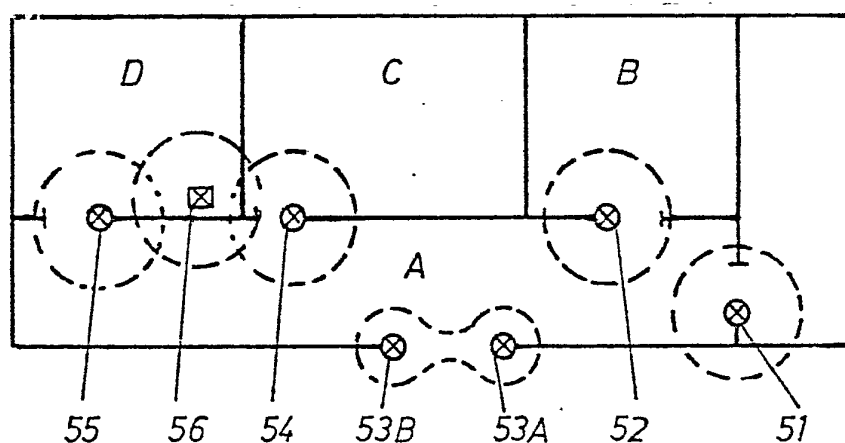




INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification³ : G08B 25/00	A1	(11) International Publication Number: WO 80/00630 (43) International Publication Date: 3 April 1980 (03.04.80)
(21) International Application Number: PCT/SE79/00188 (22) International Filing Date: 13 September 1979 (13.09.79) (31) Priority Application Number: 7809742-5 (32) Priority Date: 15 September 1978 (15.09.78) (33) Priority Country: SE (71) Applicant (for all designated States except US): TELEFONAKTIEBOLAGET L M ERICSSON [SE/SE]; S-126 25 Stockholm (SE). (72) Inventor; and (75) Inventor/Applicant (for US only): ÅKERBERG, Dag [SE/SE]; Vålbergavägen 89, S-175 63 Järfällä (SE).		(74) Agents: LUNELL, Karl-Axel, et al.; Telefonaktiebolaget L M Ericsson, S-126 25 Stockholm (SE). (81) Designated States: DE, GB, JP, US. Published <i>With international search report</i>

(54) Title: INSTALLATION FOR TRANSMITTING ALARM SIGNALS



(57) Abstract

In an installation for transmitting alarms, preferably in connection with attacks on persons, and for localizing the alarm sender, there are portable alarm senders (2) sending an alarm to a central alarm receiver (3) by radio. The senders each contain a memory (24) for a code unique to their position in the installation. The code is automatically set by fixed transmitters (1) with a small range, which transmit it electromagnetically, especially inductively, to the senders (2), the code being unique to the location of a transmitter and stored in the sender memory. When fixed transmitters (1) are arranged so close together that their unique codes are difficult to separate in the senders (2), a dummy transmitter (56) is arranged to prevent alteration of a code already stored in the memory (24) of the alarm sender, as long as the sender (2) is close to the dummy transmitter (56). The senders (2) also transmit a second code stored in a second memory, unique to the individual alarm sender and thereby to the carrier of the alarm sender.

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INSTALLATION FOR TRANSMITTING ALARM SIGNALS

FIELD OF THE INVENTION

The present invention relates to an installation for transmitting alarm signals, primarily in cases of personal attack, and localizing alarm transmitters, in accordance with the preamble to the following main claim.

DESCRIPTION OF PRIOR ART

For the staff of hospitals, prisons and other custodial institutions there is a
5 need of calling for help in assault or battery e g by means of an alarm sender which can be carried in a pocket.

In such installations it is important that the place from which an alarm has been sent can be localized. Localization can be done with the aid of an alarm receiver, e g so that every room in a building is provided with an alarm
10 receiver. Only the alarm receiver in the room where the alarm signal has been sent reacts for an alarm, localization thus being carried out simply. That implies that the propagation of the alarm signal is limited by the walls of the room which is the case when the alarm signal is sent supersonically or with infrared light. A serious drawback with alarm transmission in this mode is that
15 the transmission is hindered or heavily dampened if the alarm sender is kept under clothes or if it were to come under the body during a struggle. It should namely not be necessary to take out the alarm sender on assault, since this can initiate the aggressive action.

