

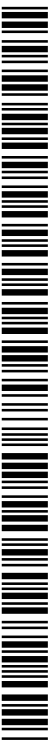


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- (71) Applicant: **WALKSAFE AUSTRALIA PTY LTD**  
[AU/AU]; 4 Park Drive, Dandenong, VIC 3175 (AU).
- (72) Inventors: **BROADBENT, Andrew George**; 16 Seafarer Court, Patterson Lakes, VIC 3198 (AU). **DE GRUCHY, Mark**; 8 Arlunya Court, Aspendale Gardens, VIC 3193 (AU).
- (74) Agent: **SMOORENBURG PATENT & TRADE MARK ATTORNEYS**; PO Box 515, Ringwood, VIC 3134 (AU).
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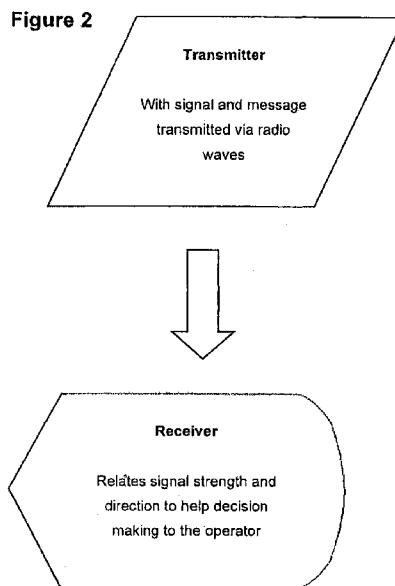
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WO 2013/155551 A1

(54) Title: HAZARD AVOIDANCE AND/OR LOCATION SYSTEM AND METHOD



(57) Abstract: The present invention relates to the field of location and/or avoidance of hazards. In one form, the invention relates to a system and/or method for location relative to an object, place or avoidance from a hazard. In one particular aspect, the present invention is suitable for use by a visually impaired user to provide location and/or avoidance of hazards.

## HAZARD AVOIDANCE AND/OR LOCATION SYSTEM AND METHOD

### FIELD OF INVENTION

[0001] The present invention relates to the field of location and/or avoidance of hazards.

[0002] In one form, the invention relates to a system and/or method for location relative to an object, place or avoidance from a hazard.

[0003] In one particular aspect, the present invention is suitable for use by a visually impaired user to provide location and/or avoidance of hazards.

[0004] It will be convenient to hereinafter describe the invention in relation to location and/or avoidance of hazards, however it should be appreciated that the present invention is not limited to that use only.

### BACKGROUND ART

[0005] Throughout this specification the use of the word "inventor" in singular form may be taken as reference to one (singular) inventor or more than one (plural) inventor of the present invention.

[0006] It is to be appreciated that any discussion of documents, devices, acts or knowledge in this specification is included to explain the context of the present invention. Further, the discussion throughout this specification comes about due to the realisation of the inventor and/or the identification of certain related art problems by the inventor. Moreover, any discussion of material such as documents, devices, acts or knowledge in this specification is included to explain the context of the invention in terms of the inventor's knowledge and experience and, accordingly, any such discussion should not be taken as an admission that any of the material forms part of the prior art base or the common general knowledge in the relevant art in Australia, or elsewhere, on or before the priority date of the disclosure and claims herein.

[0007] The inventors are aware of some obstacle avoidance systems already available in the market. For example, US 7,620,493 discloses an Infrared based system. The system is considered relatively expensive to install and is also not suitable for temporary use, such as a temporary barricade or a safety warning cone. In use, the user has to scan the area with the receiver to pick up the signal for the infrared transmitters. An infrared system is also not always useful where there are other obstacles located between the transmitter and the receiver.

### **SUMMARY OF INVENTION**

[0008] An object of the present invention is to provide an improved obstacle warning system.

[0009] It is an object of the embodiments described herein to overcome or alleviate at least one of the above noted drawbacks of related art systems or to at least provide a useful alternative to related art systems.

