(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
4 February 2010 (04.02.2010)

PCT

(10) International Publication Number
WO 2010/012040 A1

(51) **International Patent Classification**:
G08G 1/16 (2006.01) ***B61L 3/12*** (2006.01)
B61L 25/00 (2006.01) ***G06F 17/10*** (2006.01)

(21) **International Application Number**:
PCT/AU2009/000977

(22) **International Filing Date**:
31 July 2009 (31.07.2009)

(25) **Filing Language**: English

(26) **Publication Language**: English

(30) **Priority Data**:
2008903940 31 July 2008 (31.07.2008) AU

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(81) **Designated States** *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) **Designated States** *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

WO 2010/012040 A1

(54) **Title**: A SYSTEM AND METHOD FOR PROVIDING AN ALERT

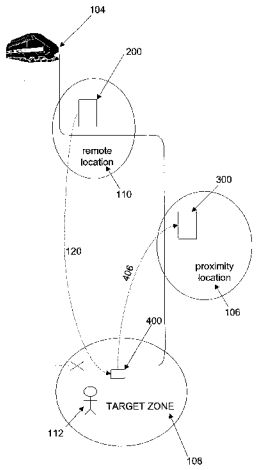

Figure 1

(57) **Abstract**: A system and method for alerting a user to a vehicle proceeding towards a target zone comprising detection for detecting the vehicle at a first waypoint and a communication device for communicating the detection to the user. When the target zone is ready to receive the vehicle, the user transmits a status to the vehicle at a second waypoint, the status providing an indication to the vehicle to proceed to the target zone.

A SYSTEM AND METHOD FOR PROVIDING AN ALERT

Technical Field

This invention relates to a system and method of providing an alert and particularly, but not exclusively, to providing alerting or warning to a work site located in the path of an approaching train or heavy vehicle.

Background

Work sites are sometimes established along the path of a train or heavy vehicle for the purpose of construction, maintenance or other necessary work along the path. In some circumstances, the work site may force closure of the path or track. In other situations where closure of the path is not viable, workers who are situated on the work sites are subject to a significant amount of risk due to the danger created by the approaching vehicle. As such, it is not uncommon that work teams have specific arrangements, such as utilizing additional workers to set up warnings along the path before the work site to provide a warning to approaching vehicles. To supplement these warnings, particularly in railroad work, workers are sometimes placed strategically on the path en-route to the work site and given radios or communication devices to warn the foreman at the work site of the approaching vehicle. Whilst this acts to reduce the risk to other workers, the practice utilizes a substantial amount of resources. To overcome this problem, some rail road warning systems which set off an alarm when the train is approaching a worksite have been developed.

In some examples of existing railroad warning systems, there are sensors and alarms system set up en-route to the work site. These sensors detect the presence of a heavy vehicle and transmit a signal arranged to

activate an alarm at the work site, warning the workers of the approaching vehicle. However, it is not uncommon that workers may be distracted by their work, particularly where they may be operating heavy construction vehicles or dealing with complex and difficult tasks. In these situations, the alarm may be missed or ignored by the workers at the work site, thereby creating a dangerous situation.

Summary of the Invention

In accordance with a first aspect of the invention, there is provided a method for alerting a user to a vehicle proceeding towards a target zone, comprising the steps of: detecting the vehicle at a first waypoint and communicating the detection to the user; and, whereupon the target zone is ready to receive the vehicle, the user transmits a status to the vehicle at a second waypoint, the status providing an indication to the vehicle to proceed to the target zone.

This embodiment is advantageous in that a target zone can be notified of an approaching vehicle, subsequently allowing parties at the target zone to give clearance to the vehicle before the vehicle is allowed to proceed. This arrangement is able to alert those at the target zone and will not signal the vehicle to proceed unless a confirmation is received from the parties at the target zone which will enhance the protection offered to the parties at the target zone as these parties must confirm their knowledge of the approaching vehicle.

In one embodiment of the first aspect, the status is received on a signalling device located at the second waypoint, wherein the device is arranged to communicate the status to the vehicle.

In one embodiment of the first aspect, the user transmits the ready status with at least one alert module, the module arranged to communicate with the vehicle or the signalling device located at the second waypoint.

In one embodiment of the first aspect, the signalling device has at least one visual indicator, the indicator arranged to communicate the status of the target site to the vehicle.

In one embodiment of the first aspect, the signalling device has at least one of an audio indicator or wireless indicator, the audio or wireless indicator arranged to communicate the ready status of the target site to the vehicle.

In one embodiment of the first aspect, the signalling device has at least one sensor, the sensor arranged to detect the vehicle at the second waypoint.

In one embodiment of the first aspect, wherein upon the sensor detecting the vehicle proceeding past the second waypoint, the signalling device displays the status reporting the target site is not ready to receive the vehicle.

In one embodiment of the first aspect, the alert module is arranged to alert a user of the vehicle at the first waypoint proceeding towards the second waypoint, and an interface for the user to input the status of the target site.

In one embodiment of the first aspect, the user enters an identification code, the code being arranged to verify the identity of the user such that the user acknowledges detection of the vehicle at the first waypoint.

In one embodiment of the first aspect, the vehicle is detected at the first waypoint with a detection device, the device arranged to transmit the detection to the alert module and has an indicator arranged to signal the vehicle of the second waypoint.

In a second aspect of the present invention, there is provided a method for alerting a platform of an oncoming train comprising the steps of: detecting the train at a first waypoint before the platform; and, communicating the detection to an alert module located at the platform, wherein the alert module provides an alert for users located on the platform of the oncoming train.

In a third aspect of the present invention, there is provided a method for alerting at least one motor vehicle travelling towards a rail crossing, of a train on route to the rail crossing comprising the steps of: detecting the train at a first waypoint before the crossing; and, communicating the detection to an alert module, the module arranged to communicate alerts to operators of the at least one motor vehicle before the vehicle reaches the rail crossing.

In a fourth aspect of the present invention, there is provided a system for alerting a user to a vehicle proceeding towards a target zone, comprising: a detection device arranged to detect the vehicle at a first waypoint and communicate the detection to the user; and, whereupon the target zone is ready to receive the vehicle, transmit a status to the vehicle at a second waypoint, the status providing an indication to the vehicle to proceed to the target zone.

In a fifth embodiment of the present invention, there is provided a system for alerting a platform of an

oncoming train comprising: a detection device arranged to detect the train at a first waypoint before the platform; and, the device communicating the detection to an alert module located at the platform, wherein the alert module provides an alert for users located on the platform of the oncoming train.

In a sixth aspect of the present invention, there is provided a system for alerting at least one motor vehicle travelling towards a rail crossing, of a train on route to the rail crossing comprising the steps of: a detection device arranged to detect the train at a first waypoint before the crossing; and, the device communicating the detection to an alert module, the module arranged to communicate alerts to operators of the at least one motor vehicle before the vehicle reaches the rail crossing.

In one embodiment of the second aspect, the device including a plurality of illuminating medium arranged to illuminate to provide an alert.

In one embodiment of the second aspect, the lighting device is controlled by the alert module.

In one embodiment of the third aspect, the lighting strips having a plurality of illuminating media arranged to illuminate to alert the operators of the approach of a vehicle.

In one embodiment of the third aspect, the display arranged to alert the operators of the approach of a vehicle.

In one embodiment of the third aspect, the display has a solar power source.

In a seventh aspect of the present invention, there is provided:

- a sensing unit arranged to connect to a pathway of the vehicle, wherein the sensor is arranged to detect the attributes of the vehicle; and
- a processor arranged to calculate the mass, speed, direction of travel of the vehicle or any combination thereof.

In an embodiment of the seventh aspect, the sensing unit comprises at least two pressure sensors arranged to provide a pressure value for the calculation of the mass of the vehicle.

Brief Description of the Drawings

Embodiments of the present invention will now be described, by way of example only, with reference to the accompanying drawings in which;

Figure 1 is a block diagram of the system in accordance with one embodiment of the present invention;

Figure 2 is an isometric view of the detection device in accordance with the embodiment of Figure 1;

Figure 2A is an example of a train sensor in accordance with the embodiment of Figure 1;

Figure 3 is an isometric diagram of the signalling device in accordance with the embodiment of Figure 1;

Figure 4 is a block diagram illustrating the alert module components in accordance with the embodiment of Figure 1;

Figure 5 is a flow diagram of the operation of one aspect of the system in accordance with the embodiment of Figure 1;

Figure 6 is a block diagram of the system in operation in another aspect of the invention;

Figure 7 is a block diagram illustrating a third aspect of the system in accordance with one embodiment of

the invention;

Figure 8 is an isometric view of the alert module in accordance with the embodiment of Figure 6;

Figure 9 is a front and side view of the strip lighting device and an illustration of the device in use in accordance with the embodiment of Figure 6;

Figure 10 is a front view of the warning display and a detailed illustration of the solar panel in accordance with the embodiment of Figure 7;

Figure 11 is a front view of light strips in accordance with the embodiment of Figure 7;

Figure 12 is a front view of an example of the alert module in accordance with the embodiment of Figure 1; and

Figure 13 is a block diagram of the system in use for a multiple track arrangement in accordance with one embodiment of the present invention.

Detailed Description of the Preferred Embodiment

In a first embodiment of the present invention, there is provided a system for alerting a user to a vehicle proceeding towards a target zone, comprising a detection device arranged to detect the vehicle at a first waypoint and communicating the detection to the user and whereupon the target zone is ready to receive the vehicle, the user transmits a status to the vehicle at a second waypoint, the status reporting the readiness of the target zone and providing an indication to the vehicle to proceed to the target zone.

With reference to Figure 1, an embodiment of the system has a detection device 200, the device is arranged to be located at a remote location 110 along the path of the vehicle 104. This device is arranged to detect the presence of a vehicle 104 at the remote location 110 and whereupon it detects the vehicle, the device sends a communication message 120 to the alert module 400, which

in some examples is located at the target zone 108.

The alert module 400, in this embodiment can communicate the detection of the vehicle 104 at the remote location 110 to a user 112 at the target zone 108. This can be done using a visual signal, audio signal, or by electronic data transfer means 404 such as a network (wired or wireless). Upon receiving this communication 120, the user 112 can prepare the target zone 108 to allow the safe passage of the vehicle 104. The alert module 400 has an input interface 402 which allows the user 112 to enter in an acknowledgement 406 of the detection of the approaching vehicle 104. This acknowledgement 406 is then transmitted to a signalling device 300 located at a proximate location 106 on the path of the vehicle en-route to the target zone 108.

The signalling device 300 in this embodiment is located at a proximate location 106. The proximate location 106 is en route to the target zone 108 and is between the remote location 110 and the target zone 108. The signalling device 300 is arranged to provide an approaching vehicle 104 with the status 408 of the target zone 108. The status 408, in this example, indicates the readiness of the target zone 108 to allow safe passage of the approaching vehicle 104. In some examples, the status 408 is displayed as a "stop" signal to the approaching vehicle, and commanding it to stop, or a "proceed" signal commanding the vehicle to proceed.

Whereupon the user 112 has adequately prepared the target zone for the safe passage of the vehicle, the user 112 enters an acknowledgement 406 with the interface 402 of the alert module 400. In this embodiment, the alert module 400 then transmits the acknowledgement to the signalling device 300 once the acknowledgement 406 is received by the signalling device 300, a signal light 302

will change to reflect the readiness of the target zone. In this example, upon the acknowledgement being received by the signalling device 300, the signal light 302 will change from a red light to a green light, indicating to the vehicle operator that the target zone is now safe for the vehicle to proceed.

