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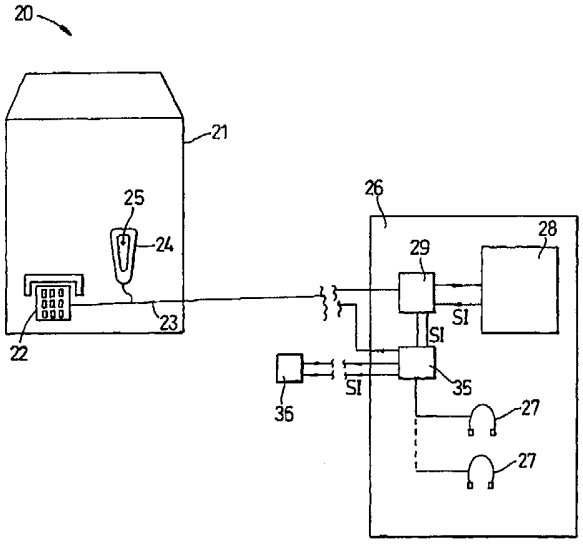
(54) Title: CALL CENTRE FOR AN ALARM MONITORING SYSTEM



(57) Abstract: Alarm monitor system (20) has in a domestic house (21), a telephone receiver unit (22) and line (23). Alarm handset unit (24) is connected, via a two-way connector, into telephone line (23) such that, when alarm button (25) is pressed, an alarm call is made toa call centre (26) permanently manned by operators (27) who have access to a databank (28) of subscriber information. When an alarm call is received at the call station (26) and compiler (29) outputs the subscriber information SI from databank (28), the telephone call to the subscriber is made automatically by transmit unit(36), so that the process is started immediately. Transmit unit (36) also passes on the alarm call and subscriber information SI to operator (27) and simultaneously adds the operator (27) into the telephone call made to the subscriber. If the telephone call isanswered, the operator (27) asks for a security number code. If an incorrect number code or name is given, the Police are alerted.

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

CALL CENTRE FOR AN ALARM MONITORING SYSTEM

The present invention relates to a call centre for an alarm monitoring system and to a method of operating such a call centre.

Conventional alarm systems exist in which the person uses the telephone to contact a carer either by dialing normally or using a remote device worn by the person which activates a telephone call.

According to the present invention, there is provided a call centre for an alarm monitoring system comprising means to receive an alarm call, means to make a telephone call to a subscriber in response to said alarm call, and means to send a further call to a specified telephone number if the call to the subscriber is not suitably answered.

Preferably, the call centre comprises means to derive information for making the telephone call to the subscriber from a databank in the call centre.

Preferably, the means to send a further call operates if the call to the subscriber is not answered within a predetermined time interval.

The call centre may comprise means to effect the further call to the specified number also when instructed by an operator.

Information on the specified number may be held in a databank in the call centre, and information in a databank in the call centre is used to effect the further call to the specified telephone number.

The call centre may comprise means to connect an operator into telephone call to the subscriber's telephone number in response to said alarm call, and means to send to the operator, additional information held at the databank of the call centre, means to connect an operator into the further call to the specified telephone number, means to send, to the operator and/or the location of the specified telephone number, additional information held at the databank of the call centre, e.g by fax or electronically.

The call centre may comprise speech processor means to send a speech message seeking a pre-agreed security number or code when the telephone call to the subscriber's telephone number is answered, and/or speech processor means to analyse a response when the telephone call to the subscriber's telephone number is answered to determine if it contains the pre-agreed security number or code.

The present invention also provides a method of operating for an alarm monitoring system comprising receiving an alarm call, making a telephone call to a subscriber's telephone number, in response to said alarm call, and sending a further call to a specified telephone number if the call to the subscriber is not suitably answered.

The method comprises deriving information for making the telephone call to the subscriber from a databank in the call centre.

Preferably, the method comprises sending a further call operates if the call to the subscriber is not answered within a predetermined time interval.

The method may comprise effecting the further call to the specified number also when instructed by an operator information on the specified number may be held in a databank in the call centre. Information in a databank in

the call centre is used to effect the further call to the specified telephone number.

The method may comprise providing processor means to send a speech message seeking a pre-agreed security number or code when the telephone call to the subscriber's telephone number is answered, and/or providing speech processor means to analyse a response when the telephone call to the subscriber's telephone number is answered to determine if it contains pre-agreed security number or code.

The subscriber information stored at the call centre may comprise one or more of the following:-

- The telephone number of the house;
- Address of the subscriber's house;
- Location of the alarm unit within the house;
- Name and/or age and/or medical information of each occupant at the house;
- The telephone number of the nearest Police station;
- The telephone number of the nearest Ambulance call centre;
- The telephone number of the nearest Fire Station call centre;
- The telephone number of a contact for emergencies;
- A security number or code pre-agreed with the subscriber;
- A history of the subscriber's use of the service and of previous calls.

The method may include effecting a telephone call to a subscriber in response to a call indicating activation of an alarm unit for that subscriber and/or effecting a telephone call to a police station if there has been no

answer within a specified time period after initiation of a telephone call to a subscriber subsequent activation of an alarm unit for that subscriber.

The method may comprise displaying at an operator station at the call centre subscriber information and/or various options on further possible actions, and/or executing one or more of the further possible actions upon activation of a button and/or sending a message to each subscriber at specified periods seeking update on information or advising of new information.

