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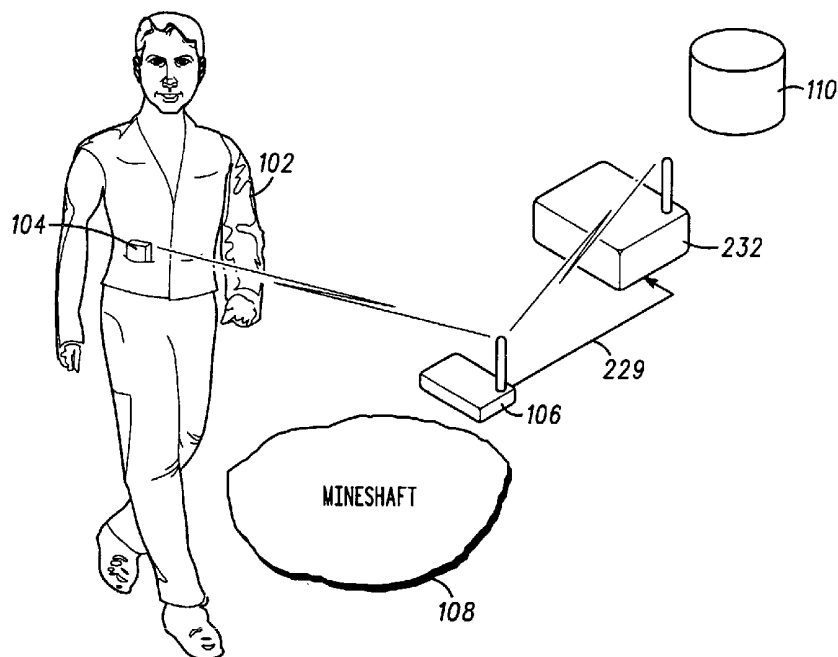
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(54) Title: METHOD, SYSTEM AND APPARATUS FOR HAZARD WARNING



(57) Abstract: A method, system and apparatus for providing a hazard warning with greatly increased effectiveness is disclosed. In the first step a hazard warning system device (106) is placed near a hazard (108) and activated. Then, the hazard warning system device (106) is used to monitor for a user device (104). When the user device (104) is detected, a warning is transmitted to the user device (104). Optional conditional access to hazard warning system device (106), information, and operational controls may be granted based on user identity and authorization status.



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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.

A METHOD, SYSTEM AND APPARATUS FOR HAZARD WARNING

Technical Field

This invention is related to warning devices and more specifically to a method and
5. system for hazard warning.

Background Art

Most hazards, both indoor and outdoor, which can lead to personal injury and
property damage, are typically not apparent. For example, the existence of fixed hazards,
10. such as mine shafts, abandoned wells, or quicksand in an area may not be well mapped and
are not always readily apparent. Transient hazards such as flash floods, glare or black ice or
the presence of airborne contaminants are even harder to detect prior to exposure to the
hazardous situation. The absence of such effective warning can cause property damage,
injuries and even death.

15. While warning signs can be posted, they are not always effective. Signs can only
communicate a finite amount of information. Signs can fall down, be stolen or otherwise be
rendered ineffective, especially under transient hazardous conditions. Transient hazardous
warning signs are often ignored when they are permanently posted. What is needed is a
system that can transmit relevant information about a hazard to an individual quickly,
20. effectively, and in a content-accessible format. It should also support interactive requests for
the transmittal of additional information in sufficient detail as may be needed at the time.

Brief Description Of Drawings

For a more complete understanding of the present invention and advantages thereof,
reference is now made to the following descriptions, taken in conjunction with the following
25. drawings, in which like reference numerals represent like parts, and in which:

FIG. 1 depicts an overall hazard warning system in accordance with the present
invention;

FIG. 2 is a block diagram showing in more detail various components of the FIG. 1
hazard warning system;

30. FIG. 3 is a flowchart showing a preferred process in accordance with the present
invention and suitable for use in the FIG. 1 hazard warning system; and

FIG. 4 is a flowchart further illustrating additional operating characteristics of the
hazard warning system device.

Disclosure of Invention

Turning first to the nomenclature of the specification, the detailed description which follows is represented largely in terms of processes and symbolic representations of operations by conventional computer components, including a central processing unit ("CPU") or processor associated with a general purpose computer system, memory storage devices for the CPU, and connected pixel-oriented display devices and output capabilities for audiovisual or multimedia. These operations include the manipulation of data bits by the CPU and the maintenance of these bits within data structures resident in one or more of the memory storage devices. Such data structures impose a physical organization upon the collection of data bits stored within computer memory and represent specific electrical or magnetic elements. These symbolic representations are the means used by those skilled in the art of computer programming and computer construction to most effectively convey teachings and discoveries to others skilled in the art.

In addition, it should be understood that the programs, processes, methods, system, apparatus, etc. described herein are but an example of one implementation of the present invention and are not related or limited to any particular computer, apparatus or computer language. Rather, various types of general purpose computing machines or devices may be used with programs constructed in accordance with the teachings described herein. Similarly, it may prove advantageous to construct a specialized apparatus to perform the method steps described herein by way of dedicated computer systems with hardwired logic or programs stored in non-volatile memory, such as read only memory. Also, similarly, embedding these computational processes within another type of user device, such as a telephone, messaging device, location device, entertainment device, etc., may be advantageous.

