerable.

Assume now that a break-in alarm is triggered in a connected alarm unit 1. By means of the telephone circuitry 17 in the alarm unit 1, a message is immediately sent to the central alarm station 9 informing it that the break-in alarm is triggered. The message contains, as above, identifying information for the alarm unit 1 and information about the channel number of the detector which has triggered the alarm. The alarm unit 1 awaits

confirmation that the alarm message has been received. Normally, when this message is sent, the connected sirens 37 also start to sound. An authorized person at or nearby this alarm unit can now turn off the alarm, for example with a key which fits the keyed-switch 27. The alarm can also be turned off by means of the remote control 25 by depressing its OFF-button. Additionally, the alarm can be turned off by entering a particular code followed by the authorization code on the keyboard of the control panel 19. When such an authorized turn-off signal arrives to the control unit 13 of the alarm unit 1, it sends a message to the central alarm station 9 as to this event. The message contains, if a new call must be made, as previously, identifying information for the alarm unit, and then a code corresponding to the occurred event. If such an alarm cancellation message has not arrived at the central alarm station within a previously determined short time, say 30 seconds, after the central alarm station has received the original alarm message, then it begins its alarm procedure.

If the alarm has been unintentionally triggered, an authorized person thus can within 30 - 45 seconds break off a begun alarm call. All other attempts to sabotage the alarm will oppositely result in the alarm call being completed according to the following.

The central alarm station 9 identifies thus first, which the alarming unit is and fetches the monitoring stations list belonging to this unit. By means of its telephone circuits 49 and circuits 47 for replaying speech it simultaneously performs, on so many outgoing telephone lines as possible, calls to telephone numbers on the monitor stations list. When a conversation has been coupled up to such a number, the answering party will hear a message regarding what has happened in his telephone earpiece. This message can, for example contain a general portion such as "Here is a message from central alarm station XX." Then a message portion is played up, which originates from an earlier recording by telephone from an authorized user's call, for example, "This is Carl Andersson's alarm equipment at 26 Mainstreet. A break-in alarm has been set off in my apartment. Hurry there! Confirm reception of this message by pushing key 8." The central alarm station 9 checks

that the right key get pressed and notes thereafter in its monitor stations list that the corresponding telephone number has been alarmed or alerted.

The central alarm station continues then calling so that all the telephone numbers on the monitor stations list are informed. In the event that a telephone conversation can not be coupled up, for example because a busy tone is received, the central alarm station control unit 39 can be setup for some suitable redialling procedure, for example redial every minute for a maximum of ten tries.

The various logical functions that the control unit 39 in the central alarm station 9 shall perform are uncomplicated and include few logical choices. The control unit 39 can be configured so that it continually tests the different connected telephone lines 11 by means of their line units to see if a call has occurred. After the call in, the control unit waits for a predetermined time for a sequence with identification information shall be received. If this does not occur, then the control unit 39 assumes that the call is from a normal telephone apparatus and that then some sequence as described above will be performed in order to change some alarm subscriber's stored information.

If the call is from an alarm unit, its identifying information is compared to the information stored in the mass memory 45. If the information is correct a check for more sent information is done. If this information contains report of a triggered alarm along with the channel number for the detector which has triggered the alarm, this information is immediately stored in the permanent memory 45 and an internal timer in control unit 39 is started. During the time which follows hereafter, until the timer times out, the control unit 39 continually checks if a cancellation message is received from the same alarm unit 1. In that case, no calls are made to the telephone numbers on the list belonging to this alarm unit. On the other hand, if no such message is received, the control unit 39 starts dialling all of these telephone numbers. The telephone numbers are retrieved therefore from the mass memory 45 and the control unit determines which telephone lines 11 are free. Then starts simultaneous sending on as many line as is needed or are

usable; that is dialling telephone numbers and the playing of voice messages is performed. By means of the channel number from the alarm information the control unit 39 can roughly divide alarms into break-in alarms, fire alarms, etc., and the corresponding message is played up. Confirmation by pressing a key on the telephone equipment as instructed in a voice message, is received and decoded by the line units 49. Re-dialling in the conventional way can be performed when no telephone connection can be established or no confirmation is received.

When the control unit 39 of the central alarm station 9 instead receives messages with programming information from an alarm unit 1, the sent information is simply stored. Confirmation is sent as mentioned above, for example by the central alarm station sending a single frequency tone.

