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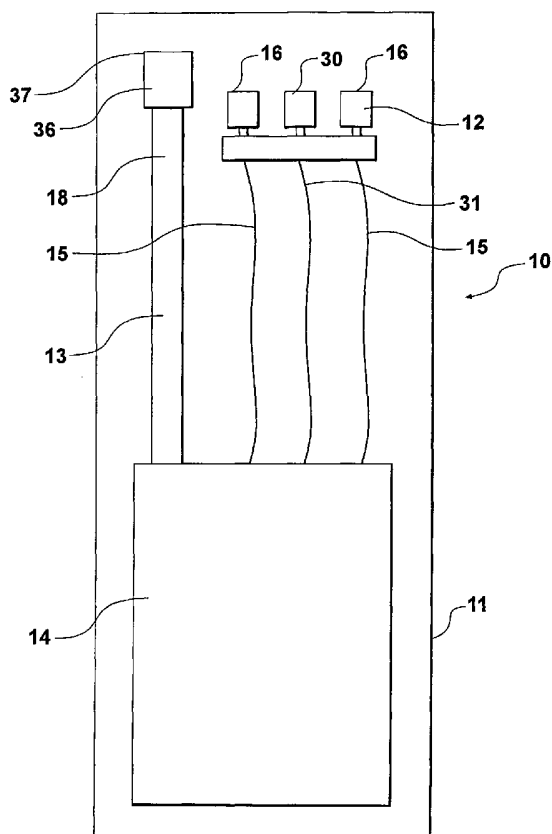
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(54) Title: THERAPEUTIC APPARATUS



(57) Abstract: A hand held device (11) contains a non-contact thermopile for detecting infra red radiation from a human or animal body, means (13) for detecting electromagnetic characteristics exhibited by the body and PEMFT means (15) for generating pulsed magnetic wave forms. The detecting means (13) locates a body area suitable for treatment and the wave forms generated to provide the treatment can be adjusted according to readings of the detection means. These are preferably provided to a computer which in turn controls the PEMFT equipment.

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## "THERAPEUTIC APPARATUS"

This invention relates to therapeutic apparatus, and more particularly to apparatus for the treatment of human or animal bodies using pulsed electromagnetic fields. It has been known for many years that the application of an electromagnetic field to an affected body part can have a healing effect or may relieve pain and this form of treatment is obviously preferable to invasive surgery or the use of drugs. Indeed there is no need for the equipment even to touch the body, so that for example there is no necessity for a patient to disrobe.

10

The International Patent Application No. PCT/GB2003/002616 published as WO/2004/00418 discloses a hand-held device for applying pulsed electromagnetic field therapy (PEMFT). The device is pointed at an area of the body to be treated and pulsed electromagnetic wave forms that include decaying pulses are generated. No provision is, however, made for modifying the wave forms generated.

15

It is observed that damaged or diseased areas of the body exhibit both thermal and electromagnetic radiation characteristics different from those exhibited by healthy areas. Where there is disease or trauma the flow of blood may be increased or decreased, locally increasing or decreasing the thermal radiation of the body. It is believed that it will be beneficial to vary the wave forms pulsed to such damaged or diseased areas appropriately to the thermal or electromagnetic characteristics exhibited by such areas. Variation may take the form of varying the frequency, amplitude, the field intensity, the pulse repetition rate or the duration of a pulsed wave form, or any combination of such variations. Therefore the principal object of the present invention is to provide apparatus which will detect areas of the body requiring treatment and vary the treatment in accordance with the thermal and/or electromagnetic characteristics exhibited by such areas.

25

Another object of the present invention is to provide a PEMFT device which will emit pulsed electromagnetic fields along angularly related axes. Existing such devices emit along a single axis. The weak DC magnetic fields emitted by the body are three

30

dimensional and to provide pulses along more than one axis will provide improved treatment.