FIG. 1 illustrates an exemplary embodiment in accordance with the present invention. FIG. 1 shows a user 102 carrying the user device 104. User 102 is in close proximity to a hazard warning system device 106 which is installed near a hazard 108 (in this example, hazard 108 is a mineshaft).

User device 104 is preferably designed such that it can be carried easily on or by a person, such as in a hand, pocket or purse, or can be worn or attached elsewhere on the person, an item of clothing, etc. User device 104 comprises a wireless transceiver for communicating with hazard warning system device 106. Additional descriptions of user device 104 can be found in conjunction with FIGS. 2-4.

Hazard warning system device 106³ can be implemented as a fixed or movable transmitter or transceiver that is located at a hazard or other area of concern. Hazard warning system device 106, in one embodiment is operable to send information concerning the hazard 108. Additional details concerning hazard warning system device 106 can be found in conjunction with FIG. 2-4.

Hazard 108 in this example is an open mineshaft. Many other types of hazards and unsafe conditions, fixed and movable, persistent or transient, can be guarded by the present invention. These include such hazards as the presence of quicksand, glare or black ice, flash flooding, etc. They can also include the presence of airborne contaminants such as CO₂, CO or contaminants that could cause allergic reactions such as peanuts, nitrates, and MSG. Work place hazards could also be protected by the present invention, including hazardous areas, and limited or controlled access areas.

In operation, a details specific to the nature of the hazard 108 are transferred to the hazard warning system device 106 and the hazard warning system device 106 is placed in proximity to the hazard 108 and activated. The hazard warning system device 106, at a minimum is operable to send basic information about hazard 108 to the user device 104 of a user 102. As user 102 with user device 104 approaches the vicinity of a marked hazard 108, hazard warning system device 106 detects the presence of user device 104 and transmits the information about the hazard 108 to user device 104. The amount of information, data transfer rate, and access to additional local or externally stored information content may further depend on specific capabilities of hazard warning system device 106 and user device 104.

The information sent can be as simple as a brief text message displayed on user's user device 104. Or it can be a content accessible message such as prerecorded audio/visual or multimedia message sent to a properly equipped user device 104. In another or additional very simple form, hazard warning system device 106 may cause user device 104 to display flashing lights, make sounds indicative of danger, vibrate, or otherwise provide warning in a form accessible to the user 102. In any case, the user 102 can make note of the pending danger.

Additionally, in the case of a mineshaft or other similar type of hazard, information such as a map of where the mine shaft hazard 108 is located, a short history of mining in this immediate area, Internet web links to relevant websites about mining, etc., can also be transmitted and made accessible in a personalized manner to user 102. In one embodiment,

user 102 may send a request to hazard warning⁴ system device 106 for more information. The type and amount of information sent to user 102 depends, in great part, on the capability of user device 104. Should user 102 desire additional information concerning hazard 108, user 102 can make a request via suitably equipped user device 104, and this request is transmitted to the hazard warning system device 106. If such information requested is stored within the hazard warning system device 106, that information is transmitted to the user device 104. If the requested information is not stored in the hazard warning system device 106, but is retrievable from an external information source 110 using communications services supported by the hazard warning system device 106, the request is forwarded to external information source 110. The external information source 110 processes the request and forwards information back to hazard warning system device 106 for retransmittal to the user device 104 or via other internal means of display organic to the hazard warning system device 106.

Additional information can be made available and transmitted at no charge or optionally for a fee. However, when external information sources 110, integral communications services, or owner of requested information require payment for information usage/retrieval, user 102 can make payment via the user device 104. Alternatively, information can be provided under the sponsorship of external commercial or another type of organization which agrees to underwrite the use of the wireless communications service or external information provisioning in exchange for other considerations, for example, marketing information, advertising, or promotional information also sent to the hazard warning system device 106 for integral display or for transmission to the user device 104 for display to the user 102.

Hazard warning system device 106 may also be operable to record the sequential number and, if necessary, the identification of each proximate user 102. Time information and additional information, examples of which may include: Duration of time a user 102 remains in proximity to the hazard 108, information requests made by user 102 and the disposition of such requests, amounts and sources of information furnished, fees paid (if any), etc. This information can be stored at hazard warning system device 106 or can be transmitted by wireless means or over a wired connection 229, to a remote server 232. This remote server can also be used to update the warning message or other software of hazard warning system device 106.

FIG. 2 illustrates a more detailed embodiment of personal user device 104 and

associated components of the hazard warning⁵ system device 106 according to the present invention. Referring to FIG. 2, user device 104 is preferably a short-range wireless system with user display 202; user input/output device(s) 204, which can also include audio input/output (e.g., speaker, microphone, earphone jack, etc.) 206; processor 208; internal
5 memory 210; wireless transceiver 212; power source 214; and antenna(s) 216.

In one embodiment, an individual hazard warning system device 106 comprises a wireless transceiver 218, antenna(s) 220, a processor 222, internal memory 224, optionally a display device 226, optionally an input/output mechanism 228, and optional self-contained
10 power source 230. In addition, wireless or wired connectivity with external information sources 110 is supported via a remote server 232 using transceiver 218 for wireless communications via antenna 220 or wired communications via wireline 229.

