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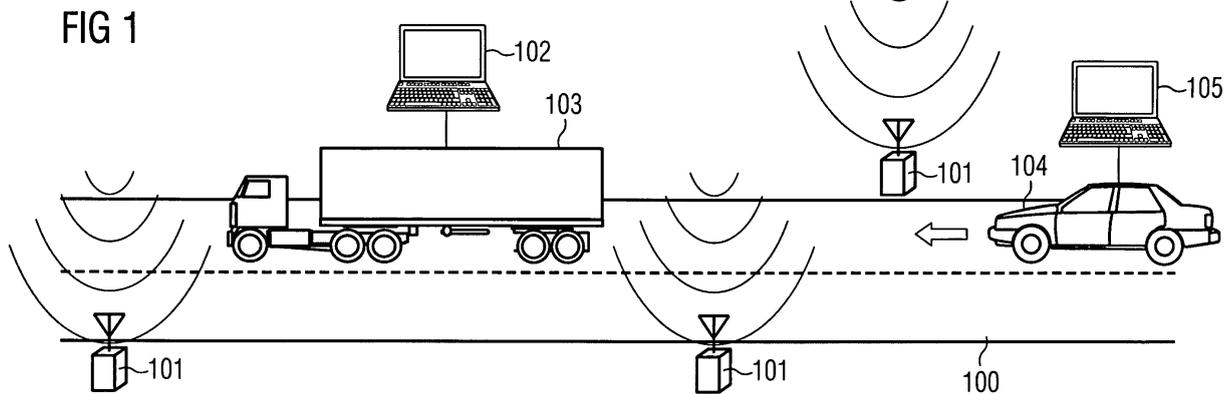
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(54) **Portable roadside traffic information output apparatus and method for outputting traffic information**

(57) The invention relates to a portable roadside traffic information output apparatus 101 that is configurable by a configuration apparatus 102. Data for configuration comprising traffic data to be output and configuration data influencing the behaviour of the portable roadside traffic information output apparatus 101 is generated with the help of a configuration apparatus 102 and is sent from the configuration apparatus 102 to the portable roadside traffic information output apparatus 101. The transition from the configuration phase to the operation phase of

the portable roadside traffic information output apparatus 101 may be either controlled remotely using the configuration apparatus 102 or may be controlled by the user using a switch 206 that is provided on the portable roadside traffic information output apparatus 101. In the operation phase the portable roadside traffic information output apparatus 101 outputs traffic information that is received by onboard apparatuses 105 of nearby vehicles 104. The onboard apparatuses 105 determine whether the received traffic information is relevant for the driver. If this is the case, the driver is informed accordingly.



Description

[0001] The invention relates to a portable roadside traffic information output apparatus, comprising an output means for outputting traffic information, a configuration apparatus for generating data for configuration of a portable roadside traffic information output apparatus, a computer program product forming a configuration apparatus, a system comprising a portable roadside traffic information output apparatus and a configuration apparatus, a method for outputting traffic information by use of a portable roadside traffic information output apparatus, an onboard apparatus for receiving traffic information sent by a portable roadside traffic information output apparatus, a computer program product forming an onboard apparatus, and a system comprising a portable roadside traffic information output apparatus and an onboard apparatus.

[0002] From the prior art, electronic road signs are known. One example is disclosed in JP 7 334 789. The road sign shown in this prior art consists of a capsule with a buffer material. Within the capsule, an antenna and a microchip are placed. The microchip receives an excitation radio wave from vehicles passing by through the antenna, converts the excitation radio wave into electric power, and sends radio information stored in it to the travelling vehicle using the antenna. The capsule is adapted to be buried into a road.

[0003] The electronic road sign disclosed in JP 7 334 789 has significant disadvantages, especially if it is necessary to alert drivers of vehicles to construction work that is carried out on the road ahead. Since the road sign is buried in the road, its relocation is very difficult. Furthermore, it is adapted to always send the same traffic information. Since the position of the construction work on the road is frequently changed according to the progress of the road works, it becomes necessary to install new electronic road signs.

[0004] Another electronic road sign is disclosed in US 2004/0178927 A1. This electronic road sign is installed close to a normal road sign, wherein the electronic road sign transmits a road warning having a preset relevant road direction in order to allow passing by vehicles to determine whether the received road warning is relevant for them based on their travelling direction.

[0005] Also this road sign has the disadvantage that the traffic information being output is preinstalled in the electronic road sign. Furthermore, relocating the electronic road sign is difficult. Therefore, this electronic road sign is unsuitable to be used to output warnings that alert drivers of vehicles to construction work due to the dynamics of the location of the construction work.

[0006] It is an object of the invention to provide a roadside traffic information output apparatus and a system which allow to be used more flexibly in comparison to apparatuses and systems known from the prior art. Another object is to provide a suitable method for outputting traffic information by use of the roadside traffic informa-

tion output apparatus.

[0007] These objects are achieved by providing a portable roadside traffic information output apparatus having the features of claim 1, a configuration apparatus for generating data for configuration of the portable roadside traffic information output apparatus having the features of claim 13, a computer program product having the features of claim 16, a system having the features of claim 17 or 18, and/or a method for outputting traffic information by use of a portable roadside traffic information output apparatus having the features of claim 19. Furthermore, the invention comprises an onboard apparatus for receiving traffic information having the features of claim 24, a computer program product for receiving traffic information having the features of claim 25, and a system having the features of claim 26 or 27.

[0008] The dependent claims describe various advantageous embodiments of the invention.

[0009] According to the invention, a portable roadside traffic information output apparatus comprising output means for outputting traffic information is provided. This portable roadside traffic information output apparatus further comprises receiving means for receiving data for configuration of the portable roadside traffic information output apparatus with regard to the traffic information to be output and control means for controlling the output means. The control means controls the output means according to the received data.

[0010] Such an apparatus has the advantage that it is able to receive data for control of the apparatus from the external, so that the operation of the apparatus and the data that is output can be controlled and determined. Furthermore, since the apparatus is portable, it can be easily relocated.

[0011] Portable in the sense of the invention means that the apparatus can be positioned by a single human being at different arbitrarily chosen locations and can be set to another location, i.e. it can be relocated. For this purpose, the weight of the apparatus is below 30 kg, preferably below 10 kg.

[0012] The term roadside in the sense of the invention means that the apparatus is used on or near the road, street, highway, or the like.

[0013] Preferably, the data that is received by the receiving means of the portable roadside traffic information output apparatus comprises traffic data to be output by the output means and configuration data for controlling the operation of the portable roadside traffic information output apparatus. This offers the advantage that the data output by the apparatus can be determined via the receiving means. Furthermore, it is possible to control the operation of the output apparatus by sending configuration data. For example, it can be determined how often the data is output, in what frequency it is output, when the outputting starts and ends, and so forth.

[0014] In an advantageous embodiment of the invention, the portable roadside traffic information output apparatus further comprises a switch being operable by a

user for activating the operation phase of the portable roadside traffic information output apparatus. The control means controls the output means according to the state of the switch. For example, in many scenarios, in which the portable roadside traffic information output apparatus is used to warn vehicle drivers against a construction site being ahead, the construction workers want to configure the portable roadside traffic information output apparatus at a certain location where only the configuration takes place, but where the apparatus should not start outputting traffic information, yet. After the configuration the configured apparatus is taken to the location where it is deployed. The construction worker turns on a switch and the apparatus starts outputting traffic information. Thus, the described switch is a simple, but effective measure to allow the separation of the configuration phase from the operation phase. This means that the portable roadside traffic information output apparatus may be configured at one location and may be deployed at another location, wherein the start of the operation phase may be easily controlled by a single switch that is part of the portable roadside traffic information output apparatus.

[0015] Preferably, the output means of the portable roadside traffic information output apparatus comprises an antenna element. The antenna element is configured to send radio signals in order to transmit traffic information.

