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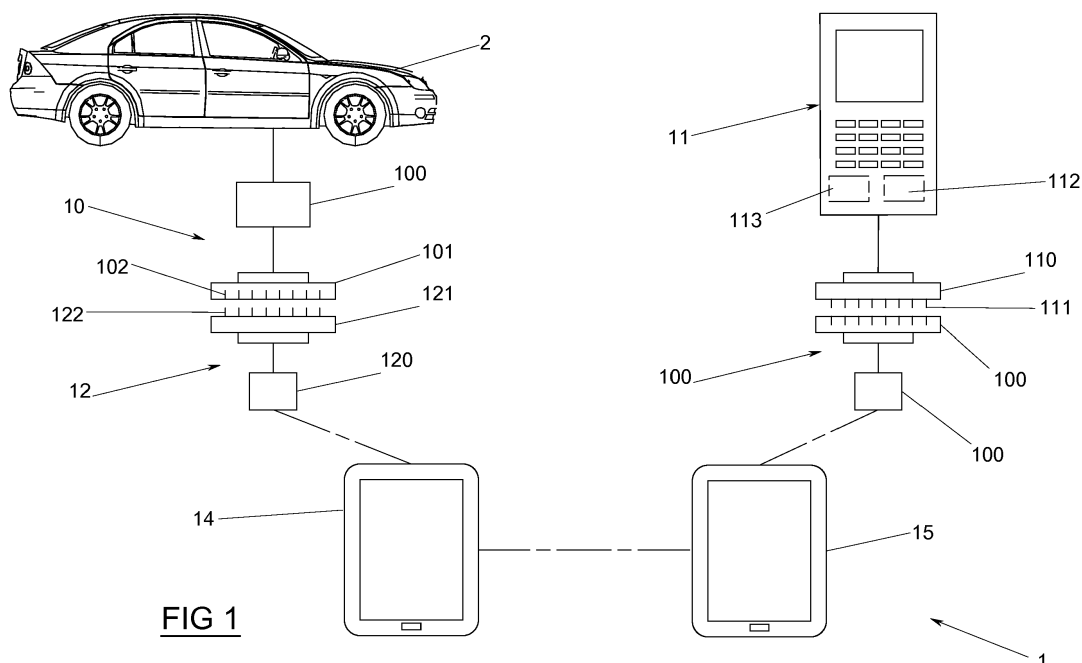
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(54) **REMOTE TESTING SYSTEM FOR A VEHICLE**

(57) A remote testing system for a vehicle comprising: a diagnostic unit installed on-board the vehicle and configured for generating a signal representing the vehicle status and sending said signal outside the vehicle via a first connecting socket; a testing device configured for receiving and processing the signal representing the vehicle status and provided with a first connecting plug; a first adapter comprising a second connecting plug, configured for coupling with the first connecting socket of the

diagnostic unit, and a remote communication unit configured for transmitting the signal representing the vehicle status outside the first adapter; a second adapter comprising a remote communication unit configured for receiving the signal representing the vehicle status from the communication unit of the first adapter, and a second connecting socket configured for coupling with the first connecting plug of the testing device.



Description

TECHNICAL FIELD

[0001] The present invention regards a remote testing system for a vehicle and a pair of adapters for such system.

[0002] In particular, the invention regards a pair of OBD adapters and an OBD remote testing system for a road vehicle, for example a motor vehicle.

PRIOR ART

[0003] As known, usually a vehicle, for example a road vehicle such as a motor vehicle, a truck or motorcycle, is provided with an OBD (On-Board Diagnostics) system, i.e. capable of performing on-board diagnostic operations, comprising several control units configured for automatically monitoring the vehicle status and its sub-systems.

[0004] The OBD system further comprises a first connector associated to the vehicle and connected to the control units, suitable to receive an output signal of the control units representing the vehicle status.

[0005] The system further comprises a testing device provided with a second connector joined to the first connector and suitable to be connected to the first connector to transmit the output signal of the control units to the testing device. In addition, the testing device is configured for decoding the output signal of the control units.

[0006] In the known systems, the testing device is provided with a connecting cable associated - at one end - to the testing device - at the opposite end - to the second connector.

[0007] Thus, in use, the testing device is always physically close to the vehicle. For example, in a motor vehicle the first connector is usually arranged in the dashboard beneath the steering wheel and, thus, the user is forced to get into the motor vehicle cockpit holding the testing device to perform the diagnosis of the means with considerable discomfort and operative difficulty. Alternatively, systems in which the testing device and the second connector can communicate in a wireless fashion in particular through Bluetooth technology are known. In such known systems, the second connector comprises an emitter suitable to transmit the output signal of the control units to a receiver associated and connected to the testing device.