[0010] In a first aspect of embodiments described herein there is provided a system and/or method of locating a hazard, comprising a transmitter adapted to be located proximate a hazard, the transmitter providing, as an output, a predetermined signal, and a receiver adapted to be responsive to the predetermined signal, the receiver also being adapted to provide an output to a user, a warning signal correlating to the predetermined signal.

[0011] Other aspects and preferred forms are disclosed in the specification and/or defined in the appended claims, forming a part of the description of the invention.

[0012] In essence, embodiments of the present invention stem from the realization that a hazard locating system can be provided, in which there is a transmitter 'temporarily' affixed to a hazard or other item to be located. The user has a receiver which picks up a signal emanating from the transmitter as they are within proximity to the hazard. In one embodiment, a higher tone can be discerned as the user comes closer to the hazard and a lower tone as they move further away.

[0013] Our system is going to be very cheap to install in comparison and would suit temporary bollards and fencing as the beacon used is practically a throw away item. The transmitter and beacon will work on radio waves so that the transmitter can be in the user pocket and still work.

[0014] Advantages provided by the present invention comprise the following:

- Relatively simply and low cost installation
- May be applied to many and varied situations and applications
- Is a hazard avoidance system, not necessarily a guidance system;

[0015] Further scope of applicability of embodiments of the present invention will become apparent from the detailed description given hereinafter. However, it should be understood that the detailed description and specific examples, while indicating preferred embodiments of the invention, are given by way of illustration only, since various changes and modifications within the spirit and scope of the disclosure herein will become apparent to those skilled in the art from this detailed description.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

[0016] Further disclosure, objects, advantages and aspects of preferred and other embodiments of the present application may be better understood by those skilled in the relevant art by reference to the following description of embodiments taken in conjunction with the accompanying drawings, which are given by way of illustration only, and thus are not limitative of the disclosure herein, and in which:

Figure 1 illustrates one embodiment of the present invention; and

Figure 2 illustrates a method associated with an embodiment of the present invention.

## DETAILED DESCRIPTION

[0017] The aim of the present invention is to assist with location of hazards of any kind, such as and without limitation in the case of a visually impaired person in order to navigate a safe course by locating traffic lights, pedestrian crossing, bus stops and avoid footpath repairs. The present invention endeavours to identify hazards of any kind and, for example, prevent trip hazards that occur with current tactile surfaces, has a relatively low installation cost and provides location relative to an object, place or avoidance from a hazard.

[0018] The system is not guidance, it is avoidance and/or a hazard location system to, without limitation, help minimize collisions and injury, locating and to allow for the navigation of fixed and non fixed hazards, ie bus stops, railway platforms, footpath repairs, and road works and has many other uses without limiting the scope of the present invention.

## THE SYSTEM

[0019] With reference to Figure 1, a relatively small electronic transmitter 1 (not shown) is associated with a hazard or hazard warning device 2. For example, the transmitter 1 may be placed with double sided tape for example, into a safety cone 2 or a temporary bollard fence. The transmitter 1 may be activated, for example, a plastic tab may be pulled out allowing the battery to make contact and activate the transmitter in order to send out a signal 3. In accordance with the present invention, the transmitter may use any type of technology. The transmitter may be active or passive, depending on the application, environment and or transmission technology used in order to implement the present invention.

[0020] The installation and removal of the transmitter is able to be carried out by any person with access to the hazard area or fixed object without any electrical background. The present system is different to any other system currently on the market as it is portable and able to be installed and removed to a hazard or fixed installation and removed on completion of works or need.

[0021] The operating life of an active type transmitter can be operated between 1 second and 1 year depending on the completion of works and the battery life fitted to the transmitter or the removal of the hazard or fixed installation (bus stop / crossing).

[0022] An electronic receiver 4 is carried by the user, for example a visually impaired person. In one embodiment, when the user (and the receiver) is within a predetermined distance of the hazard and its associated transmitter, the receiver will begin to receive a signal (from the transmitter). For example, at approximately 30 meters the device may begin to receive a signal. The receiver may generate a sound, or provide another suitable indication to the user (vibration, indicia or any combination thereof) and can also produce a vibration in conjunction with the tone. In one embodiment, the closer the receiver comes to the transmitter, the higher the frequency of tone. If there is a change in direction away from the transmitter, the tone may decrease.