Processor 208, under the control of an operating system, controls the operation of user device 104 and is used to retrieve, process, store, and display data. Memory 210 may be a random access memory ("RAM"), read-only memory ("ROM"), or other types of
15 memory.

Processor 208 is typically implemented as a microprocessor, such as those manufactured by INTEL, MOTOROLA, or HITACHI. Processor 208 may include an arithmetic logic unit to assist in performing mathematical operations. Processor 208 communicates control, address, and data signals with an operating system and with the
20 remaining components of user device 104. Processor 208 interprets and executes instructions that have been fetched or retrieved from memory 210 and may be implemented as a single integrated circuit or as a combination of integrated circuits, as a microcontroller, a digital signal processor (DSP), a field programmable grid array (FPGA), an application specific integrated circuit (ASIC), as remotely commanded circuitry hosted on hazard warning
25 system remote server 232 or hosted on a remote server associated with information services 110, etc.

I/O devices 204 may include any peripheral that allows data to be exchanged between user device 104 and user 102. This includes information entry and viewing of information entered into, or viewed on user device 104 and may include such devices as a
30 keyboard or other tactile capability; a vibrating element; audio transducer 206; a monitor; a printer; a modem; a RF transmitter; a pointing device, such as a mouse; a floppy disk drive; a mass storage device, such as a hard disk drive or memory stick; and the like.

Wireless transceiver 212, in conjunction with communication programs stored in

memory 210, allows user device 104 to ⁶receive messages from hazard warning system device 106 and to send request for additional information to hazard warning system device 106.

Turning now to hazard warning system device 106, processor 222 controls the
5 operation of hazard warning system device 106. Any necessary programs needed to control hazard warning system device 106 are stored in memory 224 or are retrievable from or by way of remote server 232. Memory 224 is also operable to store text and/or audiovisual or multimedia messages, which can be sent to the personal user device 104. Therefore, Memory 224 may be any combination of random access memory (RAM), read only memory
10 (ROM), flash memory usable for program storage, program operation, message storage, etc.

Processor 222 is typically implemented as a microprocessor, such as those manufactured by INTEL, MOTOROLA, or HITACHI. Processor 222 may include an arithmetic logic unit to assist in performing mathematical operations. Processor 222 communicates control, address, and data signals with an operating system and with the
15 remaining components of hazard warning device 106. Processor 222 interprets and executes instructions that have been fetched or retrieved from memory 224 and may be implemented as a single integrated circuit, as a combination of integrated circuits, as a microcontroller, digital signal processor (DSP), a field programmable grid array (FPGA), an application specific integrated circuit (ASIC), remotely commanded circuitry hosted on remote server
20 232, etc. as a microcontroller, a digital signal processor (DSP), a field programmable grid array (FPGA), an application specific integrated circuit (ASIC), as remotely commanded circuitry hosted on hazard warning system remote server 232 or hosted on a remote server associated with information services 110, etc.

Transceiver 218 is operable to send information to and receive information from user
25 device 104. Remote server 232 is operable to receive information from and to send updated information to hazard warning device 106. Remote server 232 can interface with hazard warning system device 106 using a direct hardwire hook-up 229 or using wireless means via antenna 220, and can also communicate with other external information sources 110 in similar fashion. Other integral wireless communications methods may also be used for
30 connectivity including for example, cellular telephony, CDPD, LMDS, satellite communications, wireless LAN (for example, IEEE 802.11 and variants) IEEE 802.15 [Bluetooth], etc. Alternatively, hazard warning system device 106 may achieve connectivity by utilizing external communications capabilities in the possession of the user, such as a

suitably equipped user device 104, cellular⁷ telephony, automotive telematics services, Land Mobile Radio, satellite telephony, and so forth. Remote server 232 can also directly access external information sources 110.

5 Hazard warning system device 106 is operable to be powered by a self-contained power source 230 such as batteries, solar power, etc.; electric utility service (if available); a generator; or, any other method to provide power.

In one embodiment, the user 102, after receiving the basic level of warning information from hazard warning system device 106, may request additional information. This information could be obtained from remote server 232 and sent to the hazard warning
10 system device 106. In another embodiment, hazard warning system device 106 is operable to send additional information per the request of the remote server 232. This could be for such things as logging the number of people who pass hazard warning system device 106 or checking the identity of each person that passes hazard warning system device 106 if personal user device 104 is equipped to send personal information. This could be useful in
15 an industrial setting where management could track which workers strayed too close to hazardous sites or to monitor access to a site restricted to authorized personal.

As discussed earlier, hazards can be categorized at least into categories of fixed or movable hazards, and as persistent or transient in nature. The category of fixed and persistent hazard is exemplified by the example of an open mineshaft. The category of a
20 fixed transient hazard may be exemplified by a roadway bridge which most of the year is relatively safe, but under specific limited meteorological conditions is subject to highly dangerous glare (or black) ice. Another example may be a roadway bridge that on rare occasions is historically swept away by extreme flash flooding. Other categories of hazards 108 for which this invention is useful will also be apparent to those practiced in the art.

