



(11) **EP 4 488 966 A1**

(12) **EUROPEAN PATENT APPLICATION**

- (43) Date of publication: **08.01.2025 Bulletin 2025/02**
- (51) International Patent Classification (IPC):
G07C 5/00^(2006.01) G07C 5/08^(2006.01)
- (21) Application number: **24186326.5**
- (52) Cooperative Patent Classification (CPC):
G07C 5/008; G07C 5/0841
- (22) Date of filing: **03.07.2024**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC ME MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA
Designated Validation States:
GE KH MA MD TN

(30) Priority: **07.07.2023 SE 2350879**

(71) Applicant: **Stoneridge Electronics AB**
169 73 Solna (SE)

(72) Inventors:
• **WECK, Björn**
169 73 SOLNA (SE)
• **HALLBERG, Sanna**
169 73 SOLNA (SE)
• **ELLINGSSON, Tomas**
191 40 SOLLENTUNA (SE)

(74) Representative: **Bergenstråhle & Partners AB**
P.O. Box 17704
118 93 Stockholm (SE)

(54) **METHODS AND VEHICLE UNITS FOR TRANSMITTING INFORMATION TO A NETWORK ENTITY**

(57) A method performed by a vehicle unit (10) for transmitting information to a network entity (20), wherein the vehicle unit (10) is communicatively connected to the network entity (20), the method comprises: recording (202) vehicle information data; transmitting (206) re-

corded vehicle information data to the network entity (20), wherein the transmission of recorded vehicle information data to the network entity (20) is carried out without a request of data by the network entity (20).

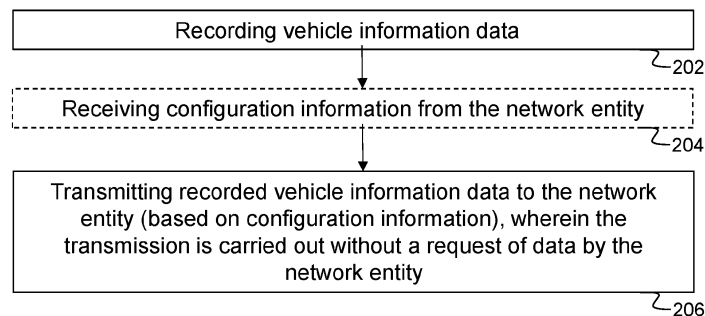


Fig. 2

Description

Technical Field

[0001] The present disclosure relates generally to methods and vehicle units for transmitting information to a network entity.

Background

[0002] Today, transportation by vehicle requires measurement of parameters and information relating to the driver activities. This is not exclusively done to satisfy regulations regarding road transportation, but also for fleet management to measure and increase performance and efficiency, as well as for the purpose of electronic road tolling, monitoring vehicle or engine performance parameters, monitoring data relevant for special transports e.g. dangerous goods, livestock or refrigerated food etc. Therefore, most vehicles, such as lorry trucks, carry a vehicle unit to measure, store and possible also report the collected data. In this document, the term "vehicle unit" shall mean a digital unit capable of gathering information relating to the vehicle. Examples of such information may be a geographical location, driving hours, distance travelled, start time, finish time, rest time, driver name, starting location and finishing location, exhaust measurements, fuel consumption, temperature data from vehicle or cargo sensors, opening and closing of cargo doors or operation of other vehicle systems, e.g. cranes and lifts etc. Such information, in this document also known as vehicle related information data, or vehicle information data, or vehicle information, can further be driving video, driver identity, speed information, position information, time information, environment information, etc. One example of a vehicle unit is a digital tachograph, capable of recording and digitally compiling and storing the vehicle data including driving times and rest periods as well as periods of other work and availability taken by the driver of a heavy vehicle. Under EU legislation it is mandatory to install digital tachographs in vehicles having a mass of more than 3,5 tons. In USA, similar rules exists, relating to an Electronic Logging Device (ELD) with the purpose of recording the driver's duty and vehicle speed in order to ensure the driver is compliant with the driving hours' legislation or the working time directive or similar legislation stipulated by authorities.