In accordance with the present invention there is provided apparatus for the therapeutic  
5 treatment of a human or animal body comprising means for detecting variations in radiation from the body to identify an area to be treated and means for applying pulsed electromagnetic wave forms to said area.

The wave forms are preferably modified in accordance with data obtained by the detecting  
10 means.

The detecting means may be adapted to detect variations in thermal radiation from the body, preferably infra red radiation. In this case the detecting means may be a non-contact thermopile able to detect infra red radiation around 10 microns in wavelength.

15 The output signal from the thermopile is preferably an analogue voltage which varies in proportion to the infra red radiation absorbed from within the field of view of the thermopile, and means is preferably provided to convert said voltage into an audible or visual signal.

20 Alternatively, or in addition, the detecting means may be adapted to detect variations in electromagnetic radiation from the body.

The means for detecting electromagnetic radiation preferably comprises a probe element  
25 adapted to detect electromagnetic characteristics when positioned near to the body, the probe communicating with a computer via a 3 axis electromagnetic field transducer and the computer having software which will convert signals received from the transducer into visible wave forms.

The said means for applying pulsed electromagnetic wave forms may comprise means for producing electrical signals and angularly related coils which will generate electromagnetic fields when energised by said signals.

- 5 The computer software is preferably adapted to modify the said electrical signals in accordance with signals received from the said transducer, thereby modifying the treatment applied to said body area in accordance with the electromagnetic characteristics thereof.

Said detecting and applying means are preferably mounted within a common housing of a  
10 unitary, hand-held device, which is preferably battery operated.

Communication between any of the probe and the transducer, the transducer and the computer and the computer and the means for producing electrical signals may be by wireless transmission, which may be Bluetooth enabled.

15

Preferred embodiments of the invention will now be described by way of non-limitative example with reference to the accompanying drawings, in which:

Figure 1 illustrates a combined detecting and PEMFT equipment mounted within a common  
20 housing to provide a unitary, hand-held device,

Figures 2 and 3 illustrate optional variations of the coil configuration of the PEMFT equipment of Figure 1,

Figure 4 is a block diagram illustrating the components of the device of Figure 1, and

Figure 5 is a block diagram illustrating cooperation between the device of Figure 1 with an  
25 external computer and VDU.

The device 10 of Figure 1 combines within one hand-held housing 11 PEMFT equipment 12 such as disclosed in the aforementioned International Patent Application published under the number WO 2004/00418, a non-contact thermopile 30 able to detect infra red radiation  
30 around 10 microns in wavelength and a probe 13 for detecting electromagnetic characteristics at the surface of a human or animal body. Within a compartment 14 at one

end of the housing 11 is a source of electricity, such as one or more batteries, and a direct to alternating current converter. Alternating current is thus applied by wires 15 to coils 16 at the other end of the housing 11. In the region of the coils 16 the housing 11 is preferably of a biocompatible material so that it will not react with a user's skin if brought into contact with the user's body.

The wave form of the electrical signals that energise the coils 16 includes exponentially decaying pulses. Typically the wave form has a pulse frequency in the range 0.5 to 10Hz, a peak voltage around +36V, a pulse length in the range 1 to 5 milliseconds and an oscillation frequency in the range 3KHz to 30KHz. Characteristics of a single pulse of a preferred wave form are illustrated in Figures 2 and 3 of the drawings of International Patent Application published as WO/2004/00418. The wave form has an oscillation frequency of 23KHz, a + or - 12V peak voltage, a pulse length of 3 milliseconds and a pulse frequency of 1.25 Hz.

The probe 13 comprises a ceramic plate 36 having a field sensitive area 37 near its tip. The plate 36 is connected by wires 18 to a 3 axis magnetic field transducer (not shown) located within the compartment 14. The power supply to the probe 13 may be the same batteries which power the PMFT equipment 12, or either or both may be connected by suitable leads (not shown) to a mains supply via a transformer.

