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(54) Improvements in or relating to personnel safety arrangements.

(57) An emergency evacuation arrangement comprises a plurality of sensors (30 to 37) each for sensing an emergency situation, such as smoke, fire, or vibration, at a respective zone (11 to 18) of a structure (1). A processor (38) is provided, for receiving signals generated by the sensors (30 to 37), for generating alarm indication signals and escape route indication signals for energising, respectively, acoustic generators (39 to 46) and visual escape

route direction markers (47 to 54). In any zone in which an emergency situation is sensed to exist, the processor (38) supplies alarm indication signals only and alarm indication signals in combination with escape route information signals in other zones. The signals provided by the processor (38) may be pulsed in sequence and varied in frequency so as to sequentially indicate safe egress routes, either visually and or acoustically.

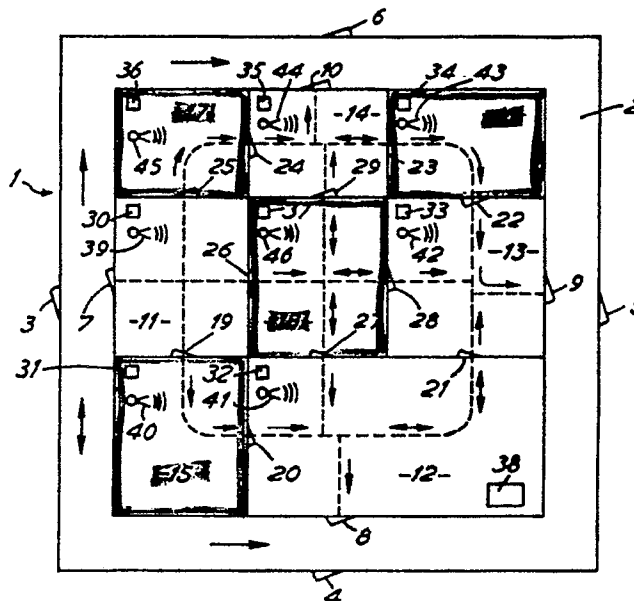


Fig.1

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IMPROVEMENTS IN OR RELATING TO PERSONNEL SAFETY ARRANGEMENTS

This invention relates to personnel safety arrangements, and it relates especially though not exclusively to such arrangements for assisting the evacuation of personnel from buildings or other enclosed areas, or areas with restricted egress and access points, under emergency conditions. Typical emergency conditions include (without limitation) structural damage due to fire or other causes, terrorist activities or threat thereof, escapes of toxic fumes, mob violence etc.

In many such circumstances it is considered desirable to provide an arrangement which automatically guides evacuees toward exits. Such arrangements are described, for example, in British Patent No. 1,498,483 and United States Patent No. 4,347,499. A difficulty with such arrangements, however, is that unless special steps are taken to the contrary, it is possible to direct personnel in the immediate vicinity of the emergency toward exits which are unusable or, worse still, toward the cause of the emergency.

This invention aims to reduce the above-mentioned difficulty and thus, in accordance with the invention, there is provided an emergency evacuation arrangement for a structure or region having limited egress locations, the arrangement including a plurality of sensor means each for sensing an emergency situation at a respective zone of said structure or region, and for generating electrical signals indicative of at least the existence of an emergency situation and the location of the zone associated with that sensor, processing means arranged to receive electrical signals from said sensors and to process said signals to generate alarm indication signals and escape route indication signals, and means responsive to the indication signals generated by said processing means to supply alarm indication signals only to any zone in which the existence of an emergency situation is sensed thereby to generate in any such zone a warning of said emergency situation without escape route indication, and to supply escape route indication signals together with alarm indication signals to other zones, thereby to generate in said other zones a warning of said emergency situation and a route for safe egress for personnel in said other zones.

The arrangements of the invention thus warns personnel in the zone at which the emergency situation has been sensed that the emergency situation exists but does not attempt to direct such personnel with regard to egress from that zone. In other zones, personnel are both warned about the emergency situation and guided to safe egress locations.

In order that the invention may be clearly understood and readily carried into effect, and embodiment thereof will now be described, by way of example only, with reference to the accompanying drawings of which:

Figure 1 shows a schematic layout of a structure from which egress of personnel is to be controlled in an emergency situation,

Figure 2 shows a schematic electrical system for controlling the egress of personnel from the structure of Figure 1, and

Figure 3 shows a route marker suitable for use with an arrangement in accordance with the invention.