[0023] At a set distance from the transmitter the receiver will produce a verbal identification of the object. "Bus stop", "traffic lights" or "hazard ahead" for example. This information may be derived from the transmitter by the receiver. The transmitter thus has the ability to be programmed with predetermined information for transmission to the receiver.

[0024] The device aims to reduce accidents caused by temporary foot path works, therefore minimizing the risk of injury and potential law suits.

## **THE RECEIVER**

[0025] The receiver, in one embodiment, is small enough to fit inside a pocket, worn around the neck or wrist. It has an on/off switch, four volume settings (off, low, medium, high) and a switch to activate the vibrating function. The tone is envisaged to become more frequent when in a closer range of the transmitter and less as when the distance decreases or direction changed. This indicates the direction of the object with transmitter placed. Different tones may be used for varied hazards. In addition, a verbal announcement saying "hazard ahead" may be used to alert the wearer as to what is ahead and/or how close they are. The verbal announcement may also be based on the verbal identification of the object pre-programmed to the transmitter. Alternatively, or in

addition, the verbal announcement may be created and/or updated by the person using the receiver, for example, by the person recording their own meaningful commentary / information.

## **THE TRANSMITTER**

[0026] The transmitter may be a battery operated device that adheres with double sided tape. A twelve month battery life allows the transmitter to be self sufficient and not depend on mains power. The case of the transmitter may be colour coded to suit the application. The device may be replaced by any employee who has access to the object.

[0027] The manufacturing cost is relatively low as there is no major works involved or infrastructure to install. Transmitters may be made to transmit at different ranges, frequencies and verbal responses. These applications may be expanded overtime.

[0028] The installation and removal of the transmitter is able to be carried out by any person with access to the hazard area or fixed object without any electrical background. The system is portable and able to be installed and removed to a hazard or fixed installation and removed on completion of works.

[0029] The operating life of the transmitter may be configured between 1 second and 1 year, or more depending on the length of time the system needs to be operational, such as completion of works, and the battery life fitted to the transmitter or the removal of the hazard or fixed installation (bus stop / crossing).

[0030] In one embodiment, there is no service requirement to the transmitter they are disposable on completion of hazard removal or when the battery life has ended.

## **THE METHOD**

[0031] Figure 2 illustrates a method associated with an embodiment of the present invention. The transmitter is configured to transmit a predetermined signal and/or message. The transmitter is affixed to a hazard, or an article which can be associated or placed near-by a hazard (such as a safety cone). When a user having a receiver on or

near their person comes within proximity of the transmitter, the receiver will provide an output indicative of the hazard (whether frequency of output and/or the preconfigured message). The user can action based on the receiver output.

[0032] The system is not guidance, it is avoidance and/or a hazard location system to minimize collisions and injury, locating and allow for the navigation of fixed and non fixed hazards, i.e.: bus stops, railway platforms, footpath repairs, and road works.

[0033] The system being supplied is self sufficient and needs no external input of power or computer / internet or data gathering devices. The system sends a signal from that transponder that has been pre determined as to what type of hazard is ahead and then transmits to the receiver set with an audible and vibration output that is also battery powered and hand held. The receiver may be a mobile phone having a suitable app putting into effect the present invention.

[0034] The system has no excessive costs involved to install as there is no infrastructure required for the transmitter and the receiver.

[0035] Unlike any other devices it is solely reliant on two components and has no additional external transmission devices. Part "A" receiver, part "B" transmitter eliminating any infrastructure and external monitoring.

[0036] There is no ongoing maintenance or requirement to upgrade the system software/hardware.

[0037] The system is designed to assist in locating hazards such as road works etc and fixed hazard train platforms and traffic lights etc.