[0003] The vehicle unit is normally located in the cabin of the vehicle, where the vehicle unit is arranged in the instrument board, so that the vehicle operator may operate the vehicle unit in adjacency to start or stop of a journey. In order to calculate and estimate the speed and the travel distance, or other parameters for instance as listed above, of the vehicle, the vehicle unit is connected to one or more sensors, where the sensors are capable of measuring, for instance, the motion of the wheels or other parameters. For this purpose, a motion sensor is attached to the gearbox of the vehicle to receive

pulses, i.e. speed and movement information, which is sent to the tachograph.

[0004] It is known to communicate between devices in a network using a Bluetooth wireless technology standard with a master/slave architecture. Setting up connections between a pair of devices in the network is carried out by the devices being initially paired. In the context of vehicle units, a separate Bluetooth module, or adapter, also known as a "dongle" connected to the vehicle unit, enables the transmission of data from the vehicle unit to a separate connected network entity such as e.g. a hand held device. The network entity needs to ask for updated data from the other Bluetooth device, i.e. pulling data from the Bluetooth device to initiate a transmission of data. A drawback with this is that it creates lots of radio traffic in the cab environment and also higher current consumption in battery powered units. Furthermore, this increases a radio pollution in the vehicle that may have adverse effect of the reliability of transmissions and the connections. Even so, as the updating occurs only upon the request of the receiving device, the receiving device cannot be expected to have the latest updated information and data. Bluetooth Low Energy (BLE), compared to classic Bluetooth, is intended to provide considerably reduced power consumption and cost while maintaining a similar communication range.

Summary

[0005] It is an object of the invention to address at least some of the problems and issues outlined above. It is an object of embodiments of the invention to transmit data from the vehicle unit to the network entity without having too much signal interaction. It is another object of embodiments of the invention to save or reduce overall radio resource consumption when transmitting vehicle information from the vehicle unit to the network entity. It is possible to achieve one or more of these objects and possibly others by using methods and vehicle units as defined in the attached independent claims.

[0006] In a first aspect of the disclosure there is provided a method performed by a vehicle unit for transmitting information to a network entity. The vehicle unit is communicatively connected to the network entity, the method comprises: recording vehicle information data; transmitting recorded vehicle information data to the network entity, wherein the transmission of recorded vehicle information data to the network entity is carried out without a request of data by the network entity.

[0007] According to another embodiment, the method further comprises: receiving configuration information from the network entity; the transmitting of the recorded vehicle information data is performed according to the received configuration information.

[0008] According to another embodiment, the vehicle information data comprises vehicle driving data.

[0009] According to another embodiment, the vehicle unit is a tachograph.

[0010] According to another embodiment, the vehicle unit is operative for communicating with the network entity via Bluetooth Classic or Bluetooth Low Energy, BLE.

[0011] According to another embodiment, the configuration information comprises vehicle information type, transmitting frequency and/or transmitting condition.

[0012] In a second aspect of the disclosure there is provided a vehicle unit for transmitting information to a network entity, wherein the vehicle unit is communicatively connected to the network entity, the vehicle unit comprises a processing circuitry and a memory, the memory containing instructions executable by the processing circuitry, whereby the vehicle unit is operative for: recording vehicle information data; transmitting recorded vehicle information data to the network entity, wherein the transmission of recorded vehicle information data to the network entity is carried out without a request of data by the network entity.

[0013] According to another embodiment, the vehicle unit is further operative for: receiving configuration information from the network entity; the transmitting of the recorded vehicle information data is performed according to the received configuration information.

[0014] According to another embodiment, the vehicle information data comprises vehicle driving data.

[0015] According to another embodiment, the vehicle unit is a tachograph.

[0016] According to another embodiment, the vehicle unit is operative for communicating with the network entity via Bluetooth Classic or Bluetooth Low Energy, BLE.

[0017] According to another embodiment, the configuration information comprises vehicle information type, transmitting frequency and/or transmitting condition.

[0018] In a third aspect of the disclosure there is provided a computer program comprising instructions, which, when executed by a processing circuitry of a vehicle unit for transmitting information to a network entity, wherein the vehicle unit is communicatively connected to the network entity, causes the vehicle unit to perform the method according to above embodiments.

[0019] In a fourth aspect of the disclosure there is provided a carrier containing the computer program according to previous embodiment, wherein the carrier is one of an electronic signal, an optical signal, a radio signal, an electric signal, or a computer readable storage medium.

[0020] In a fifth aspect of the disclosure there is provided a vehicle comprises at least one vehicle unit according to any one of the above embodiments.