In accordance with one embodiment of the invention electromagnetic characteristics detected by the probe 13 are converted by the electromagnetic field transducer into digital information which is passed to a computer 19 (Figure 5). Preferably the computer is capable of converting this information into visible wave forms which can be seen on its VDU screen 20. Preferably the computer also has software whereby it can modify the signals sent to the coils 16 in accordance with information received from the probe 13 so as to provide optimum electromagnetic fields for treatment according to information detected by the probe about the body area to be treated. Alternatively the PEMFT equipment may be manually adjustable.

Preferably communication between the hand-held device 11 and the computer 19 is by wireless transmission. Alternatively the housing 11 may be connected to the computer 19 by suitable leads.

5 Figures 2 and 3 illustrate variant coil configurations for the PEMFT equipment. Instead of parallel coils 16 as in Figure 2 coils 16A and 16B having axes at right angles to one another may be provided (Figure 3). Angularly related coils or coils grouped as in Figure 2 will "cut" lines of magnetic flux emitted by a human or animal body more effectively than a single coil.

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In use of the apparatus illustrated the housing 11 is held so that it's applied part is near to but not touching the body of a patient and is swept to and fro over a region thought to require treatment. The computer screen 20 can be watched to detect anomalous wave patterns which may indicate a precise point, analogous to an acupuncture point, where  
15 treatment will be beneficial. Unless the computer 19 has already done so the PEMFT equipment can be adjusted to produce pulsed electromagnetic waves with a characteristic appropriate to the identified area.

The thermopile 30 may be provided instead of or in addition to the coils 16, or it may be  
20 omitted. When the thermopile 30 is provided the compartment 14 contains a microprocessor 40 (Figure 4) which will convert output signals from the thermopile 30 along wires 31 into a visual and/or audible signal which will vary with the infra red radiation absorbed by the thermopile 30 from the area of a body within the field of view of the device 10. The operation of the device 10 is controlled by control buttons on the  
25 exterior of the housing 11. In addition to an on/off button there is a thermopile scan button which will cause the thermopile 30 to scan, a magnetic probe button which will cause the sensor 13 to scan, a treat button which will energise the coils 16 and an analyse button which will send signals from either of the sensor 13 or thermopile 30 to the computer 19, which in turn will adjust the output of the coils 16 in accordance with a detected radiation  
30 variation from the body.

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Preferably the output from the coils 16 is varied by the computer 19 only so long as an anomaly is detected in the radiation from the body. Such variation may take the form of varying any one or more of the intensity, frequency or duration of electromagnetic pulses. Detected radiation may be compared in the computer 19 with a "norm" and the  
5 electromagnetic pulses varied proportionally to divergence from the norm. When, for example, abnormal heat distribution is detected the treatment may be varied as the area being treated cools or warms as a result of the treatment.

It is to be stressed that either of the detecting means 13 and 30 and the apparatus associated  
10 therewith may be omitted. In a device in which they are both present output signals from both of them may be transmitted simultaneously to the computer 19, which may be programmed to vary the output of the coils 16 and thermopile 30 in accordance with an integration of the detection signals.



## CLAIMS:

1. Apparatus for the therapeutic treatment of a human or animal body comprising means for applying pulsed electromagnetic wave forms to said body, **characterised in that**  
5 the apparatus additionally comprises means (13,30) for detecting variations in radiation from the body to identify an area to be treated.
2. Apparatus as claimed in claim 1 **characterised in that** the wave forms are modified in accordance with data obtained by the detecting means (13,30).  
10
3. Apparatus as claimed in either preceding claim, **characterised in that** the detecting means (30) is adapted to detect variations in thermal radiation from the body.
4. Apparatus as claimed in claim 3, **characterised in that** the detecting means (30) is  
15 adapted to detect infra red radiation from the body.
5. Apparatus as claimed in claim 4, **characterised in that** the detecting means is a non-contact thermopile (30) able to detect infra red radiation around 10 microns in wavelength.  
20
6. Apparatus as claimed in claim 5, **characterised in that** the output signal from the thermopile (30) is an analogue voltage which varies in proportion to the infra red radiation absorbed from within the field of view of the thermopile, means (40) being provided to convert said voltage into an audible or visual signal.  
25
7. Apparatus as claimed in claim 1 or claim 2, **characterised in that** the detecting means (13) is adapted to detect variations in electromagnetic radiation from the body.
8. Apparatus as claimed in any one of the preceding claims, **characterised in that**  
30 means is provided for detecting both thermal (30) and electromagnetic (13) radiation from the body.

