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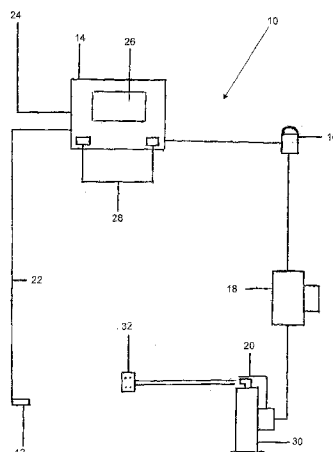
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(54) Title: AUTOMATED FIRE EXTINGUISHING SYSTEM



(57) Abstract: An automated system for extinguishing fire associated with a heat source, including a detector for detecting a temperature associated with the heat source, a controller in communication with the detector for controlling operation of the system in response to said temperature reaching a first predetermined value, an alarm operated by the controller in response to said temperature reaching said first predetermined value, a delay timer triggered by the controller in response to said temperature reaching said first predetermined value, the delay timer having an output signal which is sent after a predetermined delay after triggering of the timer unless said temperature drops beneath a second predetermined value, and a fire extinguisher unit directed at the heat source, the fire extinguisher unit being adapted to apply fire extinguishing material to the heat source in response to said output signal

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Automated fire Extinguishing System

5 **Field of the Invention**

This invention relates to an automated extinguishing system and, more particularly but not exclusively, to an automated system for detecting and extinguishing fire.

10 **Background of the Invention**

It is known to provide a system for extinguishing fire in the form of a network of conduits for carrying water to sprinklers, such as are commonly used in office buildings. However, these systems are generally subject to fixed installation in a ceiling structure of a building whereby they supply water to a number of areas and are not localised to a specific target. Moreover, previously proposed systems for extinguishing fire are typically triggered by the detection of smoke, and are prone to false alarms in response to "normal" smoke, for example from toasters, cigarettes and the like.

20 Examples of the present invention seek to provide an improved system for extinguishing fire.

Summary of the Invention

25 In accordance with one aspect of the present invention, there is provided an automated extinguishing system, including:

a detector for detecting a hazardous or potentially hazardous event at a determined location;

a controller in communication with the detector, and

30 an extinguisher unit controlled by the controller and trained to the location to direct extinguishing material in a location specific manner following detection of the event.

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The event could be any potential hazardous circumstance such as, for example, smouldering circuitry, open flames, a chemical leak, etc.

5 Preferably, the detector is able to detect a fire or an impending fire by detecting temperature associated with the heat source, and operation of the fire extinguisher unit is controlled such that the fire extinguishing unit applies fire extinguishing material to the heat source as a result of said temperature reaching a first predetermined value.

10 Preferably, the detector detects the temperature of ambient air in the vicinity of the heat source.

Preferably, the system further includes an alarm controlled by the controller in response to said temperature reaching said first predetermined value.

15 Preferably, the system further includes a delay timer triggered by the controller in response to said temperature reaching said first predetermined value, the delay timer has an output signal which is sent after a predetermined delay after triggering of the timer unless said temperature drops beneath a second predetermined value, and the fire extinguisher unit is operated to apply the fire extinguishing material to the heat source in response to the
20 output signal being sent.

Preferably, the fire extinguisher unit is self-contained. Preferably, the fire extinguisher unit has a tank for containing the fire extinguishing material, and a trigger fitted to the tank. More preferably, the system includes a solenoid which operates the fire
25 extinguishing unit by actuating the trigger. Even more preferably, the fire extinguisher unit is interchangeably mounted in the system so as to be readily removed and replaced with a replacement unit. In one form, the fire extinguishing unit is of the common handheld type typically kept in homes, offices, vehicles and the like. Preferably, the fire extinguishing material is non-toxic sodium bicarbonate.

30

Preferably, the system is formed as a portable apparatus so as to be useable with different heat sources.

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Preferably, the controller has a data input means for allowing a user to modify the first predetermined value, the second predetermined value and/or the predetermined delay.

Preferably, the heat source is a gas stove, an electric stove, a heater, or the like.
5 The heat source may be on board a boat, or may be in a bedroom or lounge room.

Preferably, the system further includes an energy shut-off which is operated in response to said output signal. For example, the energy shut-off may be in the form of a solenoid for shutting off a supply of gas, or in the form of a switch for shutting off a supply
10 of electricity.

Preferably, the system has an integral power supply such that it is able to operate as a free-standing self-contained unit, without need for an external power supply. More preferably, the system does not require any wired connections to any external devices.
15

In accordance with another aspect of the present invention, there is provided an automated system for extinguishing fire associated with a heat source, including:
a detector for detecting a location of a fire or impending fire associated with the heat source;
20 a controller in communication with the detector, and
a fire extinguisher unit,
wherein operation of the fire extinguisher unit is controlled by the controller such that an outlet of the fire extinguisher unit is selected and/or directed according to the location of the fire or impending fire, to apply fire extinguishing material to a source of the fire or
25 impending fire.