25 Again, for example, hazard warning system device 106 can be provided or placed near a fixed mineshaft which would be expected to remain dangerous for many years. In another embodiment, hazard warning system device 106 can be placed near a roadway where glare/black ice may form. Then, in conjunction with inputs from an ice detection (e.g., temperature, humidity, or other mechanism[s]) sensor, hazard warning system device
30 106 can be used to alert people about transient hazards. Although examples of outdoor hazards have been supplied above, many beneficial applications of this invention will be found in indoors, including industrial, situations. For example, present safety practices require industrial workers and/or safety and maintenance personnel to maintain constant

vigilance for anomalous conditions or for normally safe equipment that is rendered temporarily unsafe due to in-process maintenance. Such conditions are typically accomplished by manual processes, and as such are subject to compromise and danger due to the inherent nature of persons to make mistakes under conditions of stress, fatigue, etc.

5 This invention can easily be implemented widely and in diverse forms in industry. It may be readily seen by those practiced in the art that invention is suitable for application to operations/practices such as "electrical lock-out/tag-out," "confined spaces," "no-lone zone," "overhead crane operations," and many other potentially hazardous workplace conditions.

10 FIG. 3 is a flowchart illustrating a method in accordance with the present invention suitable for use in the FIG. 1 apparatus whereby hazard warning system device 106 detects the user device 104, transmits a warning of the proximate hazard 108, determines whether the user desires additional information and, if so, processes such additional information request or other user input into format suitable for retransmission to external information
15 sources.

In a preferred embodiment, the host facility (e.g., company safety department, highway patrol, etc.) or organization with hazard warning responsibility places or provides in step 302 and activates in step 304 a hazard warning system device 106 in the proximity of a hazard 108. Upon its activation, hazard warning system device 106 monitors its
20 surroundings for the presence of user device 104. Monitoring for the presence of a personal user device 104 in one embodiment comprises the hazard warning system device 106 being operable to wait for a signal from personal user device 104 before sending a warning message. Monitoring for the presence of the user device 104 can also entail sending a signal from a hazard warning system device 106 which is intended to be received by the user
25 device 104 which, if present, can then send an acknowledgment to hazard warning system device 106 to initiate further communications. Monitoring for the presence of the user device 104 can also entail continuously sending a warning message able to be received and processed unilaterally by suitable client devices 104. This occurs in step 306.

In step 308, if no proximate user device 104 is detected, the process goes back to step
30 306. If the user device 104 is detected, hazard warning system device 106 may optionally determine if the hazard currently exists, as occurs in the case of a transient hazard such as glare/black ice on a highway. If the hazard does not currently exist, in step 312 optional messages or information can be sent. This can include a message such as "Ice conditions can

exist here” or some other type of message after which the process returns to step 306. If the hazard currently exists, a warning message is sent to user device 104 in step 314. The content and format of the message is determined by both the capabilities of user device 104 and the capabilities of the hazard warning system device 106. If the user device 104 is fairly robust, the message could contain text and graphics and even audiovisual or multimedia information, if the hazard warning device 106 can provide such information. Alternatively, in conjunction with providing a warning 314, hazard warning device 106 can limit access to an area based on the privileges or rights granted to the user of specifically programmed user device 104. For example, if the hazard existed behind a door, hazard warning device 106 could send a warning to user device 104 that indicated this is a restricted area limited to authorized personal. Then, user 102 of user device 104 would have to indicate in some fashion that he or she was a user authorized to enter that area. In one embodiment, user device 104 could communicate that information to hazard warning device 106.

In step 316, it is determined whether user 102 desires additional information. If no additional information is desired, the process goes back to step 306. If additional information is desired, a request can be transmitted to hazard warning system device 106 by personal user device 104. Some or all of the additionally requested information supplied at step 320 may be purchased using electronic payments as depicted at step 318.

FIG. 4 is a flowchart further illustrating the additional operation of hazard warning system device 106 as shown within the process “A” which follows step 308 of FIG. 3. For security purposes, operation of hazard warning system device 106 may be further designed to be activated or controlled only by authorized personnel. In one embodiment, activating the device also includes activating conditional access capabilities. This allows different authorized users different access capabilities. For example, in an industrial setting, a client device in possession of a plant “Visitor” might be only able to receive hazard warning messages and request additional information as shown in FIG. 3. A low level employee of the facility might be able to access some additional system features such as downloading information concerning the number of users passing by the hazard warning system device 106 or the disposition of information requests, etc. Other workers with greater authorization might be able to alter the warning message or perform other functions the low-level worker could not.

Thus, in FIG. 3, the hazard warning system device 106 performs its normal monitoring function. This can include detecting the presence of the user device 104 in order

to send a warning message, log the number¹⁰ of people with personal client devices 104 that pass by the hazard warning system device 106, record the identity of people with personal devices, provide information to users, etc.

Once the user device 104 has been detected in step 308 of FIG. 3, however, in step 402
5 of FIG. 4, the system further acts to monitor for whether an authorized user is present. In step 404, the hazard warning system 106 determines whether a user 102 is an authorized user. If not, the process continues with step 310 of FIG. 3. If an authorized user is detected in step 404, the level of authority is determined in step 406. By checking for authorized users and their level of authority, in step 406, the hazard warning system device 106 is detecting
10 users that can perform maintenance or otherwise access the restricted functions of hazard warning system device 106. In any case, if no authorized user is detected, the hazard warning systems continues to perform normal functions as outlined in step 310 of FIG. 3.

