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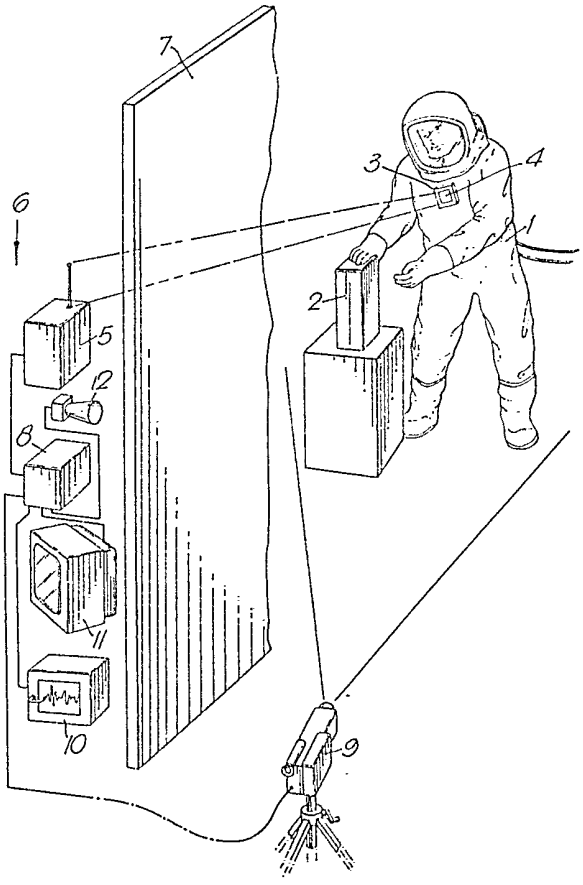
None

(58) Field of search
H4F

(54) Monitoring of dangerous environments

(57) To relate data on the exposure of a person to a dangerous condition, e.g. a high radiation level or toxic gas, with his movements, measurements of exposure, e.g. by personal dosimeter, are transmitted by radio to a processor at a safe location, and at the same time the person is observed by a TV camera sending its signal to the same processor so that the danger of each movement can be assessed.

If some term, eg close rate or total close received, exceeds a limit, an alarm may be activated.



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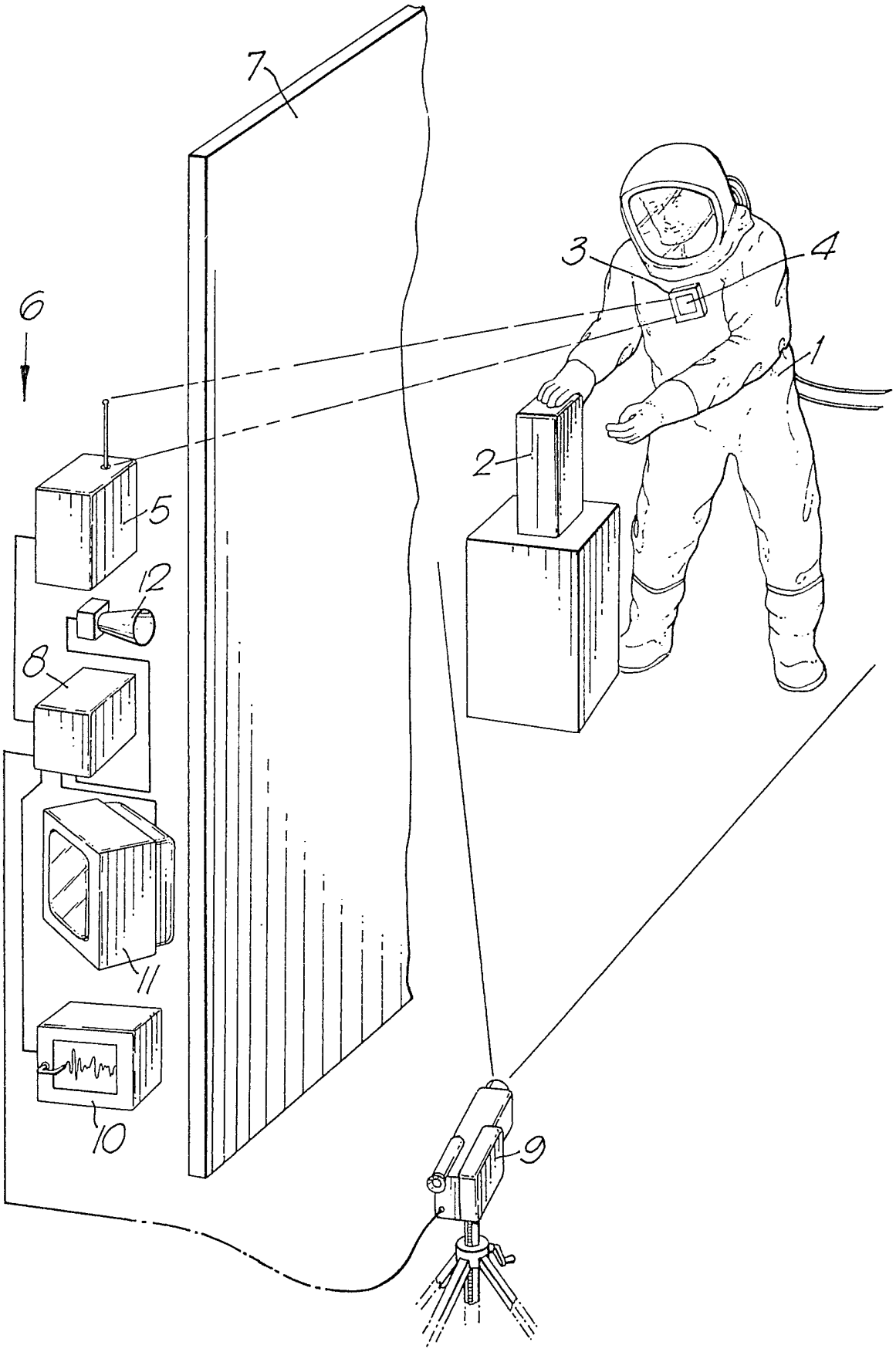
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SPECIFICATION