9. Apparatus as claimed in claim 7 or claim 8, **characterised in that** the means for detecting electromagnetic radiation comprises a probe element (13) adapted to detect electromagnetic characteristics when positioned near to the body, the probe communicating with a computer (19) via a 3 axis electromagnetic field transducer (14) and the computer having software which will convert signals received from the transducer into visible wave forms.
10. Apparatus as claimed in any one of the preceding claims, **characterised in that** said means for applying pulsed electromagnetic wave forms comprises means for producing electrical signals and angularly related coils (30,16, 30,16B) which will generate electromagnetic fields when energised by said signals.
11. Apparatus as claimed in claim 9, or claim 10 as appendant to claim 9, **characterised in that** the computer (19) is adapted to modify the said electrical signals in accordance with signals received from the said transducer (14), thereby modifying the treatment applied to said body area in accordance with the electromagnetic characteristics thereof.
12. Apparatus as claimed in any one of the preceding claims, **characterised in that** said detecting (13) and applying (30,16) means are mounted within a common housing (11) of a unitary, hand-held device (10).
13. Apparatus as claimed in claim 12, wherein the device (10) is battery operated.
14. Apparatus as claimed in claim 9, or any one of claims 10-13 as appendant to claim 9, wherein communication between any of the probe (13) and the transducer (14), the transducer and the computer (19) and the computer and the means (16) for producing electrical signals is by wireless transmission.
15. Apparatus as claimed in claim 14, wherein the wireless transmission is Bluetooth enabled.