Referring now to the drawings, the structure shown in Figure 1 comprises a galleried layout although this is, of course, in no way material to the invention. The structure 1 comprises a peripheral gallery 2 which communicates with four main external doors, 3-6, and with various internal doors 7-10 which, in turn communicate with respective internal zones 11-14 of the structure 1.

There are additional zones 15-18, and further internal doors 19-29 which permit communication between various of the zones but which do not directly communicate with the gallery 2.

The zones may be rooms, offices, laboratories or may indeed have any kind of function. Each of the zones 11-18 is provided with a respective sensor device 30-37 which, in each case, may be capable of sensing the existence of one or more alarm-worthy situations. Each sensor, for example, may have the ability to detect smoke, flame, heat and vibration or any of these or other possible indications of the existence of an emergency situation. The sensor devices generate electrical signals indicative of the existence of an emergency situation (and possibly also of the type of emergency if the devices are capable of responding to a number of stimuli) and these signals are fed into a central processing unit 38.

The unit 38 receives and correlates all input signals from the sensor devices 30-37 and also is preferably arranged to carry out regular checks on the functionality of the devices. The unit 38 is also capable of ascertaining in which zone each detector device is located. This may, for example, be achieved by each device generating an identity code which is transmitted to the unit 38 for correlation with a look-up table held within a non-volatile memory in the unit 38 or in any other convenient manner.

By the above means, the unit 38 is rendered aware of the existence of, and possible also the nature of, an alarm worthy situation and of the zone

in which such a situation has occurred.

Each zone has an alarm indicator, shown as an acoustic generator 39-46, although warnings other than, or in addition to, audible warnings can be given if desired, and escape route direction markings along approved routes therein. The escape routes are indicated as pathways by dashed lines in Figures 1 and by blocks 47-54 in Figure 2.

In response to the detection of an alarm-worthy situation, the unit 38 is effective to energise the acoustic alarm indicators 39-46 in all zones and to energise the escape route direction markings 47-54 in all zones other than the zone or zones in which the alarm-worthy situation is sensed to exist.

For ease of explanation, it will now be considered that an alarm-worthy condition has been detected in zone 11 by the sensor device 30 located therein. An electrical signal indicative of the existence of the sensed alarm-worthy condition and of the identity of sensor device 30 (and thus of the zone 11) is generated and conveyed to the unit 38. Unit 38 responds to this signal by energising the acoustic alarm indicators 39-46 in all zones and the escape route direction markings 48-54 in all zones except the zone 11. Extra escape route direction markings can be provided in the gallery 2 if desired.

The energisation of all acoustic alarm indicators 39-46 and all escape route direction markings except for those indicated at 47 in zone 11 is illustrated in Figure 2 by schematic indications of sound waves and the inclusion of arrows in boxes 48-54; box 47 being empty to indicate that the relevant escape route direction markings are not energised.

In Figure 1, single-headed arrows are used to indicate the direction of egress advised under the control of unit 38 in certain zones. It will be observed that, in some zones, double-headed arrows are shown. This indicates that, for the relevant paths and for the particular alarm situation envisaged, it is feasible for personnel to leave in either direction. In such circumstances, the unit 38 may be conditioned so as not to energise the route direction markings. Alternatively, and preferably, the unit is conditioned to review the overall egress situation and to select, for paths and zones where more than one escape direction is feasible, that route which is most appropriate in the prevailing situation, bearing in mind that crowding at some egress points might be avoidable if personnel from certain zones are guided to other egress points and bearing in mind the desirability, where possible, of directing personnel away from the zone 11 at which the emergency has arisen.

The aforementioned desirable conditioning of the unit 38 can, for example, be achieved by pre-programming suitable provisions for a number of

possible contingencies into the unit so that the appropriate reaction is automatically selected. In addition, as shown in figure 2, a manual input arrangement, via a keyboard 55 or any other convenient interface, can be provided whereby a controller can select certain modes of operation for the unit 38 and its associated components in dependence upon the actual situation as perceived by the controller, who may be based locally to the structure 1 or remotely therefrom but in visual communication with the structure 1.

Figure 3 shows a typical example of a visual indicator or route marker unit 56 suitable for use with an arrangement in accordance with the invention. These marker units such as 56 are distributed along the various escape routes and, in particular, at decision points therein. They are capable of showing, on approach thereto from each of two directions, either a green arrow or a red cross, depending whether or not a given route is to be followed in accordance with the evacuation programme selected by unit 38.

The string of marker units such as 56 along any route can, if desired, be repeatedly pulsed in sequence to encourage personnel to evacuate at a reasonable speed as well as in the desired direction. Pulsing may usefully occur between a "dim" condition and a "bright" condition, (rather than on-and-off) to ensure that at least some indication is always present of the preferred direction of evacuation.

