



(51) International Patent Classification:

G01C 9/00 (2006.01) B62D 133/00 (2006.01)
G01C 9/06 (2006.01)

(21) International Application Number:

PCT/AU2015/050371

(22) International Filing Date:

2 July 2015 (02.07.2015)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

2014902576 4 July 2014 (04.07.2014) AU

(71) Applicant: TRIS INNOVATIONS PTY LTD [AU/AU];
30 Streeon Parade, Everton Park, Brisbane, Queensland
4053 (AU).

(72) Inventors: CONLON, Gregory James; 30 Streeon
Parade, Everton Park, Brisbane, Queensland 4053 (AU).
VELING, John Leonard; 30 Streeon Parade, Everton
Park, Brisbane, Queensland 4053 (AU). GREEN, Jeffrey

Laurence; 30 Streeon Parade, Everton Park, Brisbane,
Queensland 4053 (AU).

(74) Agent: CULLENS PATENT AND TRADE MARK AT-
TORNEYS; Level 32, 239 George Street, Brisbane,
Queensland 4000 (AU).

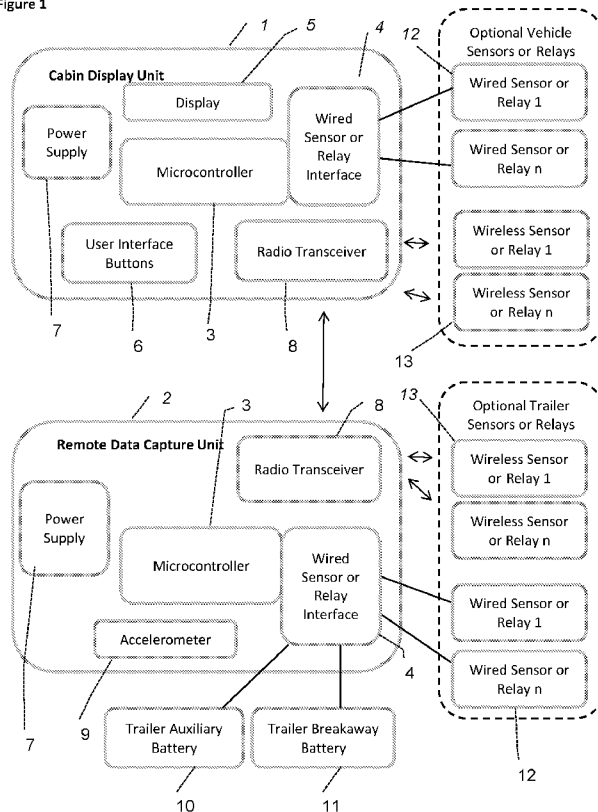
(81) Designated States (unless otherwise indicated, for every
kind of national protection available): AE, AG, AL, AM,
AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY,
BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM,
DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT,
HN, HR, HU, ID, IL, IN, IR, IS, JP,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

[Continued on next page]

(54) Title: VEHICLE LEVEL REMOTE INFORMATION SYSTEM

Figure 1



(57) Abstract: A vehicle level remote information system in-
cluding a cabin display unit having at least one controller, at
least one display associated with the controller and adapted
to display output thereon, and access to at least one commu-
nications pathway; and at least one remote data capture unit
associated with the vehicle or trailer, the remote data capture
unit having at least one controller, at least one level sensor
and access to at least one communications pathway; wherein
the at least one remote data capture unit captures data and
transmits level information to the cabin display unit via the at
least one communications pathway for display on the cabin
display unit to give an indication of at least a side to side dif-
ferential orientation of the vehicle or trailer.



TJ, TM), European (AL, 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, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

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

VEHICLE LEVEL REMOTE INFORMATION SYSTEM

TECHNICAL FIELD

[0001] The present invention relates to a vehicle level remote information system

BACKGROUND ART

[0002] The inclination of the horizontal and longitudinal axes of a recreation vehicle such as a caravan towed by a primary vehicle was determined by the use of a carpenter's type bubble level.

[0003] The ability to determine said level attitude remote from the recreation vehicle has been recognized and desired for some time. The currently used method is time consuming and can be dangerous.

[0004] Usually two people must perform the levelling task, the driver of the primary or towing vehicle and another person. Communications between the driver and the second person are usually not good, due to the distance between the back of the recreation vehicle and the driver. Accidents can occur in this process causing injury to humans and damage to property.

[0005] It will be clearly understood that, if a prior art publication is referred to herein, this reference does not constitute an admission that the publication forms part of the common general knowledge in the art in Australia or in any other country.

SUMMARY OF INVENTION

[0006] The present invention is directed to a vehicle level remote information system, which may at least partially overcome at least one of the abovementioned disadvantages or provide the consumer with a useful or commercial choice.

[0007] With the foregoing in view, the present invention in one form, resides broadly in a vehicle level remote information system including a cabin display unit having at least one controller, at least one display associated with the controller and adapted to display output thereon, and access to at least one communications pathway; and at least one remote data capture unit associated with the vehicle or trailer, the remote data capture unit having at least one controller, at least one level sensor and access to at least one communications pathway; wherein the at least one remote data capture unit captures data and transmits level information to the cabin display unit via the at least one communications pathway for display on the cabin display

unit to give an indication of at least a side to side differential orientation of the vehicle or trailer.

