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(56) Documents Cited:
EP 2006815 A1 **WO 2005/073938 A1**
US 7312712 B1 **US 7026928 B1**
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(54) Title of the Invention: **Status monitoring method and system**
 Abstract Title: **Remote monitor raises alarm if a reply to a message is not received from a monitored object in time**

(57) A monitored object 10, such as a person with a mobile cellular telephone, is in communication with a monitoring centre 13. The centre 13 sends a query to the person 10, and if no confirmation reply is received 18 or an invalid reply is received 22 a third party is contacted 26. The system preferably repeatedly sends messages to monitor the person. A number of third parties may be contacted in turn. If the person uses a cellular telephone 10, it may be provided with a motion sensor; if no motion activity is detected, the telephone may send an alert message to the monitoring centre.

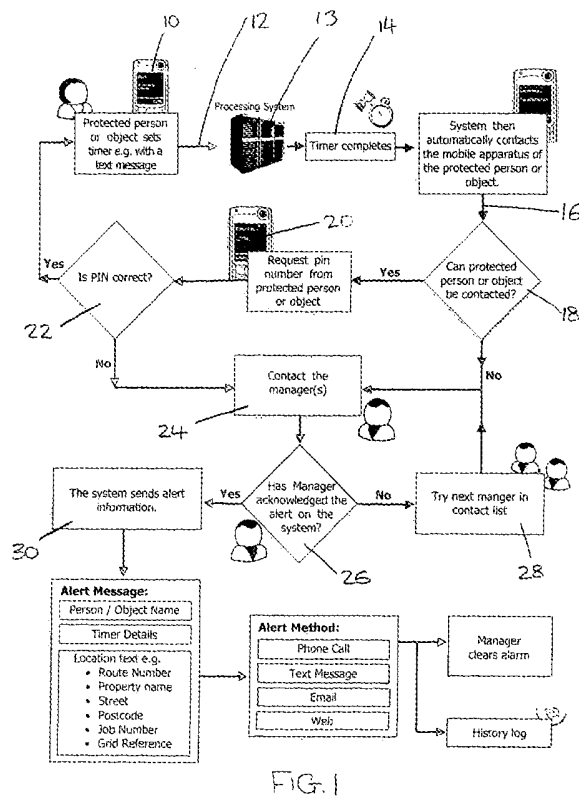


FIG. 1

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

This print takes account of replacement documents submitted after the date of filing to enable the application to comply with the formal requirements of the Patents Rules 2007.