A fire extinguisher unit adapted for use in the system defined above.

In accordance with another aspect of the present invention, there is provided an automated extinguishing system, including:
30 a detector for detecting a hazardous or potentially hazardous event at a determined location;
a controller in communication with the detector, and

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an extinguisher unit controlled by the controller and trained to the location to direct extinguishing material in a location specific manner following detection of the event.

wherein the detector is able to detect a fire or an impending fire by detecting temperature associated with a heat source, and operation of the extinguisher unit is
5 controlled such that the extinguishing unit applies fire extinguishing material to the heat source as a result of said temperature reaching a first predetermined value,

and wherein the system is formed as a portable apparatus so as to be useable with different heat sources.

In another aspect, there is provided an extinguisher unit for use in the above-
10 described system.

Brief Description of the Drawings

The invention is described, by way of non-limiting example only, with reference to
15 the accompanying drawings in which:

Figure 1 is a diagrammatic view of an automated system for extinguishing fire in accordance with a first example;

20 Figure 2 is a diagrammatic view of an automated system for extinguishing fire in accordance with a second example;

Figure 3 is a schematic plan view of an extinguishing system; and

25 Figure 4 is a schematic side view of the system of Figure 3.

Detailed Description

Figure 1 shows an automated system 10 for extinguishing fire associated with a
30 heat source. The system 10 includes a detector 12, a controller 14, an alarm 16, a delay timer 18, and a fire extinguishing unit 20.

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In the example shown, the detector 12 is in the form of a probe which is adapted to detect a temperature associated with the heat source, and the controller 14 is arranged in communication with the detector 12 via wiring 22 such that it is able to control operation of the system 10 in response to the detected temperature reaching a first predetermined value. The controller 14 has a power input 24, for example in the form of mains electricity and/or a battery, a digital display 26 for displaying operational information to a user, and function buttons 28 to enable the user to input/adjust operational data.

The alarm 16 is in the form of a siren and is operated by the controller 14 in response to the temperature reaching the first predetermined value. The first predetermined value may be adjusted by the user by way of the digital display 26 and the function buttons 28. This enables the user to set the parameters of operation of the system 10 according to specific requirements.

The delay timer 18 is triggered by the controller 14 in response to the temperature detected by the probe reaching the first predetermined value, and sends an output signal after a predetermined delay after triggering of the timer 18 unless the detected temperature drops beneath a second predetermined value. The second predetermined value and the predetermined delay may also be set by the user by way of the digital display 26 and the function buttons 28. The first predetermined value may be set to correspond to a temperature marginally above the normal operating temperature range of the heat source, the second predetermined value may be set to correspond to a temperature at an upper range of acceptable operating temperatures of the heat source, and the predetermined delay may be set to a sufficient period of time to allow a user to attend to the heat source so as to avoid unnecessary operation of the fire extinguisher unit 20 if possible.

The fire extinguisher unit 20 is arranged to be directed at the heat source, so as to apply fire extinguishing material to the heat source in response to the output signal. In the example shown, the fire extinguisher unit 20 is self-contained, having a tank 30 for containing the fire extinguishing material, and a nozzle 32 fitted to the tank 30. By virtue of the fire extinguisher unit 20 being self-contained, the system 10 is able to be used with different self-contained fire extinguisher units (ie. using different fire extinguishing materials) for extinguishing different types of fires.

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Advantageously, the fire extinguisher unit 20 may be of the hand-held portable kind typically used for extinguishing fires in domestic and/or industrial situations. As such, the system 10 is not necessarily confined to being attached to a mains supply of water as are existing sprinkler systems, and replacement extinguisher units may be
5 obtained or refilled easily.

The fire extinguisher unit 20 preferably includes both the actual fire extinguisher 30 itself, as well as the trigger arranged to automatically activate the extinguisher. The unit 20 may be interchangeably mounted in the system 10 so as to be readily removed and
10 replaced with a replacement unit. A solenoid, or other suitable actuator, is used for actuating the trigger of the fire extinguisher unit 20, and the delay timer 18 may have a separate mains voltage power source in order to provide sufficient power to the solenoid which may need to exert a relatively high force in order to actuate the trigger. The fire
15 extinguishing material may be, for example, non-toxic sodium bicarbonate, however it will be appreciated that other materials may be used in addition or instead.

The system 10 may be formed as a portable apparatus so as to be useable with different heat sources. The applicant has determined that the entire system 10 may be
20 provided within a portable unit, with power cord, of size 400mm x 200mm x 180mm and a wireless portable unit may be marginally larger.