[0016] In an advantageous embodiment of the invention, also the receiving means comprises an antenna element. Due to this antenna element, the receiving means may receive data from the external, even after its installation at the road. Other conceivable embodiments of the receiving means may be wirebound interfaces using, for example, USB-ports or any other connector technology.

[0017] In a preferred embodiment the antenna element of the receiving means is constituted by the antenna element of the output means. Thus, the output means and the receiving means use the same antenna element. This has the advantage that the structure of the apparatus is simplified. Furthermore, the overall apparatus is more compact and less expensive in comparison to apparatuses using two antenna elements, since less space is needed and less energy is consumed.

[0018] In an advantageous embodiment the output means and/or the receiving means are configured to operate based on the protocol Dedicated Short Range Communication (DSRC) or IEEE 802.11p. DSRC is a radio technology that was especially developed to be used in Vehicular Ad-hoc NETWORKS (VANETs). Also IEEE 802.11p was developed for use cases in the area of vehicle-to-vehicle communication. One advantage of these two protocols and radio technologies is that they can transmit communication packets up to hundreds of metres, which makes them suitable for vehicle-to-vehicle communication.

[0019] Preferably, the output means of the portable roadside traffic information output apparatus comprises a warning output means for outputting traffic warnings.

This allows the apparatus to output traffic warnings that may be received by nearby vehicles such that the driver of the vehicle may be warned of a potentially dangerous zone ahead.

[0020] The output means preferably also comprises a location information output means for outputting location information being related to traffic information. With the help of this location information output means, apparatuses that receive the location information that is related to received traffic information may determine where a dangerous zone is located. Thus, it is possible to determine how quickly the dangerous zone is reached by the vehicle and to control the warning operation of receiving apparatuses according to the location information.

[0021] Preferably, the control means of the portable roadside traffic information output apparatus comprises a means for controlling a start time of the operation of the output means and/or a means for controlling an end time of the operation of the output means. In this way, new usage scenarios may be realized. The portable roadside traffic information output apparatuses may be positioned at suitable positions without being configured, but with the switch for activating the operation phase being turned on. A nearby configuration apparatus may send data comprising traffic data to be output and configuration data containing instructions when the outputting of the traffic data should start and when it should end. In other words, an advantageous combination of the positioning phase, the configuration phase, and the operation phase becomes possible.

[0022] The portable roadside traffic information output apparatus may further comprise a signal means for signalling that the received data is correct. In this way, the apparatus may be configured, a construction worker can verify whether the apparatus is correctly configured by looking at the signal means, based on the signal he can decide whether he needs to configure the apparatus again or if he may take the apparatus to a place where it is deployed and after having brought the apparatus to its deployment position, he may start the operation phase by turning on a switch that is part of the apparatus.

[0023] In another preferred embodiment the portable roadside traffic information output apparatus further comprises a location determination means. Such a location determination means may be, for example, a GPS receiver. Based on this location determination means, the apparatus can determine where it is deployed. The location information may be given to vehicles passing by or it may be given to a configuration apparatus, so that the location of the portable roadside traffic information output apparatus may be taken into account when new configuration data is generated.

[0024] The invention also comprises a configuration apparatus for generating data for configuration of a portable roadside traffic information output apparatus with regard to the traffic information to be output and for sending the generated data to the receiving means of a portable roadside traffic information output apparatus. The

configuration apparatus has the advantage that it allows the generation of data by, for example, inputting the traffic information to be output and inputting parameters that control the operation of the portable roadside traffic information output apparatus and then sending the generated data to the receiving means of the portable roadside traffic information output apparatus. With the help of this configuration apparatus the roadside traffic information output apparatus may be configured in a convenient way.

[0025] In a preferable embodiment the configuration apparatus is an onboard device that is mountable in or on a vehicle. This embodiment has two advantages: The first advantage is that the configuration apparatus may be a part of a construction work vehicle that is used for the construction work. Therefore, when the construction site moves according to the progress of the construction work, the driver of the construction work vehicle may easily reconfigure the portable roadside traffic information output apparatuses. Furthermore, by combining a vehicle and the configuration apparatus, legal problems may be circumvented. Like mentioned above, in a preferred embodiment the communication protocols DSRC or IEEE 802.11p are used. In most countries, the respective frequencies on which the radio signals are transmitted by DSRC or IEEE 802.11p are reserved exclusively for vehicle-to-vehicle communication. If the configuration apparatus were a standalone apparatus not being combined with a vehicle, questions would arise whether the sending of data from the configuration apparatus to the portable roadside traffic information output apparatus is allowed according to the law.

[0026] Preferably, the configuration apparatus further comprises a location determination means. This location determination means may be, for example, a GPS receiver. By using this location determination means, the user of the configuration apparatus may easily generate traffic information that contains accurate information about the position of the construction site.

[0027] For a person skilled in the art it is obvious, that a configuration apparatus as described above may be formed on a generic computing device by running a suitable configuration software on it. A computing device may be, for example, a laptop, a notebook, a portable digital assistant, and so forth. Therefore, the invention also comprises a computer program product for generating and sending data, wherein the computer program product comprises a computer readable medium and a computer program recorded therein in form of a series of state elements corresponding to instructions which are adapted to be processed by a data processing means of a data processing apparatus such that a configuration apparatus like described above is formed on the data processing means. By realizing the configuration apparatus as a generic computer program product the configuration apparatus may be combined with an onboard radio or an onboard navigation system.

[0028] Furthermore, the invention comprises a system that comprises at least one portable roadside traffic in-

formation output apparatus according to the invention and at least one configuration apparatus. Such a system may also be set up by using at least one portable roadside traffic information output apparatus according to the invention and at least one computer program product that comprises software fulfilling the function of a configuration apparatus.

[0029] The invention further comprises a method for outputting traffic information by use of a portable roadside traffic information output apparatus comprising the steps of providing a portable roadside traffic information output apparatus near a road and outputting traffic information using the portable roadside traffic information output apparatus. According to the invention, the method further comprises the steps of generating data for configuration of the portable roadside traffic information output apparatus with regard to the traffic information to be output, sending the data to the portable roadside traffic information output apparatus, receiving the data on the portable roadside traffic information output apparatus using a receiving means, and controlling the outputting of traffic information according to the received data. This method has the advantage that the traffic information to be output may be configured.

[0030] Preferably, the data that is received by the receiving means of the portable roadside traffic information output apparatus comprises traffic data to be output and configuration data for controlling the outputting of traffic information. In this way, two things may be configured: Firstly, the traffic information that is output by the portable roadside traffic information output apparatus may be set. Secondly, the operation of the portable roadside traffic information output apparatus may be controlled.

[0031] In a preferred embodiment, the step of receiving the data on the portable roadside traffic information output apparatus using a receiving means further comprises the steps of verifying if the received data is correct, returning to the step of receiving data if the received data is not correct, and signalling that the received data is correct using a signal means, if the data is correct. In this way, the receiving of data is repeated until correct data is received. A construction worker can easily see that the receiving of data has been successfully completed by looking at the signal means. When the signal means signals that the received data is correct, the construction worker may take the portable roadside traffic information output apparatus to a suitable position near the road and may activate its operation phase.

[0032] Preferably, the step of outputting traffic information further comprises the steps of outputting a message containing traffic information, waiting for a predetermined time period, and returning to the step of outputting a message containing traffic information. Thus, the outputting of traffic information is periodically repeated. By setting the predetermined time period, the frequency of the outputting may be controlled.

[0033] In a preferred embodiment, the step of controlling the outputting of traffic information according to the

received data further comprises the steps of verifying a state of a switch being operable by a user and controlling the outputting of traffic information according to the state of the switch. These further steps allow that a user starts the operation phase by turning on a switch that is provided on the portable roadside traffic information output apparatus.

