



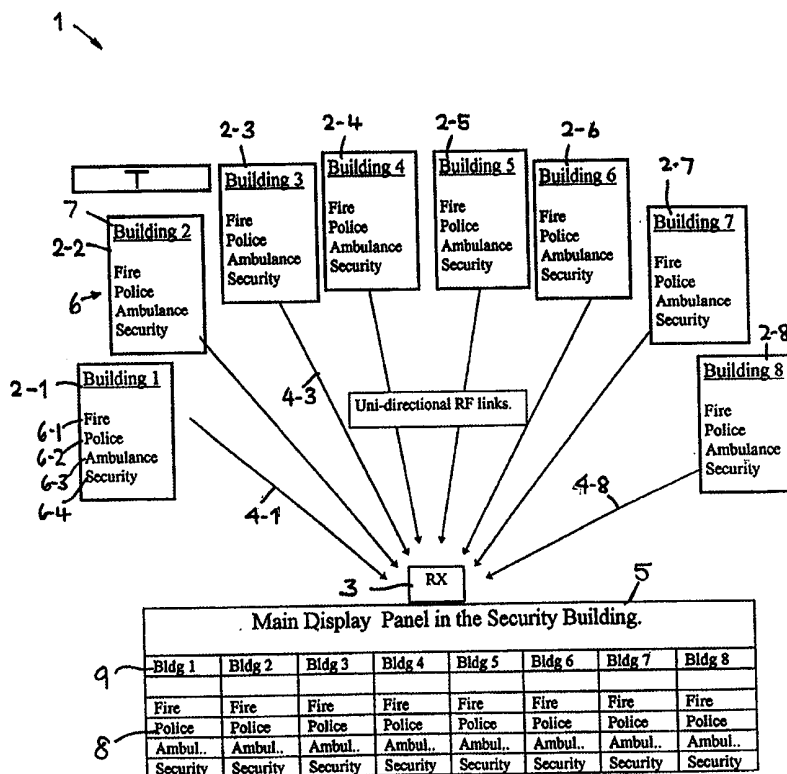
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(21) International Application Number: PCT/GB98/03378 (22) International Filing Date: 13 November 1998 (13.11.98) (30) Priority Data: 9723962.8 14 November 1997 (14.11.97) GB (71) Applicant (for all designated States except US): THE NOTTINGHAM TRENT UNIVERSITY [GB/GB]; 1 Burton Street, Nottingham NG1 4BU (GB). (71)(72) Applicant and Inventor: AHMAD, Shamim [GB/GB]; The Nottingham Trent University, The Erasmus Darwin Building, Clifton, Nottingham NG11 8NS (GB). (74) Agent: CHARIG, Raymond; Eric Potter Clarkson, Park View House, 58 The Ropewalk, Nottingham NG1 5DD (GB).		(81) Designated States: AU, CA, JP, US, European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published With international search report.

(54) Title: SECURITY AND EMERGENCY ALARM SYSTEM

(57) Abstract

A multipurpose alarm system suitable for use in large buildings, building complexes or campuses includes a central monitoring station which receives alarm call signals from a plurality of portable transmitter units (2-1, 2-8). Each transmitter unit has a number of alarm call buttons (6-1, 6-4) each capable of initiating an alarm call or a particular classification, according to the type of emergency assistance required by the user. Classifications may include fire, police, ambulance and security services. The transmitter may also transmit the alarm signals with data indicating the identity of the transmitter unit and/or the location of the transmitter unit.



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SECURITY AND EMERGENCY ALARM SYSTEM

The present invention relates to alarm systems, and in particular to remotely activated alarm systems suitable for use in large buildings,
5 building complexes and campuses.

In many large buildings and in institutions having numbers of buildings spread over a large campus, such as schools, universities, hospitals and the like, a centralised fire and/or intruder alarm system may be
10 provided. In such alarm systems, remotely located and geographically fixed calling points or sensors signal an alarm condition to a central monitoring station through hardwired or radio signalling links. These calling points or sensors typically include devices such as manually operated "glass-break" wall buttons within the buildings, automatic
15 smoke or fire sensors, infra-red intruder sensors, and the like.

It is now commonplace for members of staff in such institutions to feel vulnerable to attack from intruders in situations of unauthorised entry, and also even from members of the public or pupils legitimately on the
20 premises. In the case of attack, or other emergency, it is not always possible for a member of staff to reach a conventional means for summoning assistance, such as a telephone.