Brief Description of Drawings

[0021] The invention is now described, by way of example, with reference to the accompanying drawings, in which:

Fig. 1a and 1b schematically show a vehicle and a vehicle unit, according to possible embodiments.

Fig. 2 schematically shows the method performed by the vehicle unit, according to possible embodiments.

Fig.3 shows a block diagram illustrating the vehicle unit in more detail, according to possible embodiments.

Detailed Description

[0022] Referring to fig. 1a, a vehicle 500 can be equipped with a vehicle unit 10. The vehicle 500 can be any kind of vehicle, e.g., car, truck, bus, etc. The vehicle unit 10 can be a tachograph and operative for recording vehicle information data.

[0023] Referring to fig. 1b, the vehicle unit 10 may comprise a display unit 12, e.g., a screen. However the size of the display unit 12 is limited and may not able to display all the vehicle information data recorded by the vehicle unit 10. Therefore, the vehicle unit 10 is communicatively connected to a network unit 20, and send the recorded vehicle information data to the network unit 20, so that user can access the vehicle information data via the network entity 20.

[0024] Referring to fig. 2, a method is performed by a vehicle unit 10 for transmitting information to a network entity 20, wherein the vehicle unit 10 is communicatively connected to the network entity 20. The method comprises: recording 202 vehicle information data; transmitting 206 recorded vehicle information data to the network entity 20, wherein the transmission of recorded vehicle information data to the network entity 20 is carried out without a request of data by the network entity 20. In other words, the vehicle unit 10 proactively transmits vehicle information data to the network entity 20, even if the network entity 20 does not ask for it. According to one embodiment, the transmission of recorded vehicle information data to the network entity 20 is carried out without a preceding request of data by the network entity 20.

[0025] The network entity 20 may be a network device of any kind of wireless communication network. The network entity 20 may also be a network device of any kind of wired communication network. For example, the network entity 20 can be a user equipment (UE), or a network server, or a cloud device. Furthermore, the network entity 20 may have a display unit, so that the user can see the vehicle information data on the display unit of the network entity 20.

[0026] In the step 202, the vehicle unit 10 records vehicle information data. The vehicle information data can all kinds of vehicle related information, e.g., driving activities, driving video, driver identity, speed information, position information, time information, environment information, etc.

[0027] In the step 206, the vehicle unit 10 proactively transmits the recorded vehicle information data to the

network entity 20, without receiving a request of the network entity 20. So that the network entity 20 automatically receives vehicle information data sent from the vehicle unit 10. When the user desires to check the vehicle information data on the network entity 20, the network entity 20 does not need to send any data request to the vehicle unit 20. Instead, the vehicle information data is automatically sent to the network entity 20 so that the user can check it directly, e.g., via the display unit of the network entity 20.

[0028] By this embodiment, since the network entity 20 does not need to send a data request to the vehicle unit 10 for vehicle information data, the interaction messages between the vehicle unit 10 and the network entity 20 are reduced, so that the bandwidth and energy consumption of the whole system is reduced. More bandwidths can be saved for the transmission of the vehicle information data.

[0029] According to another embodiment, the method further comprises receiving 204 configuration information from the network entity 20; the transmitting 206 of the recorded vehicle information data is performed according to the received configuration information.

[0030] By this embodiment, the network entity 20 send configuration information to the vehicle unit 10 and controls the way of transmitting the vehicle information data. This will be discussed further in following text.

[0031] According to another embodiment, the vehicle information data comprises vehicle driving data.

[0032] According to another embodiment, the vehicle unit 10 is a tachograph.

[0033] According to another embodiment, the vehicle unit 10 is operative for communicating with the network entity 20 via Bluetooth Classic or Bluetooth Low Energy, BLE.

[0034] According to another embodiment, the configuration information comprises vehicle information type, transmitting frequency and/or transmitting condition.

[0035] Since the amount of the recorded vehicle information data is large, and there are all kinds of vehicle information data, the network entity 20 can set the vehicle information type, transmitting frequency and/or transmitting condition via the configuration information. For example, the configuration information can indicate the vehicle unit 10 to transmit specific types of vehicle information data, e.g., driving video, speed data. Other types of vehicle information data are not proactively transmitted to the network entity 20. For another example, the configuration information can indicate that the vehicle unit 10 transmits vehicle information data proactively every minute, every five minutes, every hour, etc. For another example, the configuration information can indicate that the vehicle unit 10 transmits vehicle information data proactively when the vehicle is driving in a specific area, or when the outside temperature of the vehicle is below a threshold, etc. By this embodiment, the transmission of the vehicle information data can be customized and individualized.