The heat source may be a gas stove, an electric stove, a heater, or the like, and may be in a variety of locations such as, for example, on board a boat, in a bedroom or lounge
25 room.

The system 10 shown in Figure 2 is similar to the system shown in Figure 1, and like features are indicated with like reference numerals. The system 10 of Figure 2 differs from the of Figure 1 as it further includes an energy shut-off 34 which is operated in
30 response to said output signal from the delay timer 18. In the example shown, the energy shut-off 34 is in the form of a shut-off solenoid 36 for shutting off a supply of gas in a gas line 38 which feeds gas to a gas stove 40 which is in this case the heat source. In an

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alternative example, such as where the heat source is in the form of an electric stove, the energy shut-off may be a switch for shutting off a supply of electricity.

5 The system 10 may detect the location of a fire or impending fire, and may select and/or direct an outlet of the fire extinguishing unit 20 accordingly. In this way, fire extinguishing material is applied only to the location of the fire or impending fire, and it is possible to avoid soiling other areas with fire extinguishing material. For example, the fire extinguisher unit 20 may have a single outlet which is directed at the location of the fire or impending fire, or the fire extinguisher unit 20 may have a plurality of outlets directed at
10 different areas, and an appropriate one or more of the outlets may be selected according to detection of the location of the fire or impending fire.

Automated systems for extinguishing fire in accordance with examples of the invention may be designed to monitor ambient temperature, warn of the increase in
15 temperature and extinguish fires in many applications. An advantage of these systems is the ability to extinguish fire even if the occupants are not in the vicinity of the fire, thus decreasing the possibility of major loss from large fires. Examples of where the systems can be used include gas/electric stoves, electrical boxes and boats, and the systems can be made portable for heaters in bedrooms or lounge rooms.

20

The controller 14 may be in the form of a 48mm x 48mm monitor which has the capacity to read actual ambient temperature detected by a small probe/sensor. That temperature is then displayed on a small digital LED display, which can be mounted on a wall up to 2 metres away from the probe. The digital display may be capable of
25 monitoring a range of ambient temperatures of 0-999 degrees Celsius, depending on the application.

The monitor has a push button adjustable deviation contact point (once set to desired temperature will make output contact), eg ambient temperature 85 degrees set
30 contact point 85 degrees + 50 degrees.

Once the contact point has been triggered a delayed second/minute/hour timer is activated and can be set to any number of seconds. On point of contact from the monitor a

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variable toned 110 decibel siren will also be activated. This siren will stay on until the temperature drops below the set threshold.

5 If the temperature is not brought back to "normal", depending on the seconds selected on the delay, the timer will then contact power to a pull type solenoid which is located on the side of a round cylinder holding an Australian Standard fire extinguisher. A lever fitted to the top of the cylinder is sitting over the trigger of the extinguisher and is connected to the solenoid. (The extinguisher can be removed and replaced in seconds.)

10 Once the solenoid is activated the nozzle of the extinguisher is connected to a flexible hose. This hose can be fed through a wall to the hot area being monitored. The nozzle on the end of the hose is a multi-directional spray pattern nozzle designed to cover the entire area being monitored. The extinguisher will expel non-toxic sodium bicarbonate. If the occupants get to and control the problem before the time delay, the
15 system can be switched off and reset.

The system can come in various sizes depending on the application, and is capable of holding small and large extinguishers. The system can be fitted in the down position on a range hood.

20

Advantageously, the system is very affordable and is effective as well as being small and lightweight.

25 The above automated systems for extinguishing fire have been described by way of example only and modifications are possible within the scope of the invention. For example, although communication between components of the system 10 is mentioned as being by way of wiring, it will be understood that other suitable forms of communication may be used.

30 Further additional features which may be incorporated into examples of the automated extinguishing system are outlined below:

- the system can be hard-wired or can be wireless
- the system may be in the form of a compact, self-contained unit

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- the system may include heat sensing probes affixed to sides of the unit
- the unit may have a compact Printed Circuit Board (PCB) for monitoring
- the unit may have a warning device to warn of impending danger
- 5 - the unit may have a plurality of ejection points for expelling extinguishing material
- the unit may have a "back-to-base" contact to relevant authorities/bodies
- the unit may be of a light-weight construction for convenient portability
- the unit can be fitted to domestic/industrial stove exhaust systems, stove tops, to household heating systems, and other like applications where a hazardous event
10 may occur
- the extinguishing material may be of a type such that it does not harm surroundings when used.