[0008] In another aspect, the invention resides in a vehicle level remote information system including a cabin display unit having at least one controller, at least one display associated with the controller and adapted to display output thereon, and access to at least one communications pathway; and at least one remote data capture unit associated with the vehicle or trailer, the remote data capture unit having at least one controller, at least one level sensor and access to at least one communications pathway; wherein the at least one remote data capture unit captures data and transmits level information to the cabin display unit via the at least one communications pathway for display on the cabin display unit to give an indication of at least a front to rear differential orientation of the vehicle or trailer.

[0009] In another aspect, the invention resides in a vehicle level remote information system including a cabin display unit having at least one controller, at least one display associated with the controller and adapted to display output thereon, and access to at least one communications pathway; and at least one remote data capture unit associated with the vehicle or trailer, the remote data capture unit having at least one controller, at least one level sensor and access to at least one communications pathway wherein data captured by the at least one remote data capture unit captures data and transmits level information to the cabin display unit via the at least one communications pathway for display on the cabin display unit to give an indication of orientation of the vehicle or trailer in at least two dimensions

[0010] The vehicle level remote information system of the present invention is a system for providing to a driver or passenger in the cabin of a vehicle, information about the level (side to side, front to back) of a towed trailer, such as a caravan, camper trailer, 5th wheeler, or other towed vehicle. It is also applicable to a non-articulated vehicle such as a motorhome or bus or the like.

[0011] The primary application of the present invention is to provide information relating to at least a side to side differential of the vehicle or trailer and more preferably, both a side to side and a front to rear differential, remotely, that is, to the cabin of the vehicle in real-time, so that it is not necessary to exit the cabin of the vehicle to view the information about the trailer or elsewhere on the vehicle itself. This can turn a relatively onerous single person task or two person task into a relatively straightforward single person task.

[0012] Typically, at least a side to side differential is given and more preferably, both a side to side level differential and a front to rear level differential is displayed. Importantly, the display

may give an indication of the degree of correction required, rather than simply displaying which portion of the vehicle requires levelling.

[0013] The information can be presented in millimetres or inches and/or as a symbolic indication of the level for example using a graphical display.

[0014] The level information will help to determine if adjustment to the level of the trailer or vehicle is required or not, and if so, how much elevation will be required and where on the trailer or vehicle it is required. Ramps, levelling planks, or other levelling devices can be put in place, and then the user can move the vehicle or trailer and monitor the levels until the required level is achieved.

[0015] This information can be displayed in any one or more of a number of different formats such as, raw values from sensors, calculated values based on sensor information, and/or symbolic display of information, e.g. arrows, graphs, and bubble-level simulation.

[0016] A visual indication of the data is preferably provided. The raw data collected can be used or alternatively, the raw data collected may be used in the calculation of other parameters which may provide a user with more useable information reflective of the level.

[0017] At least two readings are preferably taken for the level or height difference namely, left to right side and front to rear. Multiple remote data capture units may be provided.

[0018] The display may provide one or more measurements or one or more symbolic indications of the data collected and/or calculated parameters based on the data collected.

[0019] As mentioned above, the system of the present invention is particularly adapted to provide information in relation to a towed vehicle to the driver of the vehicle towing that vehicle but it may also be used for a primary vehicle rather (rather than a towed vehicle) where information regarding the primary vehicle is useful without requiring the driver to exit the cabin of the vehicle.

[0020] The system of the present invention includes a cabin display unit. The cabin display unit is preferably located in the cabin of the vehicle in situations where the remote data capture unit is provided on the vehicle and in the cabin of the towing vehicle in situations where the remote data capture unit is provided on a trailer or towed vehicle.

[0021] The cabin display unit may be removable from the cabin in order to operate remotely from the cabin and still provide the required functionality.

[0022] Preferably, the cabin display unit will be mounted within the cabin of the vehicle or towing vehicle, normally relative to the driver of the vehicle such that the driver of the vehicle can view the cabin display unit from a normal driving position. The cabin display unit may be viewable by a passenger instead of, or as well as, by the driver.

[0023] Any type of mount may be used and as indicated above, the mounting can be substantially permanent or temporary to allow for removal of the cabin display unit from the vehicle. Optionally the cabin display unit will be mounted relative to the dashboard or internal roof of the vehicle in order to be more easily visible to at least the driver. It is particularly preferred that the cabin display unit be mounted adjacent to the dashboard display of the vehicle.

[0024] The cabin display unit includes at least one controller. Optionally, the controller will include at least a processor and memory for storing instructions that can be implemented by the processor in order to cause changes in the system of the present invention or instruction for one or more components of the system as a whole and in particular, the cabin display unit. Optionally, a software application will be stored in the memory of the controller and executed by the processor as required. In particular, the memory will also preferably store configuration information in relation to the system and upon start-up, the at least one controller will check the configuration information stored in the memory and implement the configuration instructions accordingly.

[0025] The at least one controller is preferably provided to control other elements or components of the cabin display unit. As will be outlined further below, the remote data capture unit will also preferably check for changes in the configuration information stored in the memory of the cabin display unit in each cycle of operation in order to implement changes in the operation of the remote data capture unit if necessary.