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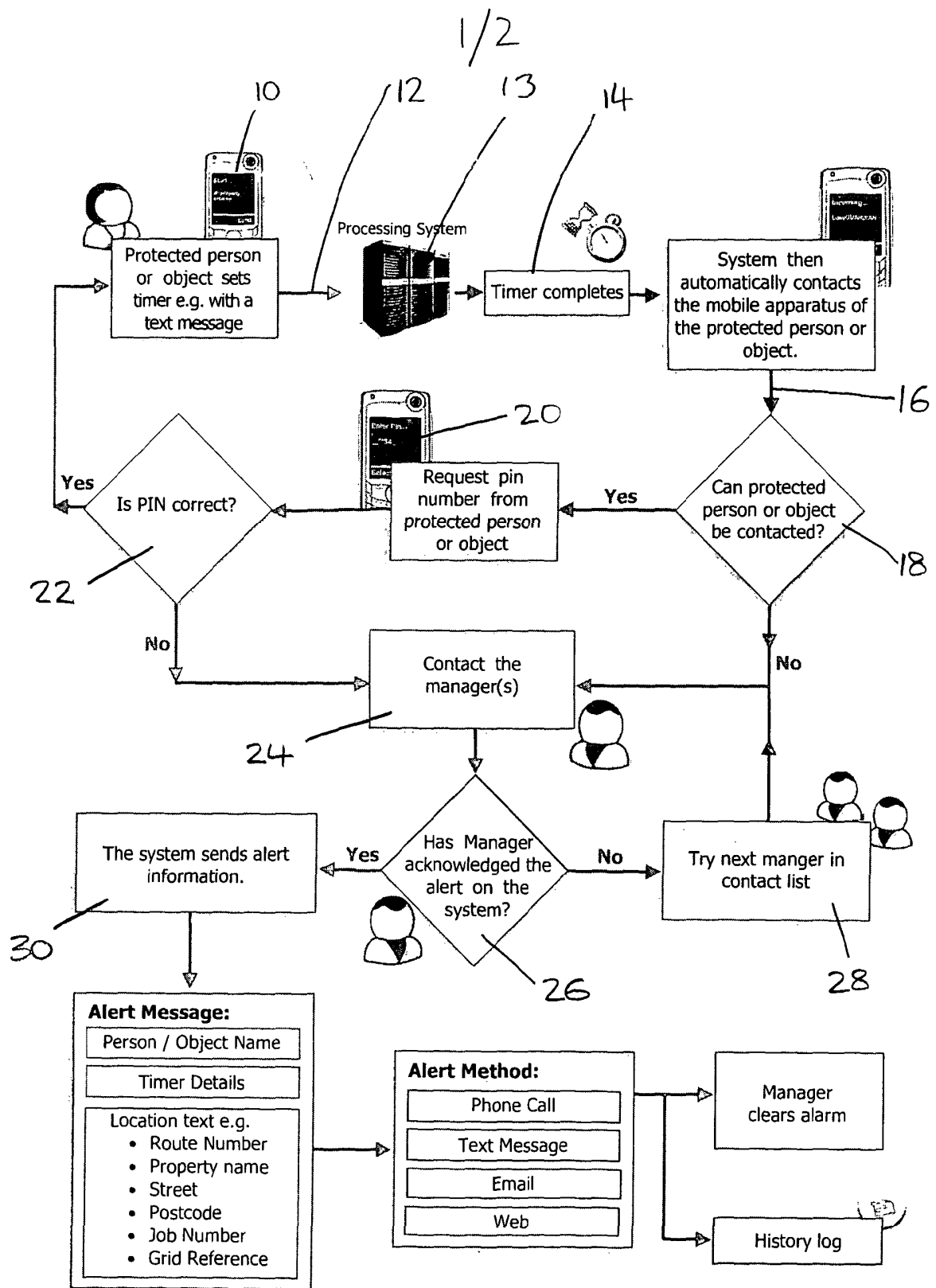