Usefully, an audible warning can be associated with the units such as 56 and may be built into the same housing or mounted closely thereto. If the audible warning is so distributed, it can be advantageous to use the sound as a sonic arrow, by pulsing and/or frequency changing the emitted sound, in known manner. If this is done, even if smoke, dust or other material obscures the lighted direction markers such as 56, evacuating personnel can be guided by the sonic arrow toward the desired egress point.

The entire arrangement is, of course, preferably connected to the emergency power supply of the structure or other region in question and moreover the unit 38 is preferably conditioned so that, in the event of failure it maintains communication with the zones in accordance with the last instruction which it received.

Claims

1. An emergency evacuation arrangement for a structure or region having limited egress locations, the arrangement including a plurality of sensor means each for sensing an emergency situation at a respective zone of the structure or region, and for

generating electrical signals indicative of at least the existence of an emergency situation and the location of the zone associated with that sensor, processing means arranged to receive electrical signals from the sensors and to generate alarm indication signals and escape route indication signals, and to supply alarm indication signals only to any zone in which the existence of an emergency situation is sensed thereby to generate in any such zone a warning of the emergency situation without escape route indication, and to supply escape route indication signals together with alarm indication signals to other zones, thereby to generate in the other zones a warning of the emergency situation and an indication of a route for safe egress from the other zones.

2. An arrangement according to claim 1 wherein the sensor means are arranged for sensing an emergency situation arising from smoke, flame, heat or vibration, either alone or in any combination thereof.

3. An arrangement according to claim 1 or claim 2 wherein the sensor means are each arranged to generate a respective identity code for transmission to the processing means, and the processing means is arranged to correlate any received identity code with a look up table stored therein, thereby to determine the identity and/or location of any sensor means.

4. An arrangement according to any one of claims 1 to 3 comprising, in any zone, acoustic alarm indicators for providing from the alarm indication signals an audible warning of the emergency situation and a visual indicator for indicating from the escape route indication signals a direction for safe egress.

5. An arrangement according to claim 4 wherein the visual indicator unit comprises two displays each display being visible on approach thereto from a respective direction, each display being arranged to show a first visual indication indicative of a direction to be followed for safe egress and a further visual indication indicative of a direction not to be followed for safe egress.

6. An arrangement according to claim 5 wherein the first visual indication is of arrow format and coloured green and the further visual indication is of cross format and coloured red.

7. An arrangement according to any one of claims 4, 5 or 6 wherein an acoustic alarm indicator is arranged with a visual indicator in a common housing.

8. An arrangement according to any one of the preceding claims wherein the processing means is arranged to provide the alarm indication signals and the escape route indication signals as pulsed sequences thereby to provide sequentially along the or each route for safe egress the warning

of the emergency situation and or the indication of the or each route for safe egress.

9. An arrangement according to claim 8 wherein the processing means is also arranged to vary the alarm indication signals in frequency during any pulse sequence or between any pulse sequence and a subsequent pulse sequence.

10. An arrangement according to claim 8, when appendant to any one of claims 4 to 7, or claim 9, wherein the processing means is arranged to provide the escape route information signals as a pulsed sequence varying between first and second levels such that the visual indicators are arranged to provide the indication of the or each route for safe egress varying between first and second visual intensity levels.