The acknowledgement 406 is advantageous in that it ensures the user is fully aware of the approach vehicle, and could not have missed or ignored the initial alert. In a work site context, the acknowledgement also ensures accountability of a manager or a senior staff member to ensure the safety of the work site.

Once the vehicle has passed the signal device 300, the signal device 300 will detect the passing of the vehicle utilizing sensor 304. The sensor then communicates with the control circuitry 308 to reset the signal device 300 back to the initial status of the target zone. In the examples presented in Figure 1 and 3, the signal light 302 will switch back to the red signal, to indicate to a subsequent vehicle the target site is not safe to proceed until another acknowledgement 406 is received from the alert module 400. This arrangement ensures a vehicle in tow will be detected and acknowledged by the user 112 before it is allowed to proceed to the target site 108.

With reference to Figure 2, the detection device 200 comprises a housing 202 with a supporting base 204 arranged to erect the device 200 at the remote location 110. In the embodiment as shown in Figure 2, the supporting base is arranged to support the device 200 near the path of an approaching vehicle 104, such as the side of a rail road or over the ledge near a rail road. In this example, a battery is located in the base 204 arranged to supply power to the device 200. As the person skilled in the art can appreciate, the device should in

some embodiments, be also be placed in alternative positions best visible to an operator of the vehicle dependent on environmental conditions. In some examples, the base 204 can be replaced with a supporting tripod with adjustable legs to allow the base to be stable when situated on an uneven surface such as a rocky ledge or a hillside.

In some examples of the detection device 200, there is a support pole 206 which extends between the housing 202 and the base 204. The pole allows the housing 202 to be erected at a height from the base 204 and thereby allowing the indicators 210 to be elevated for ease of observation by the operator of an approaching vehicle 204. In this example, the pole 206 is telescoping and manufactured in a light weight material such as ABS plastic, aluminum or other material suitable to support the housing above the base. Due to the telescoping ability of the pole, the height of the pole 206, and therefore the elevation of the housing 202 can be adjusted. In examples where the pole 206 is manufactured with light weight materials, the pole 206 is easily transportable by a user, allowing it to be transported to hard to access terrain typically found along rail roads or in rural areas.

In this embodiment, the detection device 200 has an indicator light 210 arranged to provide a warning to the approaching vehicle 104. In one example, the light 210 is a high intensity LED light, emitting an amber coloured light beam, although other colours are possible in different operational environments. The light beam in this example is visible in all operating conditions and may be configured to flash or emit a specific light pattern such as Morse code, or another universal warning indicators.

In further embodiments, the device 200 has an audio indicator emitting a sound, siren or high pitch noise to

provide a further warning to the operator of a vehicle 104. In these examples, the sound is suited to being heard over the operation noise or environmental noise of the vehicle and is emitted by a connected siren or heavy speaker 212 connected to the detection device 200.

In yet a further embodiment, the device 200 has a wireless transmitter 214 arranged to communicate a wireless signal for a receiving unit within the vehicle 104. In this example, the wireless transmitter is arranged to transmit an electronic signal to a receiver within the vehicle such that communication 120 of the target zone 108 is given to the operator. In some examples, where the vehicle 104 is equipped with a computerized cockpit such as but not limited to, the Garmin All-Glass G1000 Cockpit system, an all-glass codepit system specifically built to provide integration of all instruments in the one display for access and manipulation (see https://buy.garmin.com/shop/shop.do?cID=153&pID=6420), the transmitter is arranged to transmit a digital signal compatible for communication with the computerized cockpit system, which in advanced systems may be able to automatically control the vehicle to adjust its speed or direction of travel or to alert crew or passengers aboard the vehicle to adapt to the communication 120 of the pending proximity location 106 and target zone 108. The vehicle may also be able to communicate data to the device 200 such as its current speed, weight, persons on board, cargo on board or its GPS location such that this information may be stored with the device 200 or transmitted to the alert module 400.

In some embodiments the detection device 200 has at least one sensor 216 arranged to detect the presence of a vehicle 104. The sensor 216 may be a pressure sensor connected to the detection device 200 and installed in the path of the vehicle, such as, without limitation, pressure

sensors arranged for installation on a rail track and adapted to detect the presence of a train. These sensors can detect the presence of a train by detecting the pressure from the weight of a vehicle. In advanced versions, these sensors can detect the speed, size and weight of the train by counting the wheels detected and the time required for the passing of the wheels. An example of a sensor arranged to be clamped on a rail track to detect the presence of a train is shown in Figures 2A. In other examples, as is shown in Figure 2, the sensor 216 may be an infrared sensor arranged to detect the movement of a vehicle and is integrated within the housing 202. The infrared sensor arrangement may be specifically programmed such as that only larger objects such as a moving vehicle will be detected. This minimises the possibility of environmental noise trigging the sensor. As a person skilled in the art can appreciate a plurality of sensors 216 can be used based on the size of the vehicle 104. Whereupon the sensor 216 detects vehicle 104, the sensor 216 communicates with the detection device 200 to indicate the presence of the vehicle 104.

In the embodiment as illustrated in Figure 2, the detection device 200 has a communication transmitter 218 to transmit the communication 120 of detecting the vehicle to the alert module 400. Preferably, the transmitter 218 is integrated within the housing 202 and is arranged to transmit a wireless electronic signal to the alert module 400. In this example, the transmitter sends an encrypted digital signal to the alert module 400 such that other communication devices external to the system cannot interfere with the operations of the system (such as a GSM signal). In other examples, the transmission may be connected by cable routed to a network device connected to the alert module 400, the network devices being a device commonly found in other communications or computer networks. Examples of network devices include, without

limitations wireless network systems operating on the Wi-Fi technology or local area network (LAN) devices operating on an Ethernet protocol. A back up transmission device is also included in some embodiments to allow a redundant communication system in the event the primary connection fails.

In this embodiment, the device 200 provides an initial indication of the target zone 108, and therefore it is preferably located at a remote location 110 en route to the target zone. The remote location 110 can be decided by the user with each deployment of the system such that there will be sufficient distance for the vehicle to stop between the detection device 200 and the signalling device 300. In some examples, where the vehicle 104 is a heavy goods train which may require a significant distance to stop, the device is placed 2 kilometers from the signalling device 300 or 3 kilometers from the target zone 108. Where the terrain for deploying the system is different or the operation speed of the vehicle changes, the distances between the remote location 110, proximate location 106 and target zone 108 may change in accordance to what the user would deem to be a safe distance.

In operation, the detection device 200 will transmit a signal to the alert module 400 whereupon a vehicle passes the detection device 200. Following this event, the device 200 will reset to its initial state such that a subsequent vehicle detected will also cause a subsequent signal to be transmitted to the alert module 400.

With reference to Figure 4, there is illustrated an embodiment of the alert module 400. In this embodiment the alert module 400, is arranged to be accessible to a user at the target zone. The alert module 400 comprises an interface 402 arranged for a user to enter an acknowledgement code 406, a communication means 410

arranged to transmit the acknowledgement to the signalling device 300 and an alerting means 404 arranged to alert users at the target zone of the approaching vehicle 104 detected by the detection device 200.

In some examples, the alert module 400 may be connected to a computer, including, but not limited to, a personal computer, a server or a handheld computing device (such as a personal digital assistant) such that the computer forms both the interface 402 and the communication means 410. In this example, the computer can have computer software implemented in any suitable computing language which provides an interface 402 for the user to actively control and review the status of the detection device 200 and the signalling device 300. In other embodiments the alert module 400 is an electronic device having a communications means 410 arranged to communicate with both the signalling device 300 and detection device 400, the module having an interface 402 for reporting and receiving inputs from a user.

In this embodiment with reference to Figure 4 and 12, the alert module is provided with a screen 412, which displays the status of the system. The alert module 400 also has a communication means 410, which in this example is a wireless electronic communication devices arranged to communicate with the signalling device 300 and the detection device 200. The module 400, also has a alerting means 404, which may be in the form of a visual alarm, such as a rotating flash light 404A, an audio alarm, such as a loud speaker or siren 404B or a wireless transmitter 404C, arranged to transmit a digital signal to any connected electronic devices, such as handheld devices, mobile phones, laptop computers or electronic warning sirens.

In operation, the alert module 400 waits for receipt

of a signal (communication) 120 from the detection device 200. Upon the alert module 400 receiving the communication indicating a vehicle 104 has approached the remote location 110 and is en-route to the target zone 108, the module 400 may display and/or signal the alerting means 404 to alert the user or users located at the target site to the approaching vehicle, as the vehicle passes the remote location 110 and approaches the target site. In this example, the user, upon receiving the alert via the alerting means 404 can direct his or her crew and any other equipment that may be in the path of the vehicle to move to a safe location such that the vehicle can pass through the target zone 108 without endangering the lives of the user, crew or risk damaging any equipment.

Upon the user being satisfied that the target zone is prepared for the vehicle to pass through, the user can approach the alert module 400, and using the interface 402, enter an acknowledgement to the alert signal. In the example of the system being utilized on a work site, the user's acknowledgement 406 can represent the safe status 408 of the work site for the vehicle to pass through. In a preferred example, the acknowledgement 406 can be entered into the interface 402 by entering a specific code such as a PIN (personal identification number) or password only known to the user 112 to confirm that the status 408 of target zone is now safe for the passage of the vehicle. Upon the successful entry of this code to the interface 402, the alert module 400 will then transmit a signal to the signalling device 300, which is usually located at a proximate location 106 to the target zone 108. This example is advantageous to worksites where a site manager or foreman may be responsible for the safety of the site, and accordingly, the foreman or manager is issued with this acknowledgement code.

In other embodiments, the alert module 400 may be

located offsite and away from the target zone 108. In this embodiment, the module 400 may be controlled by portable devices accessible to users 112 located at the target zone 108. In this specific embodiment, the alert module 400 may be a server or computer located at a central point, such as a headquarters or command centre remote from the target zone 108. The module 400 is able to communicate with the user at the target zone 108 via a telecommunications link, such as a mobile phone, PDA or laptop computer. In these embodiments, the portable device will act as the interface 402 to alert the user of the approaching vehicle and provide an interface 402 for the user to enter in a specific code as an acknowledgement 406. As a person skilled in the art will appreciate, there can be plurality of alert modules 400 and interfaces 402 depending on the size of the target zone 108 or the number of users which may be located at the target zone. In these examples, the module 400 may be programmed such that all users must enter in a specific code before it is deemed the target zone 108 is safe for the passage of the vehicle.

With reference to figures 3, an embodiment of the signalling device 300 is shown. The signalling device 300, is preferably located at a proximate location 106 on the path en-route to the target zone 108, between the remote location 110 and the target zone 108. As the person skilled in the art will appreciate, the location of the signalling device 300 from the detection device should be of a sufficient distance for the vehicle 104 to respond from the original detection device, in some instances, the distance may be sufficient for the vehicle to come to a complete stop or approach a safe operational speed. In embodiments where the system us utilized in a locomotive environment, where the vehicle can be a heavy train, the approximate distance is around 2km from the detection device 110 and thereby allows a train operator to

sufficiently respond to the detection device 200 to come to a complete stop at the signalling device 300. The distances will vary based on the terrain, vehicle type or vehicle operational speed.