Thus, in institutions such as schools and other educational
25 establishments, hospitals, and other establishments where public access is required or difficult to control, it has become desirable to provide, not only a centralised fire alarm system, but also a more general method for staff and other occupants of the institution buildings to summon emergency assistance.

Indeed, in schools, the installation of so-called "panic buttons" in classrooms or offices is becoming commonplace, so that a member of staff can quickly summon assistance from security staff or police.

5

It is an object of the present invention to provide a portable, simple to operate, distress or alarm system to enable persons such as members of staff, or other members of institutions having large or dispersed premises or restricted areas, to rapidly summon assistance.

10

It is a further object of the invention for such an alarm system to be fully integrated so as to enable the caller to indicate a category of emergency assistance required. Categories of assistance might be, for example, fire service, police service, ambulance or medical service, or internal security service.

15

It is a further object of the invention to provide a fully portable system in which the user of the alarm system does not need to get to a fixed point in the building, such as a fire alarm call point, panic button, telephone or the like, in order to summon assistance.

20

It is a further object of the invention to provide a remotely operable alarm system in which the exact, or approximate, location of the caller can be established by or at a central control station.

25

According to one aspect, the present invention provides an alarm system including:

a central receiving station for receiving alarm call signals from a portable transmitter;

at least one portable transmitter unit, having manually operable means to initiate transmission of an alarm call signal to said central station;

the transmitter unit having means for indicating to the central receiving station a classification of said alarm call signal, selected from
5 at least two different types of alarm call signal.

According to another aspect, the present invention provides an alarm system including:

10 a central receiving station for receiving alarm call signals from any one of a plurality of portable transmitter units;

a plurality of portable transmitter units, each having manually operable means to initiate transmission of an alarm call signal to said central station;

15 the system further including means for indicating, at the central receiving station, an identity or location of a portable transmitter unit which has transmitted an alarm call signal.

According to a further aspect, the present invention provides a portable
20 transmitter unit for an alarm system, for transmitting alarm call signals to a central receiving station; the transmitter having manually operable means to initiate transmission of an alarm call signal to said central station; and means for indicating to the central receiving station a classification of said alarm call signal selected from at least two different
25 types of alarm call signal.

According to a further aspect, the present invention provides a portable transmitter unit for an alarm system, for transmitting alarm call signals to a central receiving station; the transmitter having manually operable

means to initiate transmission of an alarm call signal to said central station; and means for encoding said alarm call signal with information providing an indication of the identity or location of the transmitter unit.

- 5 In a general sense, the invention provides an alarm system in which a central monitoring station is adapted to receive alarm call signals from a plurality of possible transmitter units, each transmitter unit being capable of transmitting an alarm call signal to the central monitoring station which is encoded with an additional item of information which relates to
- 10 one or more of: the classification of the alarm call; the identity of the transmitter unit originating the alarm call signal; and the present location of the transmitter unit originating the alarm call signal.

Embodiments of the present invention will now be described by way of example with reference to the accompanying drawings in which:

15

Figure 1 shows a block diagram of an alarm system according to one embodiment of the invention;

Figure 2 shows a block diagram of one of the transmitter circuits of figure 2;

20 Figure 3 shows a block diagram of a receiver circuit of figure 3;

Figure 4 shows a perspective view of a transmitter unit; and

Figure 5 shows a block diagram of a transmitter unit and fixed location device.

- 25 With reference to figure 1, an alarm system 1 includes a plurality of portable transmitter units 2-1...2-8. Although eight transmitter units are shown, the system 1 may include any number desired. Each of the transmitters 2 is constructed to be able to transmit a pulse code modulated radio frequency carrier to a receiver unit 3, using an

appropriate unidirectional radio-frequency link, shown schematically as links 4-1...4-8. The receiver unit 3 is coupled to a display panel 5.

Preferably, each transmitter unit 2 is a lightweight, portable transmitter, small enough to be carried about discretely but immediately at hand. In the preferred embodiment, each transmitter 2 is capable of transmitting an alarm call signal to the central station which indicates a classification 6 of alarm call signal, ie. "fire" 6-1, "police" 6-2, "ambulance" 6-3 or "security" 6-4. Other alarm call classifications 6 may be used as required.

The receiver unit 3 is capable of decoding the alarm call signal transmission to determine the classification 6 of alarm call, and displaying this on the display panel 5 under classification display 8.