The present invention also provides a computer program product directly loadable into the internal memory of a digital computer, comprising software code portions for performing the steps according to the present invention when said product is run on a computer.

The present invention also provides electronic distribution of a computer program of the present invention.

The alarm monitoring system of the present invention is suited to warn of any difficulty or danger which occurs in the home e.g. a break-in to the premises, a fire, a medical emergency, an assault on a person, any temporary or prolonged incapacity, essentially any situation in which an occupant wishes to summon help or assistance.

While the present invention is primarily described in relation to use in a domestic house, it is equally applicable to use in other applications, for example in hospitals, schools, factories, offices or any industrial or commercial multi-occupancy buildings.

In order that the present invention may more readily be understood, a description is now given, by way of example only, reference being made to the accompanying drawings in which:-

Figure 1 is a block schematic drawing of an alarm monitoring system of the present invention;

Figure 2 is a handset of the system of Figure 1;

Figure 3 is a subscriber information display;

Figure 4 is a block schematic drawing of another call centre;

Figure 5 is a flow diagram of the operation of the call centre of Figure 4; and

Figure 6 shows part of a second embodiment of the present invention.

Figure 1 shows schematically an alarm monitor system 20 of the present invention having, in a domestic house 21, a telephone receiver unit 22 and telephone line 23. An alarm handset unit 24 is permanently connected, via a two-way connector into the telephone line 23 such that, when alarm button 25 is pressed, an alarm call is made via the telephone line to a call centre 26 which is permanently manned by a number of operators 27 who have access to a databank 28 of subscriber information. The alarm call to call centre 26 comprises a signal in the V.23 modem format with appropriate data content and it includes a serial number identifying the actual handset 24.

When an alarm call is received at the call station 26 and compiler 29 outputs the subscriber information SI from databank 28, the return telephone call to the subscriber is made automatically by transmit unit 36, so that the process is started immediately.

Once the alarm call is logged as being received at the call station 26, preferably the connection with the handset is broken (for example by the call centre sending a signal to effect this), so that the call centre can make a telephone call to the subscriber.

Transmit unit 36 also passes on the alarm call and subscriber information SI to operator 27 and simultaneously adds the operator 27 into the return telephone call made to the subscriber.

If the handset unit 24 determines, within a predetermined period, that a return call has not been made to the subscriber, the unit 24 sends a repeat call and/or it sends a call direct to the Police and/or emergency service, with an indication of what has already been sent and/or details of the subscriber.

Thus, when an alarm call is received by an operator 27, simultaneously the operator is provided with the following information from databank 28:-

- Address of house 21;
- Location of alarm handset 24 (as there may be more than one handset 24 in a house) within house 21;
- The name(s), age(s) and medical condition or medical information of the occupant(s) as registered with the call centre;
- The telephone number of the house 21;
- The telephone number of the nearest Police station;
- The telephone number of any contact;
- The telephone number of the nearest Ambulance call-out;
- The telephone number of the nearest Fire Station centre call-out;
- A security number or code pre-agreed with the subscriber;
- A history of the subscriber's use of the service and of previous calls.

An example of the display 40 of subscriber information SI on display screen 40 is provided in Figure 3.

If the return telephone call is answered, the operator 27 asks for the security number or code corresponding to that which is on databank 28; if this is correctly given, then the operator asks if any further assistance is required. If the security number or code given differs, or if no security number or code is given, then the operator immediately activates a button 41 on display screen 40 to make transmit unit 36 send an emergency telephone call to telephone the nearest Police station 35 and send by fax or electronically the subscriber information display either in its entirety or in part.

If the return telephone call is not answered within a predetermined time period (e.g. 30 seconds), the operator 27 activates button 41 to telephone the nearest Police station (perhaps also the Ambulance call-out centre and/or the Fire Station call-out centre). The information as sent also indicates that a telephone call was made to the subscriber but that the call has not been answered.

Transmit unit 36 connects the operator 27 into the emergency call being made to the Police station. Thus the operator can provide the Police with any further information required and generally handle the matter, perhaps discussing with the Police whether to alert other emergency services or take other action.

In this way, as soon as an alarm call is received at the alarm call monitor centre, an immediate appropriate response is made.

Clearly, the emergency call can be made to other emergency services additionally and/or alternatively to the Police as appropriate.

In a further modification, the call centre incorporates a speech processor unit so that a standard speech message can be given should the call be answered by someone at house 21, and also that any response given can be analysed (for example automatically) to establish whether the correct pre-agreed security number or code included. Therefore increased automated operation is achieved.

The registration procedure for setting up a handset 24 in the alarm monitor system is as follows:-

The subscriber telephones the call centre 26 using the telephone 22 at house 21. An operator 27 asks the subscriber a series of questions and inputs the appropriate information into databank 28. The operator instructs the compiler 29 to enter the "program handset" mode and asks the subscriber to connect handset 24 to the telephone line and activate the alarm on handset 24. The handset 24 sends a "ready to program" message to the call centre 26 which responds by sending the configuration information to the handset 24. Once programmed, handset 24 sends a "confirm programmed" message to call centre 26. The operator 27 advises the subscriber that programming has been completed and asks the subscriber to conduct a test activation to ensure that the system is operating correctly.

At predetermined intervals (e.g. every month), handset 24 sends a message to call centre 26 to check if any changes are to be made to the procedure for alarm calls (e.g. the telephone number of the call centre, or the subscriber information). This also acts as a check to monitor which handsets are no longer in use.