[0026] The at least one controller will typically have a “settings” functionality which allows a user to control the operational settings of the system which are then stored in the configuration information normally as a file or similar.

[0027] The at least one controller may interface with one or more wired sensors or relays and/or one or more wireless sensors or relays through the at least one communications pathway provided, as will be described further below.

[0028] Preferably, the cabin display unit also includes power supply component and/or an associated component allowing access to a vehicle power supply in order to ensure stable regulated power is provided to the cabin display unit and the various electronic components

and/or wired sensors or relays associated therewith. Preferably, the cabin display unit will preferably be provided with a connection component to allow access to the vehicle power supply. Typically, the cabin display unit will be provided with either male or female connector to allow connection to the vehicle power supply. Preferably, the vehicle power supply is attachable and detachable to the cabin display unit.

[0029] In a preferred form, the cabin display unit also includes at least one on-board battery. The at least one on-board battery is preferably rechargeable and/or replaceable. Preferably, the at least one on-board batteries charged through connection to the vehicle power supply when the cabin display unit is connected to the vehicle power supply and may be replaced at the end of its life.

[0030] One or more wired sensors can be attached with the preferred power cable connection to the vehicle power supply or independently thereof.

[0031] The cabin display unit also includes at least one display. The display can be of any type. For example, the display can be a simple display, as simple as lights which can be lit or not lit as a consequence of information received by the cabin display unit in order to indicate the level of the vehicle or trailer or other information from other types of sensors. At a more advanced level, the display could be a display screen having one or more lines of information which can be displayed as a consequence of information received by the cabin display unit in order to indicate the level of the vehicle or trailer or other information from other types of sensors. In one particularly preferred embodiment, the display may be a complex display giving a graphical illustration of level information and/or any other information collected from other types of sensors in the form of an image which is produced and displayed on a display screen.

[0032] The display can be or include a display screen. The display can be a simple numeric display or more advanced information can be displayed thereon. A touchscreen may be provided to allow the display screen to also function as an input device.

[0033] More than one display can be used. For example, a separate display for each of the left, right, front and rear level information could be provided or a single display can be used to provide multiple pieces of information in relation to different aspects of the level of the vehicle or trailer or other information from other types of sensors.

[0034] A user interface is preferably provided on the cabin display unit. Again, the user interface can be simple or complex. For example, the user interface may include one or more control buttons actuable by a user. These buttons can be provided on the cabin display unit

housing. Alternatively, one or more control buttons may be included on a displayed image produced and displayed on the display in order to control the display and/or information displayed thereon and/or the operation of the cabin display unit, the at least one remote data capture unit or the system as a whole.

[0035] The cabin display unit also includes at least one communications pathway in order to allow the cabin display unit to communicate with sensors or relays directly or indirectly and/or to communicate with the remote data capture unit and any sensors or relays directly or indirectly connected to the remote data capture unit.

[0036] Typically, a communications component will be provided in the cabin display unit in order to communicate with the remote data capture unit and/or wireless sensors associated with either the cabin display unit or the related data capture unit and any wired sensors or relays associated with either the cabin display unit or the related data capture unit. Any type of communications pathway could be used and any number of communications pathways can be used. Further, any communications system or combination of communication systems can be provided. More than one communications pathway and/or more than one type of communication system could be used to provide operational redundancy.

[0037] Communication pathways which may find use in the present invention include any type of communication system utilising a portion of the electromagnetic spectrum. Particularly preferred embodiments include Bluetooth, infrared communication, radio frequency communication or communication over a mobile telephone network as examples only. According to the most preferred embodiment, a radio communications pathway is used for simplicity and robust operation.

[0038] The channel or frequency of the preferred radio communications pathway is preferably selectable and settable by a user. These can be changed as desired by the user through the cabin display unit and particularly the settings functionality on the at least one controller of either the cabin display unit or the remote data collection unit. Further, the addressing of components in the system relative to the preferred radio communications pathway is typically selectable by a user.

[0039] As mentioned above, the communications pathways provided in the system of the present invention may be a combination of wired pathways and wireless pathways but it is particularly preferred that the communications pathway between the cabin display unit and any remote data capture units is wireless.

[0040] The system of the present invention includes at least one remote data capture unit. Each at least one remote data capture unit is typically remote from the cabin display unit. It is preferred that a remote data capture unit is provided on a trailer being towed by a towing vehicle but it is also anticipated that a remote data capture unit can be provided on a vehicle in which the cabin display unit is mounted as there are likely to be situations where a user will require the vehicle which they are driving to be levelled as well, such as in the circumstances of a self powered mobile home.

[0041] More than one remote data capture unit may be provided but preferably, a single remote data capture unit is provided although the remote data capture unit can be associated with multiple sensors and multiple types of sensors. Typically, where the remote data capture unit is provided on a trailer or towed vehicle, the remote data capture unit will be attached to the trailer or towed vehicle more or less permanently and the remote data capture unit can be linked, preferably wirelessly, to the cabin display unit of a vehicle towing the trailer or towed vehicle as required, even if the vehicle towing the trailer or towed vehicle changes. Re-syncing or relinking may be required in this case.