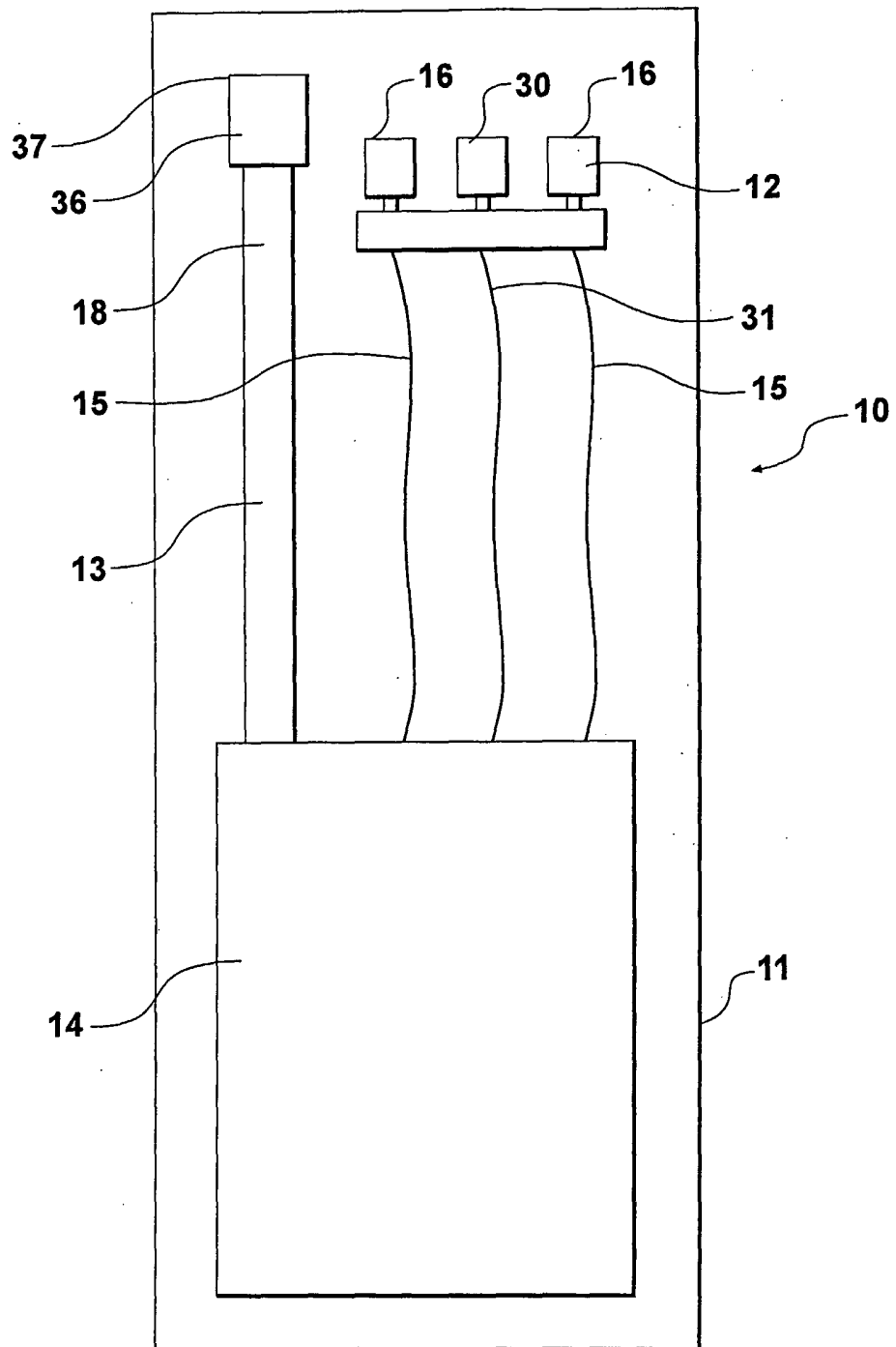


Fig. 1

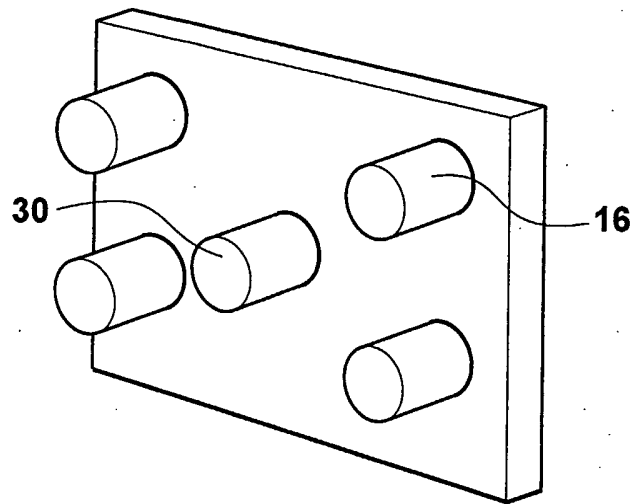