In Fig. 4 a block diagram is shown for a break-in detector 29 of magnetic type. It comprises as its main component a control circuit 101 coupled to a radio frequency transmitter 103, which can send radio signals to the alarm unit 1 and, specifically, its antenna 23 and interface and driver unit 21. A magnetically actuated switch 105 is provided. This switch 105 can also be actuated manually by means of a push-button 107 arranged on the detector unit 29. A unique identifying number is stored in a permanent memory 109 in the detector 29. The detector is powered by a battery 111. Between the poles of the battery 111 a sensing circuit 113 there is arranged for sensing the battery voltage, and specifically to produce a signal to the control circuit 101 if the battery voltage is too low.

Upon alarm activation of the detector 29 the alarm switch 105 closes which is sensed by the control circuit 101. The control circuit 101 then sends by means of the radio frequency transmitter 103 a message, which comprises first the identifying sequence stored in the memory 109, followed by information that indicates if switch 105 has been closed or opened, further followed by information reporting if the battery voltage is satisfactory or not.

Also, the detector 29 always sends a signal whenever the switch 105 changes its contact status, and the corresponding signal is also always received by the interface and driver unit 21 and is relayed to the control unit 13, which stores this

information for possible later use. The same signals are naturally sent when the switch 105 is actuated manually by pushing the button 107.

The remote control 25 is built similarly to the above detector 29 and a block diagram for such a unit is shown in Fig. 5. The hand held transmitter 25 includes two switches 115 and 117, which can be actuated manually by push-buttons 119 and 121 respectively. Pushing the ON-button 121 so that switch 115 closes means an activation of the alarm unit 1. In this case the remote control 25 sends, by means of its radio frequency transmitter 103, in a similar way as above, first its identification sequence, stored in the memory 109, followed by information which communicates that the ON-switch has been closed. The corresponding process is carried out when the other switch 117 is closed by pushing the OFF-button 121, but of course with different information or code, which are sent by means of the radio transmitter 103.

When the alarm unit 1 is powered up, its control unit 13 checks that all the connected break-in detectors have their normal status. If this is not the case, the alarm unit 1 emits an audible signal using the siren 37 and/or by means of the indicators of the control panel 19. One can then deactivate the alarm unit 1 to explore the cause of the signal, but if it is not done the control unit 13 will assume that the corresponding detector is faulty and will ignore it in the future. If a signal has been received indicating that the battery voltage in a detector is too low, it is also indicated in a corresponding way by the control unit 13.

Connection to the alarm unit 1 of an additional detector of the type having a built-in transmitter as above or a hand held transmitter 25 is done in a very simple way. Entry of a particular code on the keyboard of the control panel 19 followed or preceded by the authorization code, followed by entry of a channel number for the detector or hand held transmitter places the control unit 13 in receiving mode. The corresponding detector or hand-held transmitter 25 is manipulated so that it sends out its signal as above, for example by pressing push-button 107, or the ON- or OFF-pushbuttons 119, 121, and the signal is received by the interface and driver unit 21,

whereafter the identification number of the sending device is entered in the non-volatile memory 15 together with its channel number. After this a particular exit code is entered on the keyboard of the control panel 19. Particular channel numbers within a certain number interval can thus be assigned to hand-held transmitters, while others are assigned to break-in detectors, and further others can be assigned to detectors of another type, which require permanently enabled alarming, such as for fire, water, etc.

The connection of a wirelessly connected detector or hand-held transmitter 25 can be removed in a corresponding way by entering another particular code at the keyboard of the control panel 19, along with the authorization code. After this the channel number of the connected unit is entered, and thereby the corresponding detector or hand-held transmitter is removed from the list stored in the memory of the control unit.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:-

1. An alarm installation for supervising or monitoring at least one location, comprising:

a central alarm station and

5 at least one alarm unit, individual ones of said alarm units being placed at each of said locations which are to be supervised or monitored, for receiving signals from detectors and control devices and for generating an alarm and alarm information therefrom, and

10 at least one alarm terminal, respective ones of which are placed at a number of monitoring locations or turn-out response locations where supervision or emergency personnel or other persons are present,

15 characterised in that the alarm units, central alarm station and alarm terminals are interconnected by means of lines on the public telephone network,

