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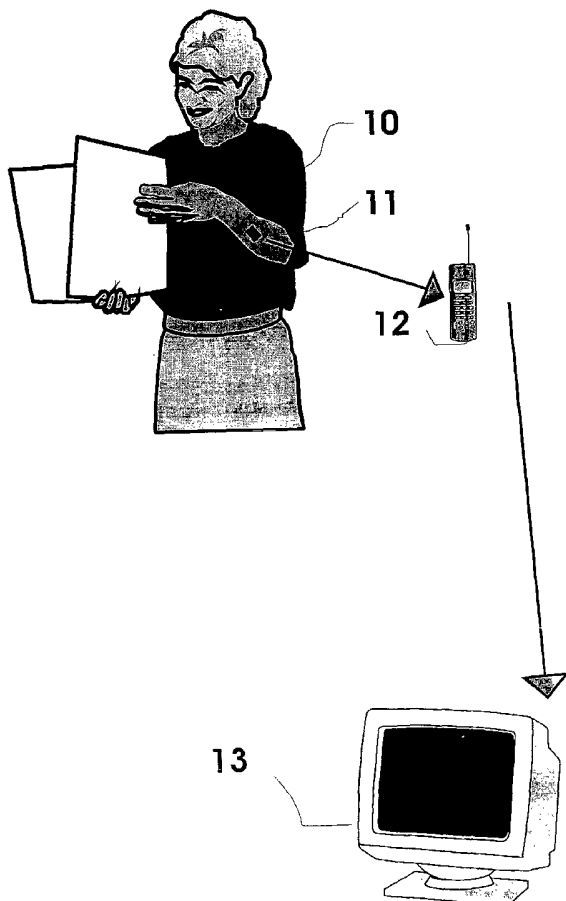
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(54) Title: MONITORING SYSTEM



(57) Abstract: A monitoring system having a means on a person which can process and transmit signals from at least one biosensor and a receiver located close to the patient, which can receive these signals. The receiver, which may be a portable phone can process the signals and provide an indication of the parameter(s) being monitored and may also, or as an alternative, forward the received signals to a remote monitor. The system may include means to indicate when the transmitter is not receiving a signal from the transmitter and can also include means so that when a parameter reaches a concern level, there is an alarm. The arrangement is such that the person being monitored is effectively not limited to remaining within a required distance of a fixed part of the system.



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European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE,
ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SK,
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— *with international search report*

MONITORING SYSTEM

This invention relates to a monitoring system and specifically to a system for use in medical applications.

5 There are particular areas where relatively constant monitoring of certain vital signs of a person are desirable but, at the same time the person is ambulatory and does not need hospitalisation.

For example, for a person who has a heart attack occurrence it may be desirable to monitor heart rate over a relatively short period whilst the person is recuperating whilst an elderly person with a heart condition or, say, diabetes may need constant monitoring
10 for substantial periods, such as years.

There are, today, many sophisticated monitoring systems one, for example, is described in Patent Cooperation Treaty Application No. PCT/AU01/01240 where various types of monitors can be connected to an electrode and, provided the monitor is close to the electrode, then it receives a message from the electrode so the user does not have to be
15 physically connected to the monitor.

It is also known to use the telephone system to provide a monitor with input material, such arrangements being commonly used with ECG's where the result of the electrodes are transmitted by way of a modem on a standard telephone line to remote recording apparatus. There are also similar systems, for example as illustrated in PCT Patent
20 specification WO 94/01039 of Jacob Segalowitz where the transmission is by way of a radio transmitter. These systems are basically short term arrangements whilst a particular reading is being taken.

There has also been proposed, in US patent specification 6,416,471 and arrangement where vital signs are measured and are fed to a small signal transfer unit which transmits

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signals to a base station which, in turn can transmit signals along conventional telephone lines. It is necessary for tis system to work that the signal transfer unit remain within a limited distance of the base station.

5 It is to monitors of this general type that this invention relates and, specifically, to a system where the person is generally not restricted to being within a specific distance from a base station.

It is also an aspect of the invention that the vital signs can be provided at a remote monitor but which can be provided with a local indication of various parameters.