Figure 2 shows the front face of the alarm handset 24 which has alarm button 25 designated by a circular area shown in red and forming a slightly raised domed portion as compared to the flat surrounding region 30. When slight pressure is applied to button 25 e.g. by a human finger, there is a responsive physical depression and audible click, thereby giving a positive feedback that switching has been achieved.

Handset 24 has a transparent circular portion 31 through which there can be seen a light-emitting diode 32 which is illuminated when handset 24 is plugged into the telephone system. Region 30 is impregnated with fluorescent material so that the front face of handset 24 can be seen in the dark.

Handset 24 has two lateral walls 33 and 34 on either side of the long side edges of region 30, being bridged by a third wall 35, the three walls forming a U-shape with button 25 located at its apex, the height of walls 33 and 34 increasing towards button 25. In this way, the front face of handset 24 is shaped so that a person is able to readily and quickly locate the button area 25 by touch alone (e.g. in the dark or in a smoky atmosphere) having little or no familiarity with the design of the handset.

In a variant, handset 24 is incorporated in a telephone answering machine.

The handset 24 may have a wire-less link e.g. by infra-red, ultra-sonic, radio-frequency or optical signals, to a base unit connected to the telephone system, for example allowing the handset to be worn by the subscriber or to be carried around the house 21. Information on such a location can be included in the SI data.

Figure 4 shows call centre 26' including a response unit 50 incorporating autodialler 51 and speech processor 52 which sends out an speech message and also analyses a speech message that it receives and acts accordingly. Figure 5 is a flow diagram which sets out the sequence of operation of call centre 26'.

Figure 6 shows part of a second embodiment of the present invention. The handset exists as two distinct versions, each representing one method of communication currently supported by the call centres. The first version uses ITU-T V.23 signalling to transfer data between the alarm button and call centre. The second version facilitates DTMF signalling to communicate. V.23 signalling provides transfer rates to allow secure encryption of data. The hardware design is not affected by the signalling method.

In use the householder, installs the button onto a telephone line on-site. Initial registration is required to allow the call centre to track the user in the client database. Typically, this will require a client to make a voice call to the Call Centre in order to extract client details, program the button with serial number and phone number (if off-hook data and voice is possible simultaneously) and allow a brief client confidence test of the button.

The client's details are stored in the Call Centre's database and are indexed by serial number (presented by the button). The first call initiated by the client, i.e. pressing the button, may be charged to the customer as a test call. Thereafter, a button activation press forces the line to be siezed, a preprogrammed Call Centre number is called and the line dropped. A Call Centre representative responds within a given time by call back to the client site. A client password is required to authenticate the legitimacy of the button activation. If there is no answer within a certain number or rings, or

if the receipt is of an incorrect password, the appropriate public service or contact is phoned.

The alarm button comprises a Hitachi H83664 16-bit CPU, an associated EEPROM which may store serial number, phone numbers, and code updates a MITEL MT88E39 DTMF/V.23 decoder, a BPR/CPC detector, a ring and speech detector, a hardware watchdog and a D/A resistance ladder for modulation encoding.

The handset communication system uses hardware and software to allow ITU-T V.23 and DTMF signalling. A Mitel MT88E39 CLI decoder presents the receive data path via the decryption module to the kernel. The transmit data path is realised by a software implementation of a dual sine wave sample generator for V.23 signals and an implementation of a realtime Z-transform of dual sine wave sample generation for DTMF signals. The DTMF generator is used exclusively for dialling in the V.23 version of the alarm button and is used for both dialling and signalling in the DTMF version. In both cases, the generated samples are output via an 8-bit port onto the R2R resistance ladder and smoothed by filters before being applied to line.

Branch Phone Resets are detected via hardware and debounced in software to allow call cleardown when a telephone is taken off-hook on a shared line. Likewise, a Call Progress Cleardown signal may be received from the network and is handled in similar fashion.

Encryption and decryption of data via a public key algorithm such as RSA or 40-bit DES/3DES is required to prevent malicious hacking of the call centre.

Non-volatile storage for serial number, phone numbers, keys, historical data, etc. is provided by a Philips I2C 2-wire bidirectional bus on which a 32Kbit EEPROM resides. A thermo device may also be placed on this bus for a heat/smoke detector application.

The CPU remains in a low-current powered-down idle state until activation via the activation switch. During this state, the real-time clock and calendar functions and various housekeeping duties are performed. When an interrupt caused by activation occurs, the CPU is forced into its normal high-speed execution state running from the onboard 10/16MHz oscillator.

The datalink and presentation layers are implemented to provide a message based link between call centre and button.

Abbreviation	**Comment**
PSTN	Public Switched Telephone Network
CLI	Caller Line Identity
EEPROM	Electrically Erasable and Programmable Read Only Memory
CPU	Central Processing Unit
DTMF	Dual Tone Multiple Frequency
D/A	Digital to analogue
BPR	Branch Phone Reset
CPC	Call Progress Cleardown
ITU-T	International Telecommunication Union – Telecommunication Standardization Sector

CLAIMS

1 A call centre for an alarm monitoring system comprising means to receive an alarm call, means to make a telephone call to a subscriber's telephone number in response to said alarm call, and means to send a further call to a specified telephone number if the call to the subscriber is not suitably answered.

2. A call centre according to Claim 1 comprising means to derive information for making the telephone call to the subscriber from a databank in the call centre.

3. A call centre according to Claim 1 wherein the means to send a further call operates if the call to the subscriber is not answered within a predetermined time interval.

