

(19)



(11)

EP 2 930 697 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
14.10.2015 Bulletin 2015/42

(51) Int Cl.:
G07C 5/00 (2006.01)

(21) Application number: **14164010.2**

(22) Date of filing: **09.04.2014**

(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 MK MT NL NO
PL PT RO RS SE SI SK SM TR**
Designated Extension States:
BA ME

(71) Applicant: **Johnson Controls Automotive
Electronics SAS**
95892 Cergy-Pontoise Cedex (FR)

(72) Inventor: **Negentsov, Ventsislav Veselinov**
1784 Sofia (BG)

(54) **Method and device for processing vehicle condition data**

(57) The present invention refers to a method for processing vehicle condition data by means of a processing unit being permanently or temporarily installed into a vehicle comprising the steps of receiving vehicle condition data from a functional subunit of the vehicle in a first

step; storing and/or analyzing the received vehicle condition data in a second step; and frequently transmitting a dataset based on the vehicle condition data to a remote host using remote data transmission in a third step.

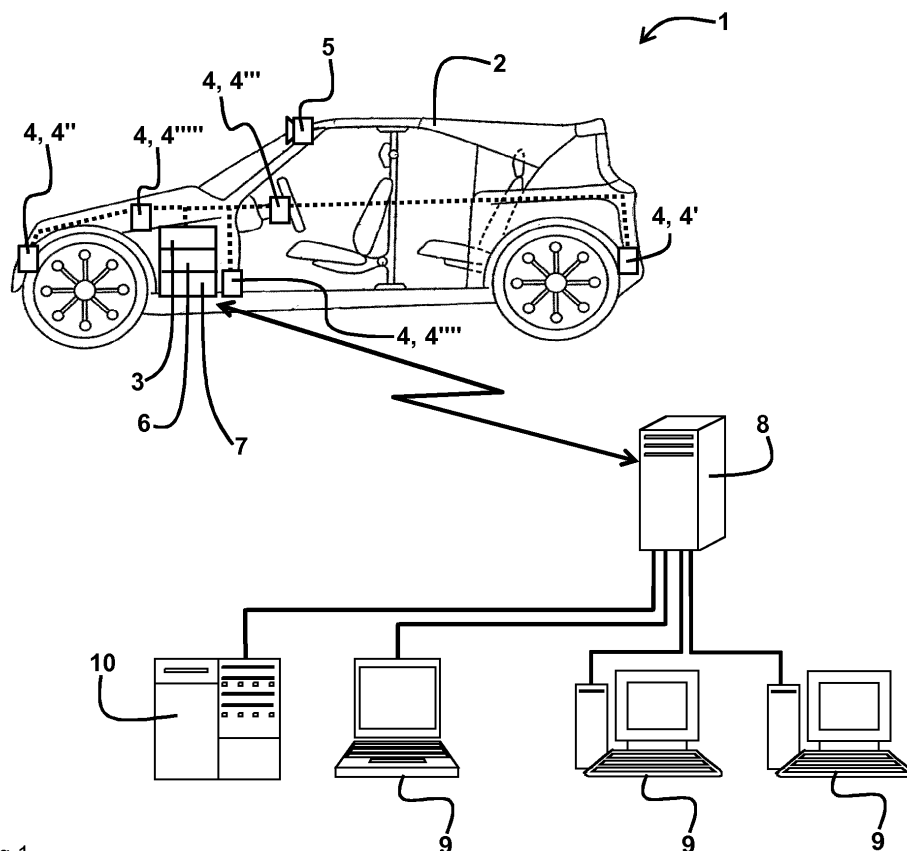


Fig.1

EP 2 930 697 A1

Description

BACKGROUND

[0001] The present invention relates to a method and a device for processing vehicle condition data of a vehicle.

[0002] In recent years, more and more electronic devices and sensors are installed into vehicles collecting and processing data about the vehicle status, activities of the driver, driving information, arising forces in the event of accidents and the like. It is already known that some of these data, hereinafter referred to as "vehicle condition data", can be used for determining a driving style profile of the driver. In case of an accident, these data can be read out from an event data recorder in the car to reconstruct the circumstances of the accident.