If a radio transmitter is instead used for sending the alarm, it can be carried in
20 the clothes and does not need to be taken out to send an alarm, since radio transmission penetrates through clothes quite easily. The good penetration ability of radio transmission, however, excludes localization of the alarm sender with the help of receivers in each room, since the emissions from the transmitters are not limited by the walls of a room. Attempts to localize such
25 an emission by taking bearings is made impossible by all the reflections obtained from the building walls.

It would be easy to localize the radio transmitter sending an alarm if the transmission contained a code notifying the location of the alarm sender, but



requiring staff to set a variable room code on their alarm senders is not reasonable in practice. Staff should not need to think about the alarm sender except at the moment when it needs to be used.

SUMMARY OF THE INVENTION

According to the present invention, a room code is automatically set in the
5 alarm sender, giving its position in the building. The set room code is automatically changed when the alarm sender is carried from one place to another. When an alarm is sent, the latest stored room code is sent by radio to a central alarm receiver. The room code received in the alarm receiver is stored in a memory and the position of the sender is shown on a digital display.
10 How coded messages are sent by radio and received and displayed in a central receiving station is already described in the US Patent specification 3 678 391.

The room code in the alarm senders is reset as follows: A number of small, locally fixed transmitters, with continuous electromagnetic emission, in this case inductive emission, are placed in a building, and send a code unique
15 for the position of the fixed transmitter to a receiver in each alarm sender, this code therefore being called the room code. The received code is stored in a memory in the sender, and if the sender is triggered for sending an alarm, the stored code is transmitted with the radio signal to the central alarm receiver.

20 Each fixed transmitter is suitably placed in one door frame so that transmission of the room code takes place when the alarm sender is taken through door frames between different rooms. The code transmitted by the fixed transmitter is thus unique for the door frame where the transmitter is placed. The fixed inductive transmitters for the unique code only transmit with low
25 power, and their transmitting antenna is a small magnetic dipole antenna. Since the transmitting power is low and the field strength from a small dipole antenna is, in the first approximation, inversely proportional to the cube of the distance from the antenna, the clear domination of the field strength from a transmitter in a door frame over the field strength from transmitters in other
30 door frames is thus ensured.



For wide doors it may be necessary to let a transmitter feed two dipole antennae, one in each door jamb.

Inductive transmission of the room code has been selected because it penetrates clothes without difficulty, so that the alarm sender can be carried in a pocket, and because the propagation of the magnetic field from the dipole antenna of the fixed transmitter can be accurately calculated and limited to the areas nearest to a door opening.

The inductive receiver for receiving the room code in a portable alarm sender will be alternately exposed to strong fields at the door openings and almost no fields at all from door to door, and sometimes to the interaction of nearly equally as strong fields from two inductive transmitters. This results in that the inductive receiver of the alarm sender alternately receives strong signals having correct codes and signals with incorrect, interrupted or mixed codes. Parity bits are therefore added to the room codes, and a decoder placed in the inductive receivers of the alarm sender are adapted for reading the parity bits and discovering errors in the received codes. Incorrect codes will thus be rejected and not allowed to alter a room code already stored in the memory of the alarm sender.

If a doorway is placed very close to the wall of a room, other than the one to which the doorway in question leads, the field strength from the transmitter in the doorway can be stronger in a portion of the first room than the field strength from the transmitter in the door frame of this room. To prevent unwarranted resetting of the alarm sender code at any place in the first room, a dummy sender can be arranged, which is adapted to transmit a signal preventing alteration of a unique code already stored in the memory of the radio transmitter.

Receivers for inductively transmitted, coded signals of the kind used here, their decoders and memories are known in the prior art as apparent from the US Patent specification 3 665 313.

All the portable radio transmitters in an installation are intended to send on the same radio channel with the same frequency.



The portable alarm senders can also be provided with a memory for a permanently stored code which is unique to a particular alarm sender. In an emergency, this code is transmitted immediately after the code which is unique to the location from which the alarm has been sent, thus indicating in
5 the alarm centre which sender and thus which person has sent the alarm.

BRIEF DESCRIPTION OF THE DRAWINGS

An installation in accordance with the invention will now be described while referring to the accompanying drawing on which
Figure 1 is a principle sketch of the installation,
Figure 2 is a block diagram of an alarm sender and a central alarm receiver,
10 Figure 3 is a block diagram of a locally fixed transmitter, and
Figure 4 is a plan of a building with examples of placing fixed transmitters.