4. A call centre according to Claim 3 comprising means to effect the further call to the specified number also when instructed by an operator.

5. A call centre according to any preceding claim wherein information on the specified number is held in a databank in the call centre.

6. A call centre according to any preceding claim wherein information in a databank in the call centre is used to effect the further call to the specified telephone number.

7. A call centre according to any preceding claim comprising means to connect an operator into the telephone call to the subscriber's telephone number in response to said alarm call.

8. A call centre according to Claim 7 comprising means to send to the operator, additional information held at the databank of the call centre.

9. A call centre according to any preceding claim comprising means to connect an operator into the further call to the specified telephone number.

10. A call centre according to Claim 9 comprising means to send, to the operator, additional information held at the databank of the call centre.

11. A call centre according to any preceding claim comprising means to send to the location of the specified telephone number, additional information held at the databank of the call centre.

12. A call centre according to any of Claims 8, 10 or 11 wherein the sending means comprises means to send the information by fax or electronically.

13. A call centre according to any of Claims 8, 10, 11 or 12 wherein the additional information comprises some or all of the subscriber information in the databank of the call centre.

14. A call centre according to any preceding claim wherein the means to send a further call comprises means to send a call to a Police station specified in the subscriber information.

15. A call centre according to any preceding claim comprising speech processor means to send a speech message seeking a pre-agreed security number or code when the telephone call to the subscriber's telephone number is answered.

16. A call centre according to any preceding claim comprising speech processor means to analyse a response when the telephone call to the subscriber's telephone number is answered to determine if it contains the pre-agreed security number or code.

17. A call centre according to any preceding claim wherein the means to send an further call operates if the call to the subscriber is answered incorrectly.

18. A call centre for an alarm monitoring system substantially as hereinbefore described with reference to, and/or as illustrated in, any one or more of the Figures of the accompanying drawings.

19. An alarm monitoring system incorporating a call centre according to any one or more of Claims 1 to 18.

20. Method of operating for an alarm monitoring system comprising receiving an alarm call, making a telephone call to a subscriber's telephone number, in response to said alarm call, and sending a further call to a specified telephone number if the call to the subscriber is not answered.

21. A method according to Claim 21 comprising deriving information for making the telephone call to the subscriber from a databank in the call centre.

22. A method according to Claims 20 or 21 comprising sending a further call operates if the call to the subscriber is not answered within a predetermined time interval.

23. A method according to any of Claims 20 to 22 comprising effecting the further call to the specified number also when instructed by an operator.

24. A method according to any of Claim 20 to 23 wherein information on the specified number is held in a databank in the call centre.

25. A method according to any of Claims 20 to 24 wherein information in a databank in the call centre is used to effect the further call to the specified telephone number.

26. A method according to any of Claims 20 to 25 comprising connecting an operator into the telephone call to the subscriber's telephone number in response to said alarm call.

27. A method according to Claim 26 comprising sending, to the operator, additional information held at the databank of the call centre.

28. A method according to any of Claims 20 to 27 comprising means to connecting an operator into the further call to the specified telephone number.

29. A method according to Claim 28 comprising sending, to the operator, additional information held at the databank of the call centre.

30. A method according to any of Claims 20 to 29 comprising sending, to the location of specified telephone number, additional information held at the databank of the call centre.

31. A method according to any of Claims 27, 29 or 30 comprising sending the information by fax or electronically.

32. The method according to any of Claims 27, 29, 30 or 31 wherein the additional information comprises some or all of the subscriber information in the databank of the call centre.

33. A method according to any of Claims 20 to 32 wherein sending a further call comprises sending a call to the Police station specified in the subscriber information.

34. A method according to any of Claims 19 to 33 comprising providing processor means to send a speech message seeking a pre-agreed security number or code when the telephone call to the subscriber's telephone number is answered.

35. A method according to any preceding claim comprising providing speech processor means to analyse a response when the telephone call to the subscriber's telephone number is answered to determine if it contains pre-agreed security number or code.

36. A method of operating a call centre for an alarm monitoring system substantially as hereinbefore described with reference to, and/or as illustrated in, any one or more of the Figures of the accompanying drawings.

37. A method of operating an alarm monitoring system incorporating a call centre according to any one or more of Claims 20 to 36.

38. A computer program product directly loadable into the interval memory of the digital computer comprising software portions for performing the steps according to the method of any one or more of Claims 20 to 35 when said product is run on a computer.

39. A computer program product stored on a computer usuable medium, comprising:

computer readable program means for causing a computer to receive an alarm call;

computer readable program means for causing a computer to make a telephone call to a subscriber's telephone number in response to said alarm call;

computer readable program means for causing a computer to send a further call to a specified telephone number if the call to the subscriber is not answered.

