



159159

AN EMERGENCY ALARM SYSTEM FOR CONFINED SPACES

FIELD OF THE INVENTION

This invention generally relates to an emergency alarm system for confined spaces designed to maintain an adequate and effective communication system with personnel outside of the confined space.

BACKGROUND OF THE INVENTION

Many industries, including construction and shipbuilding, require personnel to work in confined spaces. Safety issues affect many aspects of the job environment, particularly the issue of emergency communication between workers in the confined space and personnel outside of the confined spaces. It is essential to provide an effective communication system with the personnel in the confined space and be able to deliver an emergency assistance when necessary.

There are four conventional methods of emergency alarm system for evacuating people inside the confined spaces, such as from a vessel under construction in a shipyard. First, using an onshore crane, which is situated nearby the vessel under construction to generate a siren. According to this method, the shore crane siren will be activated when there is a need to evacuate all the people on board the vessel. The disadvantage of this method is that those people who are working in the confined space may not hear the siren generated by the crane.

The second existing method of emergency alarm system for confined space is to alert the people inside the confined space by using telecommunication devices such as cell phone or 'mobi-talk'. According to this method, all individual trade supervisors are required to inform all their workers to evacuate from the confined space by communicating with the workers by way of a telecommunication device. The disadvantage of this method is that if one of the two parties is not equipped with a compatible telecommunication device there will be no communication and no response, which may result in injury to the workers. Additionally, the steel framework under construction may effectively hinder or distort the signal, thereby preventing timely communication in an emergency, adversely affecting the effectiveness of the evacuation.

The third conventional method of emergency alarm system for confined space is to use portable air horn to evacuate the workforce from the confined space. For this



method, the supervisors will activate the air horn at the entrance of the confined space to alert the people to evacuation order out of the confined space. The major disadvantage of this method is that the sound transmission is weak when dealing with depth and width of the confined space.

The fourth existing method of emergency alarm system is that the supervisor will climb down to the confined space to evacuate the people when there is an emergency inside the confined space. The disadvantage of this method is time delay for the evacuation as the supervisor need to spend time climbing down to the confined space and then signalling the alarm to the workers.

Another dangerous situation is created where a person in the confined space needs to inform safety personnel of an incident happening inside the confined space. The person has to climb up from the tank to search for help if he has no telecommunication device. The major disadvantage of this method is time delay in delivering emergency assistance, since this process will take several minutes resulting in delayed rescue that can only worsen the injuries and may even cause death.

The industry has attempted to solve the problems by offering a number of solutions. One of such solutions is disclosed in U.S. patent No. 4,611,265 issued on September 09, 1986, which describes a method an emergency alert within a house or building for signalling to neighbours or passers-by that someone in the house requires assistance, or that an intruder is within the house. An emergency light is mounted within a central rear portion of a house. The emergency light is positioned closely adjacent the central portion of a planar reflective surface which is parallel to a translucent wall of the housing on which address indicia appears. The housing also includes a light which is turned on when it becomes dark, and which stays on to illuminate the address. A remote control circuit is provided for the emergency light so that the light can be turned on by a person inside the building, so that such person can signal to a neighbour or a passer-by that help is needed in the building, or that an intruder is inside the house or building.

Another example of an alert system is shown in U.S. patent No. 4,276,542 issued on June 06, 1981, which discloses an alarm system which may be activated by a switch located within a dwelling to provide on the outside of the dwelling both audio and visual indications of an emergency condition. An emergency alarm system using the existing

two-wire circuit between a switch assembly located within a dwelling and an externally mounted lamp housing includes a switch having an "off" position, a "normally on" position whereby a lamp is illuminated continuously, and an "alert" position which activates a circuit preferably included within the same protective enclosure that contains the switch. The circuit causes the current to the exterior lamp to be interrupted at a periodic rate, and it may also include as optional feature of an audible alarm and a visual indicator to identify when the alert feature is in operation. An adapter is positioned between the lamp and the existing lamp socket; the adapter includes a circuit responsive to the interruption of the current in the two-wire circuit to activate an audible alarm. In one embodiment, a triac (CR1) is placed in series with the lamp, and the sensing circuit controls the operation of the triac and the audible alarm. In another embodiment of the invention, a pair of relays is used to activate the alarm whenever the current is interrupted at the periodic rate.

While the above-mentioned methods may work under certain conditions, there exists a need for a safe, multiple-application effective system and method for emergency evacuation and rescue in a confined space, particularly at a shipyard.