[0038] The system can be used in buildings to determine hazard and locate infrastructure such as lifts and stairwells. The main object however of the system is to allow the visually impaired to be warned of hazards outside of a building where temporary hazards, transportation and pedestrian crossings are found.

[0039] Unlike any other system, no electrical connections to an external power supply are required, and has no secondary receiver.



[0040] While this invention has been described in connection with specific embodiments thereof, it will be understood that it is capable of further modification(s). This application is intended to cover any variations uses or adaptations of the invention following in general, the principles of the invention and including such departures from the present disclosure as come within known or customary practice within the art to which the invention pertains and as may be applied to the essential features hereinbefore set forth.

[0041] As the present invention may be embodied in several forms without departing from the spirit of the essential characteristics of the invention, it should be understood that the above described embodiments are not to limit the present invention unless otherwise specified, but rather should be construed broadly within the spirit and scope of the invention as defined in the appended claims. The described embodiments are to be considered in all respects as illustrative only and not restrictive.

[0042] Various modifications and equivalent arrangements are intended to be included within the spirit and scope of the invention and appended claims. Therefore, the specific embodiments are to be understood to be illustrative of the many ways in which the principles of the present invention may be practiced. In the following claims, means-plus-function clauses are intended to cover structures as performing the defined function and not only structural equivalents, but also equivalent structures. For example, although a nail and a screw may not be structural equivalents in that a nail employs a cylindrical surface to secure wooden parts together, whereas a screw employs a helical surface to secure wooden parts together, in the environment of fastening wooden parts, a nail and a screw are equivalent structures.

[0043] Various embodiments of the invention may be embodied in many different forms, including computer program logic for use with a processor (eg, a microprocessor, microcontroller, digital signal processor, or general purpose computer and for that matter, any commercial processor may be used to implement the embodiments of the invention either as a single processor, serial or parallel set of processors in the system and, as such, examples of commercial processors include, but are not limited to Merced™, Pentium™, Pentium II™, Xeon™, Celeron™, Pentium Pro™, Efficeon™, Athlon™, AMD™ and the like), programmable logic for use with a programmable logic device (e.g.,

a Field Programmable Gate Array (FPGA) or other PLD), discrete components, integrated circuitry (e.g., an Application Specific Integrated Circuit (ASIC)), or any other means including any combination thereof. In an exemplary embodiment of the present invention, predominantly all of the communication between users and the server is implemented as a set of computer program instructions that is converted into a computer executable form, stored as such in a computer readable medium, and executed by a microprocessor under the control of an operating system.

[0044] Computer program logic implementing all or part of the functionality where described herein may be embodied in various forms, including a source code form, a computer executable form, and various intermediate forms (e.g., forms generated by an assembler, compiler, linker, or locator). Source code may include a series of computer program instructions implemented in any of various programming languages (e.g., an object code, an assembly language, or a high-level language such as Fortran, C, C++, JAVA, or HTML. Moreover, there are hundreds of available computer languages that may be used to implement embodiments of the invention, among the more common being Ada; Algol; APL; awk; Basic; C; C++; Conol; Delphi; Eiffel; Euphoria; Forth; Fortran; HTML; Icon; Java; Javascript; Lisp; Logo; Mathematica; MatLab; Miranda; Modula-2; Oberon; Pascal; Perl; PL/I; Prolog; Python; Rexx; SAS; Scheme; sed; Simula; Smalltalk; Snobol; SQL; Visual Basic; Visual C++; Linux and XML.) for use with various operating systems or operating environments. The source code may define and use various data structures and communication messages. The source code may be in a computer executable form (e.g., via an interpreter), or the source code may be converted (e.g., via a translator, assembler, or compiler) into a computer executable form.