[0042] The primary function of the remote data capture unit is to collect and transmit data to the cabin display unit for display on the cabin display unit. The remote data capture unit typically pushes information to the cabin display unit. Preferably, the remote data capture unit will collect raw data measurements from any one or more sensors associated with the remote data capture unit, filter the raw data and/or perform any necessary calculations using the raw data to create usable or understandable information and the remote data capture unit then preferably transmits that usable or understandable information to the cabin display unit for display and then checks for changes in instructions/configuration information from the cabin display unit. The steps will normally be implemented in a loop and the loop will normally be undertaken at least once, but typically many times per second in order to give real time usable or understandable information to the cabin display unit.

[0043] The utilisation of the raw data in calculations to form useable or understandable information can take place in the cabin display unit, any one or more of the remote data capture units or any combination of cabin display unit and any one or more of the remote data capture units

[0044] The remote data capture unit will preferably be associated with at least one level sensor or at least one sensor capable of capturing raw data that can be converted into level indicating information. Optionally the remote data capture unit will also be associated with

sensors to monitor any batteries including auxiliary and/or breakaway battery is provided on the trailer or towed vehicle. Preferably, the remote data capture unit will be hardwired to at least the trailer or towed vehicle breakaway battery.

[0045] In a preferred embodiment, the remote data capture unit includes at least one controller having a processor and memory in order to store and implement the instructions. In many respects, the controller of the remote data capture unit is similar to the controller of the cabin display unit. Optionally, information and particularly instructions and configuration information relating to settings within the system can be passed between the controller of the cabin display unit and the controller of the remote data capture unit.

[0046] Optionally, the controller of the remote data collection unit includes at least a processor and memory for storing instructions that can be implemented by the processor in order to cause changes in the system of the present invention and in particular the remote data collection unit. Optionally, a software application will be stored in the memory of the controller and executed by the processor as required. In particular, the memory will also preferably store configuration information in relation to the system and upon start-up, the at least one controller (of the remote data collection unit) will check the configuration information stored in the memory (of the remote data collection unit and/or the cabin display unit) and implement the configuration information accordingly.

[0047] The at least one controller of the remote data collection unit is preferably provided to control other elements or components of the remote data collection unit and will preferably receive changes to instructions or operation from the cabin display unit. The remote data capture unit will preferably check for changes in the configuration information stored in the memory of the cabin display unit in each cycle of operation in order to implement changes in the operation of the remote data capture unit if necessary.

[0048] The at least one controller will typically have a settings functionality which allows a user to control the operational settings of the remote data collection unit.

[0049] The at least one controller may interface with one or more wired sensors or relays. The least one controller will also typically interface with one or more wireless sensors or relays through the at least one communications pathway provided, as will be described further below.

[0050] Preferably, the remote data collection unit also preferably includes power supply component and/or an associated component allowing access to a vehicle power supply in order to ensure stable regulated power is provided to the remote data collection unit and the various

electronic components and/or wired sensors or relays associated therewith. Preferably, the remote data collection unit will preferably be provided with a connection component to allow access to the vehicle power supply. Typically, the remote data collection unit will be provided with either a male or female connector to allow connection to the vehicle power supply. Preferably, the connection to the vehicle power supply is attachable and detachable.

[0051] In a preferred form, the remote data collection unit also includes at least one on-board battery. The at least one on-board battery is preferably rechargeable and/or replaceable. Preferably, the at least one on-board batteries charged through connection to the vehicle power supply when the remote data collection unit is connected to the vehicle power supply.

[0052] One or more wired sensors can be attached with the preferred power cable connection to the vehicle power supply or independently thereof.

[0053] The remote data collection unit also includes at least one communications pathway in order to allow the remote data collection unit to communicate with sensors or relays directly or indirectly and/or to communicate with the cabin display unit.

[0054] Typically, a communications component will be provided in the remote data collection unit in order to communicate with the cabin display unit and/or wireless sensors associated the remote data capture unit and any wired sensors or relays associated with the related data capture unit. Any communications pathway could be used and any number of communications pathways can be used. Further, any communications system or combination of communication systems can be provided. More than one communications pathway and/or more than one type of communication system could be used to provide redundancy in operation.

[0055] Communication pathways which may find use in the present invention include any type of communication system utilising a portion of the electromagnetic spectrum. Particularly preferred embodiments include Bluetooth, infrared communication, radio frequency communication or communication over a mobile telephone network as examples only. According to the most preferred embodiment, a radio communications pathway is preferably used for simplicity and robust operation.

[0056] The channel or frequency of the preferred radio communications pathway is preferably selectable and settable by a user via the remote data collection unit. These can be changed as desired by the user through the cabin display unit and particularly the settings functionality on the at least one controller. Further, the addressing of the preferred radio communications pathway is typically selectable by a user.

[0057] As mentioned above, the communications pathways provided in the system of the present invention may be a combination of wired pathways and wireless pathways but it is particularly preferred that the communications pathway between the cabin display unit and any remote data capture units is wireless.