20 that each alarm unit comprises means for dialling up the central alarm station in order to establish a connecting line and for conveying, over an established connecting line on the public telephone network, alarm information, the central alarm station comprising means for receiving calls on at least one line from the public telephone network and for accepting alarm information,

25 that the central alarm station comprises means for dialling up alarm terminals and for later establishing a connection with an alarm terminal, means for storing voice messages and means for sending or playing these messages over a connection established to the alarm terminal,

30 that each alarm terminal comprises a telephone apparatus or set with an audio telephone in which to audibly reproduce voice messages sent from the central alarm station,

35 that the central alarm station for every connected alarm unit comprises a stored list of attachment numbers or attachment sequences to those alarm terminals to



which a voice message shall be conveyed when the central alarm station receives alarm information to the effect that an alarm has been triggered in an alarm unit, and means for dial-up, in sequence, those alarm terminals which
5 correspond to the numbers or sequences in said list.

2. An alarm installation according to claim 1, characterised in that the central alarm station comprises means for receiving a spoken message over a telephone connection, which has been established from a telephone
10 apparatus or set connected to the public telephone network, and for storing it as a voice message which shall be sent to an alarm terminal.

3. An alarm installation according to claim 1 or 2, characterised in that the central alarm station
15 comprises means for receiving and decoding to digital characters, number dialling signals obtained over a telephone connection established to the central alarm station.

4. An alarm installation according to any one of
20 claims 1 to 3, characterised in that each alarm unit comprises means for encoding digital characters by means of number dialling signals.

5. An alarm installation according to any one of
25 claims 1 to 4, characterised in that each alarm unit is arranged to immediately send, when it generates an alarm, information thereof to the central alarm station,

that each alarm unit is arranged to send, after it has generated an alarm and the alarm information associated therewith has been sent to the central alarm
30 station, a new message to the central alarm station indicating that the earlier message shall be ignored and not lead to any response, if a particular action affecting the alarm unit, including turning of a particular key or



the reception of a special coded signal, has occurred within a predetermined time from the time when said alarm was generated, and that the central alarm station, if such a new message has not been received within a predetermined time, is arranged to send an alarm message to monitoring or emergency turn-out locations where supervision or emergency personnel, or other persons, are present.

6. An alarm installation according to any one of claims 1 to 5, characterised in that the alarm terminals comprise means for confirming or acknowledging to the central alarm station a received message and that the central alarm station comprises means for receiving such a message from the alarm terminals.

7. An alarm installation according to any one of claims 1 to 6, characterised in that the central alarm station comprises means for accepting and decoding number dialling signals obtained over a telephone connection line established with the central alarm station.

8. An alarm installation according to any one of claims 1 to 7, characterised in that at least one of said alarm units comprises at least one detector provided with a transmitter unit for wireless connection, including by means of radio frequency signals, to a control unit of the alarm unit, which is provided with a corresponding receiver unit,

that when the status of one of the at least one wirelessly connected detectors changes, said detector is arranged to wirelessly convey identifying signals that unambiguously indicate which detector is sending the message, and information regarding the condition change, and

that the control unit is arranged to compare the wirelessly received signals with information stored in the control unit to determine from which wirelessly connected



detector a received message originates and with guidance thereof perform a predetermined function, in particular one of: to generate an alarm, ignore the message, or store it for later use.

5 9. An alarm installation according to claim 8, characterised in that said wirelessly connected detector also comprises a battery for its power supply and a sensing circuit for testing voltage of said battery,

10 that said wirelessly connected detector is arranged to convey, every time it conveys messages about a condition or status change, also information about its battery voltage, particularly about the battery voltage being too low, and

15 that the control unit is arranged to derive, from the wirelessly received signals, information that relates to the battery voltage of a wirelessly connected detector and to perform, with guidance thereof, a predefined function, including to bring some indicating means into operation or store the received message for later use.

20 10. An alarm installation according to claim 8 or 9, characterised in that the control unit is arranged to wirelessly receive, in a certain receiving mode, information sent from a detector and to store the identifying signals contained in said sent information for
25 a later identification of said detector upon reception of wirelessly received signals.

11. An alarm installation substantially as herein described with reference to and as illustrated in the accompanying drawings.

30 Dated this 29th day of July 1996.

JAN RUUS

By its Patent Attorneys:

GRIFFITH HACK & CO.