[0036] According to another embodiment, referring to fig. 3, a vehicle unit 10 for transmitting information to a network entity 20 is disclosed. The vehicle unit 10 is communicatively connected to the network entity 20, the vehicle unit 10 comprises a processing circuitry 403 and a memory 404, the memory 404 containing instructions executable by the processing circuitry 403, whereby the vehicle unit 10 is operative for: recording vehicle information data; and transmitting recorded vehicle information data to the network entity 20, wherein the transmission of recorded vehicle information data to the network entity 20 is carried out without a request of data by the network entity 20. According to one embodiment, the transmission of recorded vehicle information data to the network entity 20 is carried out without a preceding request of data by the network entity 20.

[0037] According to another embodiment, the vehicle unit 10 is further operative for: receiving configuration information from the network entity 20; the transmitting of the recorded vehicle information data is performed according to the received configuration information.

[0038] According to another embodiment, the vehicle information data comprises vehicle driving data.

[0039] According to another embodiment, the vehicle unit 10 is a tachograph.

[0040] According to another embodiment, the vehicle unit 10 is operative for communicating with the network entity 20 via Bluetooth Classic or Bluetooth Low Energy, BLE.

[0041] According to another embodiment, the configuration information comprises vehicle information type, transmitting frequency and/or transmitting condition.

[0042] According to another embodiment, a vehicle is provided, the vehicle comprises at least one vehicle unit 10 according to any one of the above embodiments.

[0043] According to other embodiments, referring to fig. 3, the vehicle unit 10 may further comprise a communication unit 402, which may be considered to comprise conventional means for wireless communication with other devices, such as a transceiver for wireless transmission and reception of signals. The instructions executable by said processing circuitry 403 may be arranged as a computer program 405 stored e.g. in said memory 404. The processing circuitry 403 and the memory 404 may be arranged in a sub-arrangement 401. The sub-arrangement 401 may be a micro-processor and adequate software and storage therefore, a Programmable Logic Device, PLD, or other electronic component(s)/processing circuit(s) configured to perform the methods mentioned above. The processing circuitry 403 may comprise one or more programmable processor, application-specific integrated circuits, field programmable gate arrays or combinations of these adapted to execute instructions.

[0044] The computer program 405 may be arranged such that when its instructions are run in the processing circuitry, they cause the vehicle unit 10 to perform the steps described in any of the described embodiments of

the vehicle unit 10 and its method. The computer program 405 may be carried by a computer program product connectable to the processing circuitry 403. The computer program product may be the memory 404, or at least arranged in the memory. The memory 404 may be realized as for example a RAM (Random-access memory), ROM (Read-Only Memory) or an EEPROM (Electrical Erasable Programmable ROM). In some embodiments, a carrier may contain the computer program 405. The carrier may be one of an electronic signal, an optical signal, an electromagnetic signal, a magnetic signal, an electric signal, a radio signal, a microwave signal, or computer readable storage medium. The computer-readable storage medium may be e.g. a CD, DVD or flash memory, from which the program could be downloaded into the memory 404. Alternatively, the computer program may be stored on a server or any other entity to which the vehicle unit 10 has access via the communication unit 402. The computer program 405 may then be downloaded from the server into the memory 404.

[0045] Although the description above contains a plurality of specificities, these should not be construed as limiting the scope of the concept described herein but as merely providing illustrations of some exemplifying embodiments of the described concept. It will be appreciated that the scope of the presently described concept fully encompasses other embodiments which may become obvious to those skilled in the art, and that the scope of the presently described concept is accordingly not to be limited. Reference to an element in the singular is not intended to mean "one and only one" unless explicitly so stated, but rather "one or more." Further, the term "a number of", such as in "a number of wireless devices" signifies one or more devices. All structural and functional equivalents to the elements of the above-described embodiments that are known to those of ordinary skill in the art are expressly incorporated herein by reference and are intended to be encompassed hereby. Moreover, it is not necessary for an apparatus or method to address each and every problem sought to be solved by the presently described concept, for it to be encompassed hereby. In the exemplary figures, a broken line generally signifies that the feature within the broken line is optional.