SUMMARY OF THE INVENTION

It is, therefore, an object of the present invention to provide an emergency alarm system for confined spaces that incorporates an emergency alarm system operating in a safe, multiple-application effective manner.

It is another object of the present invention to provide a system and method of emergency alarm that utilizes an electrical and wireless signalling system.

These and other objects of the present invention are achieved through a provision of a method, which basically made up of two parts: one is wire connection from the main deck to confined spaces; the other is wireless system from each individual alarm device to control box which is carried by safety personnel. For individual alarm device, the two ends which are combined with lights and sound alarm are connected by electrical cables. Eventually all individual alarm devices will be connected to a main control panel. For wireless system, the main control panel will transmit the signal to the portable receiver which is carried by safety personnel.

The emergency alarm system is to enable all the working personnel inside the confined space to react immediately to the emergency siren with flashing light. Besides that, it can be used to alert safety personnel for rescue purposes when there is an incident in the particular confined space. With this emergency alarm system, the workers can maintain an adequate and effective communication to enable communication between people inside and outside the confined space.

BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objects, features and advantages of the present invention will become more apparent from the following detailed description made with reference to the accompanying drawings. In the drawings:

Figure 1 is a general schematic of the emergency alarm system of the present invention.

Figure 2 is a detail electrical schematic of the warning device and transmitter used in the system of the present invention.

Figure 3 is a detail schematic of a centralizer device used in the system of the present invention.

Figure 4 is a detail schematic of a portable receiver used in the system of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings in more detail, Figure 1 shows the overview arrangement of the present invention emergency alarm system. The figure 1 comprises a communication network for establishing communication between personnel in a confined space and personnel outside of the confined space. The confined space may be a vessel in a shipyard, a building, a tunnel and the like. The emergency alarm system comprises one or more transmitters 9 capable of generating an FM signal, centralizer 13, and one or more portable receivers 19 for receiving the emergency signals sent by one or more station transmitters 9.

Figure 2 illustrates a means for generating a warning signal for transmittal to a portable receiver 19. As can be seen in the drawing, the warning signal generating means comprises a warning assembly 9 positioned at each tank coaming and linked to the

confined space working area. Subsequently, all these individual signalling systems are connected to the centralizer 13.

The outside warning assembly 9 comprises a first transducer 4 capable of sending and receiving an FM signal. The transducer 4 is electrically connected to switches 2 & 6 and a visual emergency indicator 3, which can be a strobe light or other similar means. The warning light 3 at coaming is designed to identify the location for the warning system once the system has been activated.

The relay switch 2 is connected to a connector device 1, which connects the outside warning assembly 9 to a central control device, or centralizer 13. The relay 2 connects the strobe light 3 and the transmitter or transducer 4 to a power source 5 and inner warning assembly 10. The switch 2 can be a press button, which enables the user to activate a single unit of the outside warning assembly 9 and inner warning assembly 10. The present invention utilizes a wireless communication system between the outside warning assembly 9 and individual portable receiver 19. Once the help button on outside warning assembly 9 or an inner warning assembly 10 has been activated, the transmitter 4 would be activated and convert the incoming electric signal into an FM signal.

Also shown in Figure 2 is an inner warning assembly 10, which is located in a confined space, for instance a double bottom tank of a vessel. The warning assembly 10 comprises a switch 6, a light 7 and a siren 8. The switch 6, which can be a press button switch, enables to activate a single unit of outside warning assembly 9 and inner warning 10. The inner warning assembly 10 also connected with the transducer 4

When a switch 2 or 6 is activated in response to a distress signal, the light 7 and a siren 8 are activated. The warning light 7 functions as alarm and emergency access indication light once the system has been activated. The emergency siren 8 generates the warning sound and supplements the light 7 for the indication of the emergency access to all the personnel who are working inside the confined space. The transducer 4 also would be activate. At the same time, individual portable receivers 19 receive the distress signal transmitted by the transducers 4, which communicate with a communication side of the switch 16. The communication side may be a transducer 15.

Turning to Figure 4, a portable receiver device 19 is illustrated in an electrical schematic. The portable receiver 19 comprises a plurality of light indicators 17, which

can be LED indicators, each connected to a switch device 16. The switch device functions as a switch to the light indicators 17a, 17b, 17c, and 17d, as well as the buzzer 18. The switch 16 would be “on” once the FM signal is sent by the transmitter. It also functions as a selector for the light indicators 17.

The number of light indicators 17 can vary depending on the number of warning assemblies 9 employed in the system 13. Each light indicator 17a, 17b, 17c, or 17d is designed to correspond to a pre-determined station warning assembly 9.