[0045] The computer program may be fixed in any form (e.g., source code form, computer executable form, or an intermediate form) either permanently or transitorily in a tangible storage medium, such as a semiconductor memory device (e.g., a RAM, ROM, PROM, EEPROM, or Flash-Programmable RAM), a magnetic memory device (e.g., a diskette or fixed disk), an optical memory device (e.g., a CD-ROM or DVD-ROM), a PC card (e.g., PCMCIA card), or other memory device. The computer program may be fixed in any form in a signal that is transmittable to a computer using any of various communication technologies, including, but in no way limited to, analog technologies, digital technologies, optical technologies, wireless technologies (e.g., Bluetooth),

networking technologies, and inter-networking technologies. The computer program may be distributed in any form as a removable storage medium with accompanying printed or electronic documentation (e.g., shrink wrapped software), preloaded with a computer system (e.g., on system ROM or fixed disk), or distributed from a server or electronic bulletin board over the communication system (e.g., the Internet or World Wide Web).

[0046] Hardware logic (including programmable logic for use with a programmable logic device) implementing all or part of the functionality where described herein may be designed using traditional manual methods, or may be designed, captured, simulated, or documented electronically using various tools, such as Computer Aided Design (CAD), a hardware description language (e.g., VHDL or AHDL), or a PLD programming language (e.g., PALASM, ABEL, or CUPL). Hardware logic may also be incorporated into display screens for implementing embodiments of the invention and which may be segmented display screens, analogue display screens, digital display screens, CRTs, LED screens, Plasma screens, liquid crystal diode screen, and the like.

[0047] Programmable logic may be fixed either permanently or transitorily in a tangible storage medium, such as a semiconductor memory device (e.g., a RAM, ROM, PROM, EEPROM, or Flash-Programmable RAM), a magnetic memory device (e.g., a diskette or fixed disk), an optical memory device (e.g., a CD-ROM or DVD-ROM), or other memory device. The programmable logic may be fixed in a signal that is transmittable to a computer using any of various communication technologies, including, but in no way limited to, analog technologies, digital technologies, optical technologies, wireless technologies (e.g., Bluetooth), networking technologies, and internetworking technologies. The programmable logic may be distributed as a removable storage medium with accompanying printed or electronic documentation (e.g., shrink wrapped software), preloaded with a computer system (e.g., on system ROM or fixed disk), or distributed from a server or electronic bulletin board over the communication system (e.g., the Internet or World Wide Web).

[0048] "Comprises/comprising" and "includes/including" when used in this specification is taken to specify the presence of stated features, integers, steps or components but does not preclude the presence or addition of one or more other features, integers, steps, components or groups thereof. Thus, unless the context clearly

requires otherwise, throughout the description and the claims, the words 'comprise', 'comprising', 'includes', 'including' and the like are to be construed in an inclusive sense as opposed to an exclusive or exhaustive sense; that is to say, in the sense of "including, but not limited to".

**CLAIMS**

1. A hazard location system comprising:

a transmitter adapted to be located proximate a hazard; the transmitter providing, as an output, a predetermined signal, and

a receiver adapted to be responsive to the predetermined signal, the receiver also being adapted to provide an output to a user, a warning signal correlating to the predetermined signal.

2. A system as claimed in claim 1, wherein the predetermined signal is a message indicative of the hazard.

3. A system as claimed in claim 1 or 2, wherein the receiver is a passive.

4. A system as claimed in claim 1, 2 or 3, wherein the warning signal is a message indentifying the hazard.

5. A system as claimed in any one of claims 1 to 4, wherein the transmitter is releasably affixed to or proximate the hazard.

6. A system as claimed in any one of claims 1 to 5, wherein the transmitter is disposable.

7. A method of locating a hazard, the method comprising the steps of:

providing a transmitter proximate a hazard, the transmitter providing, as an output, a predetermined signal, and

providing a receiver adapted to be responsive to the predetermined signal, the receiver also being adapted to provide an output to a user, a warning signal correlating to the predetermined signal.

8. A method as claimed in claim 7, wherein the predetermined signal is a message indicative of the hazard.
9. A method as claimed in claim 7 or 8, wherein the warning signal is a message indentifying the hazard.
10. A method as claimed in claim 7, 8 or 9, wherein the transmitter is releasably affixed to or proximate the hazard.
11. Apparatus adapted to locate a hazard, said apparatus including:  
  
processor means adapted to operate in accordance with a predetermined instruction set,  
  
said apparatus, in conjunction with said instruction set, being adapted to perform the method as claimed in any one of claims 7 to 10.
12. A method as herein disclosed.
13. An apparatus and/or system as herein disclosed.