Claims

1. A method performed by a vehicle unit (10) for transmitting information to a network entity (20), wherein the vehicle unit (10) is communicatively connected to the network entity (20), the method comprises:

recording (202) vehicle information data;
transmitting (206) recorded vehicle information data to the network entity (20), wherein the transmission of recorded vehicle information data to the network entity (20) is carried out without a request of data by the network entity

(20).

2. The method according to claim 1, the method further comprises:

receiving (204) configuration information from the network entity (20);
the transmitting (206) of the recorded vehicle information data is performed according to the received configuration information.

3. The method according to any one of the preceding claims, the vehicle information data comprises vehicle driving data.

4. The method according to any one of the preceding claims, the vehicle unit (10) is a tachograph.

5. The method according to any one of the preceding claims, the vehicle unit (10) is operative for communicating with the network entity (20) via Bluetooth Classic or Bluetooth Low Energy, BLE.

6. The method according to any one of the claims 2-5, the configuration information comprises vehicle information type, transmitting frequency and/or transmitting condition.

7. A vehicle unit (10) for transmitting information to a network entity (20), wherein the vehicle unit (10) is communicatively connected to the network entity (20), the vehicle unit (10) comprises a processing circuitry (403) and a memory (404), the memory (404) containing instructions executable by the processing circuitry (403), whereby the vehicle unit (10) is operative for:

recording vehicle information data;
transmitting recorded vehicle information data to the network entity (20), wherein the transmission of recorded vehicle information data to the network entity (20) is carried out without a request of data by the network entity (20).

8. The vehicle unit (10) according to claim 7, the vehicle unit (10) is further operative for:

receiving configuration information from the network entity (20);
the transmitting of the recorded vehicle information data is performed according to the received configuration information.

9. The vehicle unit (10) according to any one of claims 7-8, the vehicle information data comprises vehicle driving data.

10. The vehicle unit (10) according to any one of claims

7-9, the vehicle unit (10) is a tachograph.

- 11.** The vehicle unit (10) according to any one of claims 7-10, the vehicle unit (10) is operative for communicating with the network entity (20) via Bluetooth Classic or Bluetooth Low Energy, BLE. 5
- 12.** The vehicle unit (10) according to any one of claims 8-11, the configuration information comprises vehicle information type, transmitting frequency and/or transmitting condition. 10
- 13.** A computer program (405) comprising instructions, which, when executed by a processing circuitry (403) of a vehicle unit (10) for transmitting information to a network entity (20), wherein the vehicle unit (10) is communicatively connected to the network entity (20), causes the vehicle unit (10) to perform the method according to any of the claims 1-6. 15
20
- 14.** A carrier containing the computer program (405) according to claim 13, wherein the carrier is one of an electronic signal, an optical signal, a radio signal, an electric signal, or a computer readable storage medium. 25
- 15.** A vehicle (500), comprising at least one vehicle unit (10) according to any one of the preceding claims 7-12. 30