According to the embodiment shown in Figure 3, the signalling device 300 comprises a status signal indicator 310 which in this embodiment is a plurality of lights arranged to indicate the status 408 of the target zone 108. According to this example, the lights are constructed of high intensity LEDS which can provide a strong light source in all conditions. In some examples, the lights include a red light and a green light arranged to indicate a safe or unsafe status 408 of the target zone 108 and subsequently communicate to the vehicle operator on whether the target zone is ready for the approaching vehicle to continue its passage towards the target site. In other examples, the status reporting indicator 310 may be a single light or a LCD screen arranged to communicate visually with the operator of the vehicle.

In other examples, an audio indicator 312 can be used to report the status of the target zone by emitting an audio signal which would allow an operator of a vehicle to distinguish between the varying statuses 408 of the target zone 108.

According to this embodiment, the statuses signal indicator 310 are housed within a housing 308 which is installed erect to a supporting base 314. The supporting base 314 is designed such that the entire unit can be remotely mounted on almost any terrain and where the terrain may not be level, a tripod base can be used to support the body of the signalling device 300. The base 314 also houses a power supply (including a back-up battery) to power the device 300.

The signalling device 300 has a communications link arranged to communicate with the alert module 400 such that on receipt of an acknowledgement 406 from the alert module the signalling device 300 will report a safe status of the target zone 108. This in reference to the example abovementioned is the changing of the light signal 302 from red to green thereby indicate to the vehicle operator that the target zone 108 is now ready for the passage of the vehicle 104.

The signalling device 300 also has a sensor 304 similar to the sensor on the detection device 200 abovementioned. The sensor 304 is capable of detecting the vehicle 104, and when the vehicle has passed the signalling device 300 the sensor 304 detects the vehicle passing through the proximate location 106. Under normal operation, the status prior to the vehicle proceeding past the device 300 should be displaying a "safe" status, in which case the device will reset to the "unsafe" status to inform a subsequent vehicle on the path to stop. This ensures a subsequent vehicle will not be reported an incorrect status 408.

In some embodiments the signalling device 300 has a transmitter utilized in conjunction with the sensor to send a warning signal to the alert module 400 if the approaching vehicle has ignored the signal given by the signalling device. In these instances, an alarm may be raised at the target zone by the alert module 400 to warn of the approaching vehicle.

With reference to Figures 2, 3 and 4, each of the device in the embodiments described 200, 300 and module 400 are arranged to carry a GPS (global positioning service) tracker to trace the location of each device, should the device be stolen or removed from its location. The GPS device can provide a tracking means as to retrieve

each of the device and/or module should they become misplaced. All data collected by each of the devices (200, 300 or 400) may also be logged for maintenance, reporting or diagnostic purposes. In other embodiments, each device and module is connected to a solar panel arranged to supply power in conjunction to its normal power supply to further supplement the lifespan of existing batteries or to provide power in a remote location where normal "mains" power is not available.

In some alternative embodiments, the detection device 200 and the signalling device 300 may be integrated into one unit and are placed on a track or path of a vehicle approaching the target zone. In these embodiments, the signalling device 300 will alert the vehicle once the vehicle has been detected in proximity to the signalling device 300. The detecting device 200 will also send an alert to the alert module 400 at the target zone. In this example, the user at the target zone will not provide a signal to the vehicle to proceed, but rather will be alerted of the approaching vehicle.

In another embodiment, the signalling device 300 may simply be deployed on a track or path to alert an approaching vehicle.

With reference to Figure 5, there is shown a flow chart illustrating the procedure of the system when in use with reference to a railway setting. Initially, a user establishes the alert module 400 at the worksite 108 and arrange for the detection device 200 to be located at remote location 110 approximately 3km from the worksite 108. Following this, the user can place the signalling device 300 at a proximate location 106 to the worksite. Upon both units are properly placed, both the detection and signalling device 200, 300 are switched-on and the alert module 400 then detects their presence and

connectivity by checking the integrity of the wireless communications between the devices (500).

After the checks, the entire system waits for an approaching train to arrive at the remote location (502). Once the approaching train arrives at the remote location, the train operator should notice the indicator light 210. In the present example, the indicator light is an amber coloured flashing light (504). The operator of the vehicle, aware of a subsequent signalling device, may be required to stop the vehicle. In this situation, the operator reduces the speed of the vehicle and prepares to stop at the proximate location 106.

Upon the detection of the vehicle by the detection device (506), the device 200 transmits a communication to the alert module 400 to indicate that a train has now passed the remote location en-route to the proximate location (506). Upon the module 400 receiving this communication, an alert in the form of both an audio (alarm) and visual (lighting) warning is provided to the workers at the worksite. The worksite is then prepared such that the train is able to pass through safely (508).

Upon the users preparing the worksite for the train to pass through, the user then enters a specific code to the interface of the receiving module to verify that the worksite has been adequately prepared for safe passage of the train (510). The code can be in the form of a PIN previously set-up by a senior user such as a foreman or site manager. Upon the code being entered into the interface, an acknowledgement is transmitted to the signalling device and reports the safe status of the worksite for the train to proceed (509). The signalling device changes the light in the status indicator 310 from a red light to a green light and signals the operator of the train to proceed. As soon as the train passes through

the signalling device (512), the signalling device resets the status signal indicator back to a red light (514). This stops any subsequent trains that are in tow and requires another acknowledgement from the worksite before the subsequent vehicle is allowed to pass through. This ensures that the worksite is adequately prepared for subsequent trains which may be in tow to the first train.

With reference to Figure 6, an alternative embodiment of the present system is shown to operate as an advance train warning system for use in a train station. The system can be arranged to operate as an advance train warning system to provide warnings to passengers awaiting trains on a platform. In these instances the detection device 200 is spaced out along a location further up from the station so as to detect the approaching train. Upon the train passing through the detection device 200, the device transmits a signal to the alert module 400 which is stationed on the platform or in communications with an interface located at the station accessible to a user on the platform.

Subsequently, the alert module 400 receives the signal of an incoming train and broadcasts a warning signal. The warning signal may be a visual or audio warning at the station that a train is approaching and to "stand clear behind the yellow line" as broadcast by the module's speaker or visual alarm.

In this embodiment, the alert module 400 has an interface arranged to receive input from a user such as station master or other employee to issue additional warnings or announcements to passengers. Where the operation of the system is on a large platform or station, multiple alert modules 400 can be connected to cover a large platform. An unlimited number of modules can be independently programmed to allow for multiple railway

lines and directions. An example of one embodiment of the alert module 400 is illustrated in Figure 8. Referring to Figure 8, the alert module 400 has a display panel 802 arranged to display alert messages to passengers. The display panel 802 may be constructed with LED display panels arranged to display digital text. In other examples, the panel 802 is a LCD panel capable of displaying computer generated graphics.

In this example of the alert module 400 as illustrated by Figure 8, the module 400 has a strobe light 804 which is arranged to provide a visual alert to passengers. The module 400 may also have a speaker system 806 arranged to provide audio alerts or broadcasts to passengers. In outdoor embodiments, the module 400 may have a solar panel 808 arranged to provide a power source to the module 400. Where night operations are necessary, the module 400 may have a battery system as a power source, or an electric mechanism to charge the power source utilising a mains power supply.

In this embodiment, the module 400 may be in communication with a strip lighting device, an example of which is illustrated in Figure 9. In this example, the strip lighting device 902 is an elongated strip of LED lights 904 arranged to be mounted within the platform. The LED lights 904 are electronically controlled and are arranged to illuminate to alert the passengers on the platform of the edge or a separate portion of a platform 906. In this example, the LED lights 904 illuminate an amber coloured light to suggest a warning to passengers, although alternate colours (or a multi-colour capable LED light) can be used to provide guidance to passengers.

The strip lighting device 902 may be controlled by the alert module 400 to provide additional alert signals. In some examples, the module 400 may control the strip

lighting device 902 to flash upon the detector of a train moving towards the platform.

In some embodiments, the system also has the option of a GSM module to allow for remote monitoring. In this embodiment, the module has an electronic interface which is integrated with the system and provides a communication signal to be transmitted via a telecommunications gateway. The gateway can be suitably implemented to connect to a mobile phone carrier with the transmission of GSM data signals. The electronic interface can monitor the status of the system, and thereby transmit suitable alert signals via the telecommunication gateway. For example, the GSM module will send an SMS or call if a fault is detected by the main unit, such as a battery fault, loss of signal from the track sensors or tampering with the systems.

In a further embodiment, the system can also monitor the time of day and adjust audio levels accordingly. Additionally or alternatively, the system may also change the message format. For example, during a day when a train approaches the station, a warning siren is given then a voice recording, in one embodiment, "warning, train approaching, please stand clear". At night the system can automatically change its message by only playing the voice message and no siren. In other words, the system may adapt to its immediate environment. In this example, the system does not require a time setting adjustment as the unit has a light sensor arranged to automatically know whether it is day or night.

With reference to Figure 7, a further embodiment of the present system is shown, wherein the system is arranged to operate on a railroad in communication with various remote units situated on a regular motorway. In this embodiment, the system provides a level-crossing warning system by detecting the presence of an approaching

train to a level-crossing. Upon the sensors detecting the train, a signal is sent to various alert modules 400 along the path of a motorway on-route towards the rail-crossing. In these instances, the alert module 400 is arranged to activate a signal on a plurality of warning displays 702 which are specifically spaced on the motorway to provide ample warning to an operator of a motor vehicle on-route towards the rail-crossing.

Upon a train activating the detection device 200, the detection device sends a communication to the alert module 400 which in turns controls various warning displays 702 or lighting strips 704 which are spaced-out on-route towards the rail-crossing 704. The warning displays may be solar-powered in one embodiment or powered on a regular electrical grid and have a plurality of features arranged to signal to a driver of the rail-crossing ahead. In some examples, without limitation, these may be visual warnings such as flashing lights or audio warnings such as sirens or alarms.

With reference to Figure 10, an example of the warning display 702 is illustrated. The display has a visual warning panel decorated 1002 with a warning symbol 1004 and may have a visual alert light 1006. The lights 1006 are powered by a solar panel 1008 which is attached to the upper portion of the warning display. The solar panel provides a power source to the display where regular mains power may not be available and may comprise solar cells 1010 and an internal battery 1012.

In this embodiment, lighting strips 704 may be planted into the road surface to alert a driver of the upcoming crossing. With reference to Figure 11, an example of the lighting strip is illustrated. The lighting strip 704 is integrated within the road surface and comprises light emitting members such as LED's. The

lighting strip 704 may be controlled by the alert module 400 to illuminate or flash where upon a train has been detected.

In this embodiment, the signalling device may also be strategically placed by a person skilled in the art on the railroad. Upon detection of a vehicle which appears to be ignoring the warnings provided by the warning signs, the receiving module is programmed to send a signal to the signalling device to indicate to the approaching train that there may be a significant risk of collision up ahead. This provides a period allowing the operator of the train to do whatever is possible to reduce the risk of collision that would occur if the operator was not warned.

In another embodiment, the solar panel 1008 is arranged with at least one row of LEDs arranged to illuminate the warning display 702. In this example, the solar panel 1008 is constructed with a housing arranged to house a rechargeable battery and a plurality of LEDs. The solar panel 1008 is arranged to be installed adjacent to the warning display 702 such that during daylight, the batteries within the panel 1008 are recharged and at nightfall or during dark conditions, the batteries are discharged to provide additional illumination to the warning panel 702.

With reference to Figure 13, a further embodiment of the system in operation for a multi-track target zone 1302 is shown. In this embodiment, a target zone 1302 may have multiple tracks directing vehicles, such as trains throughout the target zone 1302. For each track running through the target zone 1302, an alert module 400 is installed to monitor each track. Each alert module 400 is arranged to communicate with the signalling device 300 and the detection device 200 (not shown) on each track in order to detect and signal to a train traveling towards

the target zone 1302.