[0034] In addition, the invention comprises an onboard apparatus for receiving traffic information sent by a portable roadside traffic information output apparatus. According to the invention, the apparatus comprises a receiving means for receiving traffic information data, a first determination means for determining at least one type of data of a group consisting of vehicle's position data, velocity data and direction data, a second determination means for determining location information means for determining location information data in dependence on received traffic information data, an estimation means for estimating, based on the result of the first and the second determination means, if the vehicle's position will be within a predetermined distance to the location determined by the second determination means within a predetermined time frame, and a control means for controlling a signal means based on the result of the estimation.

[0035] Providing such an onboard apparatus with the mentioned features has the advantage that the onboard apparatus may receive traffic information, may determine vehicle data, and may determine, based on the location information of the traffic information and based on the vehicle data, whether the received traffic information is relevant for the driving situation. If the traffic information is relevant, the driver is informed of the traffic information. In this way, the driver's attention is directed only to traffic information that is important for him to know. In this way, the likelihood of accidents due to not being warned early enough and due to being distracted by irrelevant information is reduced.

[0036] The invention also comprised a computer program product for receiving traffic information, wherein the computer program product comprises a computer readable medium and a computer program recorded therein in form of a series of state elements corresponding to instructions which are adapted to be processed by a data processing means of a data processing apparatus such that an onboard apparatus for receiving traffic information is formed on the data processing means. Realizing an onboard apparatus for receiving traffic information by using a generic computing platform and a suitable software makes the provisioning of an onboard apparatus for receiving traffic information less expensive. Furthermore, the onboard apparatus for receiving traffic information may be combined with an onboard radio or an onboard navigation system.

[0037] The invention also comprises a system comprising at least one portable roadside traffic information output apparatus and at least one onboard apparatus for receiving traffic information sent by a portable roadside traffic information output apparatus. Furthermore, the in-

vention comprises a system comprising at least one portable roadside traffic information output apparatus and at least one computer program product such that an onboard apparatus for receiving traffic information sent by a portable roadside traffic information output apparatus is formed.

[0038] Preferably, a system comprising a portable roadside traffic information output apparatus and an onboard apparatus for receiving traffic information or an according computer program product are configured to operate based on the protocol DSRC or IEEE 802.11p. Using one of these protocols, allows the exploitation of their favourable properties.

[0039] In the following, preferable embodiments and further details of the present invention will be described in more detail with reference to the accompanying drawings.

Fig. 1 shows one usage scenario according to the present invention.

Fig. 2 shows one embodiment of the hardware architecture of a portable roadside traffic information output apparatus according to the invention.

Fig. 3 shows a flow chart of the steps that are carried out when the portable roadside traffic information output apparatus according to the invention is switched on.

Fig. 4 shows one embodiment of the configuration phase and the operation phase of the portable roadside traffic information output apparatus according to the invention.

Fig. 5 shows a data input window of one embodiment of a configuration apparatus according to the invention.

Fig. 6 shows a flow chart of the process that is carried out by a configuration apparatus according to the invention.

Fig. 7 shows one embodiment of a method for outputting traffic information by use of a portable roadside traffic information output apparatus according to the invention.

Fig. 8 shows one embodiment of an onboard apparatus according to the invention for receiving traffic information sent by a portable roadside traffic information output apparatus.

[0040] With reference to Fig. 1, one possible usage scenario of a portable roadside traffic information output apparatus according to the invention will be described. Fig. 1 shows a road 100 on which construction work is carried out. Along the road 100 three portable roadside

traffic information output apparatuses 101 have been placed. A construction work vehicle 103 is equipped with a configuration apparatus 102 that is able to configure the portable roadside traffic information output apparatuses 101 by sending radio signals. An approaching vehicle 104 is equipped with an onboard apparatus 105 for receiving traffic information. The onboard apparatus 105 for receiving traffic information receives the traffic information that is output by the portable roadside traffic information output apparatuses 101. Based on the received traffic information, the onboard apparatus 105 warns the driver of the vehicle 104 and informs him that construction work is being carried out on the road ahead of him.

[0041] The hardware architecture of one embodiment of a portable roadside traffic information output apparatus will be explained with reference to Fig. 2. The embodiment comprises a wireless device 201 for sending and receiving radio signals. A central processing unit (CPU) 202 functions as a control means and controls especially the outputting operation. The shown embodiment further comprises a memory 203 for storing data and a flash memory 204 that stores among others an operating system image. Furthermore, the embodiment possesses a power switch (PWR_SW) 205 that allows the user to switch on the apparatus and a data transmission switch (DT_SW) 206 for activating the operation phase of the apparatus. In addition, the apparatus comprises a power light-emitting diode (PWR_LED) 207 and a ready light-emitting diode (RDY_LED) 208. When the power switch 205 is turned on, the power-LED is activated to signal to the user that the apparatus is switched on. When the apparatus is correctly configured, the ready-LED 208 is turned on. The CPU 202 is connected via a generic bus 209 with the wireless device 201, the memory 203, 204, the switches 205, 206, and the LEDs 207, 208. Via this generic bus 209 the CPU retrieves required information from the memory 203, 204 or the switches 205, 206 and controls the LEDs 207, 208 and the wireless device 201 accordingly.

[0042] Fig. 3 shows one embodiment of a process that is carried out when the power switch 205 of the portable roadside traffic information output apparatus is turned on. After the power has been turned on in step 301, the operating system is booted in step 302 from the flash memory 204. Afterwards, the power-LED 207 is turned on in step 303. Then the configuration process is carried out in step 304. After the configuration, traffic information is output in step 305. In step 306, it is checked whether the operation phase is still active and whether new configuration data has arrived. If the operation phase is still unmodified and active, the process returns to step 305 in which traffic information is output again. If, however, new reconfiguration data arrived, the process returns to the configuration process that is carried out in step 304.

[0043] Fig. 4 shows one embodiment of a configuration process and a traffic information output process as well as the interactions between the two. When the configura-

tion process starts, the ready-LED 208 is turned off in step 401. Then the process waits for data input in step 402. The received data is written into the memory (step 403). In step 404, it is verified if the data is correct and complete. For example, it is checked whether all the necessary fields such as latitude, longitude, altitude, start time, end time, and road work type have been filled in. If the data is not correct, the procedure returns to step 401. If the data is correct, the ready-LED 208 is turned on in step 405. In step 406, the procedure waits for a predetermined time for additional data to arrive. If more data is received, it may either be a change to data that has been received before, i. e. an update of the data, or it may be additional data. If more data is received, the procedure returns to step 403, where the received data is written into the memory. If no more data is received, it is verified in step 407 whether the data transmission switch 206 is turned on. If the data transmission switch 206 is not turned on, the user does not want the portable roadside traffic information output apparatus to output the data, yet. Therefore, the procedure returns to step 406 and waits for more data to be received.

[0044] If the data transmission switch 206 is turned on, the configuration phase is completed and the procedure continues with step 408 where a message containing traffic information is sent out. After the sending of a message in step 408, the procedure waits for a predetermined time period in step 409. After the waiting, it is verified in step 410 whether the data transmission switch 206 is still turned on. If it is turned on, the procedure returns to step 408 and a new message containing traffic information is output. As a result, if the data transmission switch 206 is kept on, traffic information messages are periodically sent out every predefined period. If the data transmission switch 206 is turned off, the user wants to abort the operation phase. Therefore, the procedure returns to step 406 where the system waits for new configuration data to arrive. The apparatus does not start outputting traffic information again as long as the data transmission switch 206 is not turned on again.

[0045] Fig. 5 shows one embodiment of a data input window of a configuration apparatus. The data input window 501 allows to input the location of the construction work. The location can be specified by filling in the latitude field 502, the longitude field 503, and the altitude field 504. Furthermore, the start-from field 505 allows to specify when the outputting of traffic information should start. In the last-until field 506, a user can specify when the outputting of traffic information should end. Moreover, the type-of-works field 507 allows to input what kind of construction work is carried out. When all the fields are correctly filled in, the user presses the set-up button 508 to send the inputted information to the portable roadside traffic information output apparatuses. The clear-all button 509 allows to delete the values in all the fields 502 - 507.