PREFERRED EMBODIMENT

The installation in accordance with the invention comprises, as illustrated in Figure 1, a plurality of locally fixed transmitters, of which two, 1A, 1B are shown in the Figure. The installation further comprises one or more alarm
15 senders 2 and a central alarm receiver 3.

The alarm sender 2 includes, as is apparent from Figure 2, an antenna 21 for receiving inductively transmitted signals; a receiver 22 with amplifier, connected to the antenna 21; a decoder 23 for received signals; a memory 24 for storing a received code, connected to the decoder; a control logic circuit 25,
20 operable by means of a push button 26, for controlling the transmission of the code stored in the memory 24, with the help of a radio transmitter and antenna 28, connected to the logical circuit 25.

As is apparent from Figure 2, the central alarm receiver 3 includes a receiver antenna for radio signals, a radio receiver 32 with amplifier and a decoder
25 with indicator 33 for displaying received messages.

When an alarm is to be sent by the sender 2, e.g. in a case of assault, the button 26 on the sender carried in the pocket of the wearer is pressed by the



wearer. The control logic circuit 25 will thus become operable for transmitting, by means of the radio transmitter 27, radio signals coded with the room code stored in the memory 24 and unique to the place where the sender is at the moment.

- 5 The alarm sender radio transmitter 27 transmits with a frequency selected in the 160 MHz-waveband, for example.

The radio signal from the sender is received by the central alarm receiver 3 and the unique code is shown on the display 33.

- In some installations, the sender 2 is also provided with a second memory 29.
- 10 In this memory there is stored a second code unique to the individual sender, and thus also to the person carrying the sender. The control logic circuit 25 is adapted for sending the second code immediately after the first code when an alarm is sent. The display 33 in the central receiver shows the designation of the person who has sent the alarm.

- 15 Apparatus for transmitting and indicating coded radio signals are known in principle, e g from said US Patent specification 3 678 391.

- The room code stored in the memory 24 is transferred inductively to the carried alarm sender when it comes in the immediate vicinity of one of several fixed transmitters in the installation. In each such fixed transmitter 1 there is
- 20 included, as is shown in Figure 3, a modulatable oscillator 41, a code generator 42 with a code memory connected to the oscillator, an output amplifier 43 connected to the oscillator and a magnetic dipole antenna 44 connected to the output amplifier. A voltage supply unit 45 is connected to the three first-mentioned part units for supplying them with the necessary voltages.

- 25 The fixed transmitters 1 are placed in the installation, e g as is apparent from Figure 4. The figure is a plan over a building with rooms A,B,C and D. So that the fixed transmitters will act reliably on the carried alarm senders, they are placed in door frames or in other narrow passages. The transmitting power from the fixed transmitter, e g transmitter 51 in Figure 4 is small, and the
- 30 field strength from the small dipole antenna of the transmitter is inversely



proportional to the cube of the distance from the antenna, in the first approximation, it thus being ensured that the field strength of the transmitter in a door frame clearly dominates over the field strength of transmitters in other door frames, e.g. transmitter 52.

- 5 If a door is especially wide, two dipole antennae 53A, 53B may be needed, one in each door jamb and connected to the same fixed transmitter. A magnetic loop can alternatively be arranged round the door frame instead of the dipole antennae.

The inductive transmission enables the fixed transmitters to be manufactured
10 in a single monolithic circuit. The dipole antenna, monolith and voltage supply unit are molded together to one unit for fitting into the door jamb.

The fixed sender 1,51 transmits a code continuously and inductively, said code being unique to the door etc where it is placed, and when an alarm sender 2 is carried through the doorway the voltage will be sufficiently great in its
15 receiver antenna 21 in Figure 2 for the code to be written into the sender memory 24. If the sender is subsequently carried past another fixed transmitter, e.g. 52, its unique code, differing from the previous one, is transmitted, and the new code is written in over the one already in the sender memory. In this way the alarm sender will always be updated with the code unique to its
20 momentary location, and it is this code which is transmitted when an alarm signal is sent.