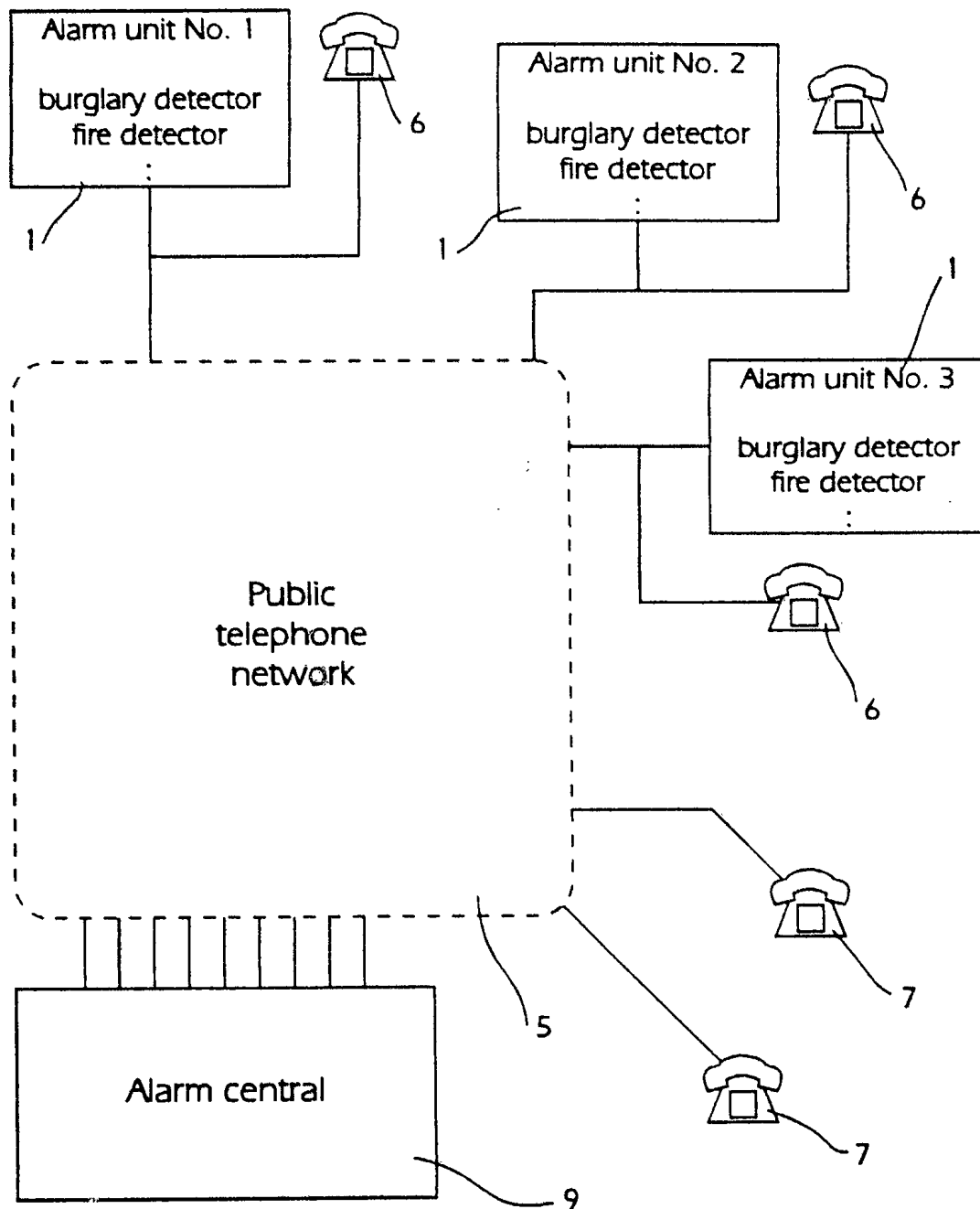
Fellows Institute of Patent
Attorneys of Australia.