In this embodiment, there may be multiple turn offs between each track to direct vehicles to different tracks. In order to allow vehicles traveling on a track and expecting to be directed to an alternative track (such as a vehicle traveling from east to west on track 2 and is expecting to be directed to track 1), the detection device 200 and the signalling device 300 on track 2 will communicate with the alert module 400 on track 1 so as to allow the target zone 1302 closest to track 1 to become alerted to the pressure of a vehicle approaching its zone. In this example, the signalling device, detection device 200 and the alert module 400 are suitably implemented to allow cross-communication such that the changes to the track configuration can be suitably detected and reported to the target zone 1302.

In this embodiment, multiple signalling device 300 and detection device 200 (not shown) are installed on each of the multiple tracks. The deployment of multiple signalling and detection devices provides an additional benefit as additional alerts can be provided to the vehicle operator and the target zone 1302. As shown, the signalling device 300 is spaced out on the track in 500-600 metre intervals and classified as an outer signal for those remote from the target zone 1302 and inner signal for signal device 300 proximate to the target zone 1302. Alternative arrangements are possible and appreciated by the person skilled in the art based on the geographic requirements of the target zone and expected vehicle traffic on the tracks proximate to the target zone 1302.

It will be understood to persons skilled in the art of the invention that many modifications may be made

without departing from the spirit and scope of the invention.

It will also be appreciated that where methods and systems of the present invention are implemented by computing systems or partly implemented by computing systems then any appropriate computing system architecture may be utilized. This will include stand alone computers, network computers and dedicated computing devices. Where the terms "computing system" and "computing device" are used, then these terms are intended to cover any appropriate arrangement of computer hardware for implementing the function described.

CLAIMS

1. A method for alerting a user to a vehicle proceeding towards a target zone, comprising the steps of:

- detecting the vehicle at a first waypoint and communicating the detection to the user; and,
- whereupon the target zone is ready to receive the vehicle, the user transmits a status to the vehicle at a second waypoint, the status providing an indication to the vehicle to proceed to the target zone.

2. A method according to claim 1, wherein the status is received on a signalling device located at the second waypoint, wherein the device is arranged to communicate the status to the vehicle.

3. A method according to claims 1 or 2, wherein the user transmits the ready status with at least one alert module, the module arranged to communicate with the vehicle or the signalling device located at the second waypoint.

4. A method according to claims 2 or 3, wherein the signalling device has at least one visual indicator, the indicator arranged to communicate the status of the target site to the vehicle.

5. A method according to any one of claims 2 to 4, wherein the signalling device has at least one of an audio indicator or wireless indicator, the audio or wireless indicator arranged to communicate the ready status of the target site to the vehicle.

6. A method according to any one of claims 2 to 5, wherein the signalling device has at least one sensor, the sensor arranged to detect the vehicle at the second waypoint.

7. A method according claim 6, wherein upon the sensor detecting the vehicle proceeding past the second waypoint, the signalling device displays the status reporting the target site is not ready to receive the vehicle.

8. A method according any one of claims 3 to 7, wherein the alert module is arranged to alert a user of the vehicle at the first waypoint proceeding towards the second waypoint, and an interface for the user to input the status of the target site.

9. A method according to any one of the preceding claims, wherein the user enters an identification code, the code being arranged to verify the identity of the user such that the user acknowledges detection of the vehicle at the first waypoint.

10. A method according to any one of the preceding claims, wherein the vehicle is detected at the first waypoint with a detection device, the device arranged to transmit the detection to the alert module and has an indicator arranged to signal the vehicle of the second waypoint.

11. A method for alerting a platform of an oncoming train comprising the steps of:

- detecting the train at a first waypoint before the platform; and,
- communicating the detection to an alert module located at the platform, wherein the alert module provides an alert for users located on the platform of the oncoming train.

12. A method for alerting at least one motor vehicle travelling towards a rail crossing, of a train on route to the rail crossing comprising the steps of:

- detecting the train at a first waypoint before the crossing; and,
- communicating the detection to an alert module, the module arranged to communicate alerts to operators of the at least one motor vehicle before the vehicle reaches the rail crossing.

13. A system for alerting a user to a vehicle proceeding towards a target zone, comprising:
- a detection device arranged to detect the vehicle at a first waypoint and communicate the detection to the user; and,
- whereupon the target zone is ready to receive the vehicle, transmit a status to the vehicle at a second waypoint, the status providing an indication to the vehicle to proceed to the target zone.

14. A system according to claim 13, wherein the status is received on a signalling device located at the second waypoint, wherein the device is arranged to communicate the status to the vehicle.

15. A system according to claims 13 or 14, wherein the user transmits the ready status with at least one alert module, the module arranged to communicate with the vehicle or the signalling device located at the second waypoint.

16. A system according to claims 14 or 15, wherein the signalling device has at least one visual indicator, the indicator arranged to communicate the status of the target site to the vehicle.

17. A system according to any one of claims 14 to 16, wherein the signalling device has at least one of an audio indicator or wireless indicator, the audio or wireless

indicator arranged to communicate the ready status of the target site to the vehicle.

18. A system according to any one of claims 14 to 17, wherein the signalling device has at least one sensor, the sensor arranged to detect the vehicle at the second waypoint.

19. A system according claim 18, wherein upon the sensor detecting the vehicle proceeding past the second waypoint, the signalling device displays the status reporting the target site is not ready to receive the vehicle.

20. A system according any one of claims 15 to 19, wherein the alert module is arranged to alert a user of the vehicle at the first waypoint proceeding towards the second waypoint, and an interface for the user to input the status of the target site.

21. A system according to any one of the preceding claims, wherein the user enters an identification code, the code being arranged to verify the identity of the user such that the user acknowledges detection of the vehicle at the first waypoint.

22. A system according to any one of the preceding claims, wherein the vehicle is detected at the first waypoint with a detection device, the device arranged to transmit the detection to the alert module and has an indicator arranged to signal the vehicle of the second waypoint.

23. A system for alerting a platform of an oncoming train comprising:

- a detection device arranged to detect the train at a first waypoint before the platform; and,

- the device communicating the detection to an alert module located at the platform, wherein the alert module provides an alert for users located on the platform of the oncoming train.

24. A system for alerting at least one motor vehicle travelling towards a rail crossing, of a train on route to the rail crossing comprising the steps of:

- a detection device arranged to detect the train at a first waypoint before the crossing; and,
- the device communicating the detection to an alert module, the module arranged to communicate alerts to operators of the at least one motor vehicle before the vehicle reaches the rail crossing.

25. A method according to claim 11, further including a lighting device, the device including a plurality of illuminating medium arranged to illuminate to provide an alert.

26. A method according to claim 25, wherein the lighting device is controlled by the alert module.

27. A method according to claim 12, further including lighting strips, the lighting strips having a plurality of illuminating media arranged to illuminate to alert the operators of the approach of a vehicle.

28. A method according to claims 12 or 27, further including a warning display, the display arranged to alert the operators of the approach of a vehicle.

29. A method according to claim 28, wherein the display has a solar power source.

30. A system according to claim 23, further including a lighting device, the device including a plurality of

illuminating medium arranged to illuminate to provide an alert.

31. A system according to claim 30, wherein the lighting device is controlled by the alert module.

32. A system according to claim 24, further including lighting strips, the lighting strips having a plurality of illuminating media arranged to illuminate to alert the operators of the approach of a vehicle.

33. A system according to claims 24 or 32, further including a warning display, the display arranged to alert the operators of the approach of a vehicle.

34. A system according to claim 33, wherein the display has a solar power source.

35. A system or method in accordance with any one of the preceding claims arranged to alert a user to a plurality of vehicles proceeding towards the target zone.

36. A system or method in accordance with claim 35 where in the plurality of vehicles proceeds towards the target zone via a plurality of paths.

37. A system for detecting attributes of a vehicle comprising:

- a sensing unit arranged to connect to a pathway of the vehicle, wherein the sensing unit is arranged to detect the attributes of the vehicle; and
- a processor arranged to utilize the attributes of the vehicle to calculate any one of mass, speed or direction of travel of the vehicle.

38. A system in accordance with claim 37, wherein the sensing unit comprises at least two pressure sensors

arranged to provide a pressure value for the calculation of the mass of the vehicle.

39. A system in accordance with claim 38, wherein the sensing unit further comprises a clock arranged to provide a time variable to the processor for calculating the speed of the vehicle.

40. A system in accordance with claim 37 or 38 wherein the at least two sensors are arranged within the sensing unit to detect the direction of travel of a vehicle.

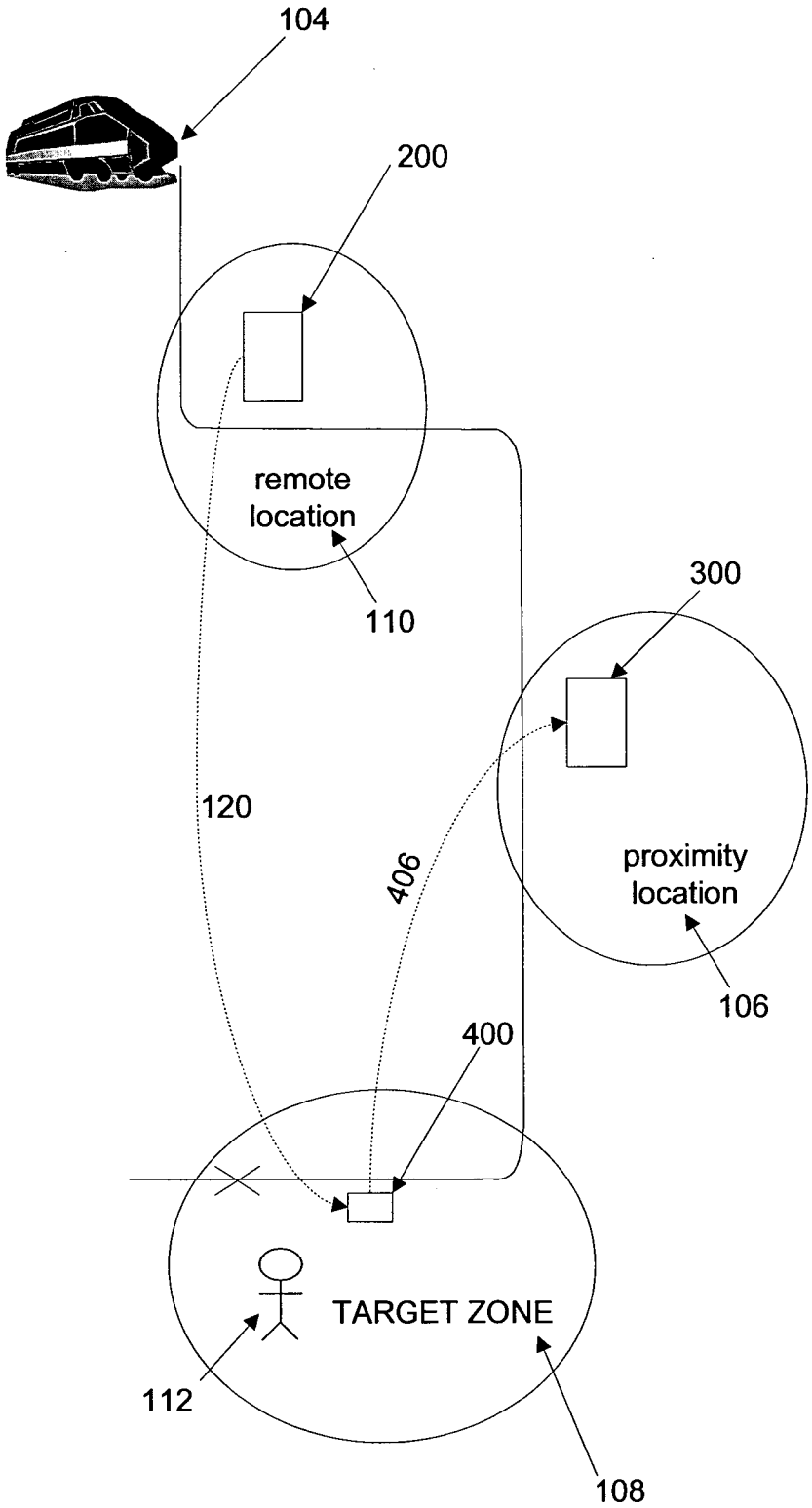
104
200
remote
location
110
300
120
406
proximity
location
106
400
TARGET ZONE
112
108