15

Each transmitter unit 2 may also be associated with a particular geographical area or zone 7 within the whole area covered by the alarm system. For example, this zone may be a particular building, floor or level, region or room within the whole area covered by the alarm system. The display panel 5 also provides a display 9 of the location of the relevant transmitter 2 that made the alarm call.

With reference to figure 2 there is shown a schematic block diagram of the transmitter unit 2 circuitry. The transmitter unit 2 includes a series of push button switches 20-1, 20-2, 20-3 and 20-4 each corresponding to one of the alarm call classifications, "Fire", "Police", "Ambulance" and "Security". Each switch 20 is connected to a microprocessor controller 21 which is connected to trigger an alarm signal, encoded with the alarm classification, to be transmitted by an RF transmitter module and aerial

22. The entire portable transmitter unit 2 is powered by a suitable power source such as a rechargeable battery pack 23.

The transmission range of the transmitter units 2 is preferably limited to
5 an expected maximum distance to the receiver unit 3 to avoid outgoing signals interfering with external receivers. Typically this maximum distance might be of the order of 200 metres. Where an alarm system is installed on a particularly large campus, a plurality of receiver units 3
10 might be provided, distributed around the campus, to ensure proper coverage. Each receiver unit 3 is then respectively connected by hardwired or further radio link to the main display panel 5.

Preferably the transmitter units 2 use a pulse code modulation system to avoid spurious incoming radio transmissions from other transmitters
15 accidentally mimicking a distress/alarm call.

Figure 3 shows the basic features of an integrated receiver unit 3 and display panel 5. A tuned radio frequency receiver 30, or frequency scanning receiver, is connected through an FM discriminator circuit (not
20 shown) and thence to a pulse decoder (also not shown) in a manner well known to those skilled in the art. An encrypted 2-byte, 4-bit or 2-byte 8-bit code can be received in a binary format, the first binary code value giving the location zone 7, and the second binary code value giving the alarm classification.

25

The received and decoded alarm signal is passed to the display panel 5 via interface 31, which preferably also includes an audible alarm indication system as well as the display panel 5 previously described. A microprocessor controller 32 provides control functions to the receiver

and display units 3, 5. Being fixed in location at a central monitoring station, the receiver and display panel may be powered by mains supply 33. However, it will be understood that the receiver and display panel could also be mobile. The receiver and display unit may also
5 incorporate a fail-safe battery back-up supply.

In one arrangement, the central power supply is part of the receiver circuitry. The circuit motherboard is mounted in a metal instrument case and has a facing translucent display panel back illuminated by high
10 intensity light emitting diodes each inset into a reflective chamber which brightens one sector of the translucent screen. The screen is divided into columns giving any one, or combination of, alarm conditions and alarm location. The audible warning system is mounted behind the display panel.

15 Located to the side of the display panel are reset switches and a control panel for enabling or disabling automatic emergency calls. Extending from the top of the display case is a telescopic aerial for short-range reception. Alternatively, provision may be made for a 75 ohm co-axial
20 feeder from a roof mounted aerial to guarantee reception.

With reference to figure 4, there is shown a perspective view of an exemplary transmitter unit 2. The transmitter unit has a front panel incorporating four push buttons 40, 41, 42, 43 respectively
25 corresponding to the switches 20-1...20-4 in schematic figure 2.

Preferably, the transmitter 2 includes a tough polyethylene casing which accommodates the transmitter circuits 21 and 22 and the rechargeable battery pack 23. The transmitter 2 preferably features a single facia

having surface mounted either four large recessed coloured buttons fixed to pressel switches or recessed planar contact switches. Each button activates a different classification of alarm condition. Each alarm condition is clearly labelled as described above.

5

The transmitter unit 2 may incorporate means to avoid accidental activation of an alarm by inadvertent operation of the switches. Such means may comprise a circuit design such that a double strike of a button, or an extended press of a button, is required to trigger a transmission of an alarm signal. Alternatively, a hinged cover or covers might be provided to switches.

To prevent spurious alarms, the transmitters may be programmed to issue two immediately sequential alarm signals both of which must be received by the receiver in order to correctly indicate an alarm condition. Trials of the system in an area that is prone to the effects of noise in the VHF radio frequency bands have demonstrated this method of error avoidance to be reliable.

To provide a rugged, cost-effective system, the transmitter and receiver circuits are preferably designed to reduce to a minimum the components needed to achieve the operational specification. This has the added benefit of reducing weight, power supply requirements etc.