10 The invention, in its broadest sense, includes a monitoring system having a means on a person which can process and transmit signals from at least one biosensor and a receiver located close to the patient, which can receive these signals.

It is preferred that the monitoring system can forward the received signals to a remote monitor.

15 It is also preferred that the receiver has a display and includes means whereby the received signals can be again processed to provide on the display the reading of the biosensor.

It is also preferred that the receiver is a mobile phone, preferably a cellular phone..

20 In a particular form of the invention the cellular phone incorporates the receiver and chip-set which performs a primary analysis according to pre-set and adjustable values, and a monitor which can provide, on the phone screen, an indication of the parameter being maintained and the current value.

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Also the phone may be arranged so that when the parameter reaches a pre-determined value, the phone automatically dials a more sophisticated monitor for the parameter which reads the value and transmits details to a remote monitoring facility where human intervention may occur.

- 5 The phone may also have an arrangement whereby if any parameter being monitored reaches a critical level there is a warning alarm to the user or his/her carer and physical resources marshalled to deal with the event.

The system may also have an arrangement whereby if the separation between the phone and the transducer is greater than the transmitters range of 1-2 metres then the phone will
10 effect a warning signal.

In order that the invention may be more readily understood we shall describe one particular arrangement of the invention in relation to the drawing.

Basically there are two components.

The first is the electrode system 11 which is worn by a person and which provides an
15 indication of the parameter or parameters being monitored. In the drawing this is shown on the arm of the user 10 but depending on the parameters, this may be on other parts of the body. The second is the cellular phone 12 which can receive this information.

In a practical arrangement, there can be considered to be a third component which is the remote monitoring facility 13.

20 As far as the electrode arrangement is concerned, it could be considered to be similar to that in the Patent Cooperation Treaty application previously mentioned but may take any form.

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Basically, there must be at least one biosensor which gathers data relating to the parameter being measured which could, for example, be heart rate and rhythm, blood pressure, temperature, respiration, as well as Oxygen, Carbon dioxide and pH levels in the blood or any of a number of other different biochemical or physiological parameters.

- 5 There will, of course, be any necessary circuitry to, say, digitise the results of the biosensor(s), if these are originally in analogue form.

The transmitter transmits its signal to a receiver inbuilt or attached to the cellular phone 12 which is adapted to be relatively close to the transmitter and which may be arranged to provide an aural or visual warning if it is further away than a maximum distance.

- 10 In one form, this warning may simply be a signal from the phone itself or it could be that the phone is caused to operate to dial an external number to provide an indication that the spacing is unsatisfactory.

The phone is provided with circuitry to receive the signal from the transmitter and to convert it back to an indication of the parameter being measured.

- 15 This parameter can be displayed on the phone screen either as instantaneous figures, a series of figures on a time basis or a plot on a time basis of the value of the parameter.

This means that the patient or a physically located carer have means whereby they can ascertain the status of the parameter.

- 20 The telephone also has means whereby the information can be transmitted to the remote monitor 13, directly or via the internet, either on a regular basis in which case the phone may have a memory and a hierarchy of calls depending on the event and the severity. The phone can store particular values of the parameter or it may simply forward the present value and also have means whereby, on the parameter reaching a pre-determined warning

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condition the phone automatically dials the remote monitor, forwards the information to it and possibly actuates an alarm at the remote monitor.

The invention can also be used in association with GPRS (General Packet Radio Service) in which there is effectively a permanent connection and a cost per kilobyte of data and under such a system, should an alarm state be reached, a packet of digitised information is automatically sent to the remote monitor without the necessity of actually dialling the monitor.

Thus, the person in ultimate charge of monitoring the condition of the patient will be rapidly made aware of any change in the parameter which could be a change for the worse.

This person may then take steps to initiate a treatment program for the patient which, in itself, could be initiated through the phone automatically initiating the operation of, say, a bolus of medication into a drip. More usually, the person will contact the patient or the carer and notify them of the necessity of action being taken.

It can be that several different parameters are monitored on the same patient and they can selectively be displayed on the mobile phone screen on operation of specific keys and these may each have a different telephone number to be dialled out on a pre-determined change in the parameter so that different properties, even in different areas, can be notified when particular parameters vary.