40. Electronic distribution of a computer program according to Claims 34 or 37.

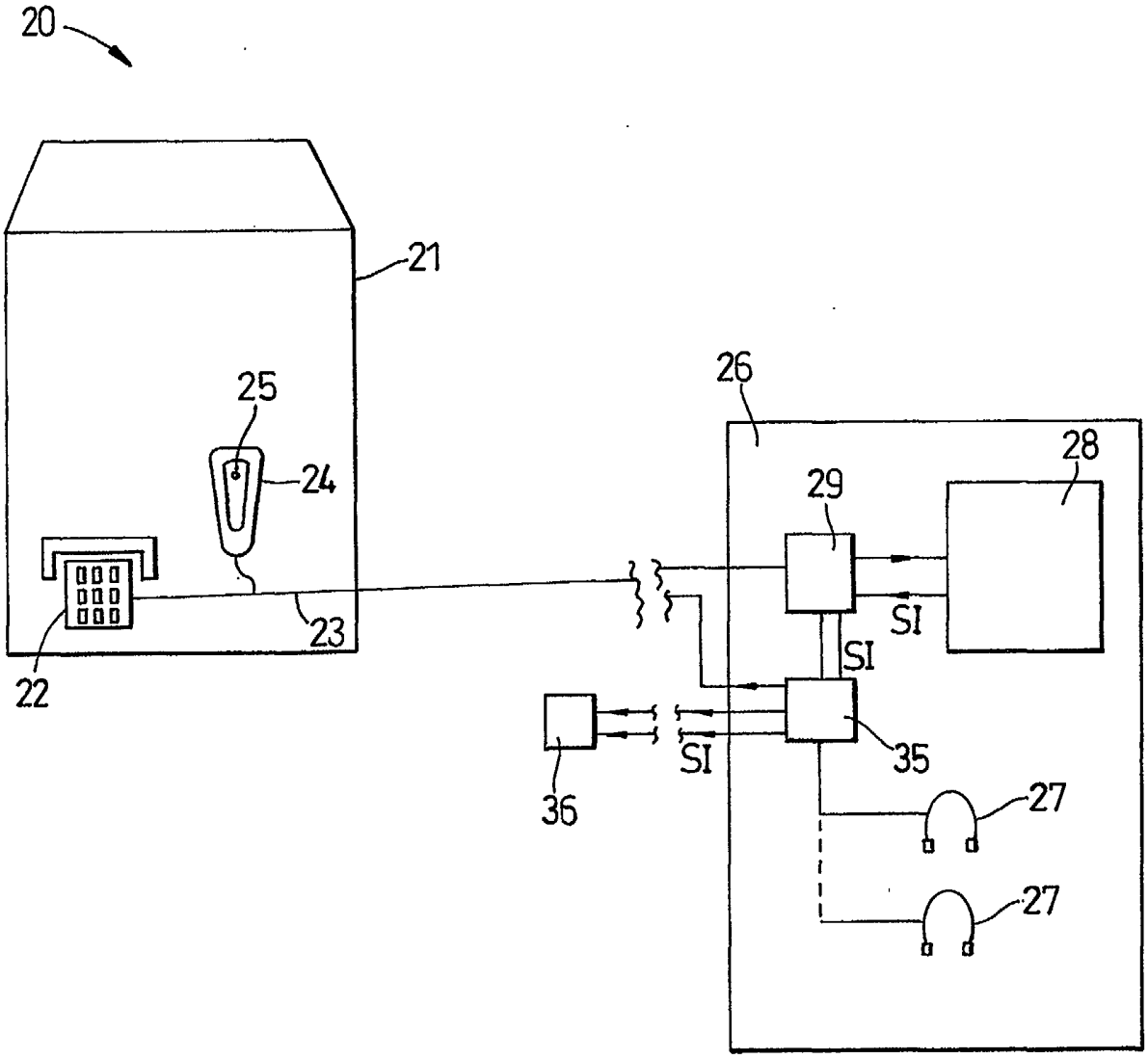


Fig. 1

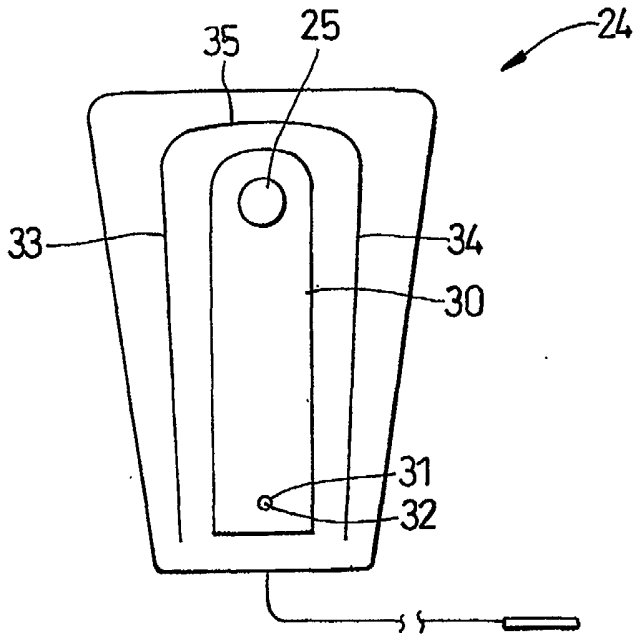
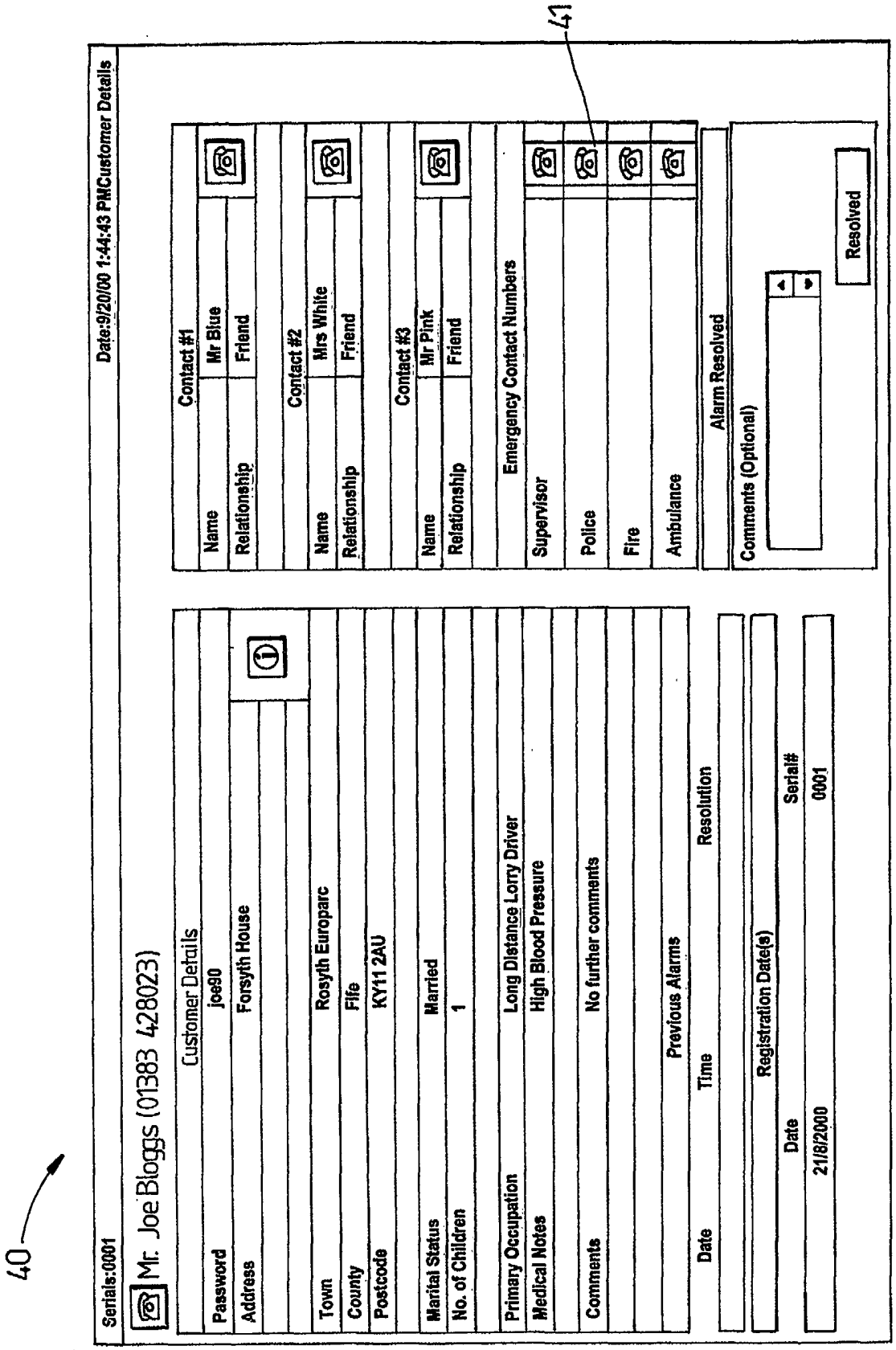


Fig. 2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41
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Town
Rosyth Europarc
County
Fife
Postcode
KY11 2AU
Marital Status
Married
No. of Children
1
Primary Occupation
Long Distance Lorry Driver
Medical Notes
High Blood Pressure
Comments
No further comments
Previous Alarms
Date
Time
Resolution
Registration Date(s)
Date
21/8/2000
Serial#
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Contact #1
Name
Mr Blue
Relationship
Friend
Contact #2
Name
Mrs White
Relationship
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Police
Fire
Ambulance
Alarm Resolved
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Fig. 3