[0046] Fig. 6 shows a flow chart describing one embodiment of a process that is carried out by a configura-

tion apparatus. When the software is started in step 601, a data input window appears. One embodiment of such an input window 501 was shown in Fig. 5. In step 602, the user inputs data into this data input window. If the configuration apparatus possesses a location determination means, like for example a GPS receiver, the location of the configuration apparatus is automatically filled into the fields 502 - 504. When all the fields are correctly filled in, the user presses the set-up button 508 in step 603. Afterwards, it is verified in step 604 whether the inputted data is correct. If the data is correct, the data is sent to the portable roadside traffic information output apparatuses in step 605. If the data is incorrect, an error dialogue appears in step 607. After the sending of the data in step 605, it is verified in step 606 whether the data was completely sent. If this is the case, an OK dialogue appears in step 608. Otherwise, the error dialogue appears (step 607).

[0047] Fig. 7 shows one embodiment of a method for outputting traffic information by use of a portable roadside traffic information output apparatus according to the invention. In step 701, a portable roadside traffic information output apparatus (PRTIOA) is provided. Then, data for configuration of the portable roadside traffic information output apparatus is generated in step 702 and is sent to the portable roadside traffic information output apparatus in step 703. In step 704, the data that was sent in step 703 is received on the portable roadside traffic information output apparatus. Afterwards, the configuration phase is completed and the portable roadside traffic information output apparatus is positioned near a road in step 705. After having positioned the portable roadside traffic information output apparatus, its operation phase is activated by turning on a switch in step 706. Then the portable roadside traffic information output apparatus starts outputting traffic information and the outputting is controlled in step 707. The controlling is done in such a way that the traffic information is output in a predetermined frequency. Furthermore, when new data for configuration is received, the operation phase is suspended and the configuration phase is being reactivated. Controlling in the sense of this method may also mean that the frequency of the outputting is adapted according to received data, that the outputting starts at a predetermined start time and/or ends at a predetermined end time according to received data, or that the start and end times are controlled according to the state of the switch. Furthermore, new location data may be received. In this case, the location data being output and being related to the traffic information is adapted.

[0048] Fig. 8 shows one embodiment of an onboard apparatus for receiving traffic information sent by a portable roadside traffic information output apparatus according to the invention. The onboard apparatus for receiving traffic information 105 comprises a receiving means 801, a first determination means 802, a second determination means 803, an estimation means 804, a control means 805, and a signal means 806. The receiving

means 801 receives traffic information data that is sent by a portable roadside traffic information output apparatus. The traffic information data is given from the receiving means 801 to the second determination means 803. The second determination means 803 analyses the type of traffic information that is contained in the traffic information data and extracts the corresponding location information. The result of the determination of the second determination means 803 is given to the estimation means 804. The first determination means 802 retrieves vehicle data like for example the vehicle's location, the vehicle's velocity, and the vehicle's direction. The retrieved vehicle data is given to the estimation means 804. Based on the vehicle's location, velocity, and direction and based on the location information that was extracted from the traffic information data by the second determination means 803, the estimation means 804 estimates whether the vehicle will be near to the location that was specified in the traffic information data. This means that the estimation means 804 forecasts whether the traffic information data is relevant for the driver because the driver will be soon near to a location that the traffic information relates to. The result of this estimation is given to a control means 805. The control means controls a signal means 806. This signal means may be a means for playing a sound, a control-LED in the driver panel, the screen of a navigation system or any other means that is suitable to inform the driver of a vehicle that a dangerous zone is ahead.

[0049] The specifications and drawings are to be regarded in an illustrative rather than a restrictive sense. It is evident that various modifications and changes may be made thereto, without departing from the spirit and scope of the invention as set forth in the claims. It is possible to combine the features described in the embodiments in a modified way for providing additional embodiments that are optimized for a certain usage scenario. As far as such modifications are readily apparent for a person skilled in the art, these modifications shall be regarded as implicitly disclosed by the above described embodiments.

[0050] For example, while in Fig. 7 the portable roadside traffic information output apparatus was configured first and was then positioned near a road, it is apparent for a person skilled in the art that it is also possible to position the portable roadside traffic information output apparatus first near a road and configure it then by sending configuration data afterwards. Such a modification is obvious for a person skilled in the art and shall be regarded as implicitly disclosed by the above described embodiments.

Claims

1. Portable roadside traffic information output apparatus (101), comprising output means (201) for outputting traffic information,

characterized by

- receiving means (201) for receiving data for configuration of the portable roadside traffic information output apparatus (101) with regard to the traffic information to be output, and
 - control means (202) for controlling the output means (201),
 - wherein the control means (202) controls the output means (201) according to the received data.
2. Portable roadside traffic information output apparatus (101) according to claim 1, **characterized in that** the data comprises traffic data to be output by the output means (201) and configuration data for controlling the operation of the portable roadside traffic information output apparatus (101).
 3. Portable roadside traffic information output apparatus (101) according to claim 1 or 2, **characterized in that** the portable roadside traffic information output apparatus further comprises a switch (206) being operable by a user for activating the operation phase of the portable roadside traffic information output apparatus and that the control means (202) controls the output means (201) according to the state of the switch (206).
 4. Portable roadside traffic information output apparatus (101) according to at least one of the preceding claims, **characterized in that** the output means comprises an antenna element (201).
 5. Portable roadside traffic information output apparatus (101) according to at least one of the preceding claims, **characterized in that** the receiving means comprises an antenna element (201).
 6. Portable roadside traffic information output apparatus (101) according to claim 5, **characterized in that** the antenna element (201) of the receiving means is constituted by the antenna element (201) of the output means.
 7. Portable roadside traffic information output apparatus (101) according to at least one of the preceding claims, **characterized in that** the output means (201) and/or the receiving means (201) are configured to operate based on the protocol DSRC or the protocol IEEE 802.11p.
 8. Portable roadside traffic information output apparatus (101) according to at least one of the preceding claims, **characterized in that** the output means (201) comprises a warning output means for outputting traffic warnings.
 9. Portable roadside traffic information output apparatus (101) according to at least one of the preceding claims, **characterized in that** the output means (201) comprises a location information output means for outputting location information being related to traffic information.
 10. Portable roadside traffic information output apparatus (101) according to at least one of the preceding claims, **characterized in that** the control means (202) comprises a means for controlling a start time of the operation of the output means (201) and/or a means for controlling an end time of the operation of the output means (201).
 11. Portable roadside traffic information output apparatus (101) according to at least one of the preceding claims, **characterized in that** the apparatus further comprises signal means (208) for signaling that the received configuration data is correct.
 12. Portable roadside traffic information output apparatus (101) according to at least one of the preceding claims, **characterized in that** the apparatus further comprises location determination means.
 13. A configuration apparatus (102) for generating data for configuration of a portable roadside traffic information output apparatus (101) with regard to the traffic information to be output and for sending the generated data to the receiving means (201) of a portable roadside traffic information output apparatus (101) according to at least one of the preceding claims.
 14. A configuration apparatus (102) according to claim 13, **characterized in that** the apparatus is an on-board device mountable in/on a vehicle (103).
 15. A configuration apparatus (102) according to claim 13 or 14, **characterized in that** the apparatus further comprises a location determination means.
 16. A computer program product for generating and sending data, the computer program product comprising a computer readable medium and a computer program recorded therein in form of a series of state elements corresponding to instructions which are adapted to be processed by a data processing means of a data processing apparatus such that an apparatus (102) according to at least one of the claims 13 to 15 is formed on the data processing means.
 17. A system comprising at least one portable roadside traffic information output apparatus (101) according to at least one of the claims 1 to 12 and at least one configuration apparatus (102) according to at least

one of the claims 13 to 15.