35

40

45

50

55

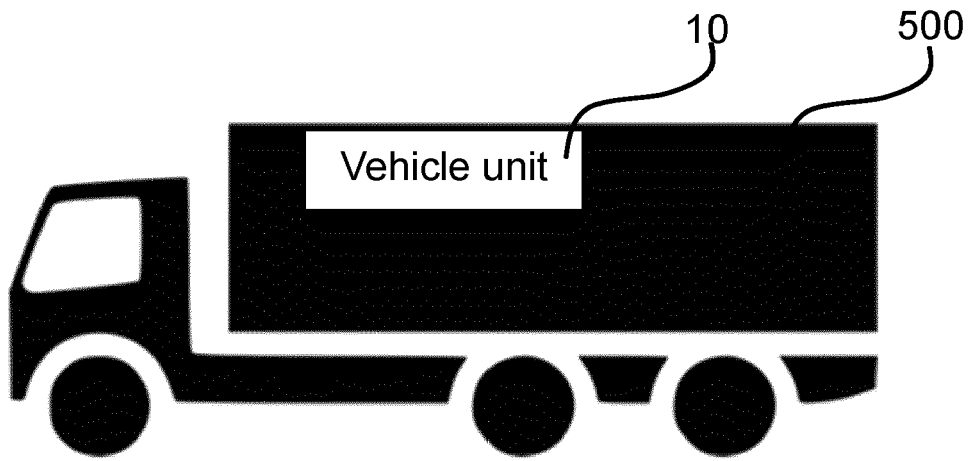


Fig. 1a

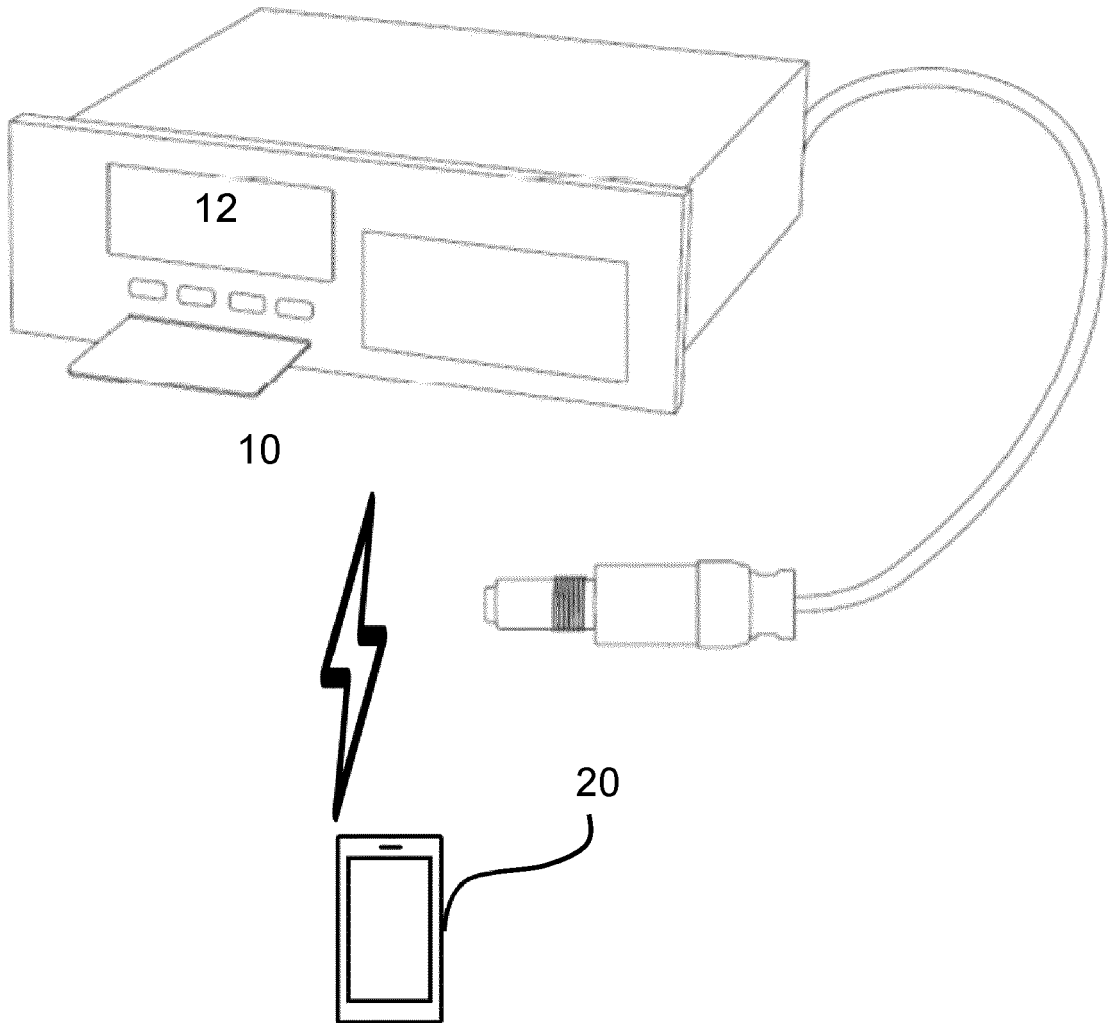


Fig. 1b

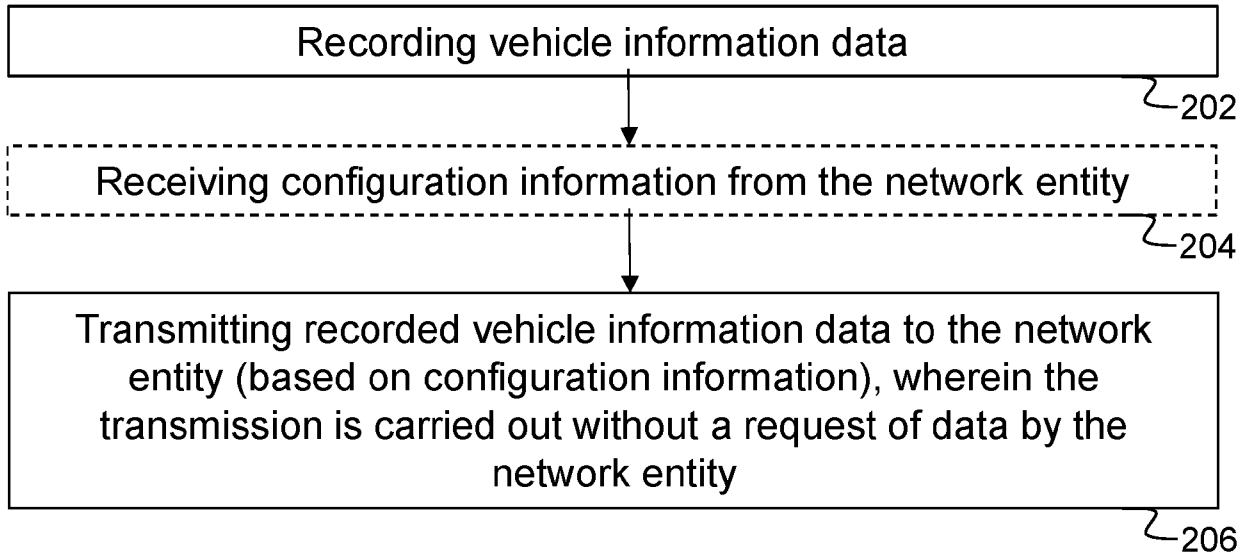


Fig. 2

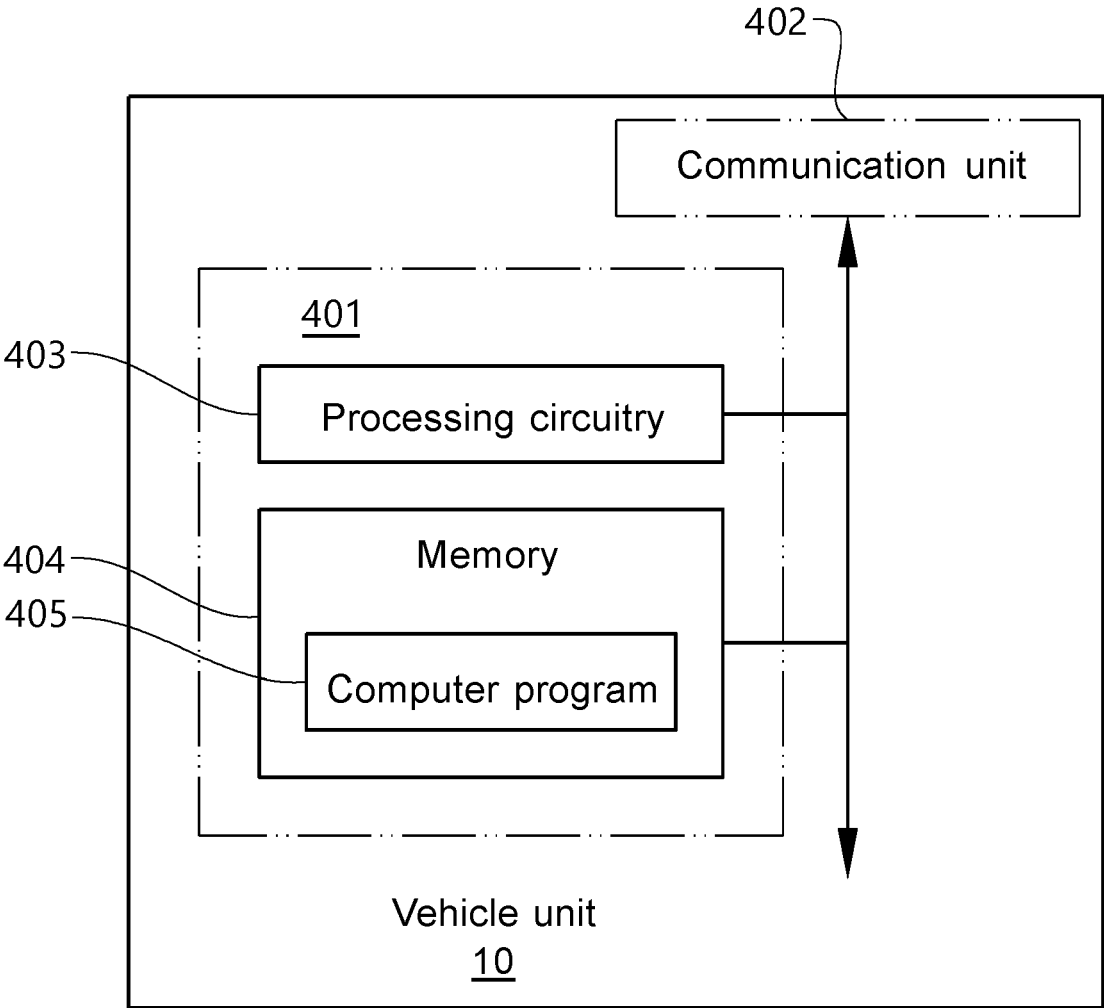


Fig. 3



EUROPEAN SEARCH REPORT

Application Number
EP 24 18 6326

5

10

15

20

25

30

35

40

45

50

55

| 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 | US 2011/208387 A1 (BOSCH RALF [DE] ET AL) 25 August 2011 (2011-08-25) * abstract; figure 1 * * paragraphs [0025] - [0041] * ----- | 1-15 | INV. G07C5/00 G07C5/08 |
| X | US 2022/230480 A1 (ATUNGSIRI SAMUEL ASANGBENG [GB]) 21 July 2022 (2022-07-21) * abstract; claims 1,2,12 * * paragraphs [0040], [0048], [0050], [0054], [0069] * * paragraphs [0118] - [0119] * ----- | 1-3,5-9, 11-15 4,10 | |
| A | EP 2 996 090 A1 (BOEING CO [US]) 16 March 2016 (2016-03-16) * paragraphs [0037] - [0046] * ----- | 1-15 | |