Improvements in or relating to the monitoring of dangerous environments

This invention relates to the monitoring of dangerous environments.

In the performing of operations in a dangerous environment, for exampe one in which a radiation source is present or one in which radiation constitutes a hazard; because radiation is invisible and the human body gives no immediate indication of the absence or presence of radiation or the quantity of radiation received, it is necessary when performing operations in such an environment to employ a radiation dosimeter which give audibly or visibly an indication of the amount of radiation which is incident on the monitor. Naturally, personnel involved in performing duties in radioactive environments try to spend as little time as possible in such environments but what may not always be appreciated is the need to perform operations in such a manner as to reduce to a minimum the time spent nearest to the source or sources of radiation. An experienced operator will have learned to do this to best effect, but an inexperienced operator may well increase the dosage to which he is exposed because of his inexperience. In these circumstances, it would be helpful to be able to record the movements and actions of operators and at the same time have information concerning the dose experienced at each movement and action displayed on the same recording so that improvements in programming operations can be provided to produce the least possible exposure to radiation. The same principle is true for exposure in any other dangerous environment, another example of which is one where toxic gas may be present.

According to the invention, a method of providing information concerning the exposure, in an environment involving a danger to humanity, of a person conducting an operation within such environment, to such danger, consists in measuring the amount or concentration of the entity consituting the danger, converting the measurements so obtained to a radio signal, transmitting the radio signal, receiving the said signal at a monitoring position remote or protected from the danger, also simultaneously viewing the said person with a video camera, feeding the video camera signal to a processor to which is also fed the said radio signal, and causing the processor to produce from the said signals an output consisting of ongoing information, which can be recorded and/or viewed, concerning the movements and actions of the said person and the amount of danger associated with each movement and action.

The processor can be caused to analyse the measurement data and relate such data to the video signal, whereby the measurement associated with each movement and action can be recorded and/or displayed. The production of a visual and/or audible signal is also envisaged should the measurement of the entity constituting the danger exceed a predetermined threshold.

In a specific application of said method, the method of providing information concerning the exposure to radiation of a person conducting an operation on or in the vicinity of a source or field c radiation, consists in measuring the intensity of th radiation experienced by the said person, converti the measurements so obtained to a radio signal, transmitting the radio signal, receiving the radiatic dose related radio signal at a monitoring position remote or shielded from the source of radiation, al simultaneously viewing the person conducting the operation with a video camera, feeding the video camera signal to a processor to which is also fed th said radio signal, and causing the processor to produce from the said signals an output consisting of ongoing information, which can be recorded and/or viewed, concerning the movements and actions of the said person and the radiation dose experienced by him and associated with each mov ment and action.

The processor or other suitable device can also b caused to analyse the dose data and relate them to the video display, whereby the dose associated wit various parts of each operation can be determined and recorded and/or displayed.

Means for performing said method can consist o a portable dosimeter able to be worn or carried by the said person, a radio transmitter associated with said dosimeter, a radio receiver at a monitoring position remote or shielded from the radiation area a video camera for viewing said person and either situated in the radiation area and operated remotel from the monitoring position or situated at and operated directly from the monitoring position whe the said person is in direct view from the monitorin position, a processor to which are fed the signals from the video camera and from the radio receiver, recorder for recording the output produced by the processor in the form of a record of the person's movements and actions and the radiation dose associated with each of them, and optionally a viewer for presenting simultaneously on a visual display an image of the said person and relevant dose information.

The processor can include means for providing a visual and/or audible warning should the radiation dose received by the person exceed a predetermine threshold.