[0058] According to the invention, at least one level sensor or at least one sensor that can collect raw data from which a level indication can be calculated is provided associated with the remote data capture unit. The preferred level sensors may be or include any one or more of a MEMS sensor, accelerometer and MEMS gyroscope. Vibrating structure gyroscopes are particularly preferred because of their simplicity and lower cost when compared to rotating gyroscopes of similar accuracy. Miniature devices using this principle are a relatively inexpensive type of attitude indicator.

[0059] Optional additional sensors or relays can be added to either the cabin display unit, or the remote data capture unit. These can be either wired sensors or relays, or wireless sensors or relays. Such additional sensors can include any one or more of the following:

- Voltage
- Current (Amps)
- Temperature
- Humidity
- Distance (Ultrasonic sensor) between any one or more point on the trailer or vehicle and other objects
- G-Forces
- Compass
- Dust Particles
- Gas
- Vibration
- Electrical Relay to control other devices.
- Voltage of Trailer Breakaway Battery if fitted.
- Voltage of Trailer Auxiliary Battery if fitted.

[0060] From the cabin display unit, the user can change configuration items that are required for the correct functioning of the system and the way in which information is displayed. Configuration items may include any one or more of the following:

- Metric or Imperial measurement display.

- Width of trailer axle to allow calculation of height difference from side to side.
- Distance from trailer axle to tow hitch to allow calculation of height different from level at the tow hitch.
- Radio Channel to be used by the radio transceivers.
- Radio Addressing for the cabin display unit, remote data capture unit and any wireless sensors.
- Resolution of the display of various information items, e.g. for level information, a 1mm resolution of display may make the display change too frequently and difficult to read, while selecting a 5mm resolution will provide a more stable display.
- Setting the required Level position for the Trailer.
- Parameters for switched relays, e.g. on/off time.
- Rounding of any numerical measurements or calculations which will affect stability of the displayed parameters.

[0061] It is a legal requirement in all Australian states that caravans over two tonnes gross trailer mass (GTM) are fitted with a caravan breakaway system, or independent brakes that will immediately be applied if the van becomes disconnected from the towing vehicle. The caravan breakaway system for electric brakes relies on a battery in the trailer to provide the power to operate the brakes once the trailer breaks away from the towing vehicle. This battery should be kept charged at all times.

[0062] It is particularly preferred that the remote data collection unit be associated with a sensor to measure the trailer auxiliary battery voltage and/amperage.

[0063] Any of the features described herein can be combined in any combination with any one or more of the other features described herein within the scope of the invention.

[0064] The reference to any prior art in this specification is not, and should not be taken as an acknowledgement or any form of suggestion that the prior art forms part of the common general knowledge.

BRIEF DESCRIPTION OF DRAWINGS

[0065] Preferred features, embodiments and variations of the invention may be discerned from the following Detailed Description which provides sufficient information for those skilled in the art to perform the invention. The Detailed Description is not to be regarded as limiting the scope of the preceding Summary of the Invention in any way. The Detailed Description will

make reference to a number of drawings as follows:

[0066] Figure 1 is a schematic block diagram of depicting the hardware components of the vehicle level remote information system of a preferred embodiment of the present invention at a high level.

DESCRIPTION OF EMBODIMENTS

[0067] According to a particularly preferred embodiment of the present invention, a vehicle level remote information system is provided.

[0068] The vehicle level remote information system of the illustrated embodiment includes a cabin display unit having a controller, a display associated with the controller and adapted to display output thereon, and access to at least one communications pathway. The system also includes a remote data capture unit associated with the vehicle or trailer, the remote data capture unit having a controller, a level sensor and access to at least one communications pathway; wherein the remote data capture unit captures data and transmits information to the cabin display unit via the at least one communications pathway for display on the cabin display unit to give an indication of at least a side to side differential orientation of the vehicle or trailer.

[0069] The basic system consists of a Cabin Display Unit (1) and a Remote Data Capture Unit (2), with communication between them provided by Radio Transceiver (8) modules. The radio communication utilises an unlicensed frequency range.

[0070] The Cabin Display Unit (1) displays the information to the user (driver or passenger), via a Display (5) and allows them to change configuration details and change the items currently being displayed via User Interface Buttons (6). The core of the Cabin Display Unit is a Microcontroller (3) which runs firmware programmed into its memory, stores configuration information, and provides interfacing for other functional elements, such as Wired Sensor Interfaces (4), and a Radio Transceiver (8) for wireless communication with the Remote Data Capture Unit (2) and optional Wireless Sensors (13). A Power Supply (7) is included in the Cabin Display Unit (1) to ensure stable regulated power is provided to the various electronic components in this unit and for any Wired Sensors (12) that may need it. The Cabin Display Unit(1) can be either mounted permanently in the cabin of the vehicle, or made to be removable and run on an internal battery power to be operated away from the cabin.

[0071] The Remote Data Capture Unit (2) collects information in the Trailer or Vehicle and transmits the information on a regular basis to the Cabin Display Unit (1). The core of the

Remote Data Capture Unit (2) is a Microcontroller (3) which runs firmware programmed into its memory, stores configuration information, and provides interfacing for other functional elements, such as the Accelerometer (9), Wired Sensor Interfaces (4), and a Radio Transceiver (8) for wireless communication with the Cabin Display Unit (1) and optional Wireless Sensors (13). A Power Supply (7) is included in the Remote Data Capture Unit (2) to ensure stable regulated power is provided to the various electronic components in this unit and for any Wired Sensors (12) that may need it.