[0003] For example, the patent document US 7,698,086 discloses a method that can be carried out on a computer of an insurance company for receiving information regarding a vehicle involved in an accident, determining availability of event data recorder data from the vehicle based on the information and if the event data recorder data is available, assigning a level of suitability for data collection from the event data recorder based on a type of the event data recorder and information regarding the accident.

[0004] A distinct disadvantage of this method is that the data are collected or read out only in case of an accident. If the event data recorder is damaged due to the accident, e.g. through mechanical impact or fire, all data are lost. Furthermore, only few vehicle condition data are collected in the prior art which does not allow to reconstruct all circumstances of a possible accident.

SUMMARY

[0005] It is therefore an object of the present invention to provide a method which allows a more secure and comprehensive collection of vehicle condition data.

[0006] The object of the present invention can be achieved with a method for processing vehicle condition data by means of a processing unit being permanently or temporarily installed into a vehicle comprising the steps of receiving vehicle condition data from a functional subunit of the vehicle in a first step; storing and/or analyzing the received vehicle condition data in a second step; and frequently transmitting a dataset based on the vehicle condition data to a remote host using remote data transmission in a third step.

[0007] It is herewith advantageously possible that important information about the vehicle and its driver, like the vehicle status, activities of the driver, driving information, arising forces in the event of accidents and the like are frequently transmitted to a remote computer also during normal operation of the vehicle. That means that this information is transmitted to the remote computer in particular regardless of whether or not the vehicle has been

involved in an accident. In this way, for example, an extensive driving style profile can be individually determined for the driver by using the vehicle condition data and in particular a history of the vehicle condition data, wherein the driving style profile can be stored remotely on the host. The data collected on the host computer can be made accessible for parental control, for the insurance company, for the law enforcement authorities (e.g. the police) to successfully prevent, detect and/or investigate road traffic offences or crime and/or for driving schools, for instance.

[0008] According to a preferred embodiment of the present invention, the dataset is transmitted in the third step to the remote host computer at certain points in time and/or at regular points in time and/or at certain events and/or whenever a transmitting unit of the processing unit has access to a network for remote data transmission. It is conceivable that there are preselected time intervals for transmitting the dataset, e.g. once a day, week or month. Alternatively, the dataset is transmitted at certain events when the vehicle parks in its garage or when a normal service or repair work is carried out in an authorized workshop, for instance.

[0009] According to another preferred embodiment of the present invention, the vehicle condition data are received in the first step comprising current information or history information about vehicle speed and/or position of the steering wheel and/or Electronic Stability Control data and/or gear position and/or gear shift position and/or gear program of the vehicle's gear shift and/or throttle level and/or engine control data and/or brake data and/or level of the vehicle's brake pedal and/or position of the vehicle's handbrake and/or Anti-lock braking system data and/or the vehicle's clutch status and/or direction indicator and/or position of direction-indicator control and/or vehicle lighting status and/or signal horn status and/or windscreen wipers status and/or vehicle error memory data and/or driver assistance system data and/or driver fatigue warning system data and/or GPS position of the vehicle and/or seat occupancy recognition system data and/or acceleration data and/or crash sensor data and/or road sign recognition data and/or lane change assistant data and/or brake assistant data and/or tire pressure data and/or internal temperature inside the vehicle and/or ambient temperature of the vehicle and/or measuring values of further vehicle sensors. It is herewith advantageously possible to monitor not only software parameters of the vehicle subunits but also the control activities or missing control activities of the driver.

[0010] According to another preferred embodiment of the present invention, picture information of a vehicle's camera is received by the processing unit in the first step and transmitted to the remote host in the third step. More and more vehicles are provided with cameras in the car, in particular due to features like road sign recognition, lane change assistant and the like. In case of an accident, the pictures of suchlike onboard cameras can be used to reconstruct the circumstances of the accident and for

giving evidence for a factual investigation of the cause of the accident. The pictures are transmitted to the host via remote communication, so that a third person is able to watch these pictures whenever needed.

[0011] According to another preferred embodiment of the present invention, the vehicle condition data are protected against manipulation in the second step, in particular the vehicle condition data are encrypted in the second step. Advantageously, the data cannot be amended by the driver or another person after an accident has happened.