FIG. 1

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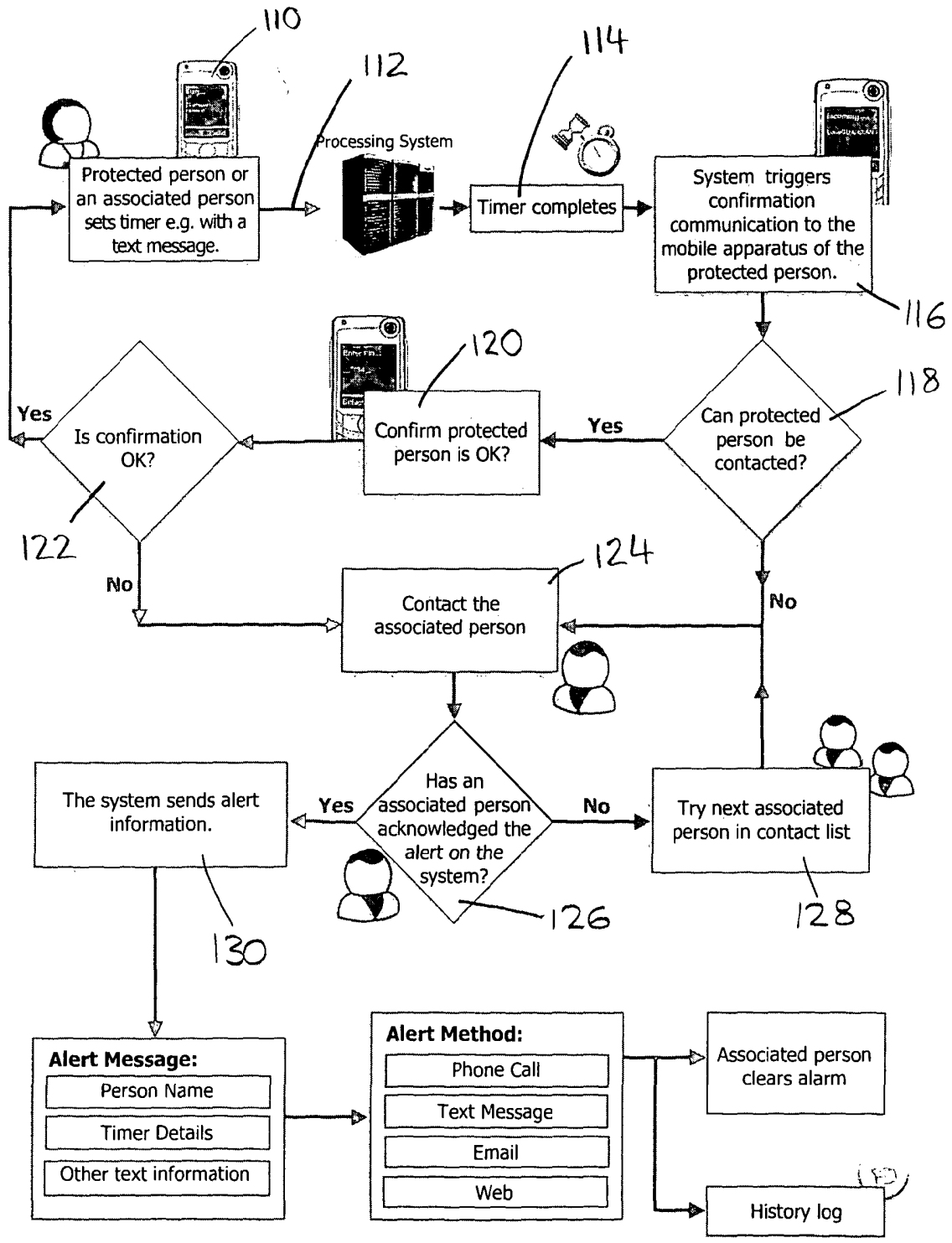


FIG. 2

Title: Status Monitoring Method and System

5 Description of Invention

The present invention relates to a status monitoring method and system. The invention has been devised, and will be described hereafter, in relation to monitoring the status of a subject which is a person (or group of persons) in terms of their well being, but may also be applicable to monitoring the status of an inanimate subject e.g. the condition or functioning of an item of equipment.

There are many situations in which it is desirable to monitor the status of well-being of a person. Such situations include, but are not limited to, an elderly or vulnerable person living alone, a person suffering from a disability, and a person working in a dangerous environment. In such circumstances it is advantageous, in terms of the costs involved in carrying out the monitoring, for the monitoring to be carried out by an automated process. Furthermore, the automation of such a process removes the opportunity for human error.

It is known for communication devices to be used to raise an alarm when a button is pressed. This method is inadequate in the case where a subject may be rendered unable to make such a communication, such as the case where an elderly person suffers a fall, or where a worker in a dangerous environment becomes unconscious. In these situations, proactive monitoring is required, wherein a request is made to the subject asking them to provide a response to indicate that they are well. If no such response is received, the system can alert others to the situation.

However, it is possible that a system of this nature is open to abuse in the case where a response is made to the request by the system, but the response is sent by someone other than the person being monitored. In this

instance, the alarm will not be raised, and hence the well-being of the subject put at risk.

It is broadly the object of the present invention to address such problems.

5

According to one aspect of the invention, we provide a method for monitoring the status of a subject, the method including storing, at a monitoring station, information relating to the status of the subject, communicating a request from a first communication means associated with the monitoring station to a
 10 second communication means associated with the subject; and either communicating a response from the second communication means to the first communication means before a predetermined period of time has elapsed, or, in the absence of a timely response, updating the stored status to an alert condition.