[0072] Optional Additional Sensors or Relays can be added to either the Cabin Display Unit (1), or the Remote Data Capture Unit (2) these can be either Wired Sensors or Relays (12), or Wireless Sensors or Relays (13). Such additional sensors can be for:

- Voltage
- Current (Amps)
- Temperature
- Humidity
- Distance (Ultrasonic sensor)
- G-Forces
- Compass
- Dust Particles
- Gas
- Vibration
- Electrical Relay to control other devices.
- Voltage of Trailer Breakaway Battery if fitted.
- Voltage of Trailer Auxiliary Battery if fitted.

[0073] An example configuration would be:

- Cabin Display Unit with Voltage and Current Sensors for the Main and Auxiliary Batteries.
- Remote Data Capture unit in a Caravan with sensors for the Level of the Caravan (side-to-side and front to back), Voltage and Current sensors for the Breakaway Battery and main Caravan Battery, and Temperature sensors for the fridge and freezer in the Caravan and a relay to drive a pressurisation (dust exclusion) fan.

[0074] The User Interface Buttons (6) on the Cabin Display Unit (1) can be either mechanical buttons or be virtual buttons provided via a touch sensors or a touch screen. These

buttons allow the user to change the information that is displayed at any point in time. For example, while driving a display configuration may be chosen showing voltages of the Breakaway Battery and an Auxiliary Battery and the Fridge Temperature. Then when locating the Trailer on a site, the display can be changed to the Level information.

[0075] From the Cabin Display Unit (1) the user can change configuration items that are required for the correct functioning of the system and the way in which information is displayed. Configuration items include:

- Metric or Imperial measurement display.
- Width of Trailer Axle to allow calculation of height difference from side to side.
- Distance from Trailer Axle to Tow Hitch to allow calculation of height different from level at the tow hitch.
- Radio Channel to be used by the Radio Transceivers.
- Radio Addressing for the Cabin Display Unit, Remote Data Capture Unit and any Wireless Sensors.
- Resolution of the display of various information items, e.g. for level information, a 1mm resolution of display may make the display change too frequently and difficult to read, while selecting a 5mm resolution will provide a more stable display.
- Setting the required Level position for the Trailer.
- Parameters for switched relays, e.g. on/off time.

[0076] From start-up the Remote Data Capture Unit (2) reads its stored configuration items and then loops through:

1. Collect readings from the various sensors connected to it.
2. Filter the readings and do relevant calculations.
3. Transmits the resultant information via the Radio Transceiver (8).
4. Check for relay control information or change in configuration details from Cabin Display Unit.
5. Loop back to 1.

[0077] This loop happens many times per second.

[0078] From start-up the Cabin Display Unit (1) reads its stored configuration items and then loops through:

1. Check the buttons for user input for activation of relays or change of configuration

details.

2. Read filter and calculate information from sensors connected directly to it.
3. Listed for information transmitted from the Remote Data Capture Unit (2), or other Wireless Sensors (13).
4. Configure and display the information.
5. Go back to 1.

[0079] This loop happens many times per second.

[0080] In the present specification and claims (if any), the word ‘comprising’ and its derivatives including ‘comprises’ and ‘comprise’ include each of the stated integers but does not exclude the inclusion of one or more further integers.

[0081] Reference throughout this specification to ‘one embodiment’ or ‘an embodiment’ means that a particular feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment of the present invention. Thus, the appearance of the phrases ‘in one embodiment’ or ‘in an embodiment’ in various places throughout this specification are not necessarily all referring to the same embodiment. Furthermore, the particular features, structures, or characteristics may be combined in any suitable manner in one or more combinations.

CLAIMS

1. A vehicle level remote information system including a cabin display unit having at least one controller, at least one display associated with the controller and adapted to display output thereon, and access to at least one communications pathway; and at least one remote data capture unit associated with the vehicle or trailer, the remote data capture unit having at least one controller, at least one level sensor and access to at least one communications pathway; wherein the at least one remote data capture unit captures data and transmits level information to the cabin display unit via the at least one communications pathway for display on the cabin display unit to give an indication of at least a side to side differential orientation of the vehicle or trailer.
2. A vehicle level remote information system including a cabin display unit having at least one controller, at least one display associated with the controller and adapted to display output thereon, and access to at least one communications pathway; and at least one remote data capture unit associated with the vehicle or trailer, the remote data capture unit having at least one controller, at least one level sensor and access to at least one communications pathway; wherein the at least one remote data capture unit captures data and transmits level information to the cabin display unit via the at least one communications pathway for display on the cabin display unit to give an indication of at least a front to rear differential orientation of the vehicle or trailer.
3. A vehicle level remote information system including a cabin display unit having at least one controller, at least one display associated with the controller and adapted to display output thereon, and access to at least one communications pathway; and at least one remote data capture unit associated with the vehicle or trailer, the remote data capture unit having at least one controller, at least one level sensor and access to at least one communications pathway wherein data captured by the at least one remote data capture unit captures data and transmits level information to the cabin display unit via the at least one communications pathway for display on the cabin display unit to give an indication of orientation of the vehicle or trailer in at least two dimensions.
4. A vehicle level remote information system as claimed in any one of the preceding claims wherein both a side to side and a front to rear differential, remotely, that is to the cabin of the vehicle in real-time, so that it is not necessary to exit the cabin of the vehicle to view the information about the trailer or elsewhere on the vehicle itself.
5. A vehicle level remote information system as claimed in any one of the preceding claims

wherein the information is presented as a measurement and/or as a symbolic indication of the orientation.