Fig. 2

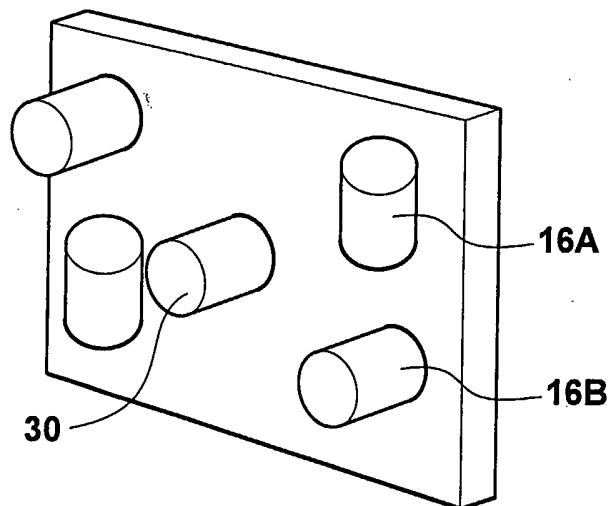
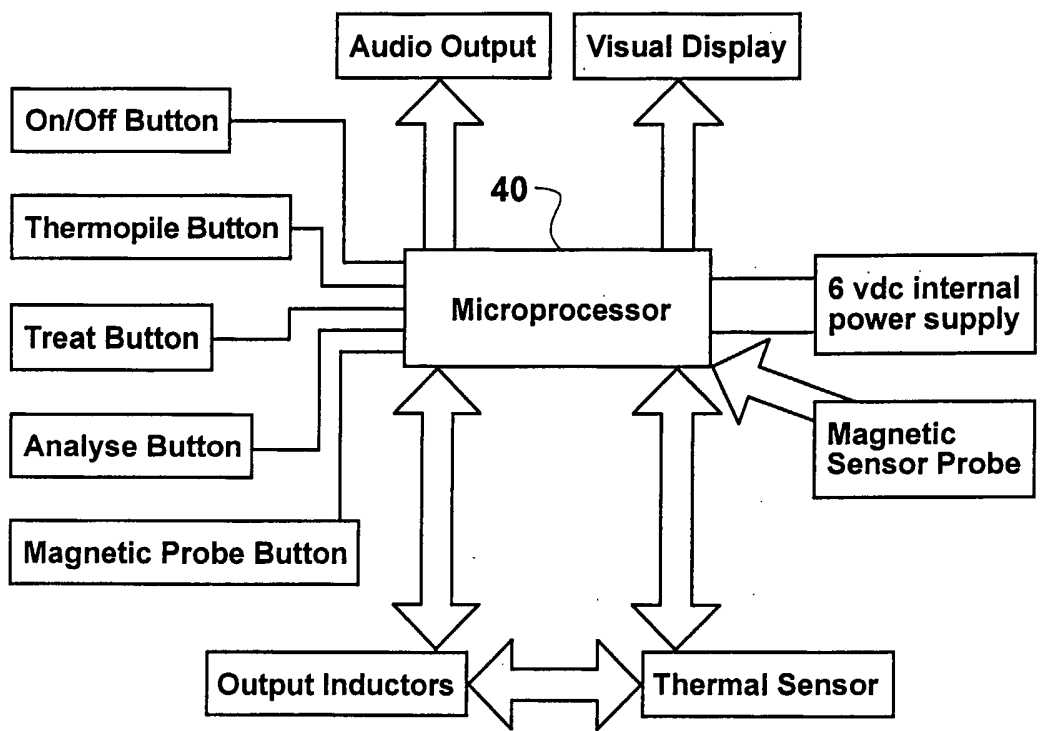