15

The steps of communicating a request from the first communication means to the second communication means; and either communicating a response from the second communication means to the first communication means before the predetermined period of time has elapsed, or updating the stored status to alert, may be repeated after a stored predetermined time interval. The times
 20 allowed for response from the second communication means, and for repeating the steps as aforesaid, may be stored in a memory, which also may store information denoting operating times outside which no request communications are made to the second communicating means.

25

Preferably a personal identifier relating to the subject is stored in the memory, and a response from the second communication means to the first communication means includes communicating the personal identifier. If the personal identifier in such communication does not match the relevant stored
 30 personal identifier, the response may be regarded as invalid and lead to the stored status of the subject to be changed to the alert condition.

It is beneficial to require the subject to communicate a personal identifier in the response, so that the system knows the response has been sent by the target subject. The personal identifier corresponding to the target subject may be stored in the memory of the system for this purpose, and may be associated
5 with a unique identifier attributed to the communication device being used, such as a Machine Access Control (MAC address), telephone number, or Internet Protocol (IP) Address.

Commonplace technology, such as mobile telephones, paging devices, home
10 telephones, or home computers, may incorporate an interface enabling the subject to communicate with the system via the communication means. It is also possible that no adaptation of communication devices is necessary, as communications can be sent and received over existing technologies which do not implement a bespoke interface. In either case, there is no need for
15 separate equipment to be carried or installed, as the communications can operate through standard devices.

Motion of the subject may be detected using a motion-detecting means and if
no such motion is detected during a predetermined time period, or if such
20 motion falls within the bounds of a preset pattern over time, an alert condition can be set. It is preferable that the motion-detecting means, e.g. one or more accelerometers, is incorporated within the communication device associated with the subject, such as a mobile telephone.

25 A communication means such as a mobile telephone, having one or more accelerometers or other motion-detecting means, may also be programmed to cause an alert condition to be established when used in a system other than that in accordance with the present invention.

30 The means of communication involved in such a system can include, but are not limited to, voice communications (including Voice over Internet Protocol),

text messages, electronic mail, interaction with web applications, and any other means of data packet transfer.

Such a system can incorporate an alert escalation procedure, wherein after an alert is raised, where no communication has been received from the subject, communications are sent to one or more further communication means in accordance with alert procedural information stored in the memory. For example, if a worker is injured and does not respond to a status request, the system may alert a colleague to the situation. After a set period, if that colleague has not responded, the system may alert a manager.

It is possible that a worker in such a situation may wish to raise an alarm manually, rather than waiting for a status request to go unanswered. In this case, a communication can be sent to the system, setting the status to alert with immediate effect.

According to another aspect of the invention, we provide apparatus for carrying out the method according to the first aspect of the invention.

Embodiments of the invention will now be described, by way of example only, with reference to the drawings:

Figure 1 is a diagrammatic illustration of the elements and operation of a status monitoring system in accordance with the invention, for monitoring workers in dangerous environments;

Figure 2 is a diagrammatic illustration of a status monitoring system for monitoring vulnerable persons.

Referring first to figure 1, there is shown a diagrammatic representation of the main elements, and operation, of a status monitoring system, which is suitable for monitoring the status of workers operating in dangerous environments. The system includes a first and a second communication means, a memory

and a processor. The memory, processor, and first communication means may be included in or associated with a computer/server 13 operating in accordance with suitable software to enable it to perform the steps described herein. The first communication means is associated with the memory and processor to form a monitoring base station from which the monitoring takes place, and the second communication means is carried, or is otherwise operable, by the worker being monitored. The second communication means may comprise a mobile (cellular) telephone or any other personal communications device, and the first communication means be suitable for sending data to such a device and receiving data therefrom.

Prior to beginning operation, information may be recorded in the memory, this information including the names of subject persons being monitored linked with personal identifiers (or 'PIN' numbers), locations, a time interval between sending response requests to the or each subject, a time limit for the subject(s) to respond to a request, a device identification (which may take the form of a machine access code, telephone number or internet protocol address), and procedural information to be acted upon when an alert status is entered. Alternatively, the subject may set all or any of the information by sending the information via a communication to the first communication means, and the system may then record this information in the memory.