1/2

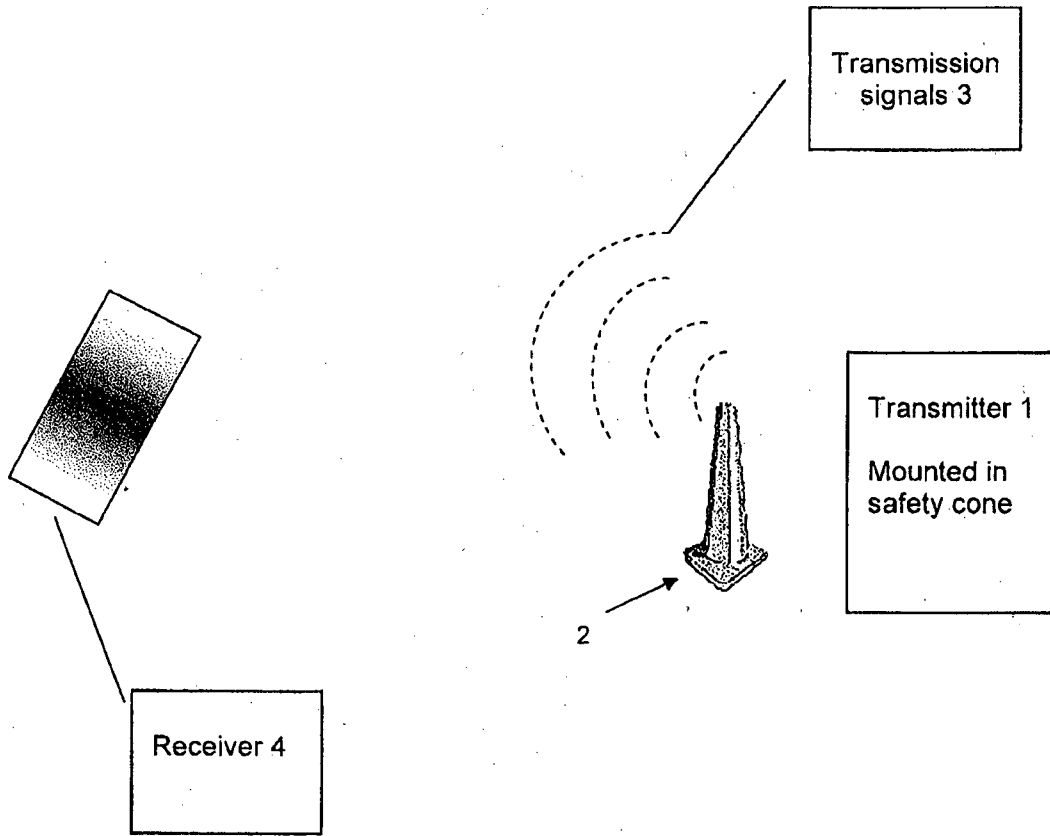
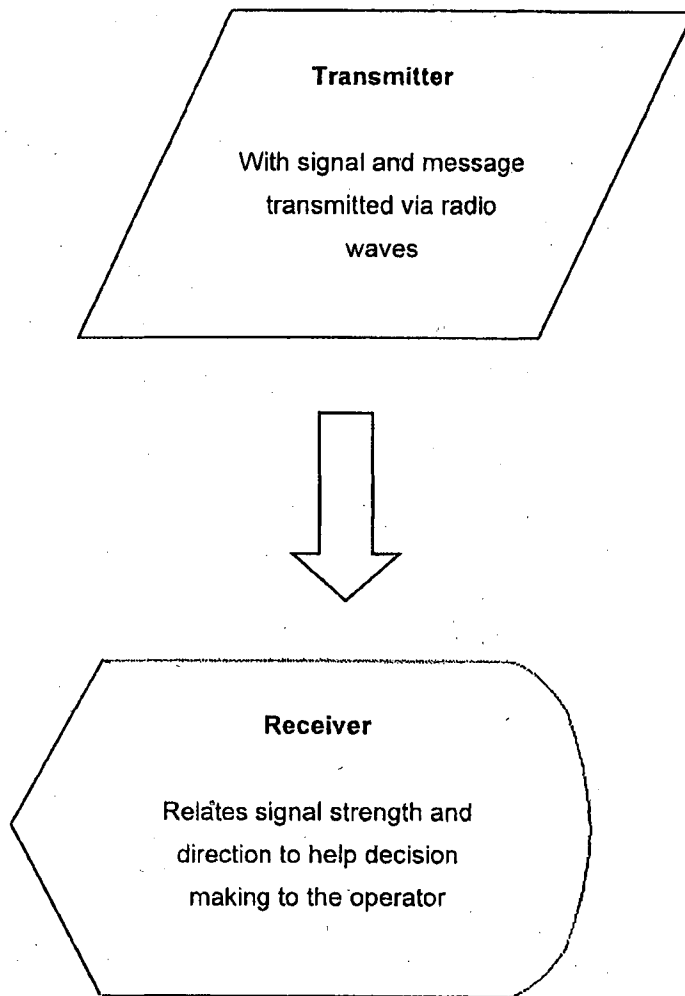