[0012] According to another preferred embodiment of the present invention, the vehicle condition data are backed up in the second step, so that the risk of data loss is reduced.

[0013] According to another preferred embodiment of the present invention, the dataset is transmitted to the remote host via a mobile communication network, a wired network, a local area network and/or a wireless local area network in the third step. It is conceivable that the dataset is transmitted via the mobile communication network. For this purpose, the processing unit comprises preferably a GSM module with a slot for a SIM mobile phone card, so that the dataset can be transmitted whenever the vehicle is located inside the coverage area of a mobile network. If the vehicle is provided with an integrated telephone or a broadband Internet access, these means of communication can be used for remote transmission without additional costs. Alternatively, the dataset can be transmitted via hardwired connection during normal service or repair work in an authorized workshop, for instance.

[0014] According to another preferred embodiment of the present invention, the vehicle condition data are permanently analyzed in the second step in order to evaluate whether the vehicle is involved in an accident or not and wherein the dataset is transferred to the remote host if an accident is detected. In case of an accident, the dataset is transferred automatically to the host. Preferably, further actions are performed automatically if an accident is detected. For example, a short message, an email or a voice call is sent to a predefined telephone number or email address in case of an accident. Of course, also an emergency call can be set up automatically if a serious accident is detected due when analyzing the vehicle condition data, in particular due to recognition of high forces detected by acceleration or crash sensors inside the car.

[0015] Another subject of the present invention is a device for processing vehicle condition data, in particular by performing a method according to one of the preceding claims, wherein said device is permanently or temporarily installed into a vehicle, wherein said device unit comprises: an input means for receiving vehicle condition data from functional subunits of the vehicle and/or a processing unit for storing and/or analyzing the received vehicle condition data and/or and a transmission means for frequently transmitting a dataset based on the vehicle condition data to a remote host using remote data transmission.

[0016] Particularly, the device is configured to perform the above mentioned method for processing the vehicle condition data according to the present invention. The device is realized preferably as a black box advantageously providing that important information about the vehicle and its driver, like the vehicle status, activities of the driver, driving information, arising forces in the event of accidents and the like, are frequently transmitted to a remote computer also during normal operation of the vehicle. The processing unit is in particular configured to analyze the vehicle condition data in order to evaluate whether the vehicle is involved in an accident or not and to transmit the dataset to the remote host if an accident is detected and/or wherein the processing unit is configured to determine a driving style profile of the driver in dependency of the vehicle condition data and to transmit the driving style profile to the remote host. Preferably, the transmission means is configured to transmit the dataset to the remote host independently of the vehicle condition data and in particular independently whether the vehicle is involved in an accident or not. Particularly preferably, the device is connected to a vehicle camera and wherein the input means is configured for receiving picture information from the camera and wherein the transmission means are configured for transmitting the picture information to the remote host.

[0017] According to another preferred embodiment of the present invention, the functional unit comprises speedometer and/or steering wheel position detector and/or Electronic Stability Control system and/or gear shift position detector and/or throttle level detector and/or engine control unit and/or brake system and/or brake pedal level detector and/or handbrake position detector and/or Anti-lock braking system and/or clutch and/or direction indicator and/or direction-indicator control and/or vehicle lighting control and/or signal horn control and/or windscreen wipers and/or vehicle error memory and/or driver assistance system and/or driver fatigue warning system and/or GPS positioning system and/or seat occupancy recognition system and/or acceleration sensor and/or crash sensor road sign recognition system and/or lane change assistant system and/or brake assistant and/or tire pressure control system and/or temperature sensor inside the vehicle and/or ambient temperature sensor and/or further vehicle sensors. It has already been mentioned that it is herewith advantageously possible to monitor not only software parameters of the vehicle subunits but also the control activities or missing control activities of the driver.

[0018] According to another preferred embodiment of the present invention, the host comprises a server and/or a database and wherein the transmission means comprises a mobile communication network interface, a wired network interface, a local area network interface and/or a wireless local area network interface for remote data transmission.