If a properly authorized user is detected, in step 408 the hazard warning system device 106 permits the authorized user to execute authorized functions, such as setting
15 additional monitoring details, performing maintenance or other functions in step 410. After that is complete, hazard warning system device 106 returns to normal operation, in step 310 of FIG. 3.

Thus, a method, system and apparatus for achieving more effective hazard warning has been disclosed which overcome the disadvantages of current warning methods. While
20 embodiments discussing warning of fixed hazards such as a mineshaft, glare ice, and certain industrial workplace applications have been disclosed, the present invention is adaptable to a wide range of applications.

What Is Claimed Is:

1. A method for transmitting a hazard warning comprising:
providing a hazard warning device near a hazard;
5 monitoring for a user device; and
transmitting a warning to the user device when the user device is detected.
2. The method of Claim 1, wherein the step of transmitting a warning further comprises transmitting a content-accessible message.
3. The method of Claim 1, further comprising the step of sending additional
10 information to a user device upon receiving a request from the user device.
4. The method of Claim 3, wherein the step of sending additional information further comprises receiving an electronic payment in exchange for the additional information.
5. The method of Claim 3, wherein the step of sending additional information further comprises accessing an external information source.
- 15 6. The method of Claim 1, further comprising the step of logging the number of users passing by the hazard warning system device.
7. The method of Claim 1, further comprising the step of logging the identity of users passing by the hazard warning system device.
8. The method of Claim 1, further comprising the step of logging the duration for which
20 each user remains proximate to the hazard warning system device.
9. The method of Claim 1, further comprising the step of logging the disposition of information requests and their corresponding fulfillment by the hazard warning system device.
10. The method of Claim 1, further comprising the step of monitoring for authorized
25 personnel.
11. The method of Claim 10, wherein the step of monitoring for authorized personnel further comprises allowing conditional access to the hazard warning system device based on the identity and authority status of a user.
12. The method of Claim 10, wherein the step of monitoring for allowed personnel
30 further comprises allowing conditional access to the hazard warning system device via remote connectivity mechanisms.
13. The method of Claim 1, wherein the step of providing a hazard warning device further comprises placing a hazard warning devices near a controlled access point.

14. The method of Claim 13, further comprising¹² allowing access to a controlled access point based upon the identity and authority status of the user as received by the hazard warning device from the user device and interpreted by the hazard warning device.

15. The method of Claim 1, wherein the step of transmitting a warning further comprises transmitting other information when the warning conditions do not exist.

16. An apparatus for transmitting a warning message comprising:
a hazard warning device located near a hazard and operable to:
monitor for the presence of a personal user device; and
send warning information when the personal user device is detected.

17. The apparatus of Claim 16, wherein the warning information comprises a content-accessible message.

18. The apparatus of Claim 16, wherein the hazard warning device is operable to send additional information to the personal user device upon receiving a request from the personal user device.

19. The apparatus of Claim 18, wherein an electronic payment is sent in exchange for the additional information.

20. The apparatus of Claim 18, wherein the additional information is stored at an external remote server or information source.

21. The apparatus of Claim 16, wherein the number of users passing by the hazard warning system device is logged.

22. The apparatus of Claim 16, wherein the identity of users passing by the hazard warning system device is logged.

23. The apparatus of Claim 16, wherein the hazard warning system device is further operable to monitor for authorized personnel.

24. The apparatus of Claim 23, wherein the hazard warning system device is operable to allow conditional access to the hazard warning system device based on the identity and authority status of a user.

25. The apparatus of Claim 16, wherein a hazard warning device is placed near a controlled access point and wherein access to the controlled access point is allowed based upon the identity and authority status of a user as received by the hazard warning device from the personal device and interpreted by the hazard warning device.

26. The apparatus of Claim 16, further operable¹³ to transmit additional information such as advertising or public service messages in lieu of a fee for additional information requested.

27. A system for transmitting warning messages comprising:

5 a personal device including a wireless receiver;

a hazard warning device including a transmitter; and

wherein the hazard warning transmitter is operable to send a warning signal to the personal device.

28. The system of Claim 27, wherein the warning signal comprises transmitting an audio-visual, multimedia or other content-accessible message.

29. The system of Claim 27, wherein an electronic payment is optionally requested of the user and received from the user in exchange for providing additional information.

30. The system of Claim 27, wherein the hazard warning system is operable to allow conditional access to the hazard warning system based on the identity and authorized status of a user.

31. The system of Claim 27, wherein a hazard warning transmitter is placed near a controlled access point and wherein the hazard warning transmitter is operable to allow access to a controlled access point based upon the identity and authority status of the user as received by the hazard warning transmitter from the user device.

32. An apparatus for receiving warning messages comprising a user device operable to receive a warning signal indicative of a hazardous condition.

33. The apparatus of Claim 32, wherein the warning signal is presented to the user as an audiovisual, multimedia or other content-accessible message.

5 34. The apparatus of Claim 32, wherein the user device is operable to request additional information and wherein the user device is operable to send an electronic payment for the additional information.

35. The apparatus of Claim 32, wherein the identity of a user of the user device is sent to a hazard warning system.

10 36. The apparatus of Claim 32, wherein the user device continues to indicate its presence while in the proximity of the hazard warning device.