Figure 1

2/2



**Figure 2**



## INTERNATIONAL SEARCH REPORT

International application No.

PCT/AU2013/000365

## A. CLASSIFICATION OF SUBJECT MATTER

**G08G 1/00 (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)

**EPODOC, WPI, INSPEC, GOOGLE PATENTS & GOOGLE SCHOLAR:** hazard location, transmitter, receiver, warning signal and similar keywords.

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	Documents are listed in the continuation of Box C	



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	
"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  
14 May 2013Date of mailing of the international search report  
14 May 2013

## Name and mailing address of the ISA/AU

AUSTRALIAN PATENT OFFICE  
PO BOX 200, WODEN ACT 2606, AUSTRALIA  
Email address: pct@ipaustalia.gov.au  
Facsimile No.: +61 2 6283 7999

## Authorised officer

Ashwin Edakandi  
AUSTRALIAN PATENT OFFICE  
(ISO 9001 Quality Certified Service)  
Telephone No. 0262256158

**INTERNATIONAL SEARCH REPORT**

International application No.

C (Continuation).

DOCUMENTS CONSIDERED TO BE RELEVANT

**PCT/AU2013/000365**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2007/0078570 A1 (DAI et al.) 05 April 2007 See Whole Document and in particular Fig. 1; Abstract; paragraphs [0003], [0018] – [0028]; claim 1	1 - 11

**Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)**

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1.  Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
  
2.  Claims Nos.: **12, 13**  
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:  
**See Supplemental Box**
  
3.  Claims Nos.:  
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a)

**Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)**

This International Searching Authority found multiple inventions in this international application, as follows:

1.  As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2.  As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3.  As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
  
4.  No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

**Remark on Protest**

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.

**Supplemental Box**Continuation of **Box II**

The claims 12 and 13 do not comply with Rule 6.2(a) because they rely on references to the description.

**INTERNATIONAL SEARCH REPORT**

Information on patent family members

International application No.

**PCT/AU2013/000365**

This Annex lists known 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.

<b>Patent Document/s Cited in Search Report</b>		<b>Patent Family Member/s</b>	
<b>Publication Number</b>	<b>Publication Date</b>	<b>Publication Number</b>	<b>Publication Date</b>
US 2007/0078570 A1	05 Apr 2007	CN 101317168 A	03 Dec 2008
		CN 101317168 B	09 May 2012
		US 2007078570 A1	05 Apr 2007
		US 7571029 B2	04 Aug 2009
		WO 2007044211 A2	19 Apr 2007

**End of Annex**

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.

Form PCT/ISA/210 (Family Annex)(July 2009)