Figure 1

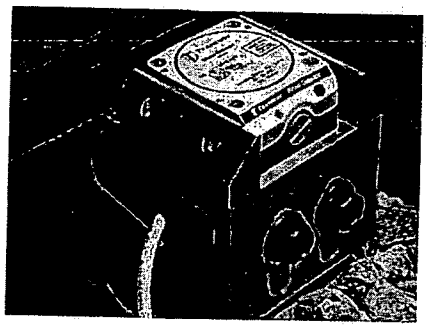

Figure 2A

Figure 2

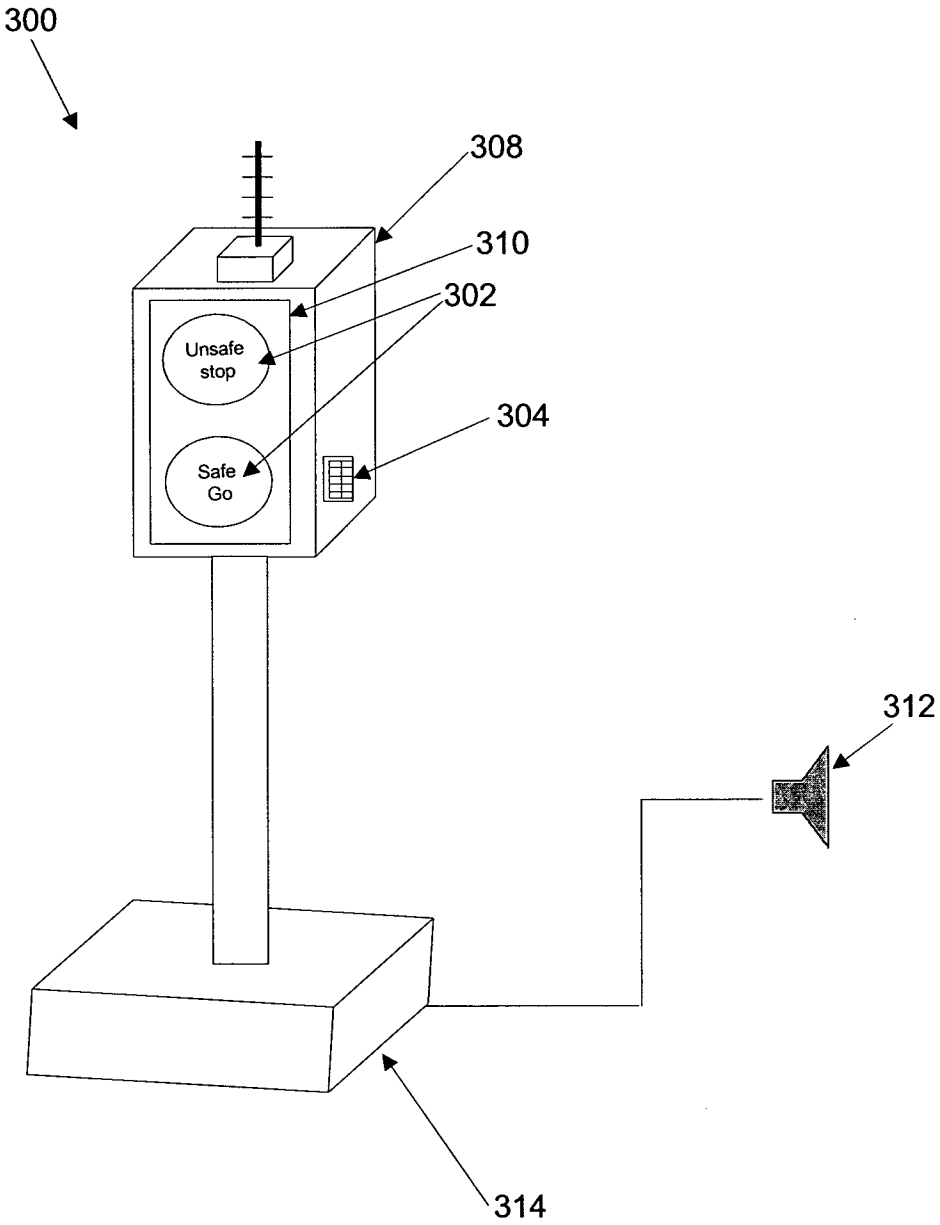

Figure 3

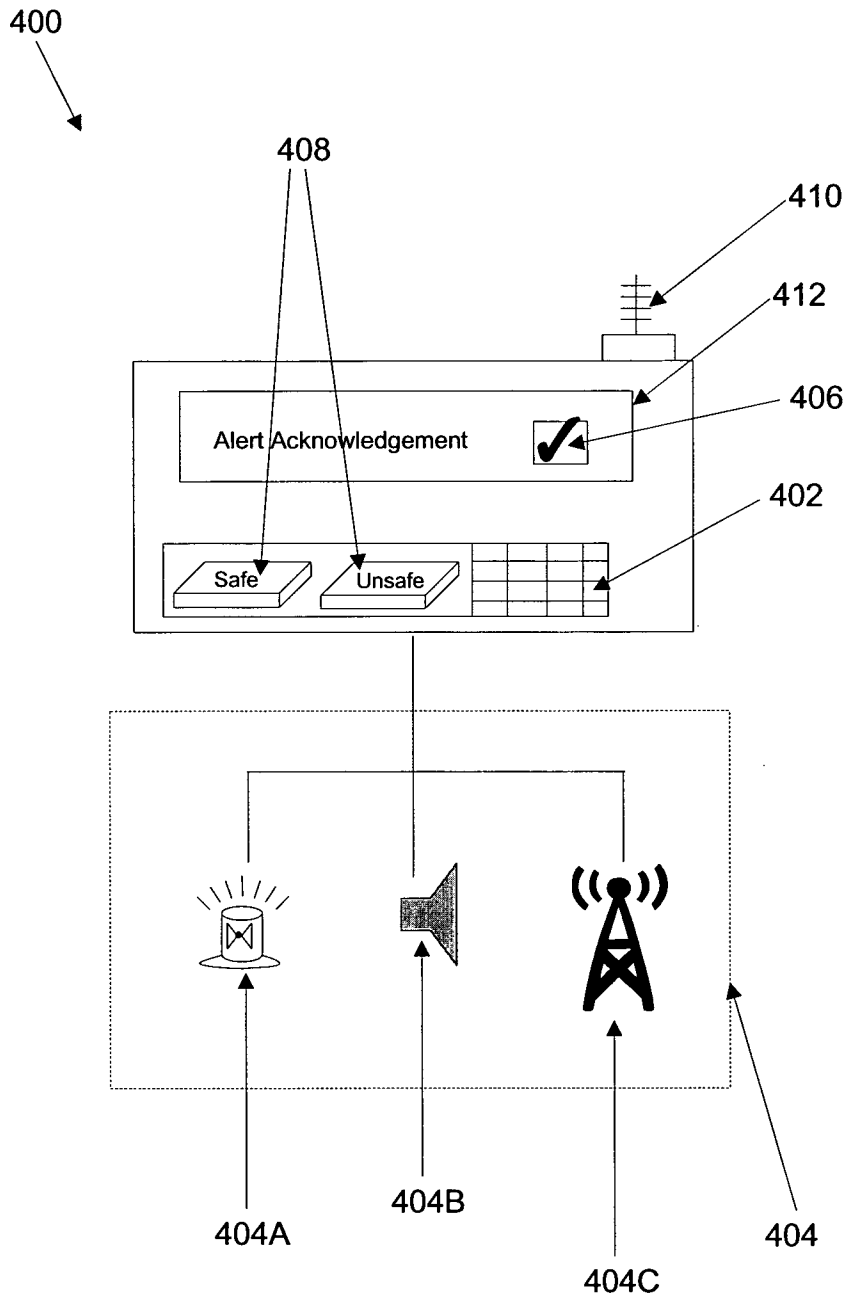
400
408
410
412
406
Alert Acknowledgement
402
Safe
Unsafe
404A
404B
404C
404

Figure 4

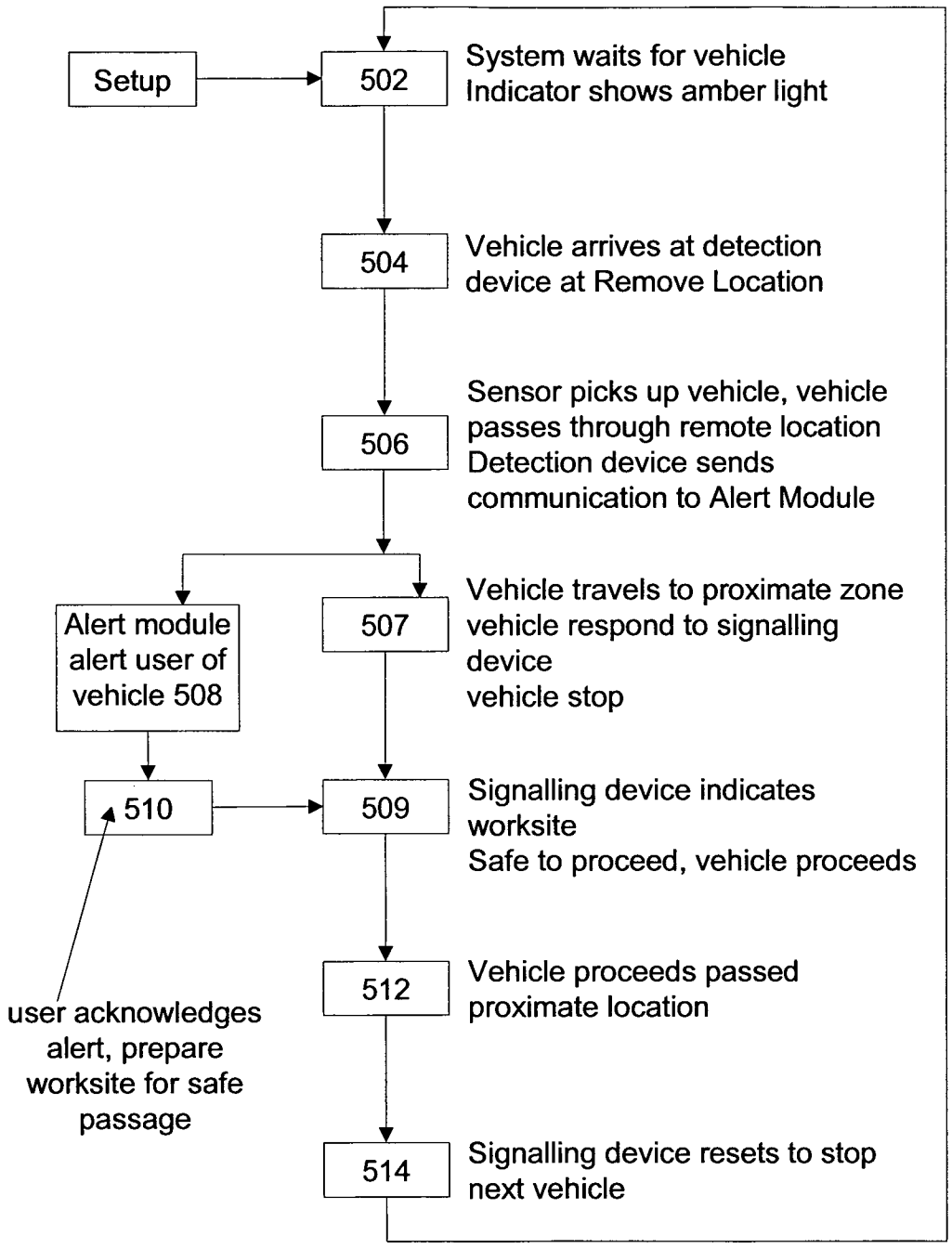
Setup
502
System waits for vehicle
Indicator shows amber light
504
Vehicle arrives at detection device at Remove Location
506
Sensor picks up vehicle, vehicle passes through remote location
Detection device sends communication to Alert Module
Alert module alert user of vehicle 508
507
Vehicle travels to proximate zone
vehicle respond to signalling device
vehicle stop
510
509
Signalling device indicates worksite
Safe to proceed, vehicle proceeds
512
Vehicle proceeds passed proximate location
user acknowledges alert, prepare worksite for safe passage
514
Signalling device resets to stop next vehicle