A modification, as mentioned above, is for the system 10 to be formed as a portable
15 apparatus. Such an apparatus 50 is shown in Figures 3 and 4, where like parts are denoted with like reference numerals and the system 10 is shown as being fully contained within the apparatus 50. The apparatus includes an extinguisher tank 30 which is actuated by a trigger 51 which is, in turn, automatically controlled by a controller 14 to eject extinguishing material through nozzles 52, when probes 53 sense a predetermined value
20 representing an event or impending event such as a fire. The apparatus also carries an alarm 16 and a delay timer 18. A cord 54 may be provided to connect the apparatus to a suitable power supply in order to power the components of the apparatus or, alternatively, a battery pack (not shown) may be provided.

25 In a further modification, various components of the apparatus 50 may be housed externally and either wired or remotely interconnected to allow for full functionality of the system 10. The apparatus 50 is also preferably portable so as to allow the extinguisher unit 20 to be placed at a desired location where the nozzles 52 can be directed accordingly. Alternatively, the apparatus is fixedly mounted in place.

30

The applicant foresees that examples of the invention will provide a convenient and affordable extinguishing unit suitable for use in households. The system is able to be used in many ways/applications to avoid costly expenditure in repairing damage resulting from

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fires, to prevent injury, and to save lives. Such fires could be the result of negligence, or could simply be unavoidable accidents such as where there is an equipment malfunction. The applicant has identified that the invention can be used in any place where a rise in temperature exceeds a safety range. The system may use a mercury probe for temperature
5 sensing, and is reusable such that it can simply be reset rather than having to outlay expense in equipment replacement. When the extinguisher unit has been completely expended, it can be replaced easily and quickly, particularly where it is in the form of a readily available common handheld type of fire extinguisher typically kept in homes, offices, vehicles and the like.

10

The invention has been described with reference to extinguishing fires but is equally applicable to other situations where a catastrophic event has occurred or is likely to occur such as a hazardous chemical reaction or the like. As such, reference to "fire" should be taken to include reference to any form of incendiary/explosive/chemically-activated
15 event or any form of agent, catalyst or accelerant causing such an event.

15

The reference in this specification to any prior publication (or information derived from it), or to any matter which is known, is not, and should not be taken as an acknowledgment or admission or any form of suggestion that that prior publication (or
20 information derived from it) or known matter forms part of the common general knowledge in the field of endeavour to which this specification relates.

20

Throughout this specification and the claims which follow, unless the context requires otherwise, the word "comprise", and variations such as "comprises" and
25 "comprising", will be understood to imply the inclusion of a stated integer or step or group of integers or steps but not the exclusion of any other integer or step or group of integers or steps.

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CLAIMS:

1. An automated extinguishing system, including:

a detector for detecting a hazardous or potentially hazardous event at a
determined location;

a controller in communication with the detector, and

an extinguisher unit controlled by the controller and trained to the location
to direct extinguishing material in a location specific manner following detection of
the event.

2. An extinguishing system as claimed in claim 1, wherein the detector is able to
detect a fire or an impending fire by detecting temperature associated with a heat
source, and operation of the extinguisher unit is controlled such that the
extinguishing unit applies fire extinguishing material to the heat source as a result
of said temperature reaching a first predetermined value.

3. An extinguishing system as claimed in claim 2, wherein the fire extinguishing
material is non-toxic sodium bicarbonate.

4. An extinguishing system as claimed in claim 2 or claim 3, wherein the detector
detects temperature of ambient air in the vicinity of the heat source.

5. An extinguishing system as claimed in any one of claims 2 to 4, wherein the system
further includes an alarm controlled by the controller in response to said
temperature reaching said first predetermined value.

6. An extinguishing system as claimed in any one of claims 2 to 5, wherein the system
further includes a delay timer triggered by the controller in response to said
temperature reaching said first predetermined value, the delay timer has an output
signal which is sent after a predetermined delay after triggering of the timer unless
said temperature drops beneath a second predetermined value, and the extinguisher
unit is operated to apply the fire extinguishing material to the heat source in
response to the output signal being sent.

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7. An extinguishing system as claimed in claim 6, wherein the system further includes an energy shut-off which is operated in response to said output signal.
- 5 8. An extinguishing system as claimed in claim 7, wherein the energy shut-off is in the form of a shut-off solenoid for shutting off a supply of gas.
9. An extinguishing system as claimed in claim 7, wherein the energy shut-off is in the form of a shut-off switch for shutting off a supply of electricity.
- 10 10. An extinguishing system as claimed in any one of claims 2 to 9, wherein the controller has a data input means for allowing a user to modify the first predetermined value, the second predetermined value and/or the predetermined delay.
- 15 11. An extinguishing system as claimed in any one of claims 2 to 10, wherein the extinguisher unit has a tank for containing the fire extinguishing material, and a trigger fitted to the tank.
- 20 12. An extinguishing system as claimed in claim 11, wherein the system includes a solenoid which operates the extinguishing unit by actuating the trigger.
13. An extinguishing system as claimed in any one of claims 2 to 12, wherein the heat source is a gas stove, an electric stove, a heater, or the like.
- 25 14. An extinguishing system as claimed in any one of claims 1 to 13, wherein the extinguisher unit is self-contained.
- 30 15. An extinguishing system as claimed in claim 1 to 14, wherein the extinguisher unit is interchangeably mounted in the system so as to be readily removed and replaced with a replacement unit.