37. The apparatus of Claim 32, further operable to send user authorization information.

38. The apparatus of Claim 32, wherein the user device receives a warning signal at a controlled access point.

15 39. The apparatus of Claim 38, wherein access to the controlled access point is allowed based on information sent by the user device.

40. A method for receiving hazard warning information comprising:

activating a user device; and

20 receiving on a user device a warning signal transmitted from a hazard warning device located near a hazard.

41. The method of Claim 40, wherein the step of receiving a warning further comprises receiving and processing a signal indicative of danger and presenting an effective warning to the user via the user device.

25 42. The method of Claim 40, wherein the step of receiving a warning further comprises presenting the user with an audiovisual, multimedia or other content-accessible warning message.

43. The method of Claim 40, further comprising the steps of:

sending a request for additional information;

receiving additional information from a hazard warning system device; and

30 sending a request for additional information further comprises sending an electronic payment in exchange for the additional information.

44. The method of Claim 40, further comprising the step of sending the identity of the user to the hazard warning system device.

45. The method of Claim 40, further comprising the step of the user device continuing to indicate its presence while in the proximity of the hazard warning system device.

46. The method of Claim 40, further comprising the step of the user device logging the
5 disposition of information requests and their corresponding fulfillment by the hazard warning system device.

47. The method of Claim 40, further comprising the step of sending user authorization information to the hazard warning system device.

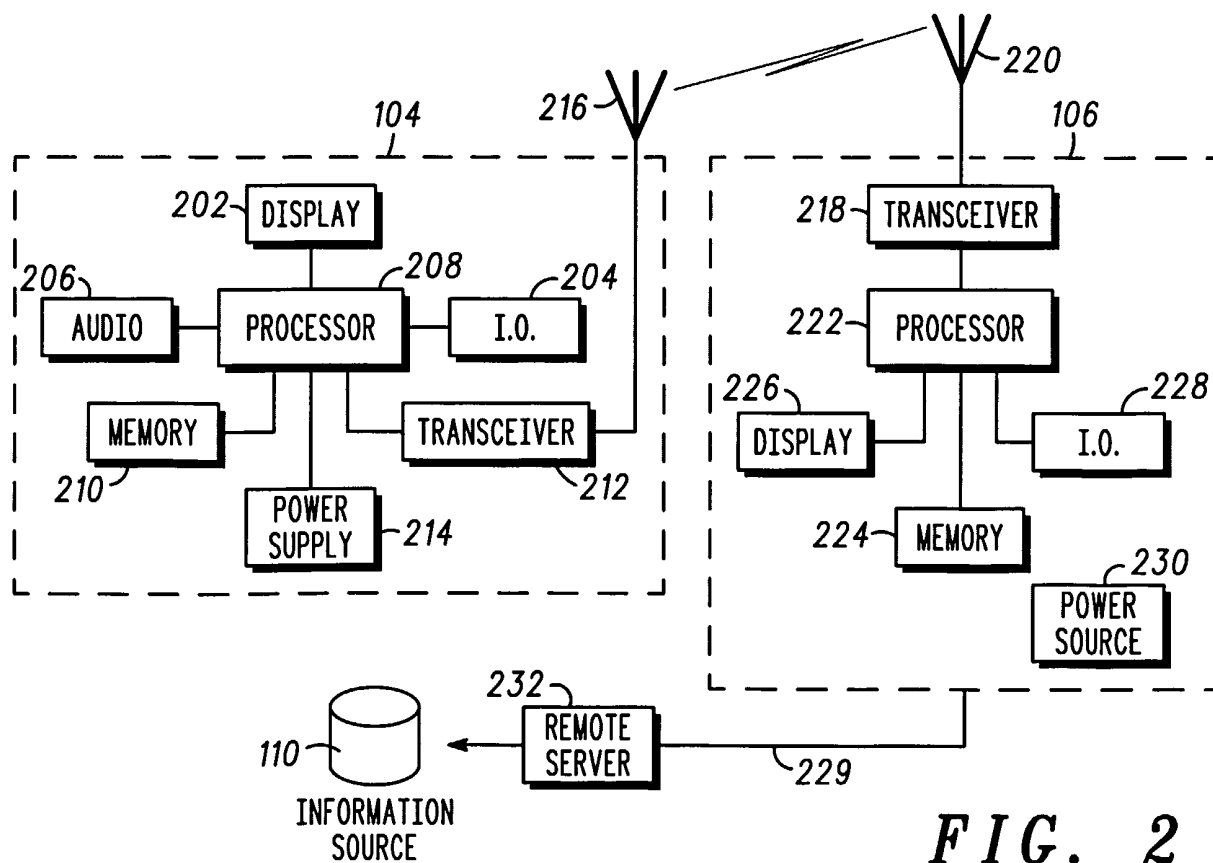
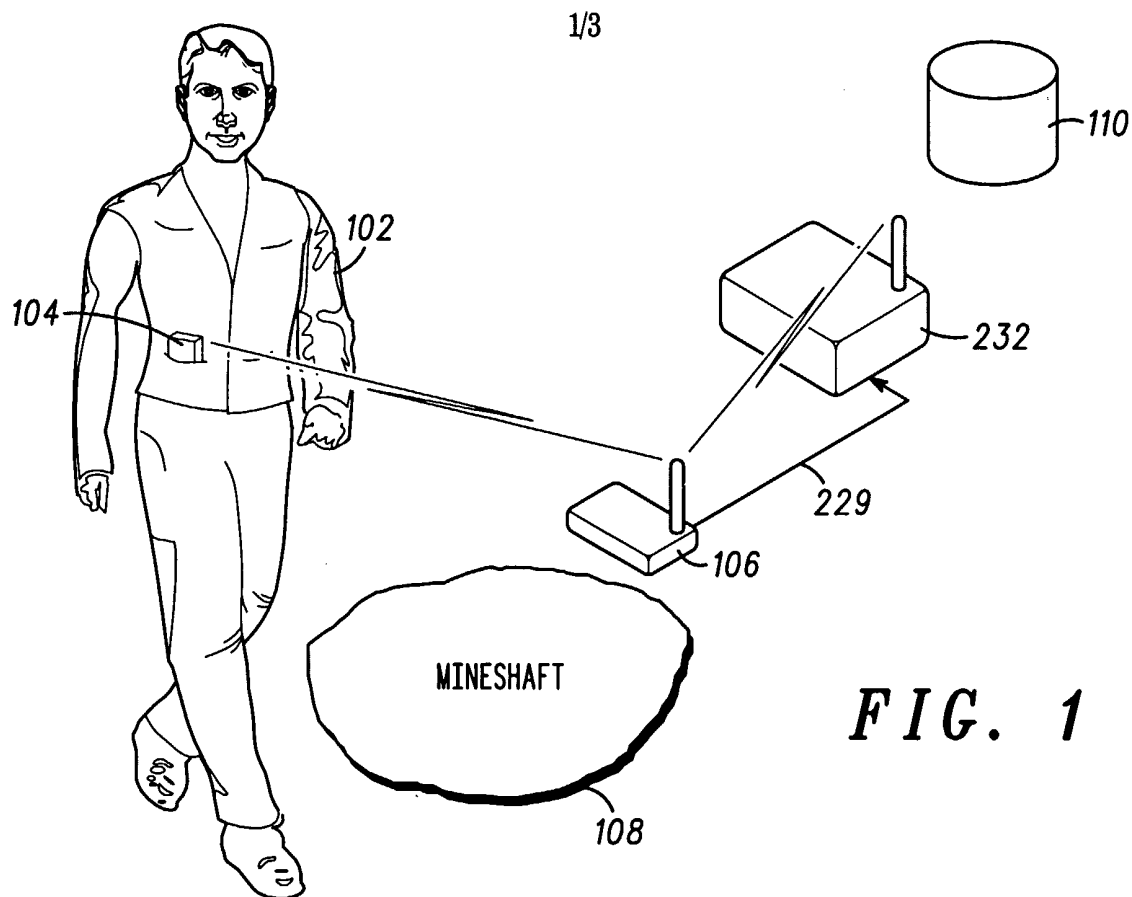
48. The method of Claim 47, wherein based on the identity and authority status of a user
10 the user device is granted conditional access to communicate electronically with hazard warning device data and/or operational controls.