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Fig. 1



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Fig. 2

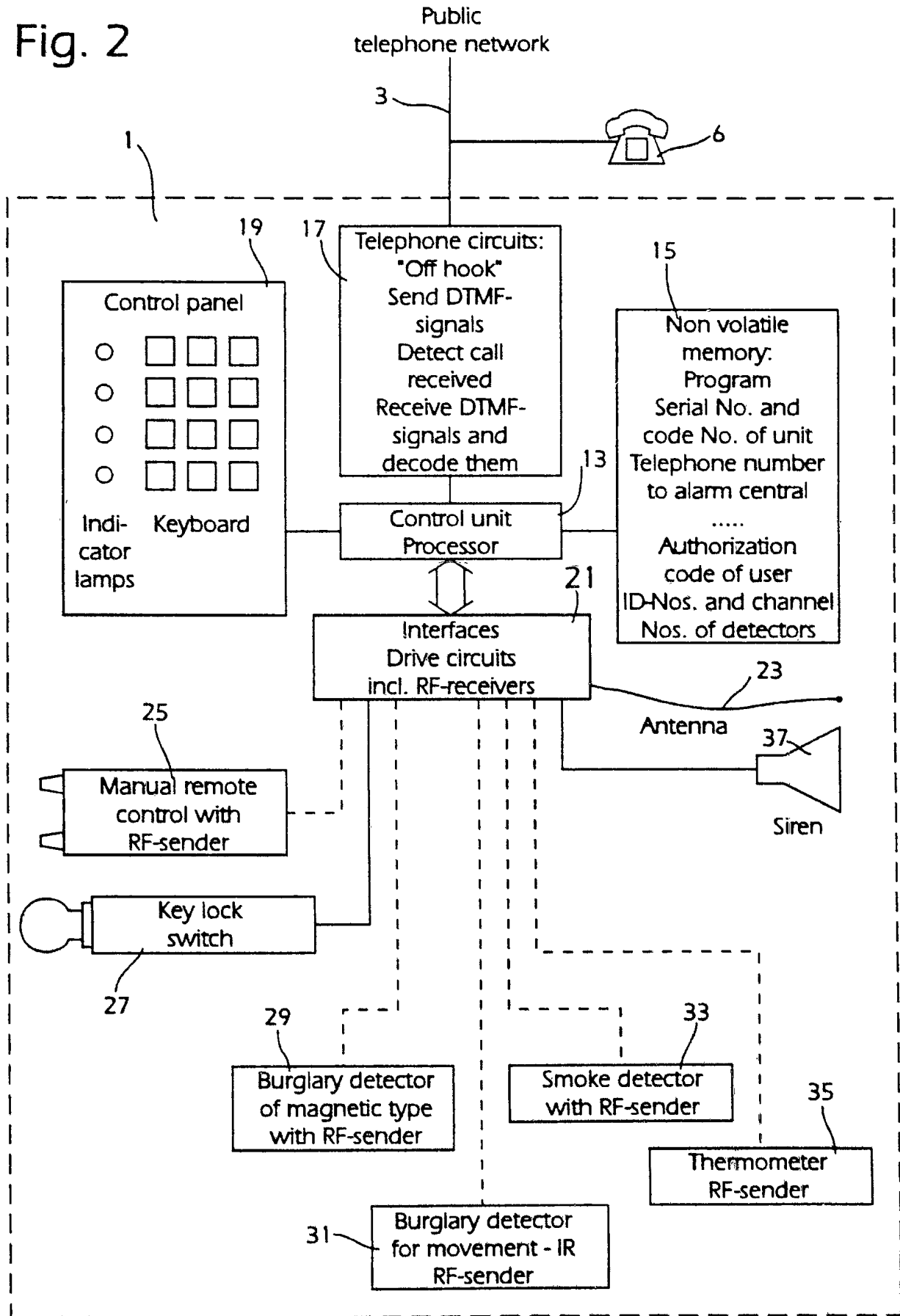
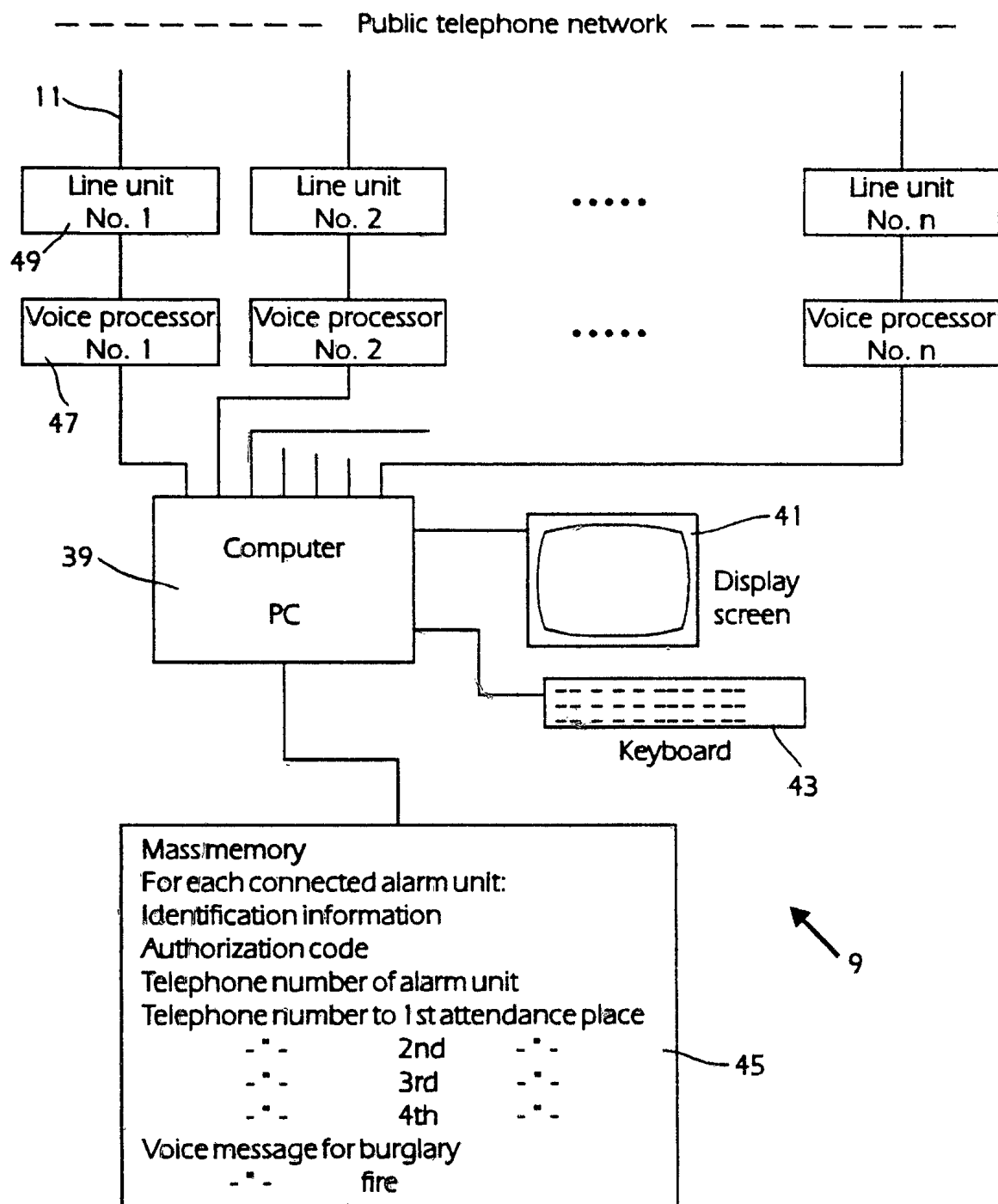