Parity bits are added to the typical code so that the right codes will be received in the alarm sender, in spite of strongly varying field strengths at its receiver. Reception reliability can be further increased by exchanging the
25 latest code put into the sender memory 24 only when two new identical and correct codes have been received in immediate sequence. The transmission rate should be at least five codes per second so that two codes will be reliably received during a hasty passage through the doorway. The fixed transmitters transmit at a frequency selected in the range of 16-140 kHz.

- 30 Apparatus for inductively transferring coded signals, their decoders and memories are known in principle, e.g. from inductive staff locator equipment,



and therefore no detailed description thereof is considered necessary.

A fixed transmitter, e g 54 in Figure 4, can be placed in a door frame of a room C, so close to an adjacent room D that in a corner of the room D an alarm sender, which has been given a unique code set by the transmitter 55
5 could get the code altered by the transmitter 54, which would be incorrect. Such unwarranted alteration of the typical code is prevented by arranging a dummy transmitter 56 between both fixed transmitters. The dummy 56 is substantially the same as the other fixed transmitters, but is adapted for only sending a carrier wave with the same frequency as the one from the fixed
10 transmitters. The dummy transmission blocks the receiver in the alarm sender and prevents reception of such transmission which can lead to resetting the stored code. The dummy transmission can also be modulated to obtain greater blocking action.

The radio transmitters of the alarm senders are normally adapted for
15 transmitting at the same frequency. The risk of two alarm senders sending an alarm simultaneously and thus blocking each other is very small. If it is feared - even so that alarms could be sent simultaneously, the risk of blocking can be reduced by making the alarm transmission short, e g 70 mS and repeating it after a comparatively long interval of 2 seconds. The risk of blocking is
20 further reduced if the intervals between the alarm transmissions are made somewhat different for individual alarm senders.



What we claim is:

1 An installation for transmitting alarms, preferably when a person is attacked, and localization of alarm senders, comprising a central alarm receiver (3) and portable alarm senders (2) containing radio transmitters, the transmitters being operable for transmitting an alarm by means of a radio
5 signal to the central alarm receiver (3), characterized in that the installation also comprises locally fixed transmitters (1), adapted for sending a signal electromagnetically to one of the alarm senders (2) in the near vicinity thereof, said sender being coded with a code unique to each individual fixed transmitter (1), and in that each alarm sender (2) is provided with a
10 memory (24) for storing the latest received code, and is adapted for sending the stored code with the transmitted radio signal from the sender after the latter being made operable for transmission.

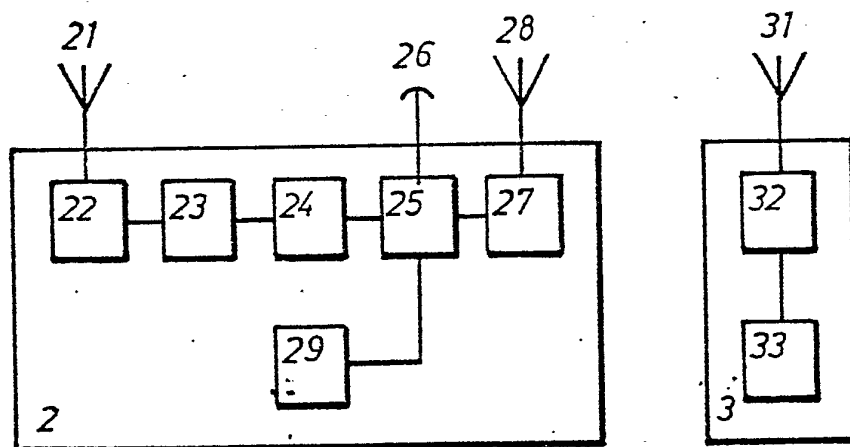
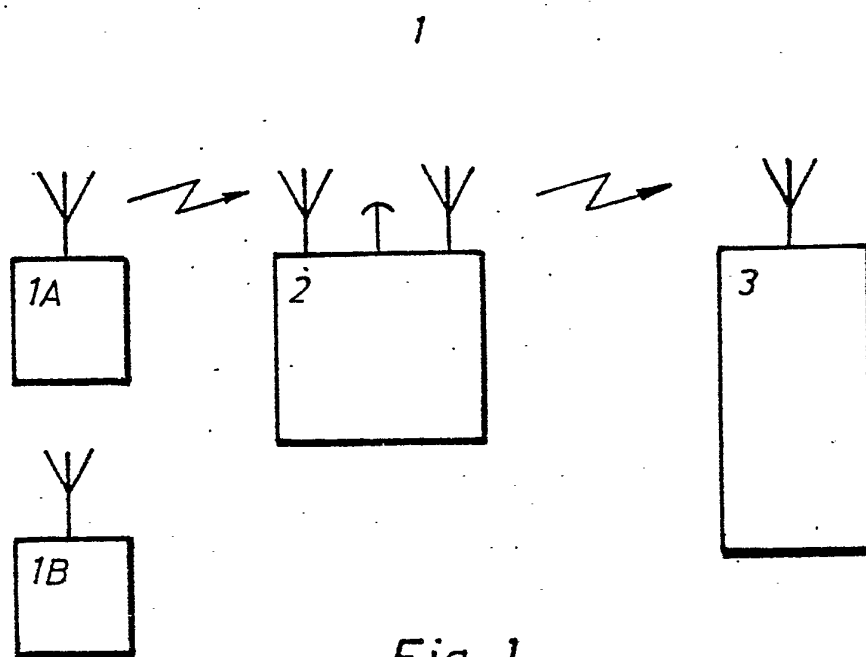
2 Installation as claimed in claim 1, characterized in that each fixed transmitter (1) is adapted for sending its signal inductively.