49. The method of Claim 48, wherein the step of user device communications for authorized personnel further comprises allowing conditional access to communicate and electronically interact with the hazard warning system device data and/or operational
15 controls via remote connectivity mechanisms.

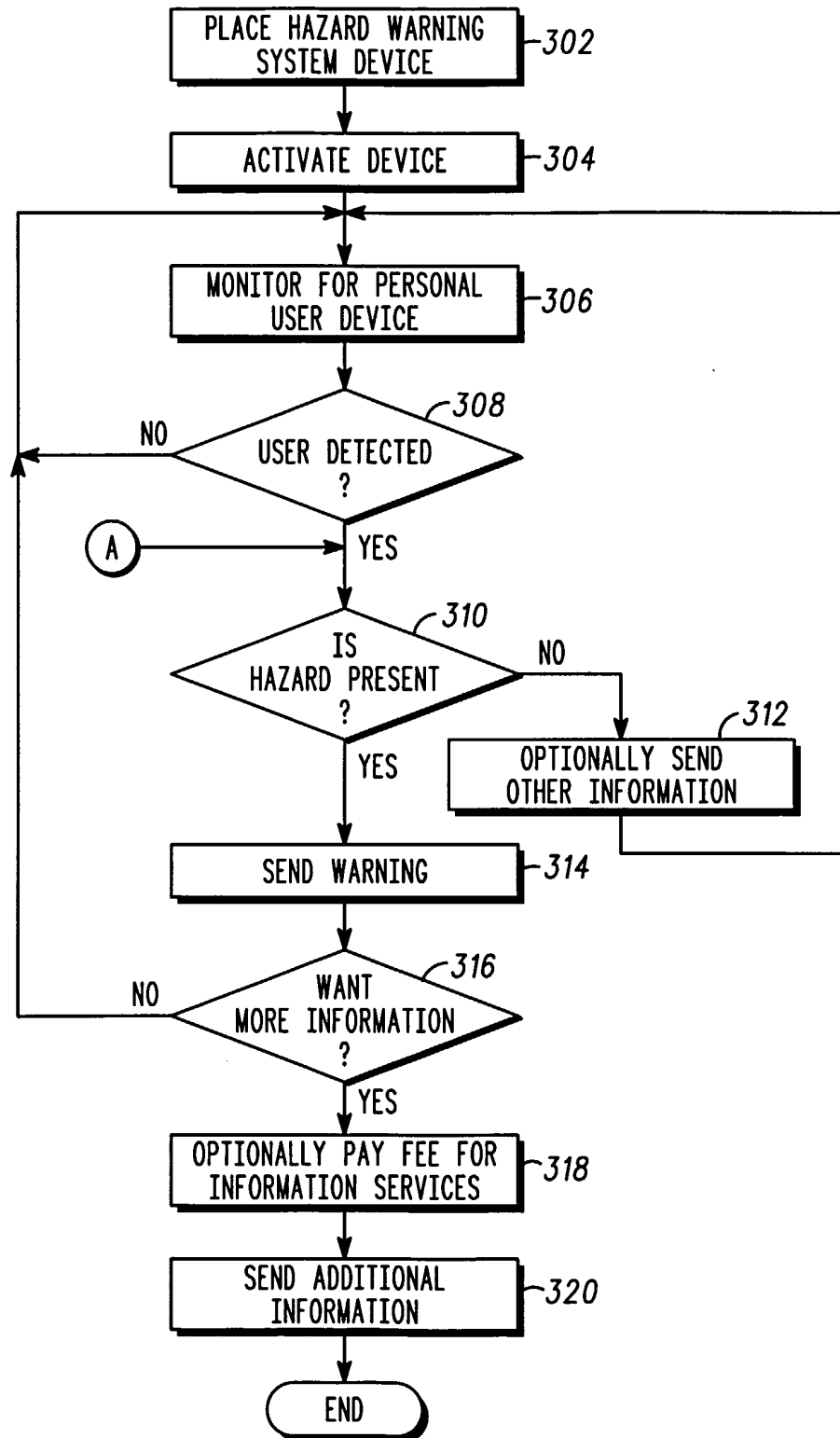
50. The method of Claim 40, further comprising the step of user device interacting with a hazard warning device placed near a controlled access point.