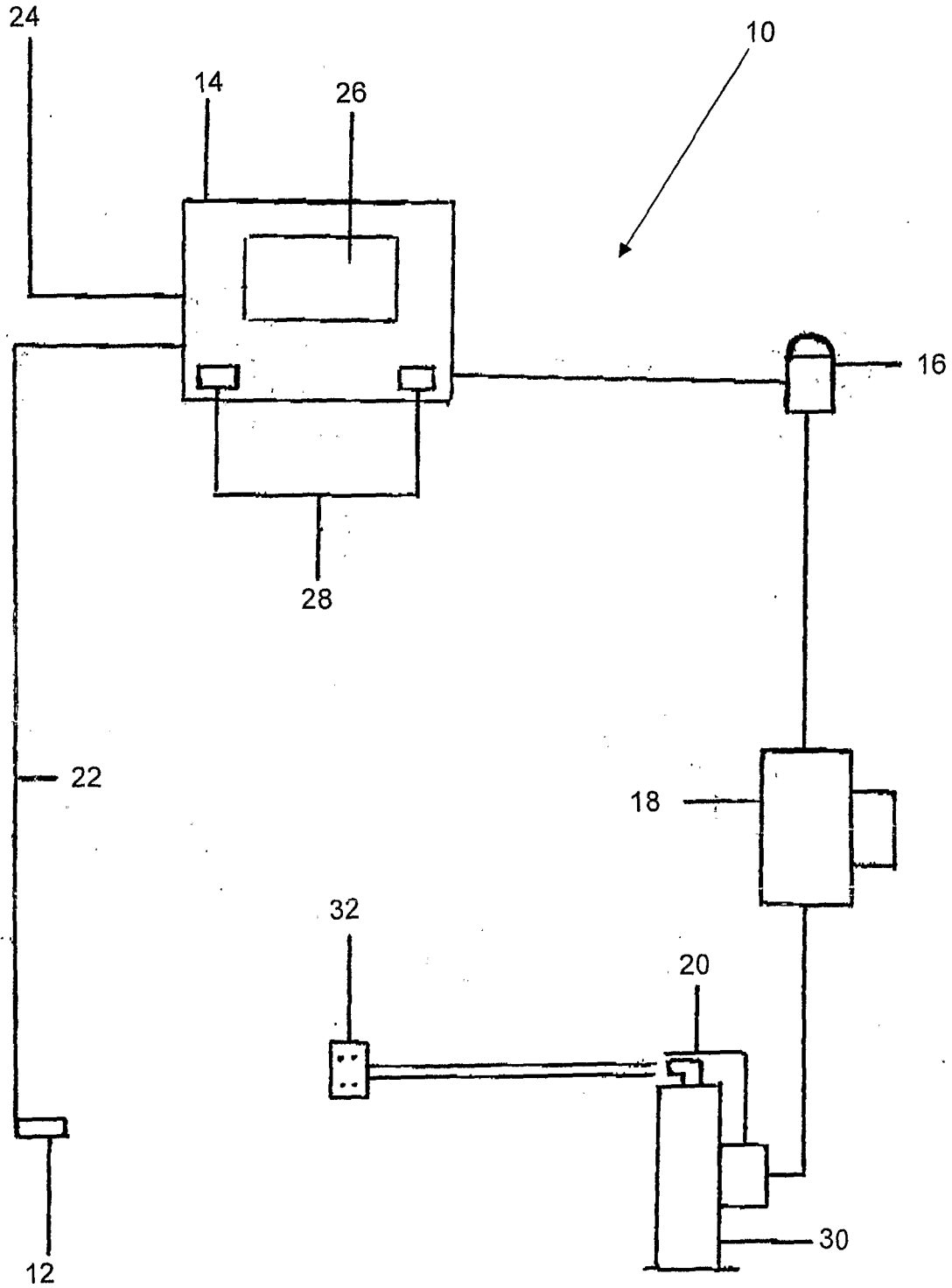
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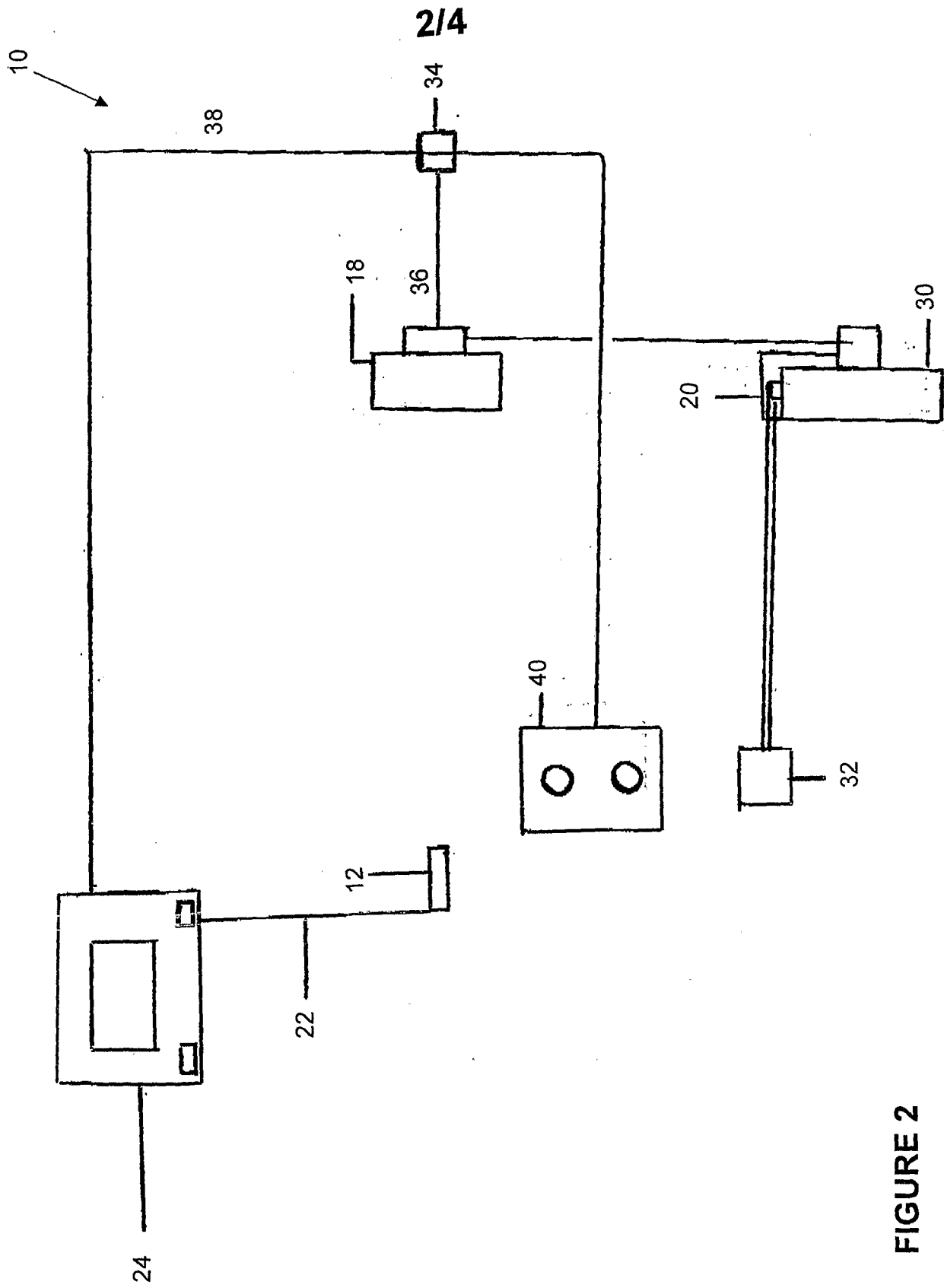
16. An extinguishing system as claimed in any one of claims 1 to 15, wherein the extinguishing unit is a fire extinguishing unit of the common handheld type typically kept in homes, offices, vehicles and the like.
- 5 17. An extinguishing system as claimed in any one of claims 1 to 16, wherein the system is formed as a portable apparatus so as to be useable with different heat sources.
- 10 18. An extinguishing system as claimed in claim 17, wherein the system is a self-contained unit.
19. An extinguishing system as claimed in claim 18, wherein the system has an integral power source.
- 15 20. An automated system for extinguishing fire associated with a heat source, including:
a detector for detecting a location of a fire or impending fire associated with the heat source;
a controller in communication with the detector, and
20 a fire extinguisher unit,
wherein operation of the fire extinguisher unit is controlled by the controller such that an outlet of the fire extinguisher unit is selected and/or directed according to the location of the fire or impending fire, to apply fire extinguishing material to a source of the fire or impending fire.
- 25 21. An extinguisher unit adapted for use in a system as claimed in any one of claims 1 to 20.
- 30 22. An extinguisher unit as claimed in claim 21, including an extinguisher and a trigger arranged to automatically actuate the extinguisher.
23. An apparatus including an extinguisher unit as claimed in claim 21 or 22.