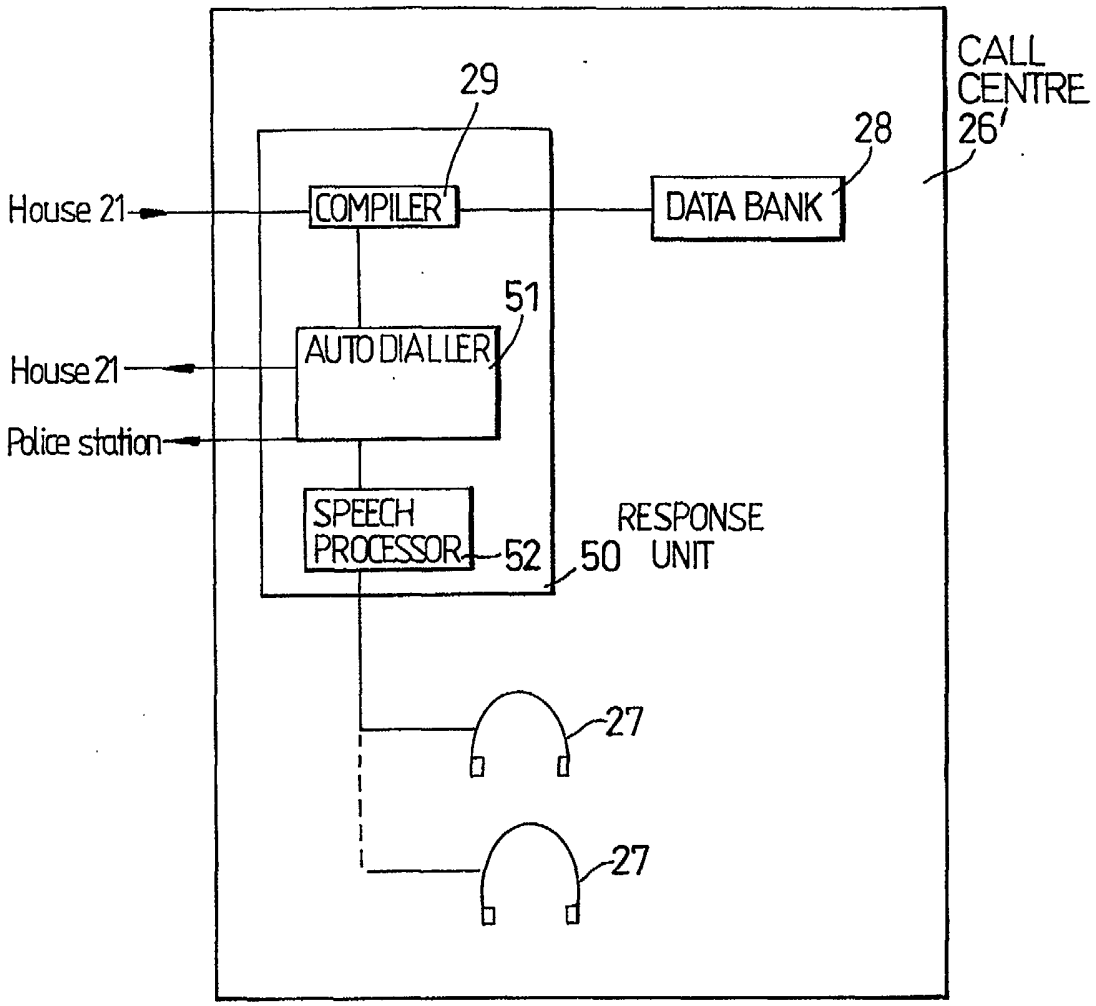
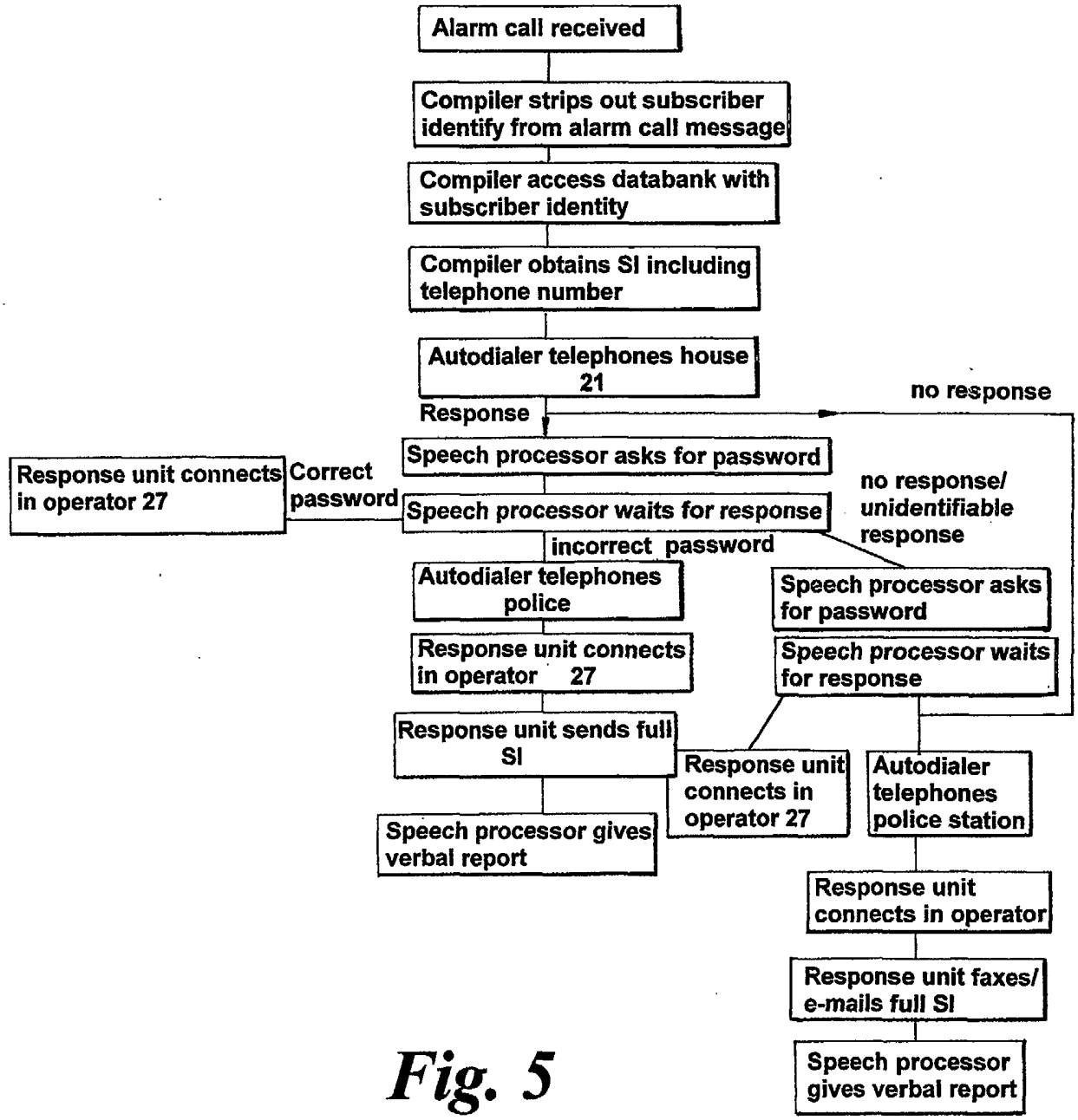