The monitoring system may begin operation to monitor a subject when the second communication means (10) carried by or otherwise operable by the subject sends an initialising communication (12), which may be an initialising communication as described above or may be a standard initialising communication containing less information. Alternatively, monitoring may begin at a set time. Upon receipt at the base unit, a timer (14) starts operating, to measure a set time interval since the initialising or any subsequent communication (as described hereafter) from the subject has been received. The set time may be a default time interval, or a time recorded in the

memory of the system to be associated with a particular subject (e.g. sent by the subject as referred to above). After the set time has elapsed, a request is sent, as indicated at (16), to the second communication means associated with the particular subject if contact can be established with the second

5 communication means, as indicated at (18), and if a personal identifier associated with that subject is recorded in the memory, a request is sent from the first communication means to the second communication means to ask the subject for confirmation of the personal identifier in a return communication. Assuming a personal identifier is received from the second communication

10 means, it is tested for its correctness, i.e. agreement with the stored relevant personal identifier, as indicated at (22), and assuming it is correct the timer (14) is restarted. The system notes that the status of the subject remains unchanged. The communication from the subject may contain additional details including location, status, and job status. If the personal identifier does

15 not match that recorded in the memory, a further communication may be sent to the subject asking for resending of the identifier, and this step may be repeated more than once, to allow for the possibility of personal error without noting any change in the recorded status of the subject.

20 If it is found, as a result of step (18) or (20) that no response at all can be obtained from the subject, or that no correct personal identifier is received, within the set time limit, the status of the subject is updated to 'alert' ('alarm activated'). Once this status has been set, information relating to an alert procedure for the subject in question is retrieved from the memory: this

25 information will include details for contacting further communication means associated with a further person or persons, e.g. one or more colleagues and/or managers of the subject, to enable such further persons themselves to check the well-being of the subject, and/or the emergency services. The alert procedural information may require that a message initially is sent to a

30 colleague of the subject, and in the absence of any response from that colleague, that a message is sent after a pre-determined elapsed time to a

more senior figure. This allows for an escalation procedure to be defined wherein other parties are contacted in a specified order, until one or more parties respond to the contact in a satisfactory way.

5 With reference to figure 1 of the drawings, a negative response to either of the steps (18) or (20) causes the alarm escalation procedure to be initiated, drawing the alarm procedural information from the memory of the system and initiating the step before contacting further communication means. Depending on whether or not the person/communication means first contacted in step (24)
10 responds to the contact (26), either the next person on the alert contact list is contacted (28), or an alert message is sent to the first-mentioned contact (30). It would be possible, when an alert status is established, for more than one person or communication means to be contacted at the same time as part of the procedure, and appropriate means of communication may be utilised.

15

The alert message may include details drawn from the memory of the system, which may include (but not be limited to) the name or other identifier of the subject in question in respect of whom the alert has been raised, and/or when the timer relating to that subject expired and/or the last known location of the subject in question and/or the status of the task upon which the subject was known to be working and/or the last time the subject responded to an attempt to establish contact and/or the job number of the working being undertaken and/or the schedule of jobs assigned to the worker and/or the position of the worker on a predefined route. This information can be used by the recipient of
20 the alert message to attempt to contact the subject, or to identify his location or to check his status personally.

25

Once the contacted party has dealt with the situation and ensured the well-being of the subject, a message can be sent to the first communication means
30 instructing the system to reset, with a status of the subject reverting to normal. Normal monitoring of the subject may then continue. It would of course be

possible for the subject to communicate with the system at any point during the above procedure, with the appropriate personal identifier, to cause the system status with regard to that subject to be returned from alert to normal, and the alert procedure cancelled. Preferably the system provides for a subject to send a communication at any time from the second communication means to the first communication means to indicate that the status should be changed to the alert status. Such a communication may take the form of a telephone call to a specific number, or an e-mail, or text message, or any other form of communication. If this is done, the alert procedure is initiated as described above. By this means, a subject may request assistance at any time.