[0008] However, given that the Bluetooth technology has a short radius, the user must be in the vicinity of the vehicle, for example a few meters away, and generally in the same environment. Thus, the control units may communicate with the testing device only when the operator is present, for example when the vehicle is in the garage.

[0009] Furthermore, such systems require the use of specific testing devices, which are usually very expensive.

[0010] An object of the present invention is to overcome the aforementioned drawbacks of the prior art through a solution that is simple, rational and inexpensive.

[0011] These objects are attained by the characteristics of the invention, which are outlined in the independent claim. The dependent claims outline preferred and/or particularly advantageous aspects of the invention.

DESCRIPTION OF THE INVENTION

[0012] An embodiment of the invention, in particular provides a remote testing system for a vehicle comprising: a diagnostic unit installed on-board the vehicle and configured for generating a signal representing the vehicle status and sending said signal outside the vehicle through a first connecting socket; a testing device configured for receiving and processing the signal representing the vehicle status and provided with a first connecting plug.

[0013] According to the invention, the system comprises a first adapter comprising a second connecting plug, configured for coupling with the first connecting socket of the diagnostic unit, and a remote communication unit configured for transmitting the signal representing the vehicle status outside the first adapter; a second adapter comprising a remote communication unit configured for receiving the signal representing the vehicle status from the communication unit of the first adapter, and a second connecting socket configured for coupling with the first connecting plug of the testing device.

[0014] Thanks to this solution, the system may be made up of a diagnostic unit and a conventional testing device, for example via cable, that can be placed in mutual remote communication by means of the communication unit of the first and the second adapter without the operator having to change the testing device with considerable economic burden.

[0015] According to another aspect of the invention, the system may comprise at least one communication device configured for placing the communication units of the first and the second adapter in mutual communication by means of a wireless network.

[0016] Thus, this enables expanding the communication capacity between the first and the second adapter.

[0017] According to a further aspect of the invention, said at least one communication device may comprise a router or a modem.

[0018] Thus, this enables placing the first and the second adapter in communication via telephone, internet or WiFi connection expanding the radius of action. According to another aspect of the invention, said at least one communication device is a mobile communication device.

[0019] Thus, the expansion of the radius of action of the system is enabled by means of common and versatile communication devices without the operator having to buy a dedicated device with considerable economic burden.

den. Furthermore, thanks to such devices, communication is guaranteed also outside a garage or other organised facilities and, for example, the system can be used by a rescue vehicle which, during a road rescue operation, for example sends the signal representing the vehicle status to the garage so that it can be processed by the testing device.

[0020] Furthermore, the at least one communication device can be configured for connecting to the first and/or to the second adapter through a Bluetooth or WiFi connection.

[0021] Thus, the connection between the communication device and the adapters is obtained through a simple and reliable communication system.

[0022] Furthermore, the system may comprise at least one first communication device configured for connecting to the first adapter, and at least one second communication device configured for connecting to the second adapter, said first and second communication device being configured for establishing mutual communication via a wireless network.

[0023] Thanks to such devices, communication is also guaranteed outside the garage or other organised facilities.

[0024] According to another aspect of the invention, at least one from among the first and the second adapter may comprise a voltage regulator connected to the respective second connecting plug and/or the second connecting socket and configured for enabling electrical supply to the respective adapter from an external source.

[0025] Thanks to such solution, the first adapter and/or the second adapter do not require their own internal source of electrical supply, for example a battery, thus being economic and compact.

[0026] According to another aspect of the invention, the diagnostic unit is configured for generating a signal according to a predetermined standard and the second adapter can be configured for selectively replicating said standard. Thus, the second adapter is capable of replicating any standard serving as a universal adapter.

[0027] According to a further aspect of the invention, the second adapter may comprise a control microprocessor connected to connectors of the second connecting socket according to an interconnection diagram that is a function of the standard of the signal, the second adapter further comprising a switch configured for selectively modifying the interconnection between the control microprocessor and the connectors of the second connecting socket as a function of a command received from the testing device adapting the interconnection diagram to the particular standard of the vehicle.

[0028] Thus, the second adapter may easily replicate the standard of any diagnostic unit.