CALL CENTRE 26'
29
28
House 21
COMPILER
DATA BANK
51
House 21
AUTO DIALLER
Police station
SPEECH PROCESSOR
52
50
RESPONSE UNIT
27
27

Fig. 4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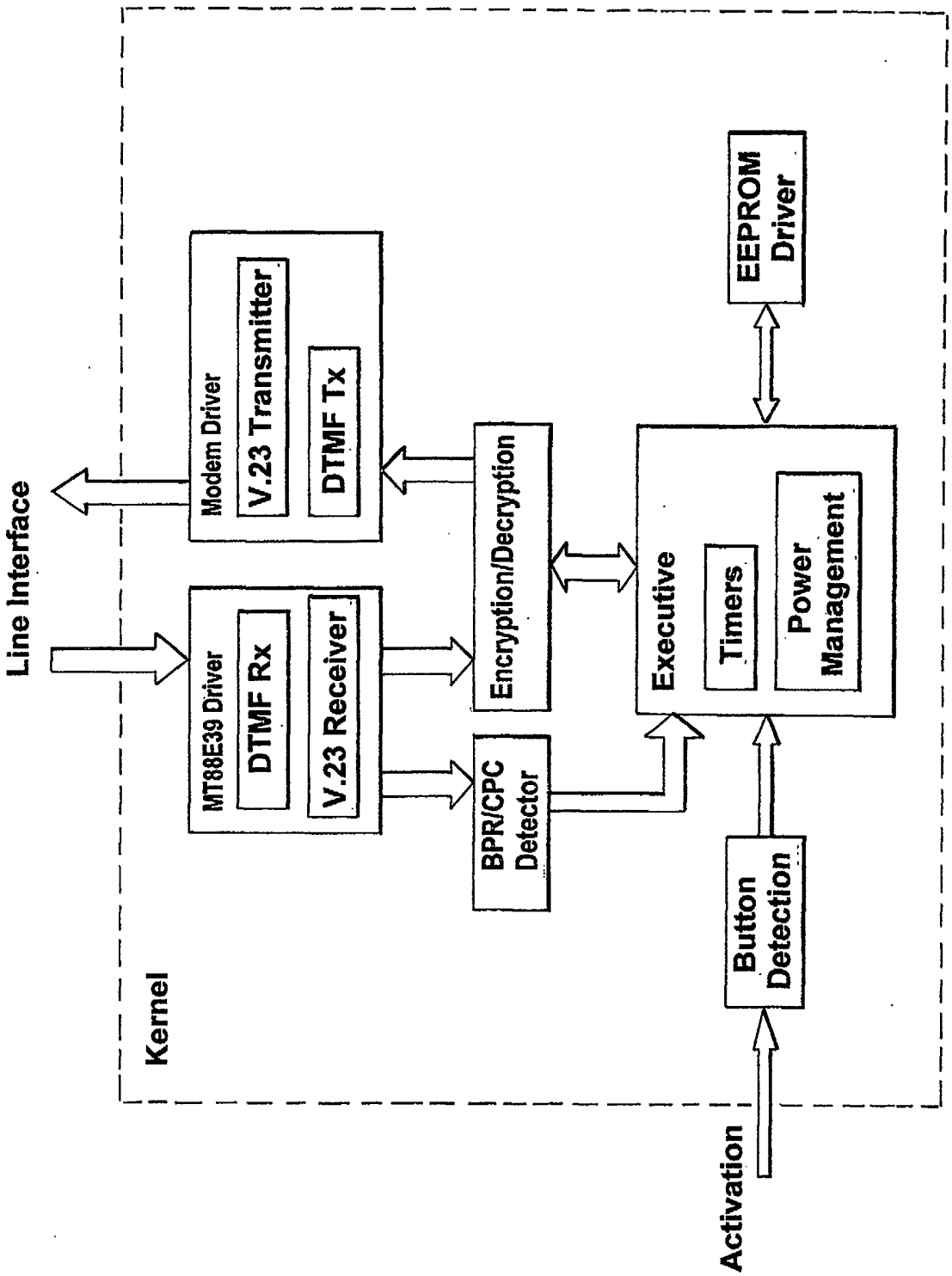
Compiler strips out subscriber identify from alarm call message
Compiler access databank with subscriber identity
Compiler obtains SI including telephone number
Autodialer telephones house 21
Response
no response
Speech processor asks for password
Response unit connects in operator 27
Correct password
Speech processor waits for response
no response/ unidentifiable response
incorrect password
Autodialer telephones police
Speech processor asks for password
Response unit connects in operator 27
Speech processor waits for response
Response unit sends full SI
Response unit connects in operator 27
Autodialer telephones police station
Speech processor gives verbal report
Response unit connects in operator
Response unit faxes/ e-mails full SI
Speech processor gives verbal report

Fig. 5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V.23 Transmitter
DTMF Tx
MT88E39 Driver
DTMF Rx
V.23 Receiver
Encryption/Decryption
BPR/CPC Detector
Executive
Timers
Power Management
EEPROM Driver
Button Detection
Activation

Fig. 6