It is known that mobile telephones can incorporate accelerometers to detect motion of the telephone in one or more directions. If the telephone is carried by a person, and no motion is detected over a period of time, this may indicate that the person has been incapacitated in some way. Alternatively, a pattern of motion including a sudden motion followed by a static period might indicate that the person has fallen, or else a pattern of repeated still periods could indicate that an alert status should be set, depending on the situation. A telephone can be programmed to initiate a communication with the system in order to indicate that the status should be changed to the alert status. Alternatively, the telephone may be programmed to ring, and to initiate an alert communication to the system if the ringing does not provoke a response from the subject within a predefined time period.

25

A record of the motion detected by the telephone may be recorded in graphic format, as a continuous graph over the period in which monitoring takes place. An irregular pattern might be spotted by a colleague monitoring the graph and in the case where an alert status has not been set, the colleague might, as a precautionary step, initiate a communication with the person being monitored. Alternatively, if an alert status is set, the graph may be studied in order to gain

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some indication from the pattern of motion as to what might have caused the alert.

In general, any convenient form of data communication may be used for communication between the first and second communication means. For example, a (pre-recorded) voice telephone call may be sent, a SMS or other text message, an e-mail, or in the case of suitably enabled communication devices, a web page. This may be responded to by a corresponding or other type of message including the personal identifier. By way of example only, in the case of a subject responding by text message to send a personal identifier number, the following or preceding of that number with a predetermined character or series of characters may initiate the monitoring process or stop the monitoring process when the current task of the subject has been completed. Upon receipt of a message causing initiation of the monitoring procedure, a message may be sent requiring the subject to provide certain information, for example a detailed address or the like, enabling the location of the subject to be established with a high degree of accuracy.

Referring now to figure 2 of the drawings, this illustrates the operation of an alternative embodiment of status monitoring system, monitoring a subject such as a vulnerable person, for example an elderly or disabled person. In principle, this is very similar to what is shown in figure 1, and corresponding parts/steps are indicated by the same reference numerals used in figure 1 but with the addition of 100. Thus, the monitoring system includes a first communication means, a processor and a memory, and a second communication means which is provided for use by the vulnerable person. The second communication means may be hand-held, as in the case of a mobile telephone or pager, or alternatively may be a static device, provided on the wall of an apartment for instance. The memory of the monitoring system stores details of the person being monitored, including, but not limited to: their location or address, any medical conditions suffered, details of a suitable time

interval between monitoring requests, and an alert escalation procedure. In addition, the memory has to store details enabling contact to be made with the second communication means.

- 5 To start operation of the system, a communication may be sent from the second communication means (110), as shown at (112), to start operation of the time (114). Once the system is in operation, request messages are communicated to the subject, being sent (116) from the first communication means to the second communication means at intervals specified in
- 10 accordance with the time information stored in the memory. The subject is then required to indicate his/her status by sending a communication (120) from the second communication means to the first communication means. The indication of status may take the form of a message containing text, or may be given by the operation of a single reply button in the case of a mobile telephone, pager, or dedicated device installed in the subject's home
- 15 premises, for example. Unlike the embodiment of figure 1, the system may not call for a personal identifier to be communicated, as this adds complication and, in the case of an elderly person it may be difficult for him/her to recall the personal identifier at the time when it is required. When the subject has sent a communication, it is checked for being satisfactory (122), and if a satisfactory status has been communicated, the status stored in the memory remains as normal. If no satisfactory communication of status is received by the first
- 20 communication means after a set period of time stored in the memory, or if communication with the second communication means cannot be established within a stored time interval, the status in the memory is updated to alert, and the alert procedure recorded in the memory is followed.
- 25
- 30

The alert procedural information may include details of people and/or devices to contact once the status has been set to alert. This information may include details of relatives, carers, wardens, and so forth. The recorded information

may also include a contact telephone number, electronic mail address, or any alternative means of making contact with each of the parties specified.