Figure 5

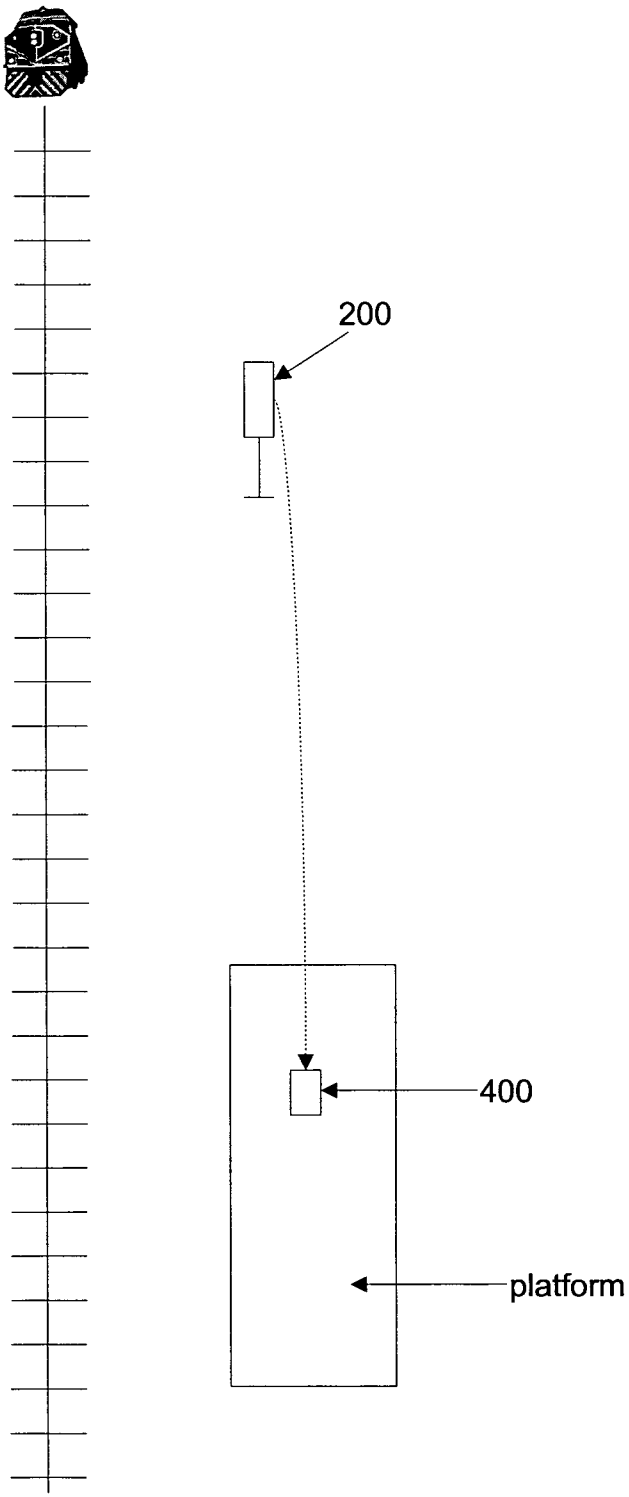

Figure 6

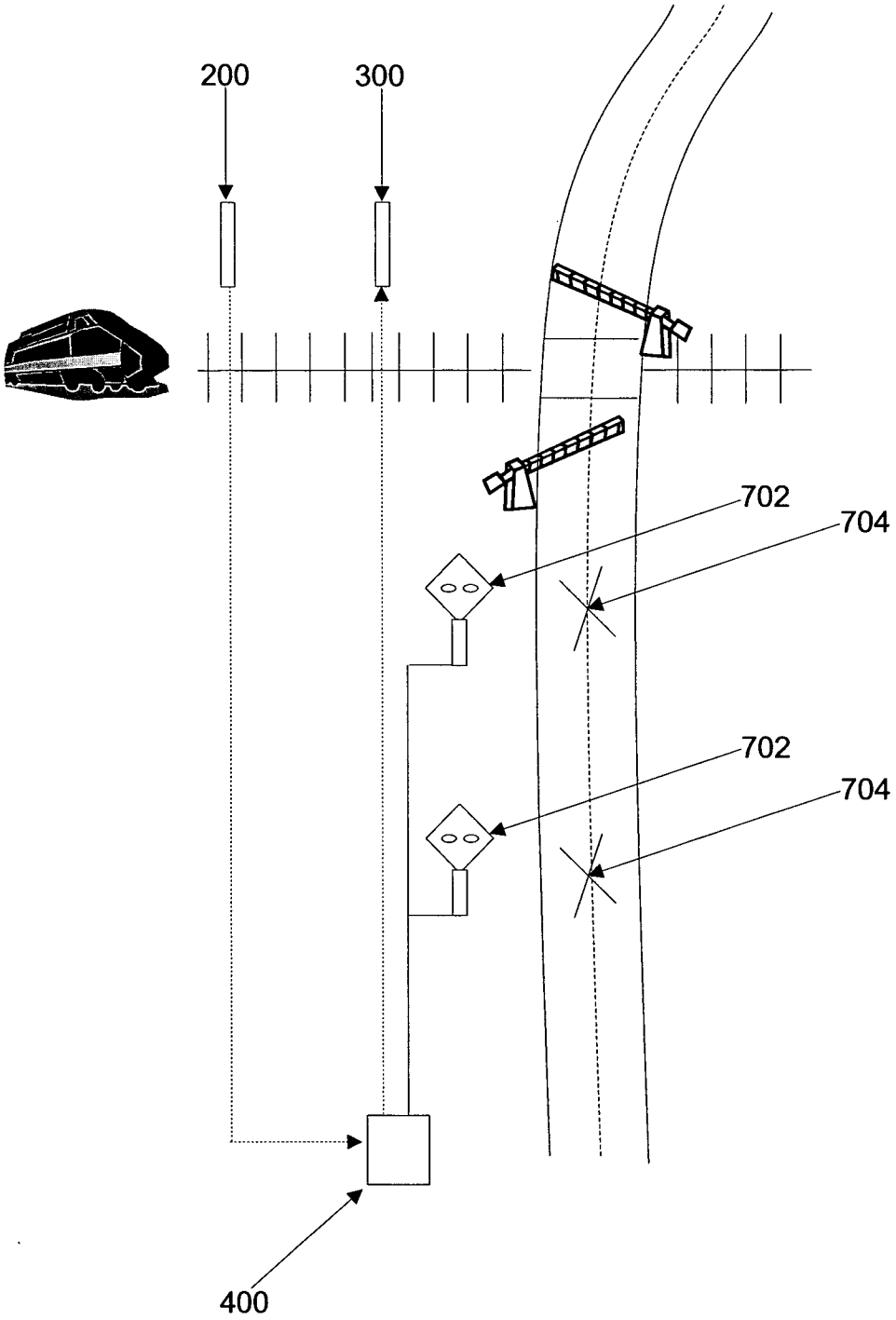

Figure 7

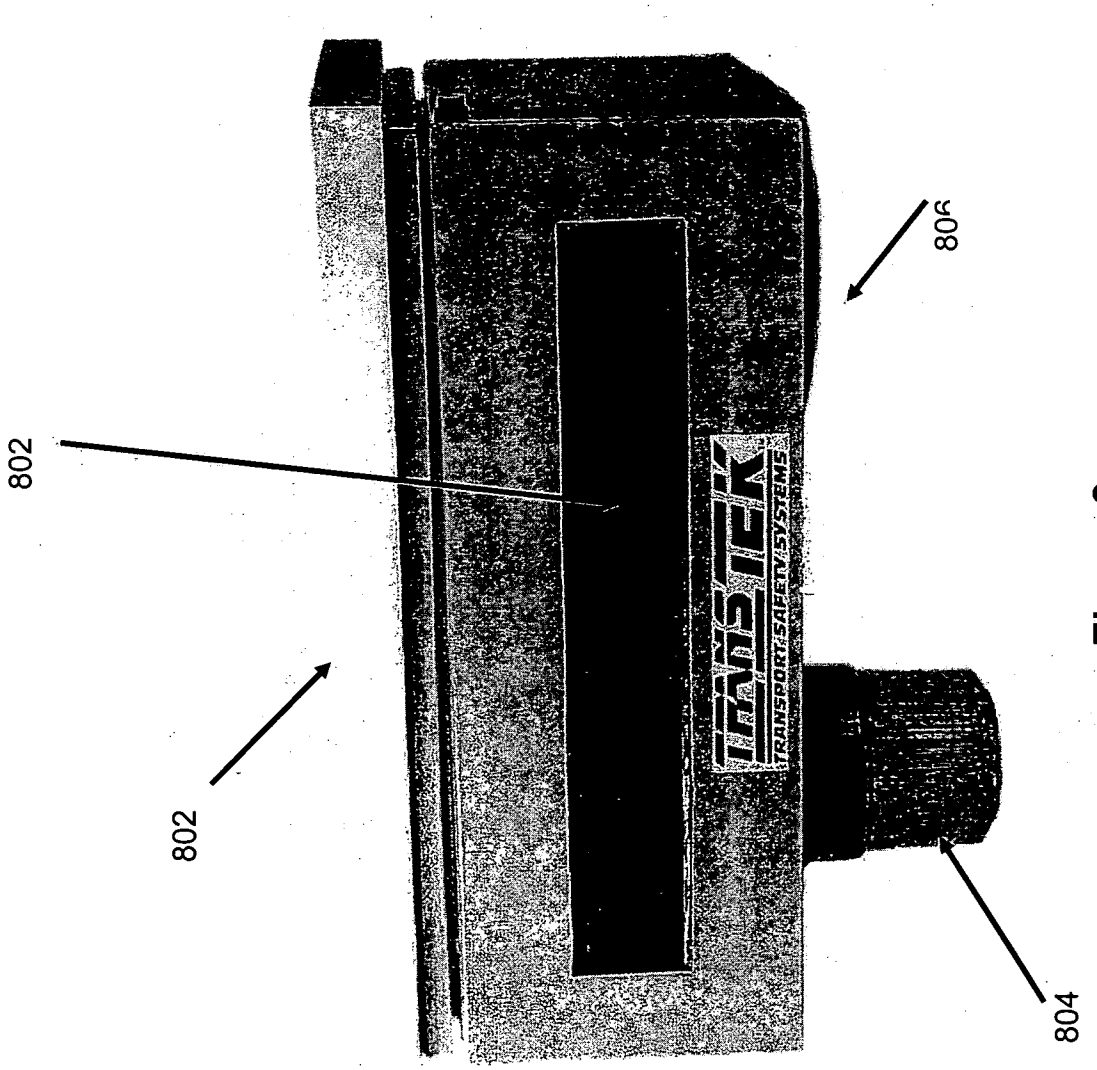

Figure 8

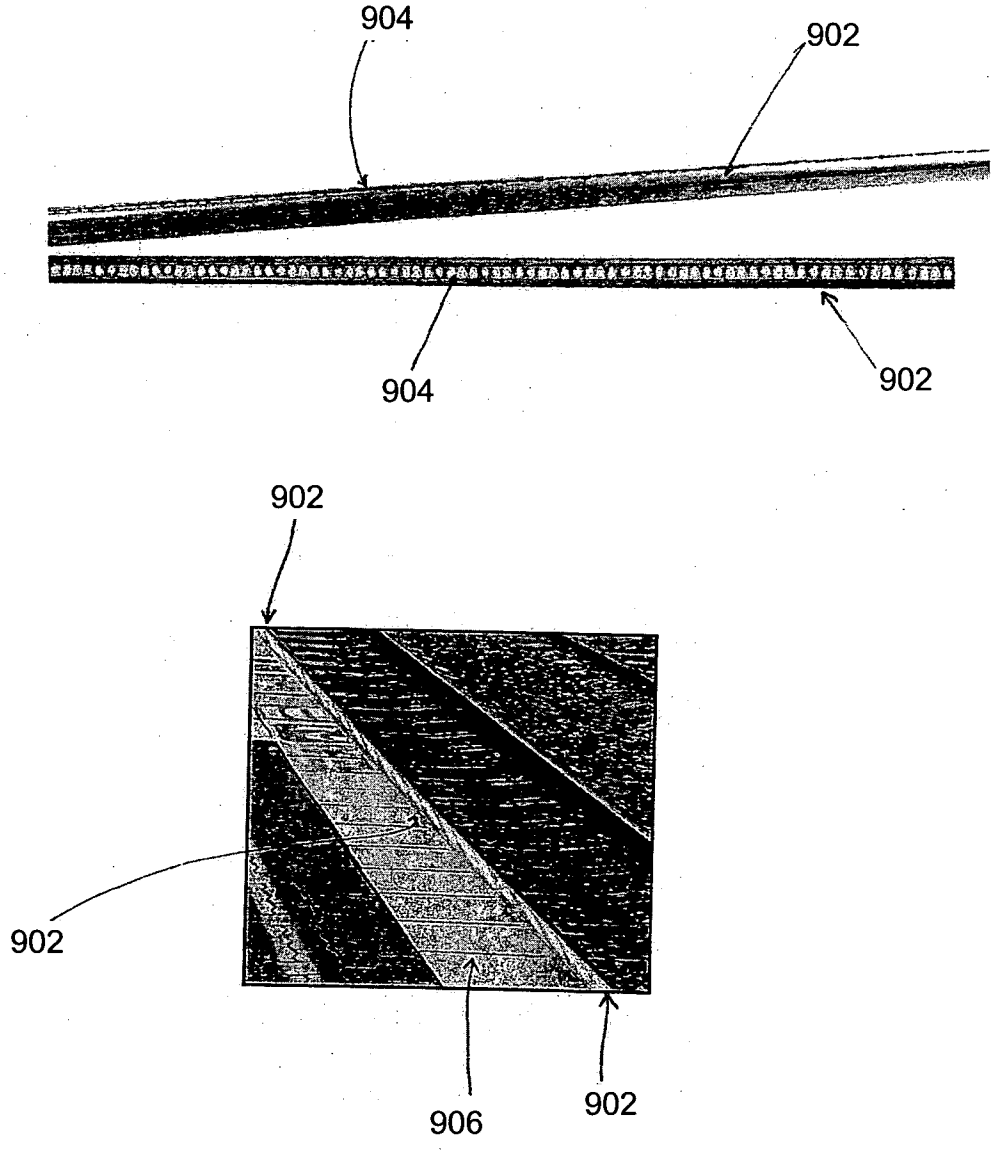

Figure 9

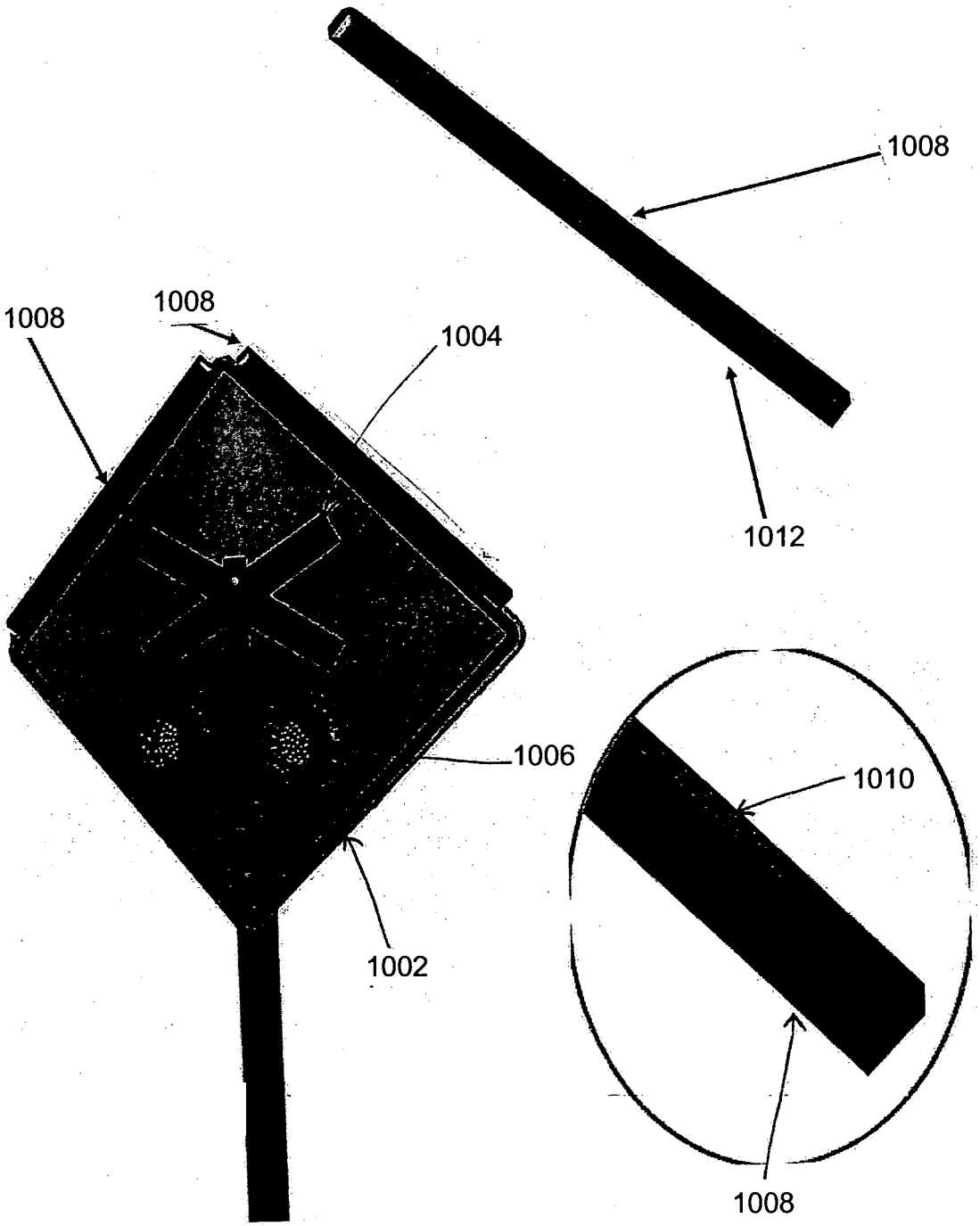

Figure 10

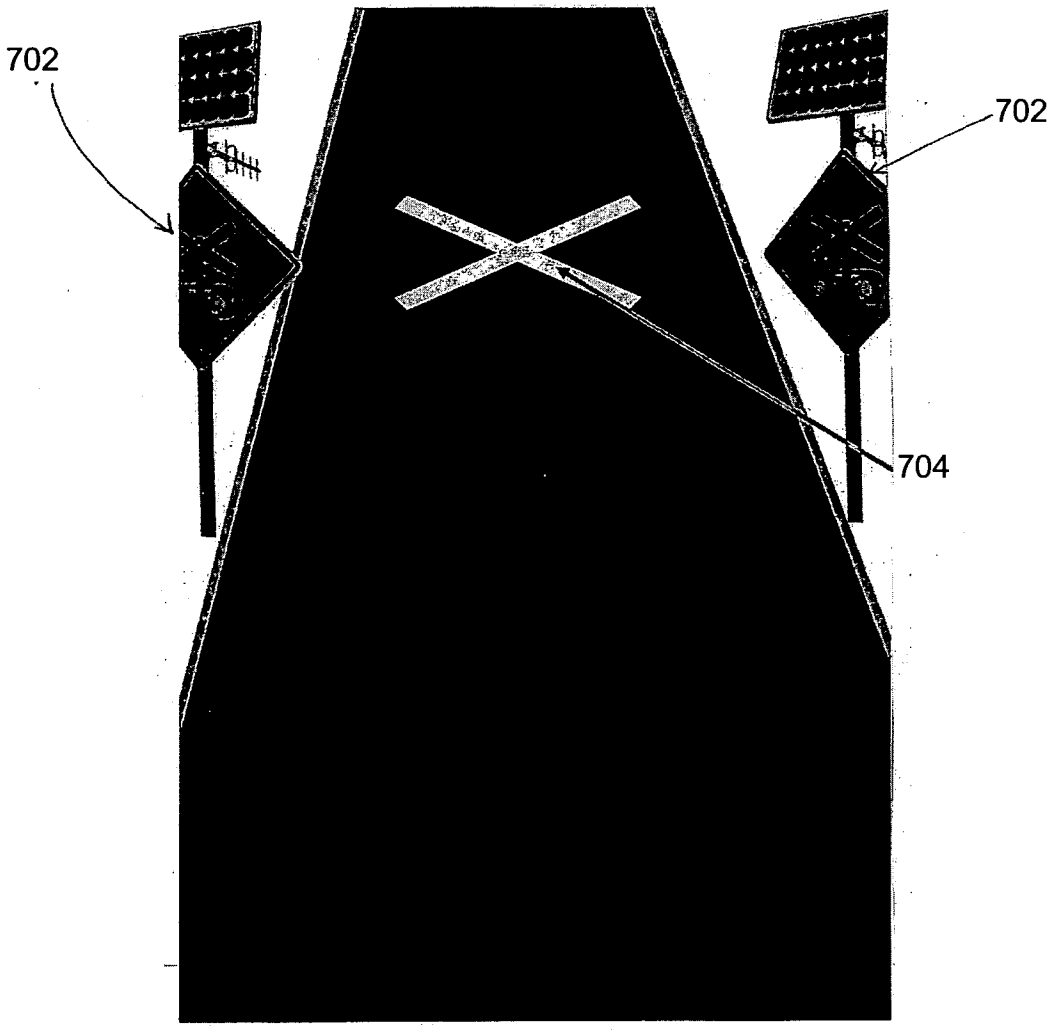

Figure 11

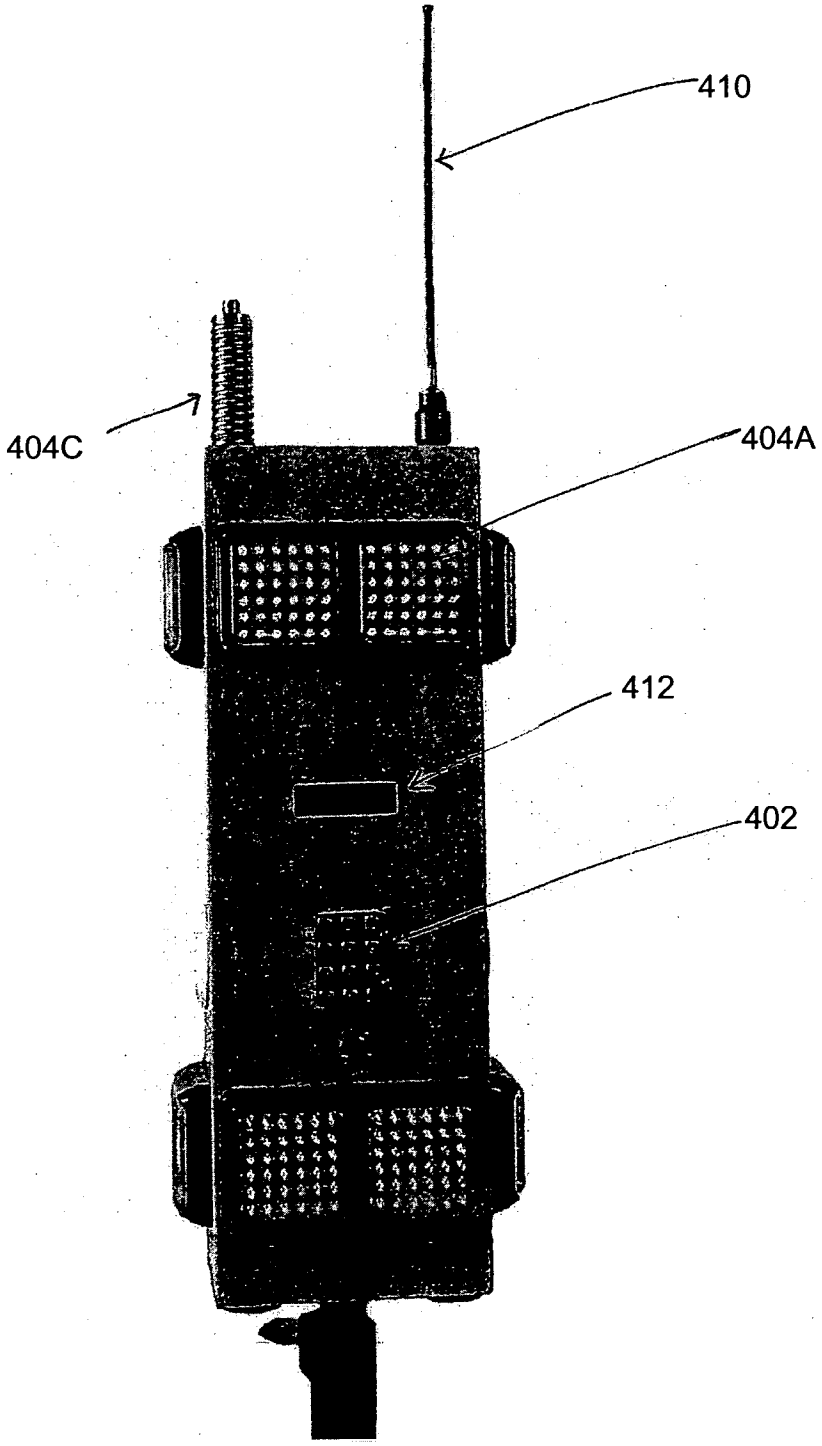

Figure 12

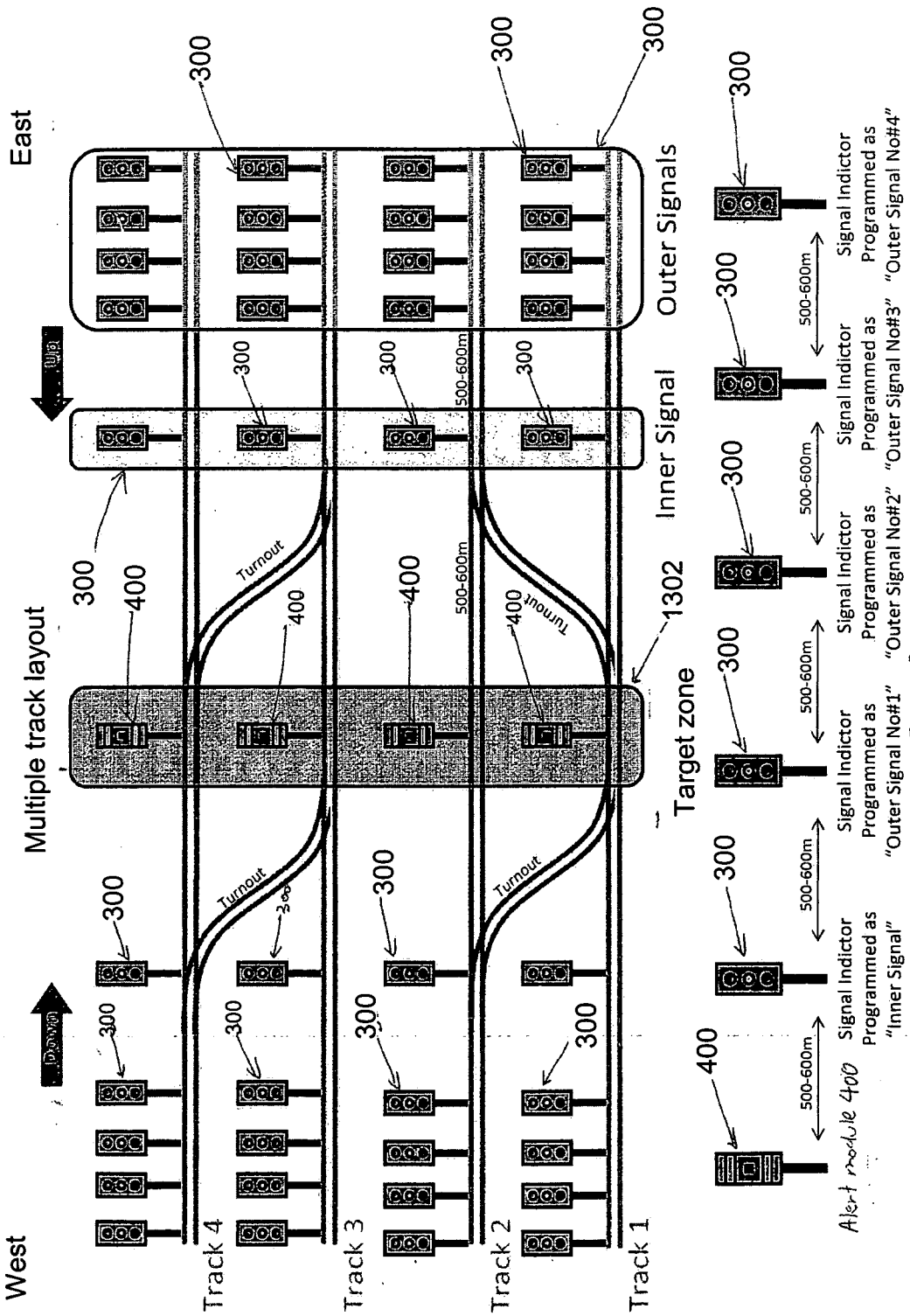
West
East
Multiple track layout
Down
Up
Track 4
Track 3
Track 2
Track 1
Turnout
300
400
500-600m
1302
Target zone
Inner Signal
Outer Signals
Signal Indictor Programmed as "Inner Signal"
Signal Indictor Programmed as "Outer Signal No#1"
Signal Indictor Programmed as "Outer Signal No#2"
Signal Indictor Programmed as "Outer Signal No#3"
Signal Indictor Programmed as "Outer Signal No#4"
Alert module 400

Figure 13

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU2009/000977

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl.

G08G 1/16 (2006.01) ***B61L 25/00*** (2006.01)
B61L 3/12 (2006.01) ***G06F 17/10*** (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)