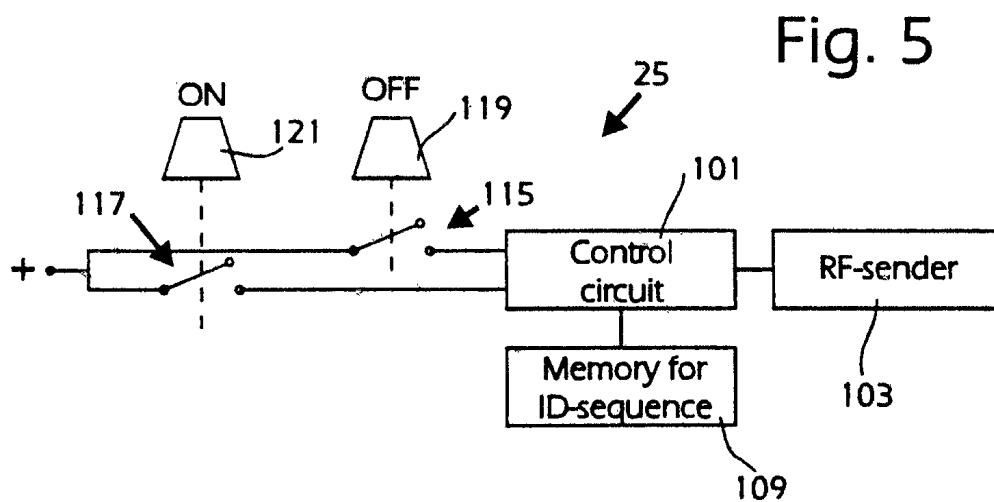
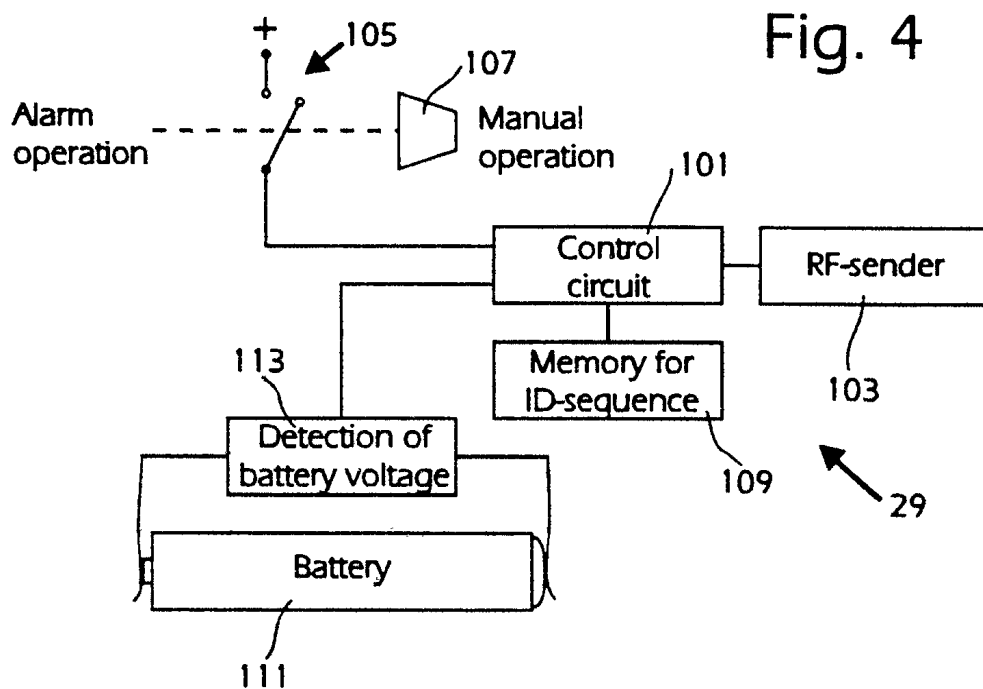