18. A system comprising at least one portable roadside traffic information output apparatus (101) according to at least one of the claims 1 to 12 and at least one computer program product according to claim 16. 5
19. A method for outputting traffic information by use of a portable roadside traffic information output apparatus (101), comprising the steps of 10
- providing a portable roadside traffic information output apparatus near a road (701, 705), and
 - outputting (707) traffic information using the portable roadside traffic information output apparatus (101), 15
- characterized by** the further steps of
- generating data (702) for configuration of the portable roadside traffic information output apparatus with regard to the traffic information to be output, 20
 - sending the data (703) to the portable roadside traffic information output apparatus, 25
 - receiving the data (704) on the portable roadside traffic information output apparatus using a receiving means, and
 - controlling (707) the outputting of traffic information according to the received data. 30
20. Method for outputting traffic information according to claim 19, **characterized in that** the data comprises traffic data to be output and configuration data for controlling the outputting of traffic information. 35
21. Method for outputting traffic information according to claim 19 or 20, **characterized in that** the step of receiving the data on the portable roadside traffic information output apparatus using a receiving means further comprises the steps of verifying (404) if the received data is correct, returning to the step of receiving data (402, 403) if the received data is not correct, and signaling (405) that the received data is correct using a signal means, if the data is correct. 40 45
22. Method for outputting traffic information according to at least one of the claims 19 to 21, **characterized in that** the step of outputting traffic information further comprises the steps of outputting a message (408) containing traffic information, waiting for a predetermined time period (409), and returning to the step of outputting a message (408) containing traffic information. 50
23. Method for outputting traffic information according to at least one of the claims 19 to 22, **characterized**

in that the step of controlling the outputting of traffic information according to the received data further comprises the steps of verifying (410) a state of a switch being operable by a user and controlling (410) the outputting of traffic information according to the state of the switch.

24. An onboard apparatus (105) for receiving traffic information sent by a portable roadside traffic information output apparatus (101) according to at least one of the claims 1 to 12, 10
- wherein the apparatus comprises
- a receiving means (801) for receiving traffic information data,
 - a first determination means (802) for determining at least one type of data of a group consisting of vehicle's position data, velocity data and direction data,
 - a second determination means (803) for determining location information data in dependence on received traffic information data,
 - an estimation means (804) for estimating based on the result of the first and the second determination means if the vehicle's position will be within a predetermined distance to the location determined by the second determination means within a predetermined time frame, and
 - a control means (805) for controlling a signal means (806) based on the result of the estimation. 15 20 25 30

25. A computer program product for receiving traffic information, the computer program product comprising a computer readable medium and a computer program recorded therein in form of a series of state elements corresponding to instructions which are adapted to be processed by a data processing means of a data processing apparatus such that an apparatus (105) according to claim 24 is formed on the data processing means. 35 40

26. A system comprising at least one apparatus (101) according to at least one of the claims 1 to 12 and at least one apparatus (105) according to claim 24. 45

27. A system comprising at least one apparatus (101) according to at least one of the claims 1 to 12 and at least one computer program product according to claim 25. 50

28. A system according to claim 26 or 27, **characterized in that** the system is configured to operate based on the protocol DSRC or IEEE 802.11p. 55

Amended claims in accordance with Rule 137(2) EPC.

1. Portable roadside traffic information output apparatus (101), comprising 5

- output means (201) for outputting traffic information,
- receiving means (201) for receiving data for configuration of the portable roadside traffic information output apparatus (101) with regard to the traffic information to be output, and 10
- control means (202) for controlling the output means (201),
- wherein the control means (202) controls the output means (201) according to the received data, 15

characterized in that

the apparatus further comprises signal means (208) 20 for signalling that the received configuration data is correct.

2. Portable roadside traffic information output apparatus (101) according to claim 1, **characterized in that** the data comprises traffic data to be output by the output means (201) and configuration data for controlling the operation of the portable roadside traffic information output apparatus (101). 25

3. Portable roadside traffic information output apparatus (101) according to claim 1 or 2, **characterized in that** the portable roadside traffic information output apparatus further comprises a switch (206) being operable by a user for activating the operation phase of the portable roadside traffic information output apparatus and that the control means (202) controls the output means (201) according to the state of the switch (206). 30

4. Portable roadside traffic information output apparatus (101) according to at least one of the preceding claims, **characterized in that** the output means comprises an antenna element (201). 35

5. Portable roadside traffic information output apparatus (101) according to at least one of the preceding claims, **characterized in that** the receiving means comprises an antenna element (201). 40

6. Portable roadside traffic information output apparatus (101) according to claim 5, **characterized in that** the antenna element (201) of the receiving means is constituted by the antenna element (201) of the output means. 45

7. Portable roadside traffic information output apparatus (101) according to at least one of the preceding 50

claims, **characterized in that** the output means (201) and/or the receiving means (201) are configured to operate based on the protocol DSRC or the protocol IEEE 802.11p.

8. Portable roadside traffic information output apparatus (101) according to at least one of the preceding claims, **characterized in that** the output means (201) comprises a warning output means for outputting traffic warnings.

9. Portable roadside traffic information output apparatus (101) according to at least one of the preceding claims, **characterized in that** the output means (201) comprises a location information output means for outputting location information being related to traffic information.

10. Portable roadside traffic information output apparatus (101) according to at least one of the preceding claims, **characterized in that** the control means (202) comprises a means for controlling a start time of the operation of the output means (201) and/or a means for controlling an end time of the operation of the output means (201).

11. Portable roadside traffic information output apparatus (101) according to at least one of the preceding claims, **characterized in that** the apparatus further comprises location determination means.

12. A configuration apparatus (102) for generating data for configuration of a portable roadside traffic information output apparatus (101) with regard to the traffic information to be output and for sending the generated data to the receiving means (201) of a portable roadside traffic information output apparatus (101) according to at least one of the preceding claims.

13. A configuration apparatus (102) according to claim 12, **characterized in that** the apparatus is an onboard device mountable in/on a vehicle (103).

14. A configuration apparatus (102) according to claim 12 or 13, **characterized in that** the apparatus further comprises a location determination means.

15. A computer program product for generating and sending data, the computer program product comprising a computer readable medium and a computer program recorded therein in form of a series of state elements corresponding to instructions which are adapted to be processed by a data processing means of a data processing apparatus, the computer program comprising

- a code for allowing a user to input a location

of a construction work by filling in a latitude field (502), a longitude field (503), and an altitude field (504);

- a code for allowing the user to specify when an outputting of traffic information should start and when the outputting of traffic information should end;
- a code for allowing the user to input what kind of construction work is carried out; and
- a code for sending the inputted information to a portable roadside traffic information output apparatus according to at least one of the claims 1 to 11.

16. A system comprising at least one portable roadside traffic information output apparatus (101) according to at least one of the claims 1 to 11 and at least one configuration apparatus (102) according to at least one of the claims 12 to 14.

17. A system comprising at least one portable roadside traffic information output apparatus (101) according to at least one of the claims 1 to 11 and at least one computer program product according to claim 15.

18. A method for outputting traffic information by use of a portable roadside traffic information output apparatus (101), comprising the steps of

- providing a portable roadside traffic information output apparatus near a road (701, 705),
- generating data (702) for configuration of the portable roadside traffic information output apparatus with regard to the traffic information to be output,
- sending the data (703) to the portable roadside traffic information output apparatus,
- receiving the data (704) on the portable roadside traffic information output apparatus using a receiving means,
- outputting (707) traffic information using the portable roadside traffic information output apparatus (101), and
- controlling (707) the outputting of traffic information according to the received data,

characterized by the further step of providing signal means (208) for signalling that the received configuration data is correct.

19. Method for outputting traffic information according to claim 18, **characterized in that** the data comprises traffic data to be output and configuration data for controlling the outputting of traffic information.

20. Method for outputting traffic information according to claim 18 or 19, **characterized in that** the step

of receiving the data on the portable roadside traffic information output apparatus using a receiving means further comprises the steps of verifying (404) if the received data is correct, returning to the step of receiving data (402, 403) if the received data is not correct, and signaling (405) that the received data is correct using a signal means, if the data is correct.