It will be seen in that the invention provides a means whereby ambulatory patients who could well normally need hospitalisation can be maintained at home or in a non-hospital environment whilst having their vital signs monitored as effectively as would be the case if they were hospitalised, and with good warning if there is any change in their state. At the same time, where the receiver is a cellular phone, the person is restricted only by the area of coverage of the cellular system when means that for most people, particularly

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those in urban areas, that they are effectively non-restricted as far as movement is concerned.

Furthermore, those patients with manageable health conditions can be closely monitored without undue imposition or intrusiveness.

5 Whilst we have described one particular method of using the invention it will be appreciated that the invention could also be applied to hard wired telephone systems or even radio systems should this be required. It will also be understood that the types of electrodes and transmitters used could be varied to suit particular circumstances and it could also be that the degree of manipulation of the incoming signals by the telephone
10 system can be modified depending upon particular requirements and uses.

The transmission from the transmitter to the telephone 12 can be in any required way, such as using Bluetooth technology or Ultra Wide Band (UWB) technology.

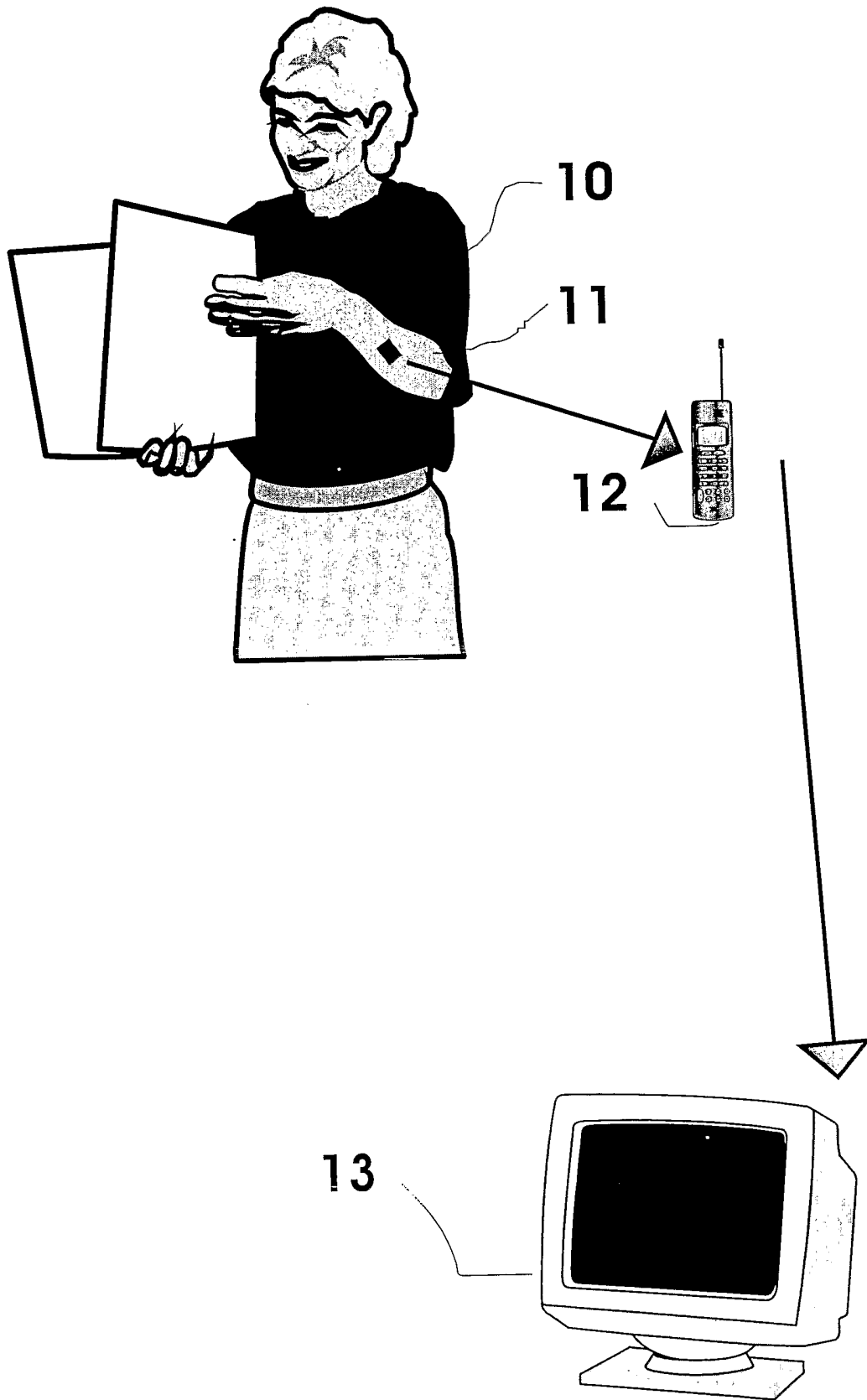
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We claim:

1. A monitoring system having a means on a person which can process and transmit signals from at least one biosensor and a receiver located close to the patient, which can receive these signals.
- 5 2. A monitoring system as claimed in claim 1 wherein the receiver can forward the received signals to a remote monitor.
3. A monitoring system as claimed in claim 1 or claim 2 wherein the receiver has a display and includes means whereby the received signals can be again processed to provide on the display the reading of the biosensor.
- 10 4. A monitoring system as claimed in claim 2 wherein the signal is further processed in the receiver before transmission to the remote monitor.
5. A monitoring system as claimed in any preceding claim wherein the transmitted signal is effected by way of a Bluetooth transmission.
- 15 6. A monitoring system as claimed in any one of claims 1 to 6 wherein the transmission of the signal is effected by the use of an Ultra Wide Band communication transmission system.
7. A monitoring system as claimed in any preceding claim wherein the receiver is a mobile phone.
- 20 8. A monitoring system as claimed in claim 7 wherein the mobile phone is a cellular phone.

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9. A monitoring system as claimed in claim 7 or claim 8 wherein the mobile phone has a screen and wherein the phone can convert the signal so that the reading of the biosensor can be displayed on the screen of the phone.
10. A monitoring system as claimed in either claim 7 or claim 8 wherein a received
5 signal can be forwarded to the remote monitor.
11. A monitoring system as claimed in claim 9 wherein the received signal is automatically forwarded to the remote monitor.
12. A monitoring system as claimed in any preceding claim wherein if the receiver
is at a distance greater than a predetermined distance from the monitor, a warning
10 condition is established.
13. A monitoring system as claimed in any preceding claim wherein if the or any one of the signals from a biosensor reaches a critical level then a warning signal is transmitted to the remote monitor.



INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU02/01530

A. CLASSIFICATION OF SUBJECT MATTER		
Int. Cl. 7: A61B 5/00, G06F 17/60		
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)		
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) WPAT: MONITOR, PATIENT, CELLULAR, PHONE AND SIMILAR TERMS		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2001/0029321A1 (BEETZ et al.) 11 October 2001 whole document	1-13
X	WO 01/52934A1 (MEDTRONIC, INC.) 26 July 2001 whole document	1-13
X	WO 01/45014 A1 (QUY) 21 June 2001 whole document	1-13
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C <input checked="" type="checkbox"/> See patent family annex		
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"A"	document defining the general state of the art which is not considered to be of particular relevance	"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
"E"	earlier application or patent but published on or after the international filing date	"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
"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)	"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
"O"	document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"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 28 January 2003		Date of mailing of the international search report - 3 FEB 2003
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustralia.gov.au Facsimile No. (02) 6285 3929		Authorized officer SUSHIL AGGARWAL Telephone No : (02) 6283 2192

INTERNATIONAL SEARCH REPORT

International application No.

PCT/AU02/01530

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5544661A (DAVIS et al.) 13 August 1996 whole document	1-13

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/AU02/01530

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member					
US	2001/0029321	EP	1127535	DE	10008917		
WO	01/52934	EP	1251906	US	2001051787	US	2002013613
		US	2002052539	US	2002082665	EP	1196082
		WO	2002057994	WO	200103575	WO	2002056762
WO	01/45014	EP	1247229	US	2001047125		
US	5544661	NONE					

END OF ANNEX