Fig. 3



**Fig. 4**

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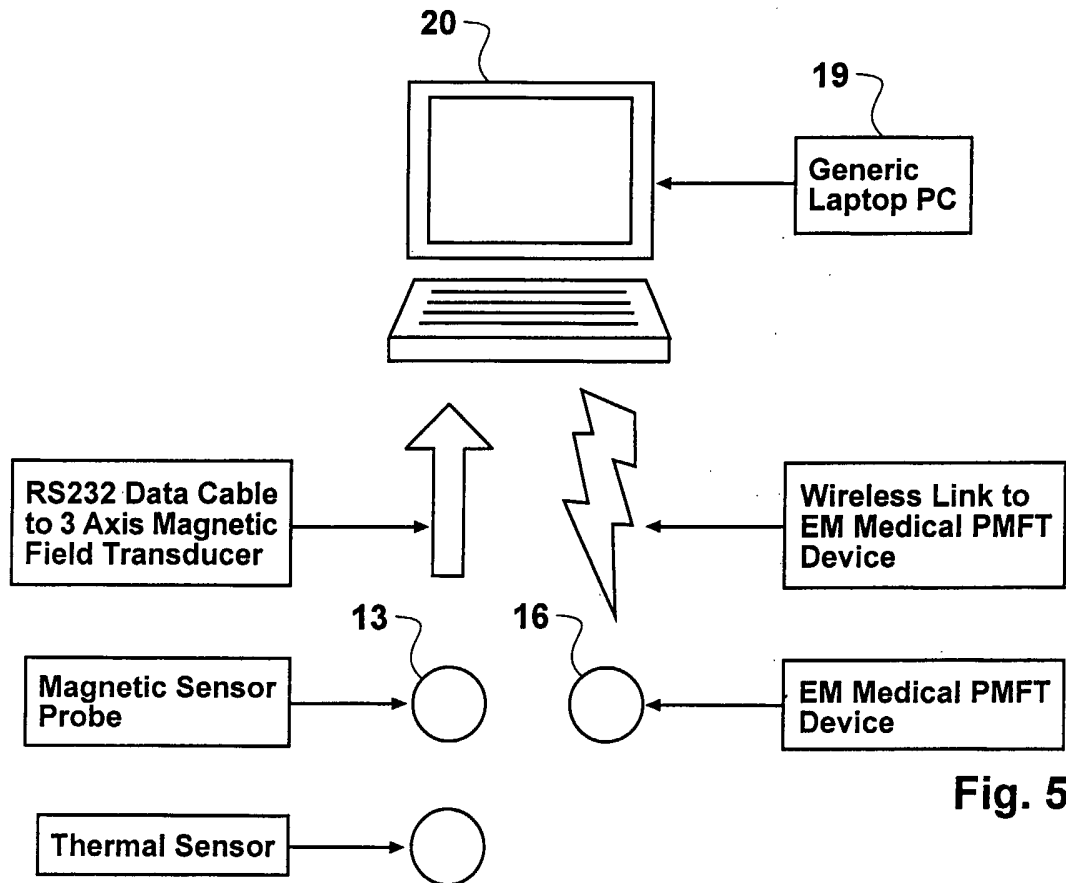


Fig. 5

## INTERNATIONAL SEARCH REPORT

 International Application No  
 PCT/GB2005/000849

<b>A. CLASSIFICATION OF SUBJECT MATTER</b> IPC 7 A61N2/02 A61B5/04 A61B5/00		
According to International Patent Classification (IPC) or to both national classification and IPC		
<b>B. FIELDS SEARCHED</b> Minimum documentation searched (classification system followed by classification symbols) IPC 7 A61N A61B		
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 practical, search terms used) EP0-Internal		
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 458 142 A (FARMER ET AL) 17 October 1995 (1995-10-17) abstract	1,2,7, 9-15
Y	column 7, line 5 - column 8, line 17 column 9, line 57 - column 13, line 56	8
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Y	paragraph '0005! - paragraph '0007! paragraph '0013!	8
A	EP 1 302 761 A (OMRON CORPORATION) 16 April 2003 (2003-04-16) abstract	4,5
<input type="checkbox"/> Further documents are listed in the continuation of box C.		
<input checked="" type="checkbox"/> Patent family members are listed in annex.		
* Special categories of cited documents :		
*A* document defining the general state of the art which is not considered to be of particular relevance *E* earlier document but published on or after the international filing date *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) *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		*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 *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 *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. *&* document member of the same patent family
Date of the actual completion of the international search 13 June 2005		Date of mailing of the international search report 21/06/2005
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## INTERNATIONAL SEARCH REPORT

Information on patent family members

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5458142	A	17-10-1995	NONE
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