Fig. 3





INTERNATIONAL SEARCH REPORT

International Application No PCT/SE 92/00405

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all) ⁶ According to International Patent Classification (IPC) or to both National Classification and IPC IPC5: G 08 B 25/08, G 08 B 27/00, H 04 M 11/04														
II. FIELDS SEARCHED Minimum Documentation Searched⁷ <table style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 20%; border: 1px solid black;">Classification System</th> <th style="border: 1px solid black;">Classification Symbols</th> </tr> <tr> <td style="border: 1px solid black; height: 40px; vertical-align: bottom;">IPC5</td> <td style="border: 1px solid black; vertical-align: bottom;">H 04 M, G 08 B</td> </tr> </table> Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in Fields Searched⁸ SE,DK,FI,NO classes as above			Classification System	Classification Symbols	IPC5	H 04 M, G 08 B								
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IPC5	H 04 M, G 08 B													
III. DOCUMENTS CONSIDERED TO BE RELEVANT⁹ <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%; border: 1px solid black;">Category *</th> <th style="border: 1px solid black;">Citation of Document,¹¹ with indication, where appropriate, of the relevant passages¹²</th> <th style="width: 10%; border: 1px solid black;">Relevant to Claim No.¹³</th> </tr> </thead> <tbody> <tr> <td style="border: 1px solid black; text-align: center; vertical-align: top;">Y</td> <td style="border: 1px solid black; vertical-align: top;">US, A, 3492426 (D. S. FOREMAN ET AL) 27 January 1970, see abstract --</td> <td style="border: 1px solid black; text-align: center; vertical-align: top;">1-20</td> </tr> <tr> <td style="border: 1px solid black; text-align: center; vertical-align: top;">Y</td> <td style="border: 1px solid black; vertical-align: top;">US, A, 4492820 (LON H. KENNARD ET AL) 8 January 1985, see column 2, line 65 - column 3, line 5; column 16, line 44 - column 19, line 51; abstract --</td> <td style="border: 1px solid black; text-align: center; vertical-align: top;">1-20</td> </tr> <tr> <td style="border: 1px solid black; text-align: center; vertical-align: top;">Y</td> <td style="border: 1px solid black; vertical-align: top;">EP, A1, 0037573 (NEWART ELECTRONIC SCIENCES, INC.) 14 October 1981, see page 2, line 12 - page 3, line 28; page 7, line 36 - page 8, line 29; abstract; figure 4 --</td> <td style="border: 1px solid black; text-align: center; vertical-align: top;">8-10,18-20</td> </tr> </tbody> </table>			Category *	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³	Y	US, A, 3492426 (D. S. FOREMAN ET AL) 27 January 1970, see abstract --	1-20	Y	US, A, 4492820 (LON H. KENNARD ET AL) 8 January 1985, see column 2, line 65 - column 3, line 5; column 16, line 44 - column 19, line 51; abstract --	1-20	Y	EP, A1, 0037573 (NEWART ELECTRONIC SCIENCES, INC.) 14 October 1981, see page 2, line 12 - page 3, line 28; page 7, line 36 - page 8, line 29; abstract; figure 4 --	8-10,18-20
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* Special categories of cited documents: ¹⁰ "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance, the claimed invention cannot be considered novel or cannot be considered to involve an inventive step "Y" document of particular relevance, the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art. "&" document member of the same patent family														
IV. CERTIFICATION <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; border: 1px solid black; padding: 5px;"> Date of the Actual Completion of the International Search 2nd September 1992 </td> <td style="width: 50%; border: 1px solid black; padding: 5px;"> Date of Mailing of this International Search Report 1992 -09- 14 </td> </tr> <tr> <td style="border: 1px solid black; padding: 5px;"> International Searching Authority SWEDISH PATENT OFFICE </td> <td style="border: 1px solid black; padding: 5px;"> Signature of Authorized Officer MAGNUS STIEBE </td> </tr> </table>			Date of the Actual Completion of the International Search 2nd September 1992	Date of Mailing of this International Search Report 1992 -09- 14	International Searching Authority SWEDISH PATENT OFFICE	Signature of Authorized Officer MAGNUS STIEBE								
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III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)		
Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No
Y	US, A, 4257038 (MICHAEL F. ROUNDS ET AL) 17 March 1981, see column 3, line 7 - line 19; column 3, line 57 - column 4, line 24; abstract; figure 1a --	8-10, 18- 20
A	US, A, 4482785 (CHRISTOPHER D. FINNEGAN ET AL) 13 November 1984, see abstract --	6
A	US, A, 4652859 (JAMES L. VAN WIENEN) 24 March 1987, see column 3, line 49 - column 4, line 4 --	5, 16
A	Patent Abstracts of Japan, Vol 13, No 99, E724, abstract of JP 63-274256, publ 1988-11-11 YAZAKI CORP. -- -----	9, 19

**ANNEX TO THE INTERNATIONAL SEARCH REPORT
ON INTERNATIONAL PATENT APPLICATION NO.PCT/SE 92/00405**

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the Swedish Patent Office EDP file on 31/07/92
The Swedish Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A- 3492426	70-01-27	NONE	
US-A- 4492820	85-01-08	CA-A- 1173981	84-09-04
		EP-A- 0051383	82-05-12
		JP-A- 57099857	82-06-21
EP-A1- 0037573	81-10-14	AU-B- 536736	84-05-24
		AU-D- 6910681	81-10-15
		CA-A- 1171985	84-07-31
		JP-A- 56157165	81-12-04
		US-A- 4371751	83-02-01
US-A- 4257038	81-03-17	NONE	
US-A- 4482785	84-11-13	NONE	
US-A- 4652859	87-03-24	NONE	