6. A vehicle level remote information system as claimed in any one of the preceding claims wherein the display gives an indication of the degree of correction required in any one or more of orientation.
7. A vehicle level remote information system as claimed in any one of the preceding claims wherein the cabin display unit is removable from the cabin in order to operate remotely from the cabin and still provide the required functionality.
8. A vehicle level remote information system as claimed in any one of the preceding claims wherein at least one controller of the cabin display unit includes at least a processor and memory for storing instructions that can be implemented by the processor, the memory storing configuration information in relation to the system and upon start-up, the at least one controller checks the configuration information stored in the memory and implements the software accordingly.
9. A vehicle level remote information system as claimed in any one of the preceding claims wherein the at least one controller of the cabin display unit has a settings functionality which allows a user to control operational settings of the system.
10. A vehicle level remote information system as claimed in any one of the preceding claims wherein the cabin display unit also includes at least one on-board battery.
11. A vehicle level remote information system as claimed in any one of the preceding claims wherein a user interface is provided on the cabin display unit to control the display and/or information displayed thereon and/or the operation of the cabin display unit, the at least one remote data capture unit or the system as a whole.
12. A vehicle level remote information system as claimed in any one of the preceding claims wherein the communications pathway between the cabin display unit and any remote data capture units is wireless.
13. A vehicle level remote information system as claimed in any one of the preceding claims wherein the remote data capture unit collects raw data measurements from any one or more sensors associated with the remote data capture unit, filters the raw data measurements and/or performs at least one calculation using the raw data measurements to create usable or

understandable information and the remote data capture unit then transmits that usable or understandable information to the cabin display unit for display and then checks for changes in instructions/configuration information from the cabin display unit.

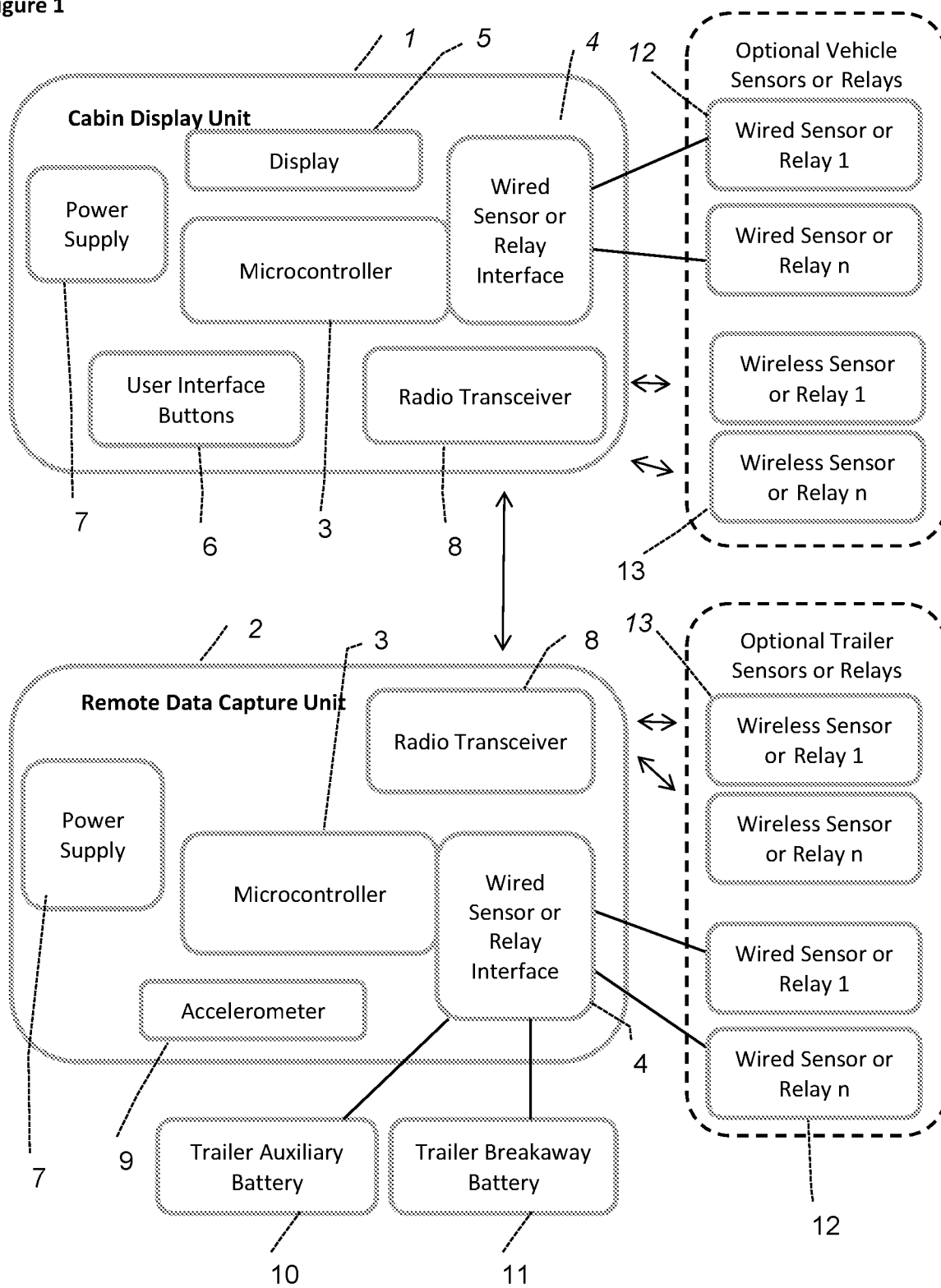
14. A vehicle level remote information system as claimed in any one of claims 1 to 12 wherein the remote data capture unit collects raw data measurements from any one or more sensors associated with the remote data capture unit and transmits that raw data measurement to the cabin display unit for at least one calculation using the raw data measurements to create usable or understandable information and display and then checks for changes in instructions/configuration information from the cabin display unit.
15. A vehicle level remote information system as claimed in claim 13 of claim 14 wherein the remote data collection unit operates on a loop undertaken at least once per second in order to give real time usable or understandable information to the cabin display unit.
16. A vehicle level remote information system as claimed in any one of the preceding claims wherein the remote data capture unit is hardwired to at least a trailer or towed vehicle breakaway battery.
17. A vehicle level remote information system as claimed in any one of the preceding claims wherein information and particularly instructions and configuration information relating to settings within the system are passed between the controller of the cabin display unit and the controller of the remote data capture unit.
18. A vehicle level remote information system as claimed in claim 8 wherein the remote data capture unit checks for changes in configuration information stored in the memory of the cabin display unit in each cycle of operation in order to implement changes in the operation of the remote data capture unit if necessary.
19. A vehicle level remote information system as claimed in any one of the preceding claims wherein at least one additional sensor or relay is added to either the cabin display unit, or the remote data capture unit, the at least one additional sensor or relay are chosen from the group including:
 - Voltage in any one or more batteries associated with the vehicle or trailer;
 - Current in any one or more batteries associated with the vehicle or trailer;
 - Temperature;
 - Humidity;