[0019] These and other characteristics, features and advantages of the present invention will become appar-

ent from the following detailed description, taken in conjunction with the accompanying drawings, which illustrate, by way of example, the principles of the invention. The description is given for the sake of example only, without limiting the scope of the invention. The reference figures quoted below refer to the attached drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] Figure 1 illustrates schematically a method and a device for processing vehicle condition data according to an exemplary embodiment of the present invention.

DETAILED DESCRIPTION

[0021] The present invention will be described with respect to a preferred embodiment and with reference to a drawing, but the invention is not limited thereto but only by the claims. The drawing describes the invention only schematically and non-limiting. In the drawing, the size of some of the elements may be exaggerated and not drawn on scale for illustrative purposes. Where an indefinite or definite article is used when referring to a singular noun, e.g. "a", "an", "the", this includes a plural of that noun unless something else is specifically stated.

[0022] Furthermore, the terms first, second, third and the like in the description and in the claims are used for distinguishing between similar elements and not necessarily for describing a sequential or chronological order. It is to be understood that the terms so used are interchangeable under appropriate circumstances and that the embodiments of the invention described herein are capable of operation in other sequences than described or illustrated herein.

[0023] In Figure 1, the device 1 for processing vehicle condition data according to an exemplary embodiment of the present invention is schematically shown.

[0024] In the present example, the device 1 is permanently installed into a motor vehicle 2. The device 1 comprises an input means 3 which is connected via the vehicle bus (e.g. CAN bus) to several functional units 4 of the vehicle 2. For the sake of clarity, only five different typical functional units 4 are illustrated to explain the main functionality of the device 1: A rear crash sensor 4', an acceleration sensor 4'', a steering wheel position detector 4''', a throttle control detector 4'''' and an electronic stability control unit 4'''''. Consequently, the input means 3 receives several vehicle condition data from said functional units 4: Acceleration data from the acceleration sensor 4'', a crash signal from the rear crash sensor 4' (only if a rear end collision occurs), the steering wheel position from the steering wheel position detector 4''', the throttle level from the throttle control detector 4'''' and a plurality of driving information, like vehicle speed, rotational-speed, retardation, traction and the like from the electronic stability control unit 4'''''.

[0025] Furthermore, the device 1 comprises a processing unit 6 for analyzing the vehicle condition data. In par-

ticular, a dataset comprising a predefined selection of required and most important vehicle condition data are generated. The dataset and preferably a history of datasets are stored in an internal storage of the processing unit. Preferably, said dataset is being encrypted before storing in order to protect the data against manipulation.

[0026] Preferably, the processing unit 6 determines an individual driving style profile of the driver by analyzing the received vehicle condition data, the dataset and/or the history of the received vehicle condition data or the dataset. It is conceivable that the dataset inter alia represents said driving style profile.

[0027] The device 1 comprises furthermore a transmission means 7 which is directly connected to the processing unit 6 and which comprises a GSM module for transmitting the datasets frequently to a remote host 8 via remote data transmission over a mobile communication network whenever the vehicle 2 is located inside the coverage area of the mobile network. The dataset is transmitted from the transmission means 7 to the host 8 at regular points in time independently whether the vehicle 2 is involved in an accident or not.

[0028] The host computer 8 is connected to the Internet. Depending on the required requirements and applications, the host 8 is accessible via a web interface by client computers 9 for parental control, for the insurance company, for the law enforcement authorities (e.g. the police) to successfully prevent, detect and/or investigate road traffic offences or crime and/or for driving schools, for instance. Furthermore, it is conceivable that all datasets on the host computer 8 are regularly downloaded and stored on a backup server 10.

[0029] Preferably, the processing unit 6 is configured to analyze the vehicle condition data permanently in order to evaluate whether the vehicle 2 is involved in an accident or not. If an accident is detected, the dataset is immediately transferred to the remote host 8. Preferably, further actions are performed automatically if an accident is detected. For example, a short message, an email or a voice call is sent to a predefined telephone number or email address in case of an accident. Of course, also an emergency call can be set up automatically if a serious accident is detected when analyzing the vehicle condition data, in particular due to recognition of high forces detected by acceleration or crash sensors inside the car.