3 Installation as claimed in claim 1 or 2, characterized in that for the typical codes in two fixed transmitters (1,54,55) situated very close to each other to be separated in the alarm sender (2), a dummy transmitter (56) is arranged between both fixed transmitters and is adapted for transmitting a
5 signal preventing alteration of a unique code already stored in the alarm sender memory (24), as long as the sender (2) is close to the dummy (56).

4 An installation as claimed in claim 1 or 2, characterized in that the sender (2) is adapted for repeating the alarm transmission, the intervals between the said transmissions being considerably longer than said transmissions themselves.

5 An installation as claimed in claim 1 or 2, characterized in that the radio signal transmitted by the alarm sender (2) also contains a code unique to the individual alarm sender (2).





2

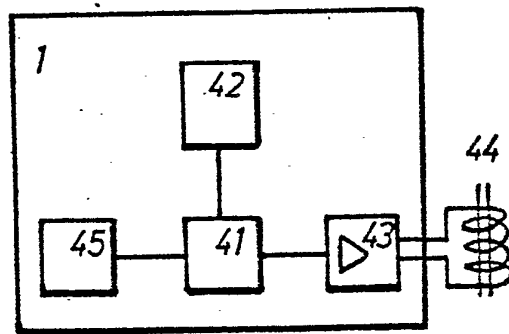


Fig. 3

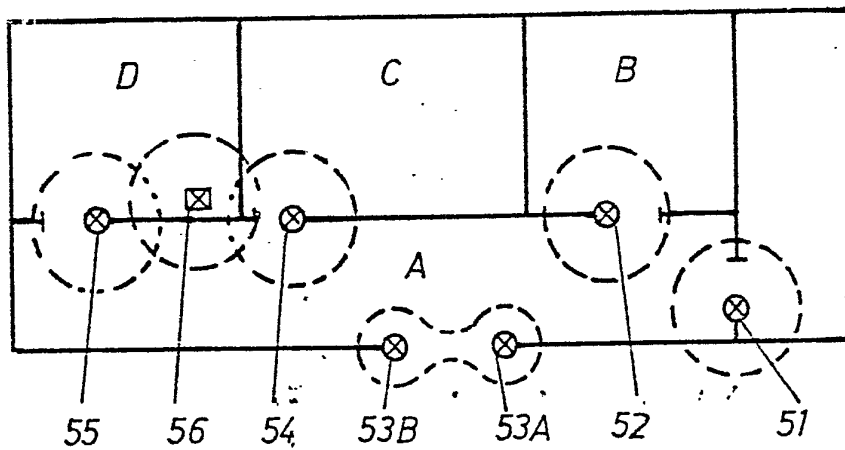


Fig. 4

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all) ³		
According to International Patent Classification (IPC) or to both National Classification and IPC 2		
G 08 B 25/00		
II. FIELDS SEARCHED		
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Classification System	Classification Symbols	
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