Furthermore, the low cost of the receiver makes it possible to provide two receivers (or more) at any one or more locations to prevent vandalism, or deliberate disablement of the receiver, shutting down the receiver in a crisis.

In the case of the first three alarm states (police, fire, ambulance), the alarm system may include an automatic telephone dialling system to call the relevant emergency services through the normal telephone system, for example using a standard pre-recorded message. This has the
5 advantage of obviating the need for other staff to be in permanent attendance at the receiver/display unit.

Thus, in a first aspect, the system provides for a person carrying a transmitter unit to immediately summon assistance according to one of a
10 number of possible classifications.

In a second aspect, the system provides an indication of the location from which a call for assistance is made. This can be achieved in a number of ways.

15

In a first, relatively simple arrangement, each transmitter unit 2 can be coded with a different identification signal to identify the transmitter making the call. Up to 256 transmitters can be used in the present coding sequence but this can easily be increased by transmitting a 16-bit
20 encryption to the receiver.

The receiver and display unit is provided with a stored look-up table in a database 34 that indicates where the user of a transmitter is based. One possibility is for each transmitter to be designated for specific use by
25 persons within a given zone, such as a building, a room, or a set of rooms. Another possibility, which accommodates a greater degree of mobility of the users of transmitter units, is to provide the microprocessor controller 32 with a stored database 34 having entries indicating the expected location of each person to whom a transmitter

unit has been assigned. Thus, the microprocessor 32 can quickly establish that a call from transmitter 2-4 represents a call from a person presently assigned to building "B", for example.

- 5 In a more sophisticated example, this database 34 could cover staff schedules or timetables so that for any given time of day, the database can provide the identity of one particular expected location from the many which the member of staff may be expected to use during that day, depending upon the time at which the alarm call signal is received.

10

- In another arrangement, the transmitter unit 2 may be provided with a location switch 44 which may be variably set by the user of the transmitter according to which zone (eg. which part of a building) they are in at any given time. Thus, when moving from building "A" to
15 building "B" during the working day, the user of the transmitter simply sets the switch 44 from A to B. If a distress call is made using the transmitter unit, the location or zone identification will be transmitted together with the security call classification to the receiver.

- 20 The location switch 44 could be replaced by a numeric, or alphanumeric keypad on the transmitter unit by which the user can enter a location code, such as a room or building number.

- In a still further arrangement, semi-automatic or fully automatic input of
25 location or zone identification information to the transmitter unit 2 may be provided. As shown in figure 5, in this case, each classroom or zone in which the transmitter units 2 may be used is provided with a fixed location device 50 which includes a microprocessor 51 with a memory 52 storing a digital location code. The microprocessor 51 is coupled to

an infrared transceiver unit 53. Each transmitter 2 also includes an infrared transceiver 54 for receiving the code from the fixed location device, passing that to the microprocessor controller 21.

- 5 The user of the transmitter can then, on entry to a new zone of the building, press a further button either on the transmitter unit 2 (not shown), or alternatively on the fixed location device 50, shown as pressure switch 55, to initiate a transfer of information, or handshake signal between the transmitter unit and the fixed location device.

10

The handshake signal may operate over a distance of meters, or may, as shown in figure 5, operate by pressure contact of the transmitter 2 with the fixed location device 50.

- 15 The transfer of information need not necessarily be by infrared remote link, but could also be by direct contact or induction loop system.

In a still further arrangement, automatic location updating of the transmitter unit 2 may be provided by fixed location transceiver devices positioned in doorways, corridors and other suitable locations. Fixed location transceiver devices may be supplied with power from the mains supply and may have battery backup.

- 20 Successful updating of the transmitter location by data from the fixed location device may be confirmed by an audible tone emitted by the fixed location device.

The alarm system may be adapted to accommodate multiple classification alarm calls. For example, sequential operation of more

than one button 20 of a transmitter may cause the receiver unit to activate successive alarm conditions and trigger more than one automatic telephone dialling routine.

CLAIMS

1. An alarm system including:
a central receiving station for receiving alarm call signals from a
5 portable transmitter;
at least one portable transmitter unit, having manually operable
means to initiate transmission of an alarm call signal to said central
station;
the transmitter unit having means for indicating to the central
10 receiving station a classification of said alarm call signal, selected from
at least two different types of alarm call signal.
2. An alarm system according to claim 1 in which the transmitter
unit includes a plurality of alarm call switches each adapted to
15 respectively initiate transmission of a specific coded signal from a set of
possible coded signals to the central receiving station as said alarm call
signal.
3. An alarm system according to claim 2 in which the transmitter
20 unit is adapted to transmit said specific coded signal using a pulse code
modulated radio-frequency carrier.
4. An alarm system according to claim 1 in which the central
receiving station further includes a display panel providing an indication
25 of the classification of alarm call signal transmitted thereto.
5. An alarm system according to any preceding claim in which the
alarm call signal classifications include four classifications indicated as
fire, police, ambulance or security.