[0030] Furthermore, the vehicle 2 is provided with an on board camera 5 making pictures of the road in front of the vehicle 2. The picture information is continuously delivered from the camera 5 to the input means 3. Either the picture information is also frequently transmitted to the host computer 8 like the datasets or the recent picture information is transmitted to the host computer 9 only if the processing unit 6 detects an accident.

[0031] In practice, the input means 3 will be connected to further functional units 4 of the vehicle 2 like a speedometer, a gear shift, an engine control system, a brake, a brake pedal detector, a handbrake level detector, an anti-lock braking system, a brake assistant, a clutch, a

direction indicator, a position detector of the direction-indicator control, a vehicle lighting system, a signal horn control, a windscreen wipers control, a vehicle error memory, any driver assistance system, a driver fatigue warning system, a GPS positioning system, a seat occupancy recognition system, a road sign recognition system, a lane change assistant system, a temperature sensor inside the vehicle, ambient temperature sensor, tire pressure control system or further sensors in order to collect any corresponding data.

REFERENCE SIGNS

[0032]

1	device	
2	vehicle	
3	input means	
4	functional unit	
4'	rear crash sensor	
4"	acceleration sensor	
4'''	steering wheel position detector	
4''''	throttle control detector	
4'''''	Electronic Stability Control unit	
5	camera	
6	processing unit	
7	transmission means	
8	remote host computer	
9	client computer	
10	backup server	

Claims

1. Method for processing vehicle condition data by means of a device (1) being permanently or temporarily installed into a vehicle (2) comprising the steps of:
 - receiving vehicle condition data from a functional subunit (4) of the vehicle (2) in a first step;
 - storing and/or analyzing the received vehicle condition data in a second step; and
 - frequently transmitting a dataset based on the

vehicle condition data to a remote host computer (8) using remote data transmission in a third step.

2. Method according to claim 1, wherein the dataset is transmitted in the third step to the remote host independently of the vehicle condition data and in particular independently whether the vehicle (2) is involved in an accident or not.
3. Method according to one of the preceding claims, wherein the dataset is transmitted in the third step to the remote host computer (8) at certain points in time and/or at regular points in time and/or at certain events and/or whenever a transmission means (7) of the device (1) has access to a network for remote data transmission.
4. Method according to one of the preceding claims, wherein vehicle condition data are received in the first step comprising current information or history information about:
 - vehicle speed;
 - position of the steering wheel;
 - Electronic Stability Control data;
 - gear position;
 - gear shift position;
 - gear program of the vehicle's gear shift;
 - throttle level;
 - engine control data;
 - brake data;
 - level of the vehicle's brake pedal;
 - position of the vehicle's handbrake;
 - Anti-lock braking system data;
 - vehicle clutch status;
 - direction indicator;
 - position of direction-indicator control;
 - vehicle lighting status;
 - signal horn status;
 - windscreen wipers status;
 - vehicle error memory data;
 - driver assistance system data;
 - driver fatigue warning system data;
 - GPS position of the vehicle;
 - seat occupancy recognition system data;
 - acceleration data;
 - crash sensor data;
 - road sign recognition data;
 - lane change assistant data;
 - brake assistant data;
 - tire pressure data;
 - internal temperature inside the vehicle;
 - ambient temperature of the vehicle; and/or
 - measuring values of further vehicle sensors.
5. Method according to one of the preceding claims, wherein picture information of a vehicle on board