Analogously to the embodiment of figure 1 of the drawings, in the alert procedure a communication may be sent to a first person as indicated at (124), and if communication with that person is satisfactorily established (126) the alert information may be sent to that person. If the first communication with an associated person is not established, the next associated person in the alert procedure contact list is sent a communication (128). Once communication has been established with a person on the alert procedure list, an alert message is sent (130) to that position, including relevant details relating to the subject in question, to enable checking of their well-being. Once the situation has been dealt with and the well-being of the subject ensured, a message can be sent to the first communication means instructed in the system to reset to normal status of the subject, and normal monitoring of the subject to continue.

As in the embodiment first described, any suitable form of data communication may be used for communication between the respective parties.

When used in this specification and claims, the terms "comprises" and "comprising" and variations thereof mean that the specified features, steps or integers are included. The terms are not to be interpreted to exclude the presence of other features, steps or components.

The features disclosed in the foregoing description, or the following claims, or the accompanying drawings, expressed in their specific forms or in terms of a means for performing the disclosed function, or a method or process for attaining the disclosed result, as appropriate, may, separately, or in any combination of such features, be utilised for realising the invention in diverse forms thereof.

Claims

1. A method for monitoring the status of a subject, the method including:
 Storing, at a monitoring station, information relating to the status of the
 5 subject,
 communicating a request from a first communication means associated
 with the monitoring station to a second communication means associated with
 the subject; and either
 communicating a response from the second communication means to
 10 the first communication means before a predetermined period of time has
 elapsed, or, in the absence of a timely response,
 updating the stored status to an alert condition.

2. The method according to claim 1, wherein the predetermined period of
 15 time in which a response can be made is stored in a memory.

3. The method according to claim 1 or claim 2, wherein the steps of
 communicating a request from the first communication means to the
 second communication means, and either
 20 communicating a response from the second communication means to
 the first communication means before the predetermined period of time has
 elapsed, or
 updating the stored status to alert,
 are repeated after a stored predetermined time interval.

25

4. The method according to claim 3, wherein information denoting
 operating times is recorded in the memory, and outside the recorded hours of
 operation no request communications are made to the second communicating
 means.

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5. The method according to claim 3 or claim 4, wherein a predefined communication may be made from the second communication means to the first communication means which terminates the monitoring.

5 6. The method according to any one of the preceding claims, further including storing a personal identifier in the memory.

7. The method according to claim 6, wherein communicating a response from the second communication means to the first communication means includes communicating a personal identifier.
10

8. The method according to claim 7, wherein communicating the response is invalid if the personal identifier in the communication does not match the personal identifier stored in the memory.
15

9. The method according to any one of the preceding claims, further including communicating initialising information from the second communication means to the first communication means, the initialising information being stored in the memory.
20

10. The method according to claim 9, wherein the initialising information includes the subject's name, personal identifier, location, status, the time interval between response requests, the time limit on response time, or any combination of these features.
25

11. The method according to any one of the preceding claims, wherein a device identification of a communication means sending a communication is recorded in the memory when a communication is received by the first communication means, the device identification including at least one of: the telephone number, Internet Protocol address, Media Access Control address, or other means of identifying a communication source.
30

12. The method according to claim 11, further including referencing the device identification of a communication received by the first communication means, against the device identification recorded in the memory for that device.

5

13. The method according to any one of the preceding claims, further including storing information in the memory at an initial stage, including subject names, personal identifiers, locations, time interval between response requests, time limit on response time, device identification, and alert procedural information, or any combination of these features.

10

14. The method according to claim 13, wherein the alert procedural information includes a plurality of instructions for contacting further communication means, which may include a telephone number and/or email address, and a specified time after which to attempt to contact this means.

15

15. The method according to claim 14, wherein the status monitoring system further includes at least one further communication means.

20

16. The method according to claim 17, further including communicating an alert from the first communication means to one or more of the further communication means, as specified in the alert procedural information stored in the memory.

25

17. The method according to claim 16, wherein the alert is communicated to each further communication means after a set period of time has elapsed since the status was set to alert, as recorded in the alert procedural information.

30

18. The method according to claim 16 or claim 17, wherein the alert is communicated to each further communication means repeatedly, at an interval

recorded in the alert procedural information, until a response is communicated from said further communication means to the first communication means.