6. An alarm system according to any preceding claim further including means for indicating, at the central receiving station, an identity or location of said portable transmitter unit which has
5 transmitted a security call signal.

7. An alarm system according to claim 6 in which the transmitter unit includes means for transmitting, in an alarm call signal, a code identifying the transmitter unit.

10

8. An alarm system according to claim 7 in which the central receiving station includes a database, coupled to said means for indicating, which database stores information identifying the expected location of the transmitter unit transmitting said alarm call signal.

15

9. An alarm system according to claim 8 in which said database information identifying the expected location of the transmitter is correlated with a time value.

20 10. An alarm system according to claim 6 in which the transmitter unit further includes means for transmitting, in an alarm call signal, a code indicating the location of the transmitter unit.

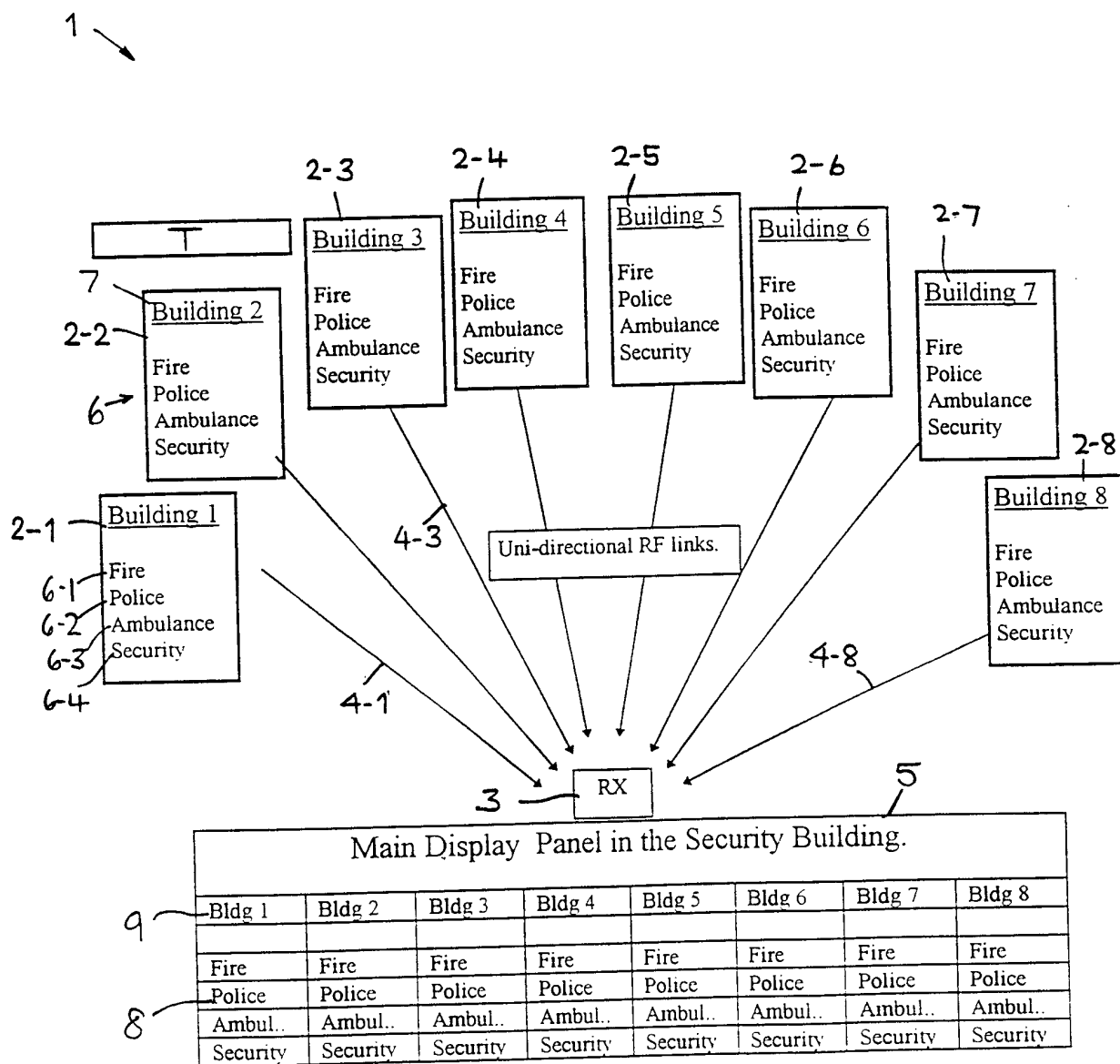
11. An alarm system according to claim 10 in which the transmitter
25 unit further includes means for updating said means for transmitting with different location codes.