- camera (5) is received by the device (1) in the first step and transmitted to the remote host computer (8) in the third step.
6. Method according to one of the preceding claims, wherein the vehicle condition data are protected against manipulation in the second step, in particular the vehicle condition data are encrypted in the second step, and/or wherein the vehicle condition data are backed up in the second step. 5 10
7. Method according to one of the preceding claims, wherein the dataset are transmitted to the remote host computer (8) via a mobile communication network, a wired network, a local area network and/or a wireless local area network in the third step. 15
8. Method according to one of the preceding claims, wherein an individual driving style profile of the vehicle driver is determined in dependency of the vehicle condition data and a vehicle condition data history in the second step and wherein the dataset transmitted to the remote host computer (8) represents the driving style profile and is preferably accessible for parental control or by insurances. 20 25
9. Method according to one of the preceding claims, wherein the vehicle condition data are permanently analyzed in the second step in order to evaluate whether the vehicle (2) is involved in an accident or not and wherein the dataset is transferred to the remote host computer (8) if an accident is detected. 30
10. Device (1) for processing vehicle condition data, in particular by performing a method according to one of the preceding claims, wherein said device (1) is permanently or temporarily installed into a vehicle (2), wherein said device (1) comprises: 35
- an input means (3) for receiving vehicle condition data from functional subunits (4) of the vehicle (2); 40
 - a processing unit (6) for storing and/or analyzing the received vehicle condition data; and
 - a transmission means (7) for frequently transmitting a dataset based on the vehicle condition data to a remote host computer (8) using remote data transmission. 45
11. Device (1) according to claim 10, wherein the transmission means is configured to transmit the dataset to the remote host computer (8) independently of the vehicle condition data and in particular independently whether the vehicle (2) is involved in an accident or not. 50 55
12. Device (1) according to one of the claims 10 or 11, wherein the functional unit (4) comprises a
- speedometer;
 - steering wheel position detector (4, 4'');
 - Electronic Stability Control system (4, 4''');
 - gear shift position detector;
 - throttle level detector (4, 4''');
 - engine control unit;
 - brake system;
 - brake pedal level detector;
 - handbrake position detector;
 - Anti-lock braking system;
 - clutch;
 - direction indicator;
 - direction-indicator control;
 - vehicle lighting control;
 - signal horn control;
 - windscreen wipers;
 - vehicle error memory;
 - driver assistance system;
 - driver fatigue warning system;
 - GPS positioning system;
 - seat occupancy recognition system;
 - acceleration sensor (4, 4'');
 - crash sensor (4, 4'');
 - road sign recognition system;
 - lane change assistant system;
 - brake assistant;
 - tire pressure control system;
 - temperature sensor inside the vehicle;
 - ambient temperature sensor; and/or
 - further vehicle sensors.
13. Device (1) according to one of the claims 10 to 12, wherein the device (1) is connected to a vehicle camera (5) and wherein the input means (3) is configured for receiving picture information from the camera (5) and wherein the transmission means (7) are configured for transmitting the picture information to the remote host computer (8).
14. Device (1) according to one of the claims 10 to 13, wherein the host computer (8) comprises a server, a web interface and/or or a database and wherein the transmission means (7) comprises a mobile communication network interface, a wired network interface, a local area network interface and/or a wireless local area network interface for remote data transmission.
15. Device (1) according to one of the claims 10 to 14, wherein the processing unit (6) is configured to analyze the vehicle condition data in order to evaluate whether the vehicle (2) is involved in an accident or not and to transmit the dataset to the remote host computer (8) if an accident is detected and/or wherein the processing unit (6) is configured to determine a driving style profile of the vehicle driver in dependency of the vehicle condition data and to transmit the driving style profile to the remote host computer (8).