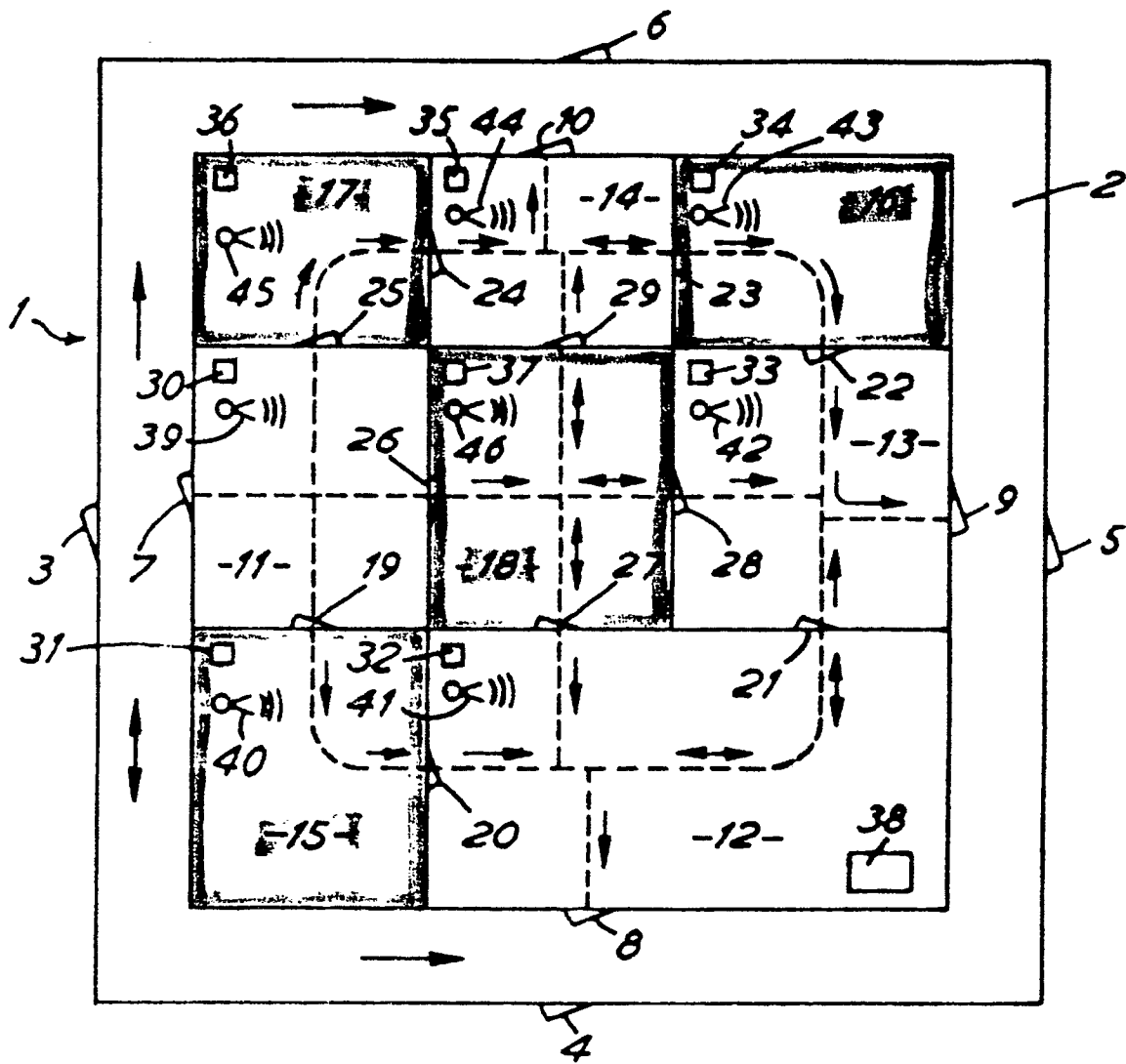


FIG. 1

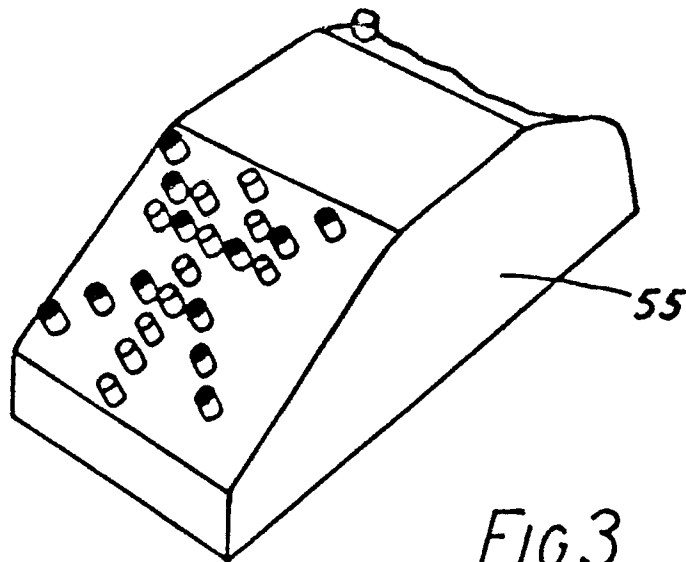


FIG. 3

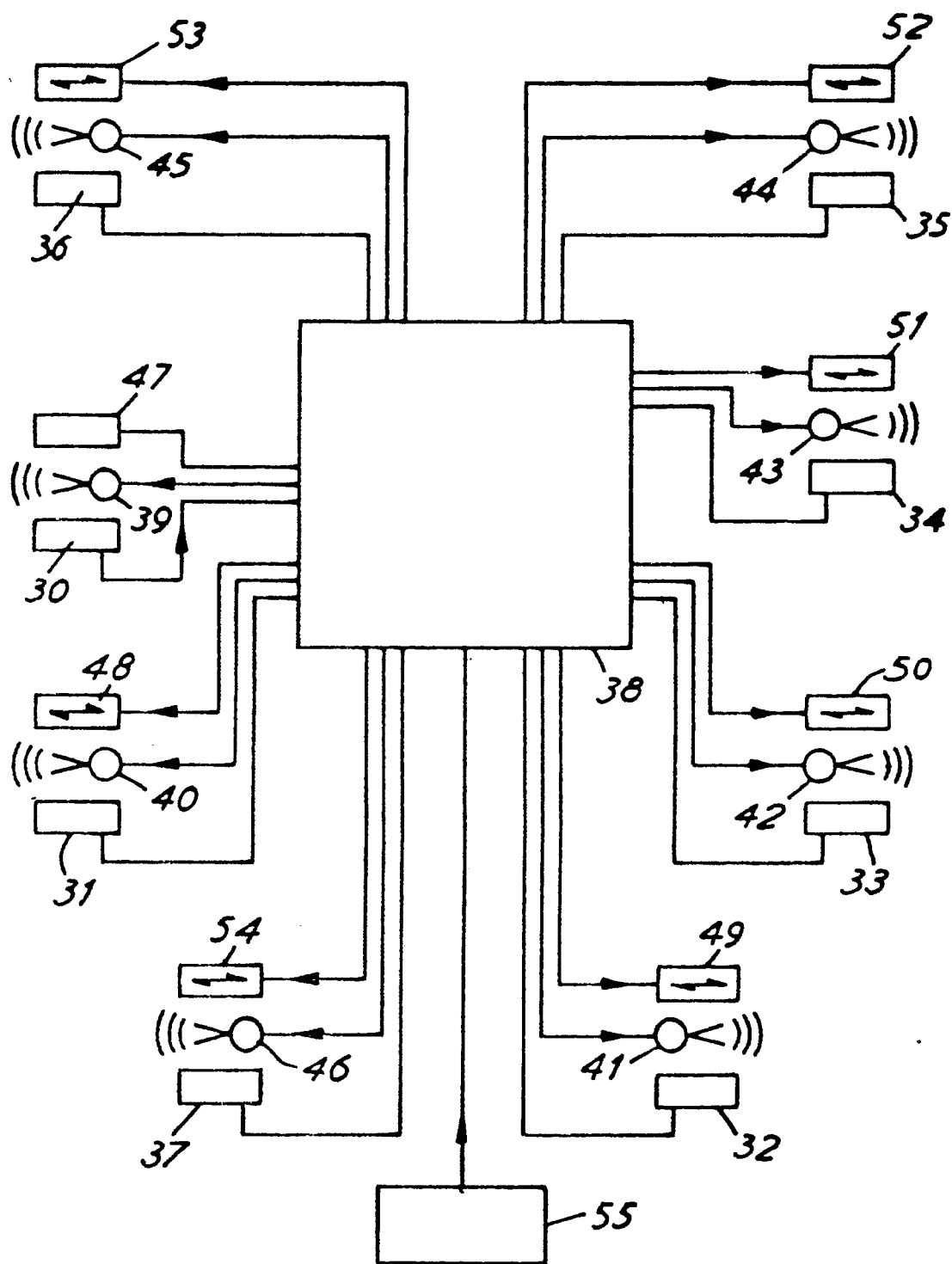


FIG. 2



European Patent
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EUROPEAN SEARCH REPORT

Application Number

EP 90 30 6003

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	GB-A-2191028 (HOCHIKI) * page 1, lines 54 - 71 * * page 2, lines 83 - 95 * * page 3, lines 54 - 116; figures *	1-4	A62B3/00 G08B5/36
Y	---	8-10	
Y,D	GB-A-1498483 (ESSER) * page 1, line 47 - page 2, line 30; figures 1-3 *	8-10	
A	---		
A	US-A-4074225 (ENGLEWAY) * abstract; figures 1, 2, 3 *	1, 5, 7	
A	---		
A	US-A-4754266 (SHAND) * abstract; figures 1, 2 *	5, 6	
A	---		
A	US-A-4801928 (CHLORIDE GROUP) * abstract; figures 1, 2, 5 *	5	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			A62B G08B
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 27 SEPTEMBER 1990	Examiner WALVOORT B.W.
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ----- & : member of the same patent family, corresponding document	