19. The method according to claim 18, further including communicating an alert information message from the first communication means to a further communication means when a response has been communicated.

20. The method according to claim 19, wherein the alert information message includes details recorded in the memory, including a name and/or contact details of the second communication means and/or location and/or job status and/or time of last response.

21. The method according to any one of the preceding claims, wherein a predefined alert message may be communicated from the second communication means to the first communication means, upon receipt of which the status in the memory is updated to an alert status.

22. The method according to any one of the preceding claims, wherein details of the communications are logged to the memory.

23. The method according to any one of the preceding claims, further including monitoring a plurality of communication means, each having corresponding information stored in the memory, and a corresponding status, and each being monitored in the same way as the second communication means.

24. The method according to any one of the preceding claims, wherein communications are established by one or more of voice (live or recorded) communications, text messages, electronic mail, web communications.

25. The method according to any one of the preceding claims, wherein the or each second communication means is a mobile telephone.

26. The method according to claim 25, wherein the or one of the mobile telephones incorporates motion-detecting means and, if no motion of the respective subject is detected in a predetermined time period, an alert condition is established.

27. A method for monitoring the status of a subject, substantially as described herein and/or with reference to the accompanying drawings.

28. Apparatus for carrying out the method according to any one of the preceding claims, comprising:

means for storing the information relating to the status of the subject,

15 a first communication means,

at least one second communication means, and

a timer operable to measure the time between a request, from the first communication means to the second communication means, and any response from the second communication means.

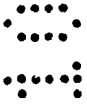
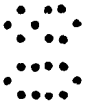
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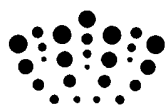
29. Apparatus according to claim 28 wherein the timing means is able to determine a predetermined timed interval between the sending of requests from the first communication means to the second communication means.

25 30. Apparatus according to claim 28 or claim 29 wherein the timing means, a memory for storing information, the first communication means, and a processor operating in accordance with software for determining operation of the first communication means and the timing means are provided at a monitoring station.

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31. Apparatus according to any one of claims 28 to 30 wherein the or at least one of the second communication means is a mobile telephone.
32. Apparatus according to claim 31 wherein the or at least one of the
5 mobile telephones incorporates motion-detecting means.
33. Apparatus adapted for carrying out the method according to any one of claims 1 to 27.
- 10 34. Any novel feature or novel combination of features described herein and/or in the accompanying drawings.





Application No: GB0819065.4

Examiner: Gareth Lewis

Claims searched: 1-33

Date of search: 17 February 2009

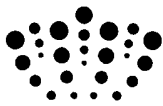
Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
X,Y	X: 1-3, 9, 11, 13-16, 22, 24-25, 28-30, 31, 33 Y:26,32	US7026928 B1 (LANE) See especially figure 1, paragraphs 12,13,17, 26-30, 40, 43, 59-67
X,Y	X:1-4, 6,7, 11-18, 22-25, 28-31 Y :26,32	WO2005/073938 A1 (MOBILE REACH) See figures, claims and especially pages 6, 7, 11-12.
X,Y	X: 1-3, 6,7, 13-16, 22-25, 28-31 Y:26,32	US2003/091158 A1 (PUCHEK) See especially figure 1 and paragraphs 14, 22, 45, 47, 49, 52
X	1-4, 6,7, 13-16, 28-30	US5333173 A (SEAZHOLTZ) See especially columns 2-4
X	1,2,4,5, 9,10, 13-16,	US7312712 B1 (WORRALL) See especially figure 1, abstract, column 7
X,E	1-3, 6,7, 13-16, 24,25, 28-31	EP2006815 A1 (COMPLICITY) See abstract, figures, claims
Y	26, 32	US4906972 A (SPENCER) See especially column 2, 6, 8

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.



& Member of the same patent family

E Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC^X :

G4N

Worldwide search of patent documents classified in the following areas of the IPC

G08B

The following online and other databases have been used in the preparation of this search report

Online ; EPODOC WPI

International Classification:

Subclass	Subgroup	Valid From
G08B	0021/04	01/01/2006