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24. An apparatus as claimed in claim 23, further including a controller for actuating the extinguisher unit.
- 5 25. An apparatus as claimed in claim 23, further including at least one probe for producing a signal which is monitored by the controller.
26. An apparatus as claimed in claim 23, further including at least one nozzle through which material from the extinguisher unit is ejected.
- 10 27. An apparatus as claimed in claim 23, including an alarm coupled to the controller.
28. An apparatus as claimed in claim 23, being portable.
29. An automated extinguishing system, including:
- 15 a detector for detecting a hazardous or potentially hazardous event at a determined location;
- a controller in communication with the detector, and
- an extinguisher unit controlled by the controller and trained to the location to direct extinguishing material in a location specific manner following detection of
- 20 the event.
- wherein the detector is able to detect a fire or an impending fire by detecting temperature associated with a heat source, and operation of the extinguisher unit is controlled such that the extinguishing unit applies fire extinguishing material to the heat source as a result of said temperature reaching a
- 25 first predetermined value,
- and wherein the system is formed as a portable apparatus so as to be useable with different heat sources.

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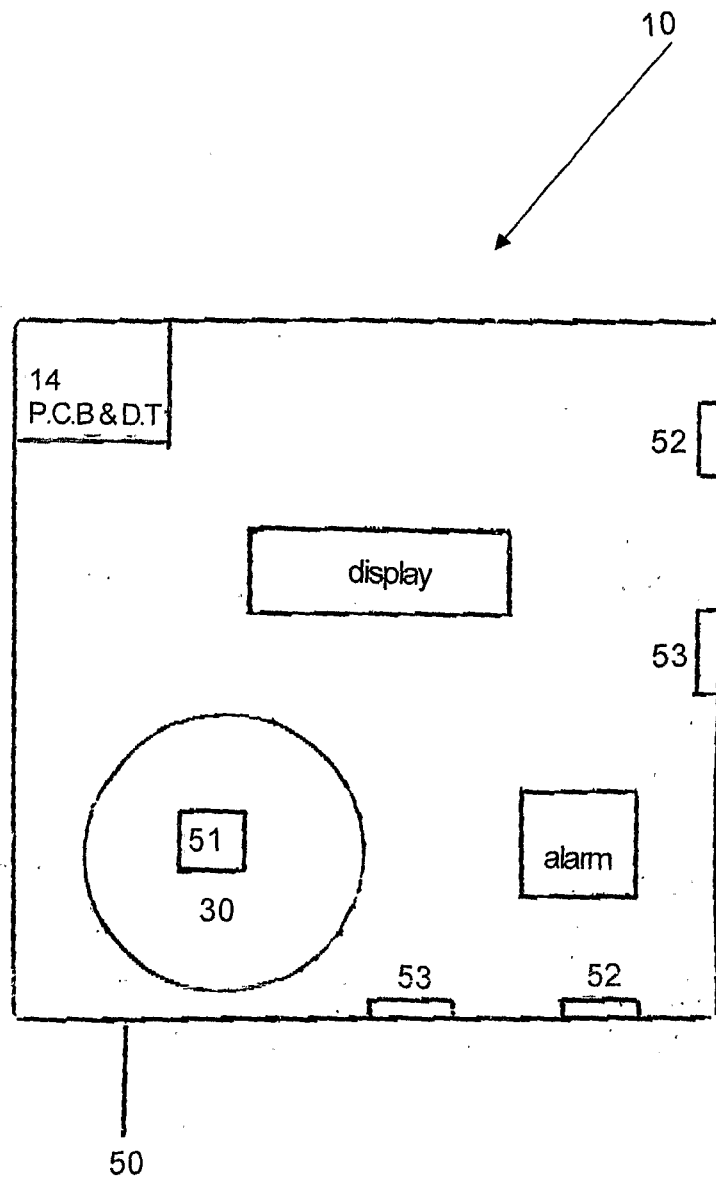