21. Method for outputting traffic information according to at least one of the claims 18 to 20, **characterized in that** the step of outputting traffic information further comprises the steps of outputting a message (408) containing traffic information, waiting for a predetermined time period (409), and returning to the step of outputting a message (408) containing traffic information.

22. Method for outputting traffic information according to at least one of the claims 18 to 21, **characterized in that** the step of controlling the outputting of traffic information according to the received data further comprises the steps of verifying (410) a state of a switch being operable by a user and controlling (410) the outputting of traffic information according to the state of the switch.

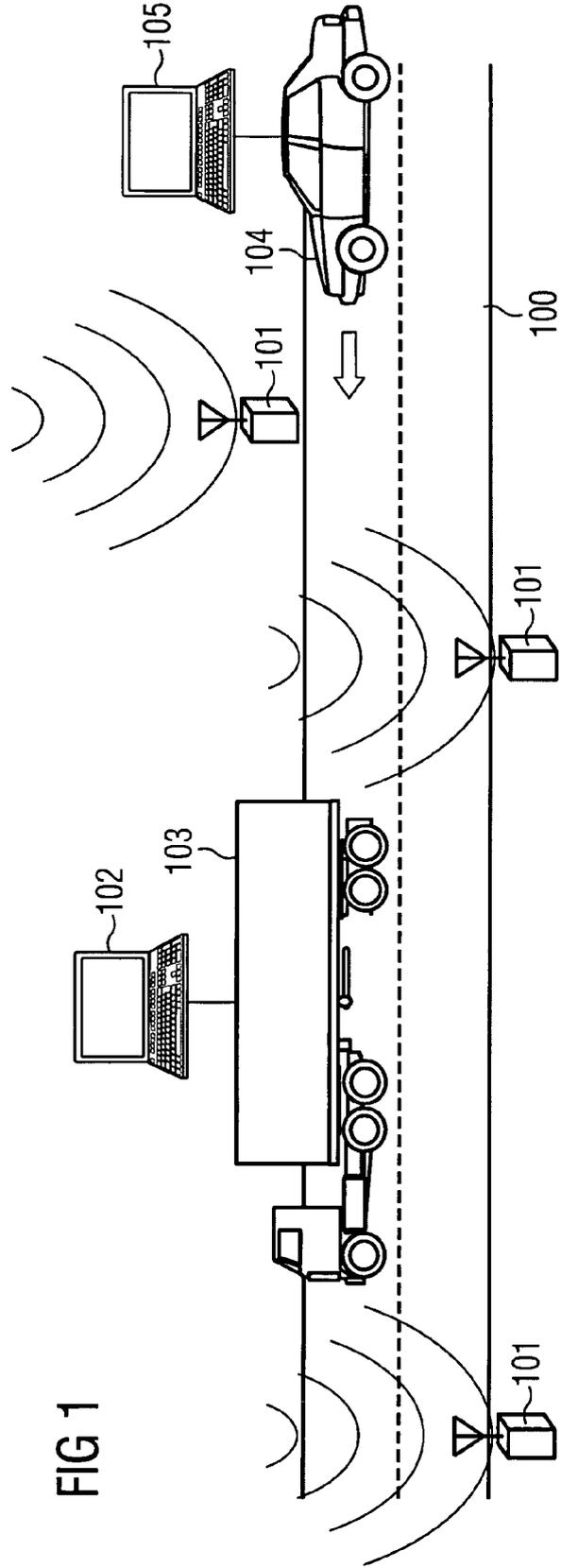


FIG 1

FIG 2

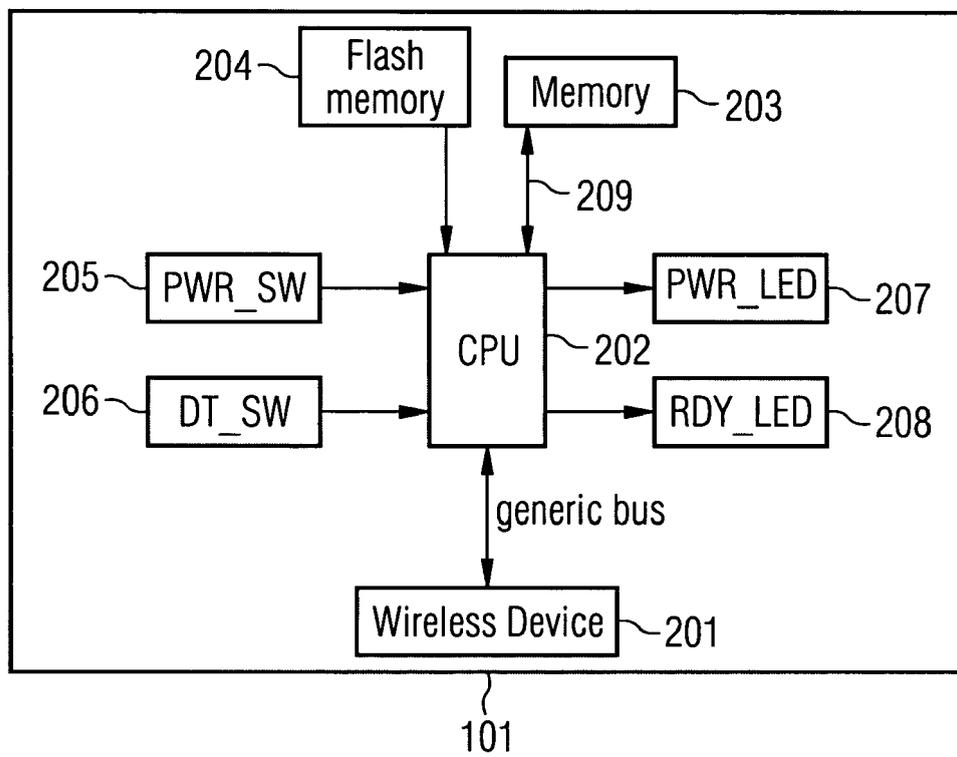


FIG 3

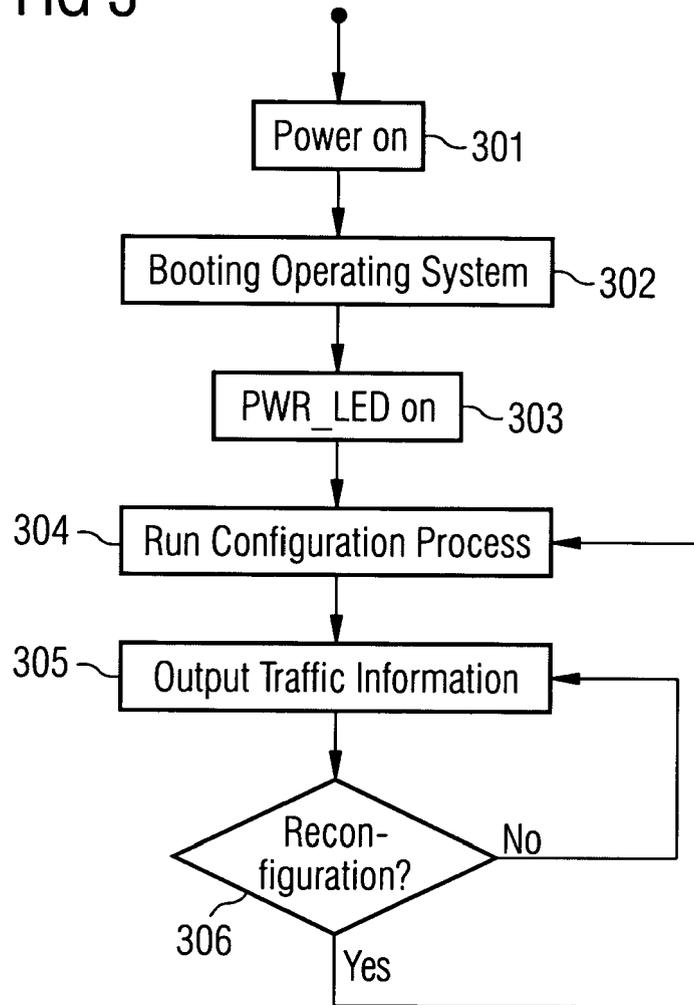


FIG 4

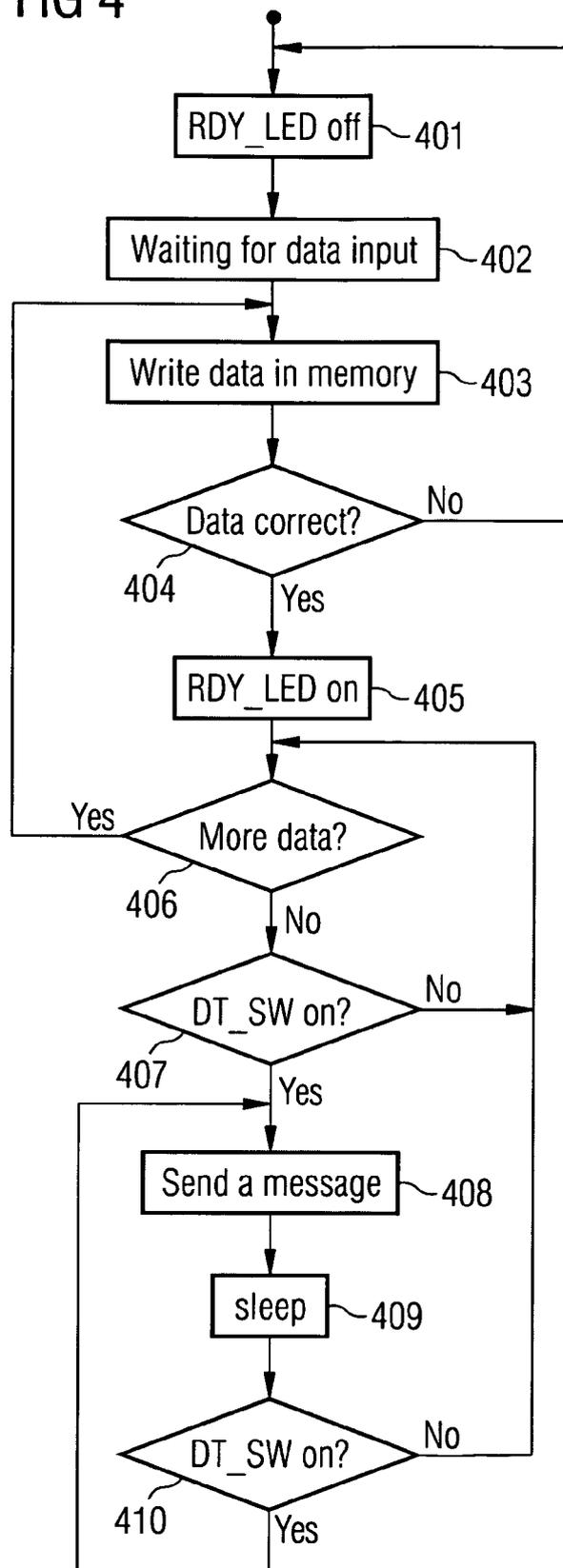


FIG 5

The image shows a software window titled "WorkRoadCone" with a close button in the top right corner. The window contains several input fields and buttons:

- Latitude:** A text input field containing "4916.123456,N" with a reference number 502.
- Longitude:** A text input field containing "12311.987654,W" with a reference number 503.
- Altitude:** A text input field containing "545.42,M" with a reference number 504.
- Start from:** A date selection field containing "2006/10/01" with a dropdown arrow and a reference number 505.
- Last until:** A date selection field containing "2006/10/28" with a dropdown arrow and a reference number 506.
- Type of Works:** A dropdown menu containing "Highway" with a dropdown arrow and a reference number 507.
- Buttons:** Two buttons at the bottom: "Set-up" with reference number 508 and "Clear All" with reference number 509.

The entire window is labeled with reference number 501 at the bottom center.