- Distance between any one or more point on the trailer or vehicle and other objects;
- G-Forces;
- Compass;
- Dust Particles;
- Gas concentration;
- Vibration;
- Electrical Relay to control other devices;
- Voltage of Trailer Breakaway Battery if fitted; and
- Voltage of Trailer Auxiliary Battery if fitted.

20. A vehicle level remote information system as claimed in any one of the preceding claims wherein the cabin display unit allows a user to change configuration items required for correct functioning of the system and/or the way in which information is displayed wherein the configuration items are chosen from the group including:

- Metric or Imperial measurement display;
- Width of trailer axle to allow calculation of height difference from side to side;
- Distance from trailer axle to tow hitch to allow calculation of height different from level at the tow hitch;
- Radio Channel to be used by the radio transceivers;
- Radio Addressing for the cabin display unit, remote data capture unit and any wireless sensors;
- Resolution of the display of various information items;
- Setting the required Level position for the Trailer;
- Parameters for switched relays; and
- Rounding of any numerical measurements or calculations which will affect stability of the displayed parameters.

Figure 1



INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU2015/050371

A. CLASSIFICATION OF SUBJECT MATTER

G01C 9/00 (2006.01) G01C 9/06 (2006.01) B62D 133/00 (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)

Database: WPIAP, EPODOC

Keywords: Level, tilt, vehicle, trailer, caravan, sense, display, wireless and similar combinations of terms

IPC/CPC marks: G01C9/LOW/CC/IC, B62D133/00/IC

Database: Google Patents, Espacenet

Keywords: trailer, vehicle, RV, remote, levelling, system, tilt, pitch and similar terms; Espacenet IPC/CPC marks: G01C9, B62D

Applicant(s)/Inventor(s) name search in Google Patents: Conlon, Veling, Green, TRIS Innovations Pty Ltd and similar combinations of terms

Inventor(s) name search in Espacenet: Conlon, Veling, Green, vehicle, level and similar combinations of terms

Applicant(s)/Inventor(s) name searched in internal databases provided by IP Australia.

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

* "A"	Special categories of cited documents: 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
8 September 2015

Date of mailing of the international search report
08 September 2015

Name and mailing address of the ISA/AU

AUSTRALIAN PATENT OFFICE
PO BOX 200, WODEN ACT 2606, AUSTRALIA
Email address: pct@ipaustalia.gov.au

Authorised officer

Susan Bellm
AUSTRALIAN PATENT OFFICE
(ISO 9001 Quality Certified Service)
Telephone No. 0262832751