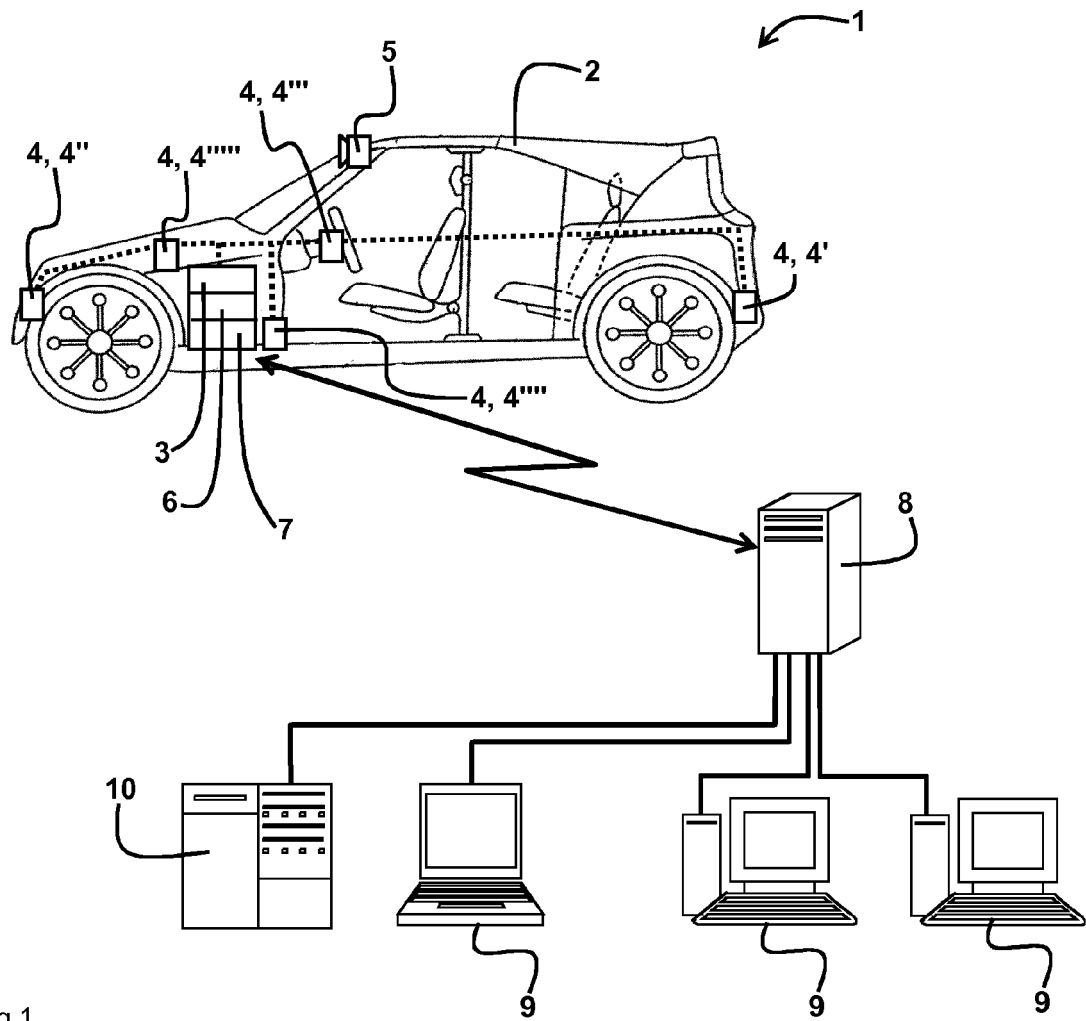


Fig.1



EUROPEAN SEARCH REPORT

 Application Number
 EP 14 16 4010

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 2013/268157 A1 (OK MIN HWAN [KR] ET AL) 10 October 2013 (2013-10-10) * abstract * * * paragraph [0001] - paragraph [0012] * * paragraph [0023] - paragraph [0038] * * claims 1-3 *	1-15	INV. G07C5/00
X	US 2013/302758 A1 (WRIGHT ANDREW WILLIAM [GB]) 14 November 2013 (2013-11-14) * abstract * * * figures 1-4 * * paragraph [0007] - paragraph [0156] *	1-15	
X	US 2007/032929 A1 (YOSHIOKA SATOMI [JP] ET AL) 8 February 2007 (2007-02-08) * abstract * * * paragraph [0007] - paragraph [0079] * * claims 1-19 * * figures 1-8 *	1-15	
X	US 2007/135978 A1 (KIM JAE M [KR] ET AL) 14 June 2007 (2007-06-14) * abstract * * * paragraph [0007] - paragraph [0038] * * pages 1-4 *	1-15	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 8 September 2014	Examiner Pañeda Fernández, J
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			

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

EP 14 16 4010

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.

08-09-2014

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2013268157 A1	10-10-2013	US 2013268157 A1	10-10-2013
		WO 2012081784 A1	21-06-2012
US 2013302758 A1	14-11-2013	EP 2652718 A1	23-10-2013
		GB 2488954 A	12-09-2012
		GB 2488956 A	12-09-2012
		US 2013302758 A1	14-11-2013
		WO 2012080741 A1	21-06-2012
US 2007032929 A1	08-02-2007	JP 4396597 B2	13-01-2010
		JP 2007047914 A	22-02-2007
		US 2007032929 A1	08-02-2007
US 2007135978 A1	14-06-2007	NONE	

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 7698086 B [0003]