An example of the said method and the means for performing it is illustrated in the accompanying diagrammatic perspective drawing, the sole Figure of which illustrates an operator 1 in an environment subject to radiation and therefore provided with the necessary degree of protection, performing a manual operation at a station 2 and wearing (alternatively not shown, carrying if its bulk should so demand) a portable radiation dosimeter 3 which includes a radio transmitter 4 arranged to transmit radio signals directly related to the size of radiation dose experienced by the dosimeter 3. A radio receiver 5, located at a monitoring station 6 which is either protected from radiation by screening or shielding 7 as shown, or is sufficiently remote from the radiatior area not to need protection, is arranged to receive radio signals from transmitter 4 and to pass them to

a processor 8. Either sufficiently remote from the radiation area that it can be manually operated, or as shown, within the radiation area and remotely operated from the monitoring station 6, is a video camera 9 arranged to view the operator 1 and to pass the video signals to the processor 8. The latter produces ongoing information to a recorder 10 and to a viewer 11, the viewer being arranged to show an image of the operator as he moves and performs his operations together with a constantly updating visual dose measurement. A visual alarm can be arranged to show on the viewer if the dose exceeds a pre-determined threshold. In addition an audible warning such as a klaxon 12 can be arranged to sound in these circumstances.

The said method and means for performing it can obviously be employed during actual operations not only to ensure that permitted dosages are not exceeded but also to warn operatives when they are making a movement or performing an action which is potentially dangerous from a radiation point of view.

However, another important application of the said method and means for performing it concerns the training of operatives for work involving exposure to radiation. By means of the equipment and by performing the said method a training film can be produced which can demonstrate by the movement and actions of an experienced operator how to minimise exposure to radiation, and can also, by employing an inexperienced operative, demonstrate undue exposure to radiation so that potential operators can be instructed by means of the film what not to do. The said method and means can also advantageously be employed for obtaining information of use to designers of radioactive plant enabling them to consider means of reducing radiation doses.

The use of a processor enables computations concerning the total exposure, the maximum exposure and time-related information concerning dose rates to be produced either in recorded form or visually. Many other implications of the employment of the computer element of a processor will become evident to those experienced and skilled in the field of radiation science.

It is envisaged that the method and means may additionally have application in fields where hazards other than radiation are involved, for example, in environments where toxic, invisible and odourless gases constitute a hazard. In the case of that example, conventional means for quantitative detection of such gases would replace the dosimeter, and the radio transmitter would transmit a signal directly indicative of the concentration of the toxic gas involved.

CLAIMS

1. A method of providing information concerning the exposure, in an environment involving a danger to humanity, of a person conducting an operation within such environment, to such danger, consisting in measuring the amount or concentration of the entity constituting the danger, converting the measurements so obtained to a radio signal, transmitting the radio signal, receiving the said signal at a monitoring position remote or protected from the danger, also simultaneously viewing the said person with a video camera, feeding the video camera signal to a processor to which is also fed the said radio signal, and causing the processor to produce from the said signals an output consisting of ongoing information, which can be recorded and/or viewed, concerning the movements and actions of the said person and the amount of danger associated with each movement and action.

2. A method according to claim 1, including causing the processor to analyse the measurement data and relate such data to the video signal, whereby the measurement associated with each movement and action can be recorded and/or displayed.

3. A method according to either of claims 1 and 2, including the production of a visual and/or audible signal should the measurement of the entity consisting the danger exceed a pre-determined threshold.

4. A method according to any of the preceding claims, wherein the method is employed for providing information concerning the exposure to radiation of a person conducting an operation on or in the vicinity of a source or field or radiation, and the method includes measuring the intensity of the radiation experienced by the operator, converting the measurements of radiation so obtained to a radio signal, receiving the radiation dose related radio signal at a monitoring position remote or shielded from the source or field of radiation, simultaneously viewing the said person with a video camera, feeding the video camera signal to a processor to which is also fed the said signal, and causing the processor to produce from the said signals an output consisting of ongoing information, which can be recorded and/or viewed, concerning the movements and actions of the said person and the radiation dose experienced by him and associated with each movement and action.

5. Means for performing the method according to claim 4, consisting of a portable dosimeter able to be worn or be carried by the said person, a radio transmitter associated with the said dosimeter, a radio receiver at a monitoring position remote or shielded from the radiation area, a video camera for viewing the said person and either situated in the radiation areaand operated remotely from the monitoring position or situated at and operated directly from the monitoring position when the said person is in direct view from the monitoring position, a processor to which are fed the signal from the video camera and from the radio receiver, a recorder for recording the output produced by the processor in the form of a record of the person's movements and actions and the radiation dose associated with each of them and optionally a viewer for presenting simultaneously on a visual display an image of the said person and relevant dose information.

6. Means according to claim 5, wherein the processor includes means for providing a visual and/or audible warning should the radiation dose received by the person exceed a pre-determined threshold.

7. A method of providing information concerning the exposure, in an environment involving a danger to humanity, of a person conducting an operation within such environment, to said danger, substantially as hereinbefore described.

8. Means for performing a method as specified in claim 7, substantially as hereinbefore described with reference to the accompanying drawing.

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