WPI and IPC G08-, B61L-, G06- and keywords and phrases such as: alert, warning, beep, signalling, indicator, transmission, beacon, railway signalling, target zone, proximity zone, proximity location, target location, arriving, leaving, train, vehicle, track, motor cycle, bus, plane, car, cab, taxi, tracking, railway crossing, detect+, sense, GSP tracking, wireless tracking, and the like.
ESP@CENET and the corresponding IPCs (Intl. Classification) and keywords as tracking and GSP.
Google patents search engine with phrases '*warning system train proximity zone*' or '*vehicle target zone location*' and the like.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5823481 A (GOTTSCHLICH) 20 October 1998 Abstract, Figures 1-11 and related text.	1, 3, 6, 10, 11, 15, 17-18, 22, 23, 37
X	US 5554982 A (SHIRKEY ET AL.) 10 September 1996 Abstract, figures 1-6 and related text.	1-5, 7-8, 10, 11, 13-19, 22, 23, 35, 37

[X] Further documents are listed in the continuation of Box C [X] 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
"E" earlier application or patent 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	Date of mailing of the international search report
31 August 2009	08 SEP 2009
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. +61 2 6283 7999	Authorized officer **VIARA VAN RAAD** AUSTRALIAN PATENT OFFICE (ISO 9001 Quality Certified Service) Telephone No : +61 2 6222 3643

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU2009/000977

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 5890682 A (WELK) 06 April 1999 Abstract, Figure 2 and elements (10), (20), (13)-(14), Figures 2, 3a, 3b, 4, elements (46), Figures 5-6 and related text, esp.	1, 3-6, 10-13, 15, 22, 23, 35
X	US 6371416 B1 (HAWTHORNE) 16 April 2002 Abstract, Figure 1, elements (22), (10), 912), (17), (14), (18), (16), (28) and related text, esp. column 2, line 22-column 3, line 65; Figure 3 and elements (48), (52), (58) and related text.	1, 3-6, 10, 11, 13-18, 22, 23, 35
A	US 5917430 A (GRENEKER , III ET AL.) 29 June 1999 Abstract, Figures 1-8 and related text	

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/AU2009/000977

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 5823481	NONE					
US 5554982	NONE					
US 5890682	CA	2185052	CA	2210270	US	5699986
US 6371416	NONE					
US 5917430	AU	68526/96	CA	2230869	EP	0847536
	WO	9708565				

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

END OF ANNEX