FIGURE 3

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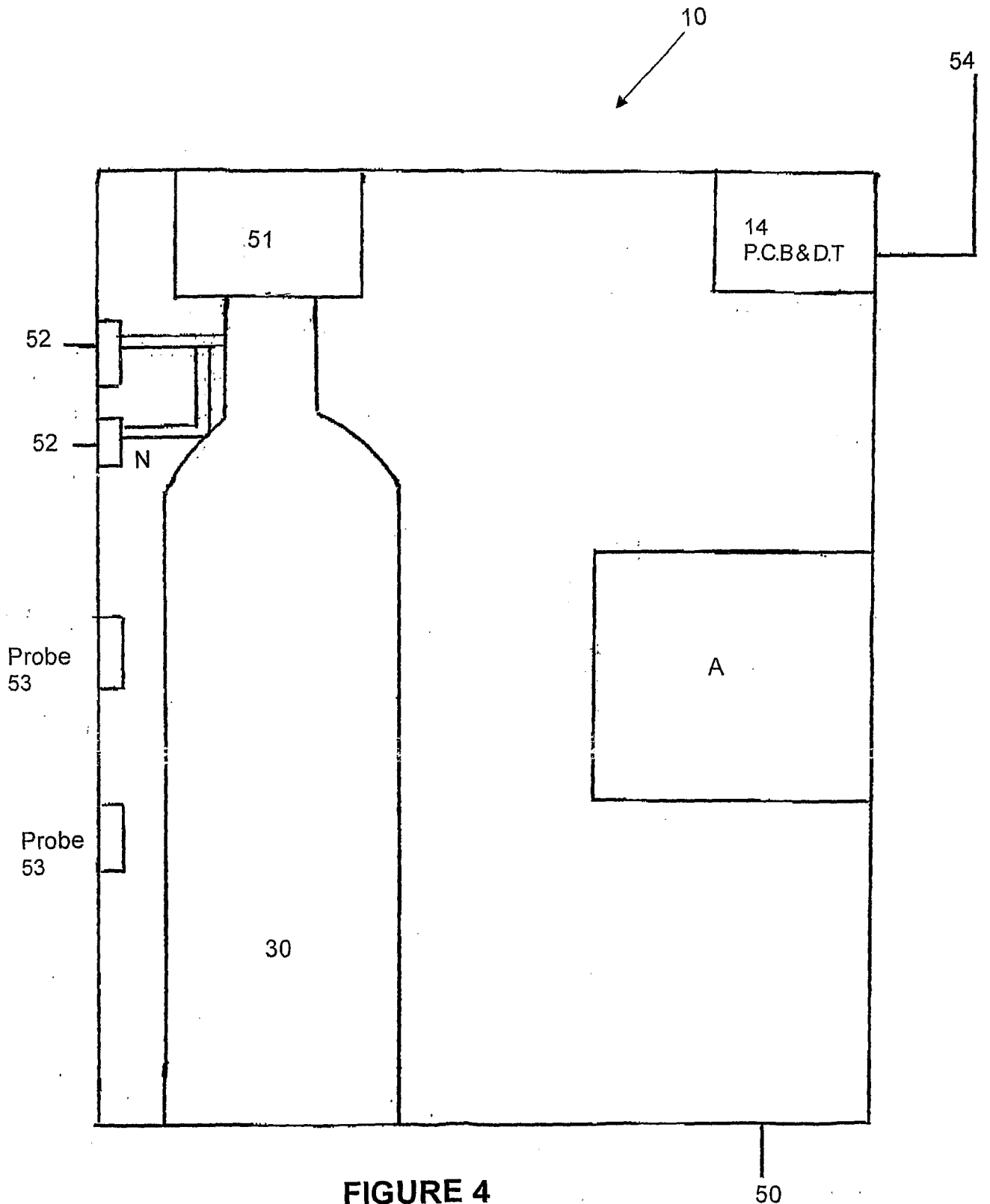


FIGURE 4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU2006/001630

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl.

A62C 35/58 (2006.01) *A62C 37/10* (2006.01) *A62C 37/40* (2006.01) *A62C 25/00* (2006.01)
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A62C 37/38 (2006.01)

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)

DWPI: IPC: A62C/- & keywords: PLC, PC, COMPUTE, PROCESSOR, CPU, ELECTRIC, PROGRAM, IC, AUTOMATIC, SELF, DETECT, SENSOR, FEEDBACK, MONITOR, PROBE, LOCALITY, LOCUM, LOCUS, TARGET, LOCATION, AREA, POSITION, PLACE, GPS, COORDINATE, SITE, SECTION

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	DE 19621347 A1 (DOERR) 5 December 1996 Whole document and Derwent Patent Abstract Accession No. 97-022297/03, class P35	1, 2, 4, 6, 7, 9, 11-16, 20-27 4-6
X Y	DE 10065502 A1 (BRANDSTETTER) 4 July 2002 Whole document & Derwent Patent Abstract Accession No. 2002-576370/62, class P35; X25	1-4, 11, 12, 14-29 4-6
X	JP 08-266675 A (NOHMI BOSAI KK) 15 October 1996 Whole document & Derwent Patent Abstract Accession No. 96-51300/51, class X25	1-4, 11, 12, 14-29 4-6

☒ Further documents are listed in the continuation of Box C☒ See patent family annex

* Special categories of cited documents:	
"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
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Date of the actual completion of the international search
31 January 2007

Date of mailing of the international search report
07 FEB 2007

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/AU2006/001630

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Information on patent family members

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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.

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