| A | WO 2017/135825 A1 (ABAX AS [NO]) 10 August 2017 (2017-08-10) * abstract * * page 9, line 27 - page 13, line 20 * ----- | 1-3,6-9, 12-15 | |
| | | | TECHNICAL FIELDS SEARCHED (IPC) |
| | | | G07C |
| The present search report has been drawn up for all claims | | | |
| Place of search The Hague | | Date of completion of the search 19 November 2024 | Examiner Pfyffer, Gregor |
| 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 | |

1
EPO FORM 1503 03.82 (P04C01)

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

EP 24 18 6326

5

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.

19 - 11 - 2024

10

15

20

25

30

35

40

45

50

55

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---------------------|----------------------------|---------------------|
| US 2011208387 A1 | 25-08-2011 | BR PI0918946 A2 | 01-12-2015 |
| | | CN 102160089 A | 17-08-2011 |
| | | DE 102008048162 A1 | 25-03-2010 |
| | | EP 2329460 A1 | 08-06-2011 |
| | | RU 2559744 C1 | 10-08-2015 |
| | | RU 2011115210 A | 27-10-2012 |
| | | US 2011208387 A1 | 25-08-2011 |
| US 2022230480 A1 | 21-07-2022 | CN 113950799 A | 18-01-2022 |
| | | EP 3980977 A1 | 13-04-2022 |
| | | US 2022230480 A1 | 21-07-2022 |
| | | WO 2020245238 A1 | 10-12-2020 |
| EP 2996090 A1 | 16-03-2016 | CN 105404707 A | 16-03-2016 |
| | | EP 2996090 A1 | 16-03-2016 |
| | | JP 6501675 B2 | 17-04-2019 |
| | | JP 2016095834 A | 26-05-2016 |
| | | SG 10201507006Q A | 28-04-2016 |
| | | US 2016071335 A1 | 10-03-2016 |
| WO 2017135825 A1 | 10-08-2017 | EP 3411852 A1 | 12-12-2018 |
| | | NO 342828 B1 | 13-08-2018 |
| | | WO 2017135825 A1 | 10-08-2017 |

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82