51. The method of Claim 50, further comprising user device sending identity and authorization information sufficient to grant conditional access to an area controlled by a
20 controlled access point.

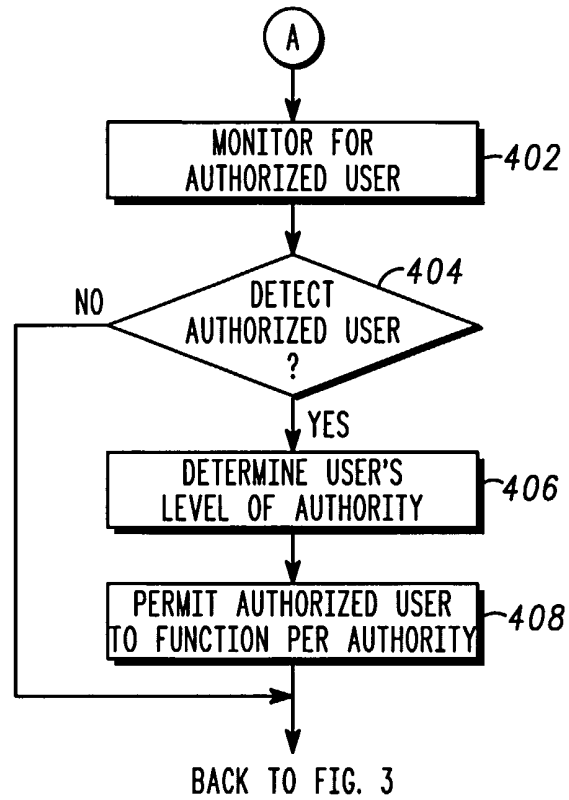
52. The method of Claim 51, wherein the step of receiving a warning further comprises receiving other information when entry to a controlled area is not granted.



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*FIG. 3*

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**FIG. 4**

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US01/51331

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : G06F 7/04

US CL : 340/825.32, 991, 993, 539, 825.36, 825.49, 905, 825.37.

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)

U.S. : 340/825.32, 991, 993, 539, 825.36, 825.49, 905, 825.37.

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 practicable, 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.
Y	US 5,218,344 A (RICKETTS) 08 JUNE 1993, COL. 9, LINES 21-42	1-52
Y	US 5,310,999 A (CLAUS ET AL.) 10 MAY 1994, COL. 4, LINES 27-54	1-52
Y	US 5,324,028 A (LUNA) 28 JUNE 1994, COL. 5, LINES 16-39	1-52
Y	US 5,787,429 A (NIKOLIN, JR.) 28 JULY 1998, COL. 4, LINES 8-39	1-52
Y	US 5,815,802 A (LOECHMER, II) 29 SEPTEMBER 1998, COL. 5, LINES 8-54	1-52
Y	US 6,028,514 A (LEMELSON ET AL.) 22 FEBRUARY 2000, COL. 5, LINES 26-59	1-52



Further documents are listed in the continuation of Box C.



See patent family annex.

•	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E"	earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search	Date of mailing of the international search report
05 JUNE 2002	07 AUG 2002

Name and mailing address of the ISA/US
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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US01/51331

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 6,091,956 A (HOLLENBERG) 18 JULY 2000, COL. 21, LINES 32-54	1-52
Y	US 6,097,313 A (TAKAHASHI ET AL.) 01 AUGUST 2000, COL. 13, LINES 17-54	1-52