FIG 6

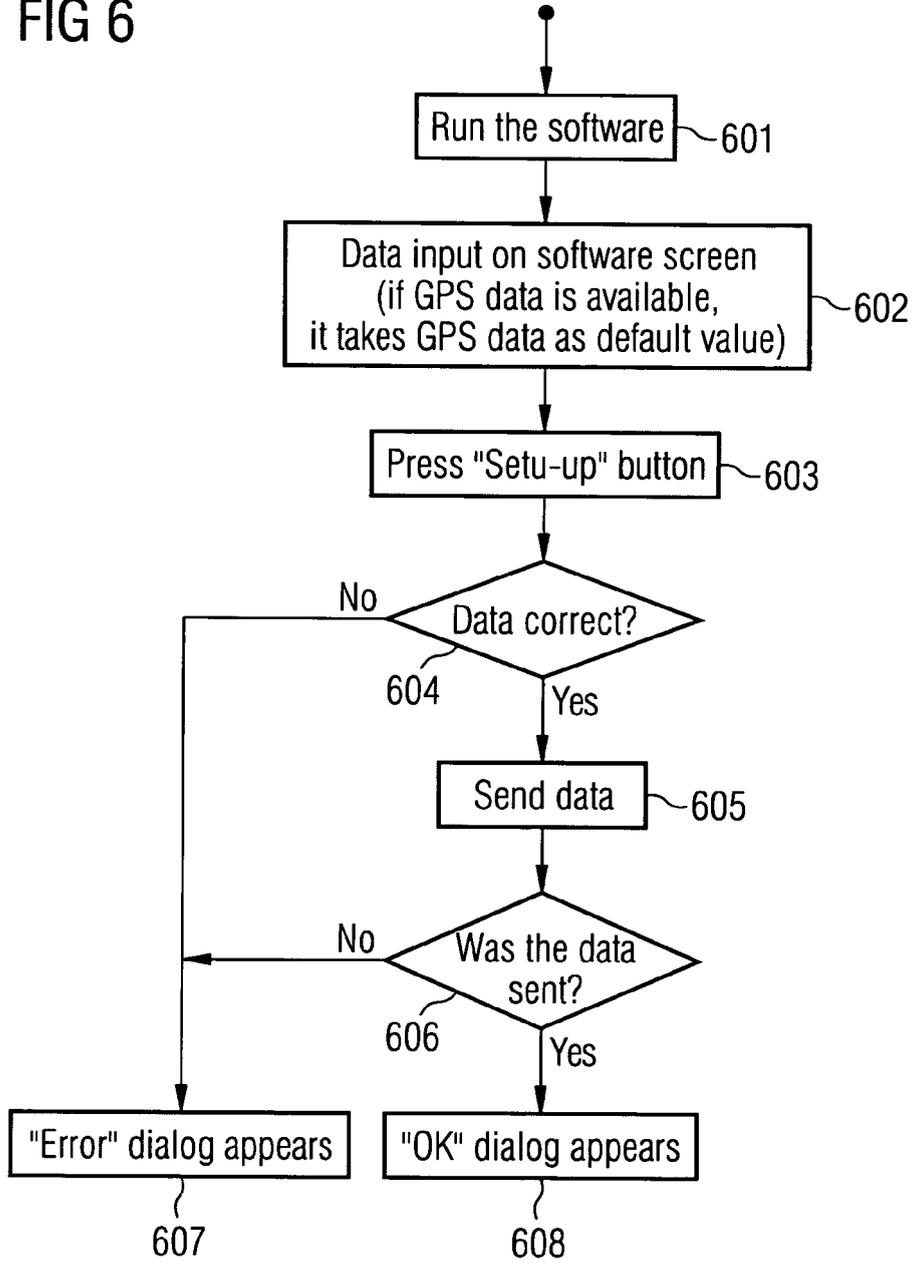


FIG 7

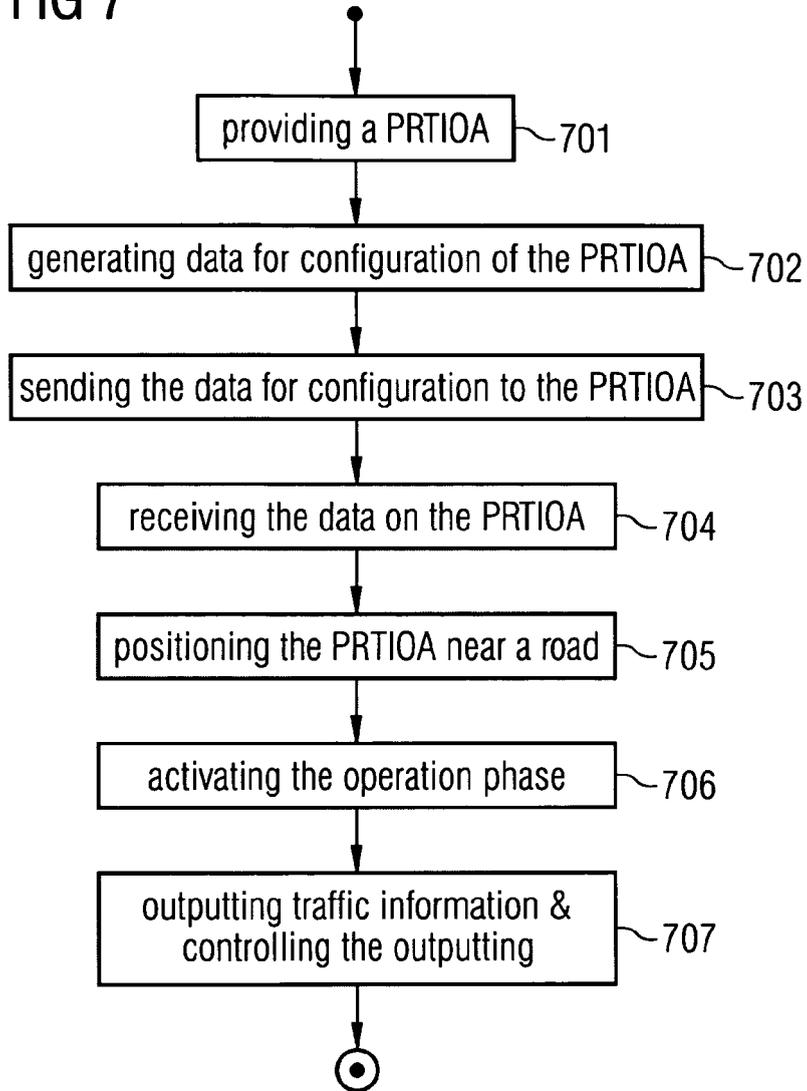
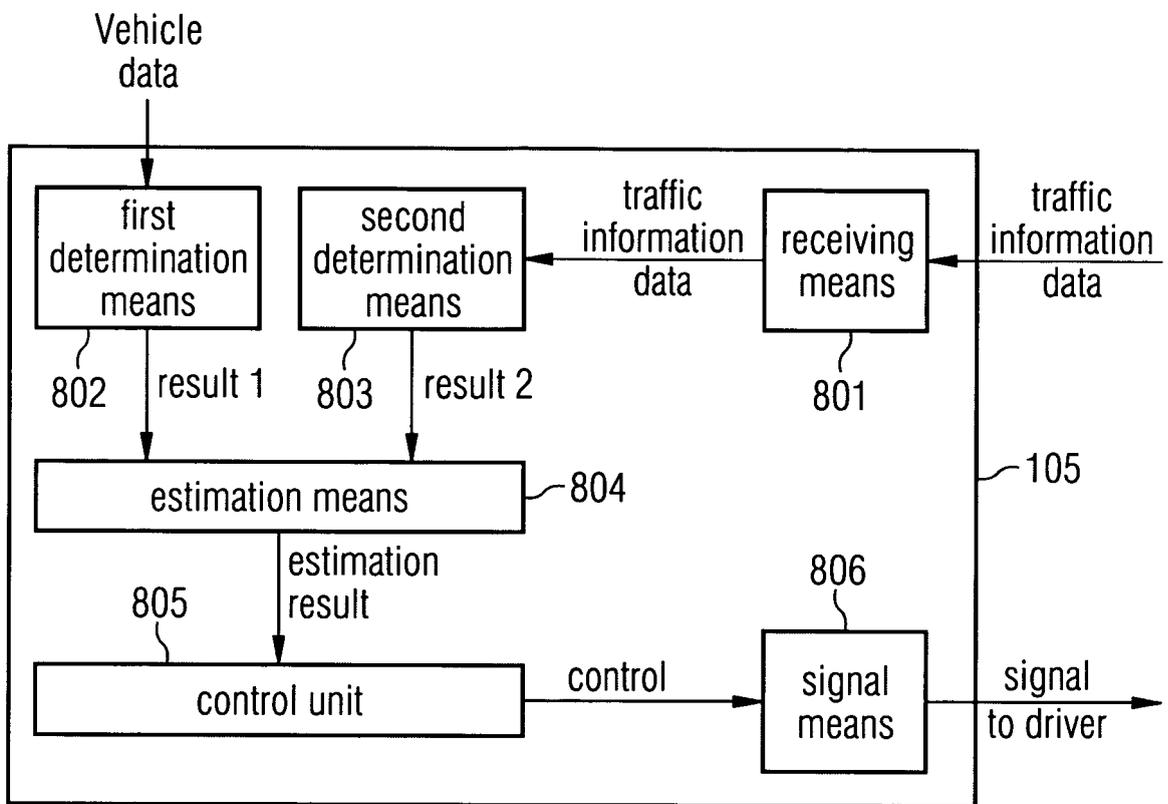


FIG 8





DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 1 229 508 A1 (MINGUELLA LLOBET JOSE MARIA [ES]; GAGGIOLI DE MAURO RUBEN HORACI [ES]) 7 August 2002 (2002-08-07)	1-6,8, 13,14, 16-20, 22,23 7,9,12	INV. G08G1/0967
Y	* paragraph [0001] - paragraph [0002] * * paragraph [0008] * * paragraph [0010] * * paragraph [0014] - paragraph [0016] * * paragraph [0035] - paragraph [0036] * * paragraph [0041] - paragraph [0046] * * paragraph [0050] - paragraph [0051] * * paragraph [0055] - paragraph [0057] *		
X	US 2004/248545 A1 (DOI MIWAKO [JP]) 9 December 2004 (2004-12-09)	1-6,8,9, 12,14, 16-20 9,12	
Y	* paragraph [0011] - paragraph [0013]; figures 1-4 * * paragraph [0033] - paragraph [0049] * * paragraph [0053] - paragraph [0054] * * paragraph [0085] *		TECHNICAL FIELDS SEARCHED (IPC)
X	GB 2 179 824 A (VERNON MALCOLM BARRY) 11 March 1987 (1987-03-11) * page 1, line 5 - line 24 * * page 1, line 47 - page 2, line 1 * * page 3, line 39 - line 41 * * figure 1 *	1,13, 16-19	G08G
Y	EP 1 111 339 A (HITACHI LTD [JP]) 27 June 2001 (2001-06-27) * paragraph [0009] *	7	
Y	WO 2005/106823 A (3M INNOVATIVE PROPERTIES CO [US]) 10 November 2005 (2005-11-10) * page 9, line 3 - line 24 *	7	
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 4 December 2006	Examiner Seisedos, Marta
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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EPO FORM 1503 03/02 (P04C01)

**CLAIMS INCURRING FEES**

The present European patent application comprised at the time of filing more than ten claims.

- Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid, namely claim(s):
- No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

- All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.
- As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.
- Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:
- None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

see annex



The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-23

Configuration data are send to a portable roadside traffic
information output apparatus for outputting information

2. claims: 24-28

An onboard apparatus characterised by receiving traffic
information and processing it together with the vehicle
status data

ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.

EP 06 01 5908

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

04-12-2006

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- JP 7334789 A [0002] [0003]
- US 20040178927 A1 [0004]