Depending on the location of the emergency condition, a light indicator 17a, b, c, or d will activate and warn others about the emergency condition in the respective section or work station, where the assembly 9 is located. The switch device 16 establishes connection between each light indicator 17 and a power source 14. The power source 14 can be a portable battery, for instance a 12-volt battery.

A buzzer 18 is electrically connected to the power source 14 and to a transducer 15, which receives information from other transmitters. Once an alarm signal is generated by any of the stations, the light indicators 17a, b, c, or d and the audible alarm device 18 are activated to generate a warning signal alerting personnel that an emergency signal is being transmitted by one or more transmitters 4. The buzzer 18 gives the warning sound to the personnel who is holding the portable receiver 19 that one or more of the warning assemblies 9 have been activated.

Figure 3 schematically illustrates a central control device for establishing communication between the elements of the system 9. As can be seen in the drawing, the centralizer 13 comprises a plurality of switches 11 corresponding to the number of stations where the assembly 9 is located, and a socket board 12. The press button switches 11 activate all warning assemblies 9, 10, which are connected to the centralizer 13 once any of the buttons 11 has been triggered.

The socket board 12 works as a connecting point for the connector devices 1. Eventually, all the individual signalling systems are connected to the socket board 12. Therefore, upon activation of the centralizer 13, all the individual signalling system will be activated simultaneously.

As schematically illustrated in Figure 1, all warning assemblies 9 are connected to the centralizer 13 and to individual portable receivers 19. The transducers 4 send warning

signals to the transducers 15 alerting personnel of danger and providing information to the users of the danger signal generated by one or more stations in the confined space.

The power source 5 can be a municipal power source operating at AC 110V—the power supply would be connected with the individual shore power can supply the power in case of power failure from the main electricity supply. As a whole, all the individual signalling systems are connected to the individual shore power supply AC 110V. The system of the present invention provides several advantages over the existing conventional emergency alarm system for confined space. Firstly, the workers are able to react immediately towards this emergency alarm system. Therefore the hazard for failing to evacuate the people inside the confined space is being eliminated.

Secondly, the signal transmitted through a wireless system provides immediate information when there is an incident inside the confined space. When the emergency alarm system of the instant invention has been properly installed, the procedure for ‘All-For-One’ and ‘One-For-All’ would be ready for activation once the emergency switch is turned on. In this case the rescue efficiency is increased and life of the injured may be protected.

While the invention has been described with reference to a specific embodiment, the description is not meant to be construed in limiting sense. Various modifications of the disclosed embodiment, as well as other embodiments of the invention, will be apparent to persons skilled in the art upon reference to this description. It is therefore contemplated that the appended claims will cover any such modifications or embodiments as fall within the true scope of the invention.

CLAIM

We Claim:

1. An emergency alarm system for detecting and signalling emergency condition in a confined area, the system , comprising:
 - at least one outside warning assembly located outside of the confined area and comprising a first switch and a first transducer;
 - a plurality of portable receivers units carried by users when in the confined area;
 - and
 - a controller operationally connected to said at least one warning assembly for controlling an origination of an emergency call in response to operation of the first switch to transmit an alert signal to said plurality of portable receiver units once an emergency condition is signalled by said first transducer.
2. The system of Claim 1, further comprising at least one inner warning assembly located inside the confined area and operationally connected to said at least one outside warning assembly for generating a visual and audio emergency signal for persons within the confined area.
3. The system of Claim 2, wherein said at least one inner warning assembly comprises a second transducer for receiving an emergency signal from the first transducer and for transmitting an emergency signal to the first transducer.
4. The system of Claim 2, wherein said inner warning assembly further comprises a second switch for activation within the confined area, said inner warning assembly switch being operationally connected to the first switch for transmitting an emergency signal from the confined area to the outside of the confined area.
5. The system of Claim 1, wherein said first transducer is adapted to converting an electrical signal received from said first switch into an FM signal prior to transmitting said signal to said plurality of portable receiver units.
6. The system of Claim 1, wherein each of said portable receivers comprises an audible and visual emergency signal generating means.
7. The system of Claim 6, wherein each of said portable receivers further comprises a receiver unit transducer for communicating with the first transducer.

8. The system of Claim 6, wherein said visual emergency signal generating means comprises a plurality of light members, each of said light members being activated in response to an emergency signal generated within a pre-determined section of the confined area.
9. The system of Claim 1, wherein each of said portable receiver units is provided with an independent power source.
10. The system of Claim 1, wherein said emergency alert signal is a wireless signal.