12. An alarm system according to claim 11 in which the means for updating comprises a location switch means for manually controlling a location code setting of said transmitter unit.
- 5 13. An alarm system according to claim 11 in which the means for updating comprises means for retrieving, from a fixed location code-transmitting device, a current location code of said transmitter unit.
14. An alarm system including:
- 10 a central receiving station for receiving alarm call signals from any one of a plurality of portable transmitter units;
- a plurality of portable transmitter units, each having manually operable means to initiate transmission of an alarm call signal to said central station;
- 15 the system further including means for indicating, at the central receiving station, an identity or location of a portable transmitter unit which has transmitted an alarm call signal.
15. A portable transmitter unit for an alarm system, for transmitting
- 20 alarm call signals to a central receiving station; the transmitter having manually operable means to initiate transmission of an alarm call signal to said central station; and means for indicating to the central receiving station a classification of said alarm call signal selected from at least two different types of alarm call signal.
- 25
16. A portable transmitter unit for an alarm system, for transmitting alarm call signals to a central receiving station; the transmitter having manually operable means to initiate transmission of an alarm call signal to said central station; and means for encoding said alarm call signal

with information providing an indication of the identity or location of the transmitter unit.

17. An alarm system substantially as described herein and with
5 reference to the accompanying drawings.

Fig 1



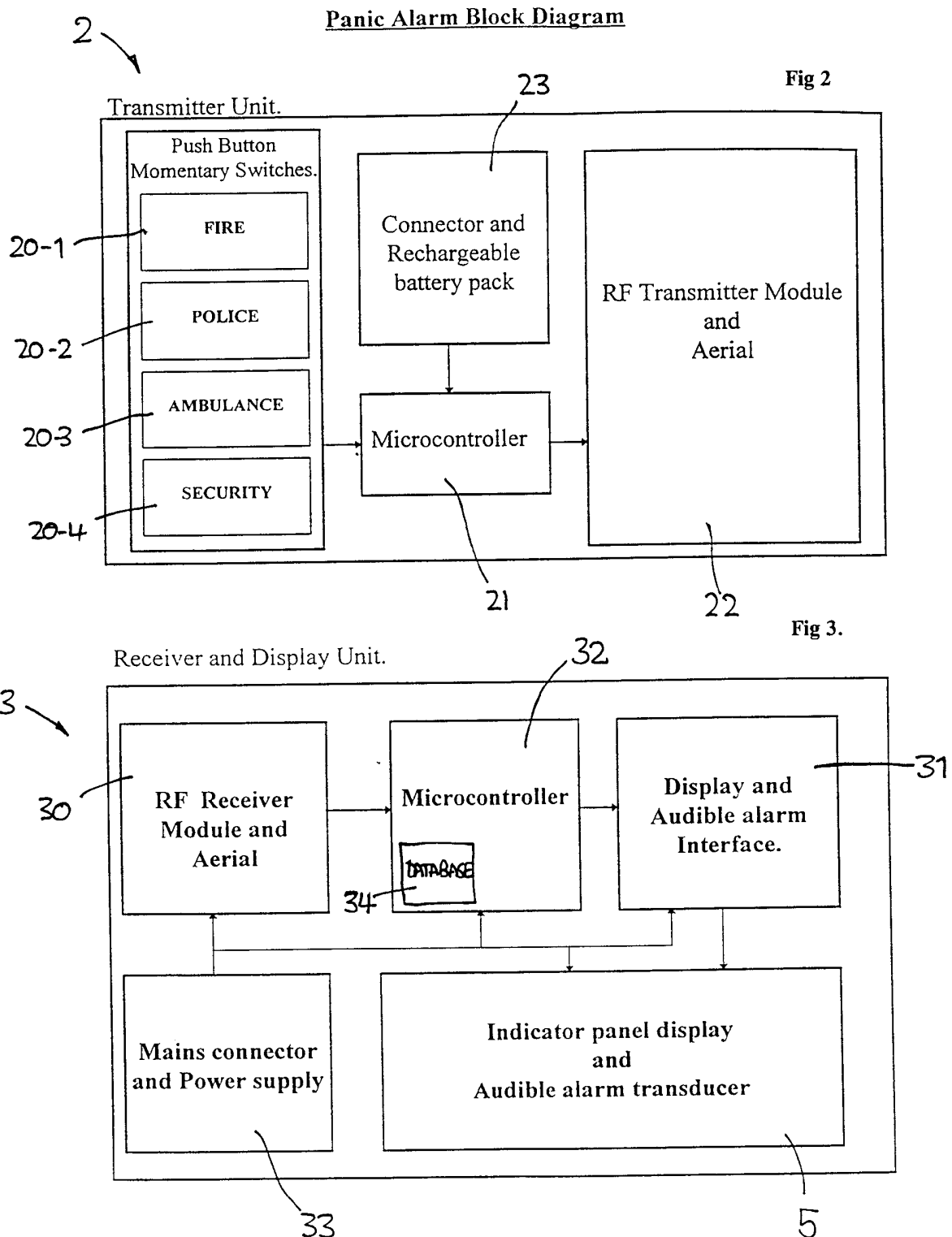
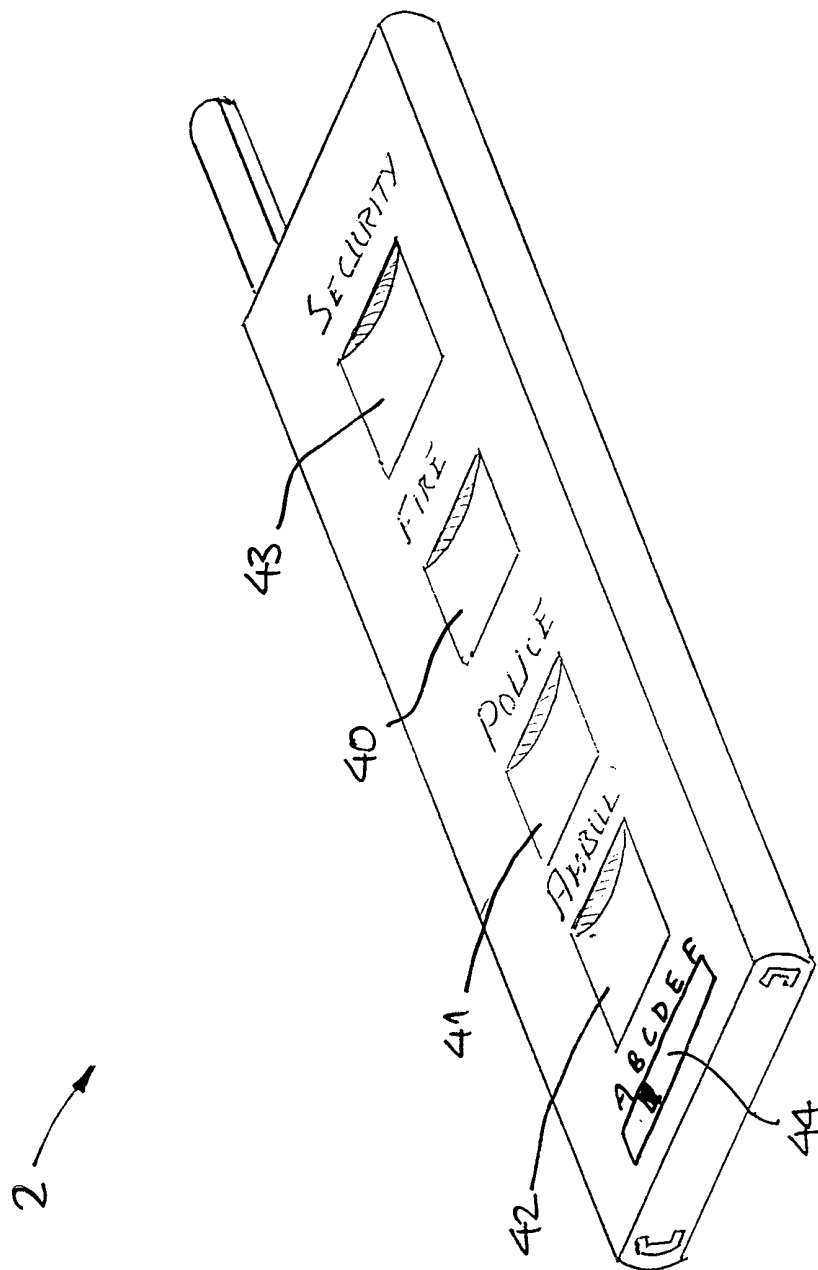
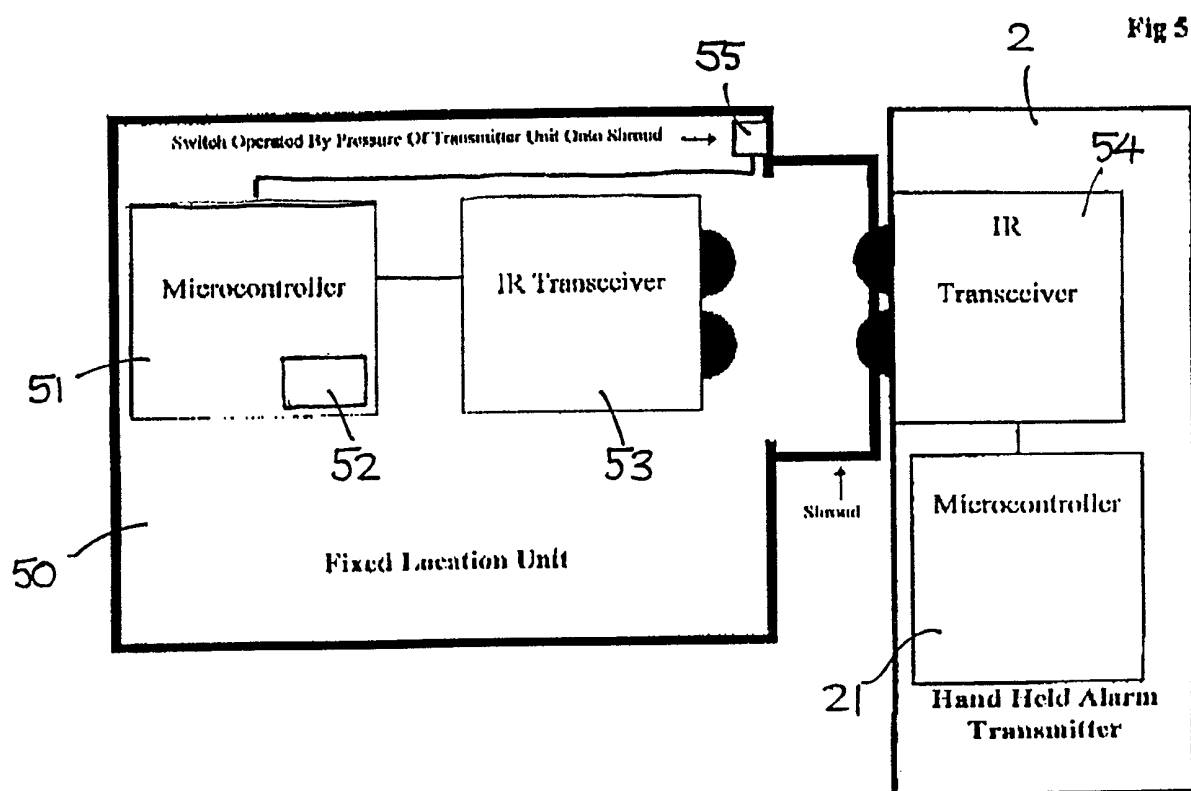


Fig 4





INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 98/03378

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 G08B25/01

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 G08B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3 694 579 A (MCMURRAY PETER H) 26 September 1972	1,2,6,7, 14-17
Y	see page 4, line 14 - page 5, line 64 ---	3,4,10
Y	US 5 305 370 A (KEARNS LLOYD ET AL) 19 April 1994 see column 5, line 57 - column 6, line 39 ---	3
Y	US 5 365 217 A (TONER FRANK J) 15 November 1994 see column 4, line 28 - column 5, line 29 ---	10
Y	US 4 581 605 A (VOGT WILLIAM R) 8 April 1986 see figure 2 --- -/--	4

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

International Application No
PCT/GB 98/03378

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 686 886 A (STENSNEY JOHN S) 11 November 1997 see the whole document ---	1,14-17
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INTERNATIONAL SEARCH REPORT

Information on patent family members

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