[0029] Furthermore, the invention provides a pair of adapters for a remote diagnosis system of a vehicle, provided with a diagnostic unit having a first connecting socket and a testing device having a first connecting plug, said pair comprising: a first adapter comprising a second

connecting plug, suitable for coupling with the first connecting socket of the diagnostic unit, and a remote communication unit configured for transmitting a signal representing the vehicle status outside the first adapter; a second adapter comprising a remote communication unit configured for receiving the signal representing the vehicle status from the communication unit of the first adapter, and a second connecting socket suitable for coupling with the first connecting plug of the testing device.

[0030] Thus, there is provided a pair of adapters that enable a known system of the conventional type to perform a remote analysis of the vehicle status without the operator having to change the testing device with considerable burden of costs. In addition, the operator does not have to carry the device along all the time thus making the use of the system easier and safer.

BRIEF DESCRIPTION OF THE DRAWINGS

[0031] Further characteristics and advantages of the invention will be apparent from reading the flowing description - provided by way of non-limiting example - with reference to the figures illustrated in the attached drawings.

Figure 1 is a simplified diagram of the testing system according to an embodiment.

Figure 2 is a simplified diagram of a first adapter of the testing system.

Figure 3 is a simplified diagram of a second adapter of the testing system.

BEST EMBODIMENT OF THE INVENTION

[0032] With particular reference to such figures, an OBD (On-Board Diagnostics) testing system for a vehicle 2, for example a motor vehicle or motorcycle, is indicated in its entirety with 1.

[0033] The system comprises a diagnostic unit 10 of the vehicle 2 provided with a plurality of control units 100 connected with the main systems and sub-systems of the vehicle 2 and configured for generating a signal Y representing the vehicle status 2.

[0034] In particular, the diagnostic unit 10 is configured for generating the signal Y according to a specific standard of the type of vehicle or the vehicle maker for example: SAE J1850 PWM, SAE J1850 VPW, ISO 9141-2, ISO 14230 KWP2000 and ISO 15765 CAN.

[0035] The diagnostic unit 10 further comprises a first connecting socket 101 connected to the control units 100 and configured for transmitting the signal Y outside the vehicle 2 according to the particular standard of the vehicle.

[0036] In particular, the first connecting socket 101 comprises a plurality of data access connectors 102 configured for enabling a stable but removal connection with a corresponding plug device to be better described hereinafter.

[0037] The first connecting socket 101 is for example arranged in proximity of the dashboard of the vehicle 2 so that the connectors 102 are easily accessible. Furthermore, the system 1 comprises a testing device 11 configured for processing the signal Y.

[0038] As regards the present invention, the testing device 11 may be a testing scanner of the conventional type provided with a central control device, for example a palmtop or a PC, provided with an external interface, for example a keypad and a display, connected by means of a cable to a first connecting plug 110 configured for coupling with a corresponding connecting socket for example to the first connecting socket 101 of the diagnostic unit 10.

[0039] The expression coupling is used to indicate that the first connecting plug 110 is suitable to be directly mechanically coupled/fitted with/in the first connecting socket 101, i.e. without the intermediation of further intermediate adapters or connectors, obtaining a mutual shape-coupling with said first connecting socket 101.

[0040] In particular, the first connecting plug 110 is provided with a plurality of connectors 111, for example to contact pins, configured to provide a stable but removable connection with a connecting socket so as to enable access to a signal transmitted from the connecting socket.

[0041] More in detail, the testing device 11 comprises a control means 112, for example a control unit, configured to process the signal and connected to connectors 111 of the first plug device 111. The testing device 11 further comprises a switch 113 configured for selectively defining the interconnection between the control means 112 and the connectors 111 of the first connecting plug 111.

[0042] The testing device 11 is further configured for controlling the switch 113 so as to selectively programme the interconnection between the control means 112 and the connectors 111 of the first connecting plug according to the programming profile corresponding to the particular standard of the vehicle 2. The system 1 further comprises a first adapter 12 configured to be removably associated to the first connecting socket 101 of the vehicle 2 and transmit the signal representing the vehicle status 2 to the testing device 11.

[0043] The first adapter is provided with a communication unit 120, configured for transmitting the signal Y connected to a second connecting plug 121 provided with connectors 122, which is also configured for coupling with the first connecting socket 101 of the diagnostic unit 10.

[0044] The expression coupling is used to indicate that the second connecting plug 121 is suitable to be directly mechanically coupled/fitted with/in the first connecting socket 101, i.e. without the intermediation of further intermediate adapters or connectors, obtaining a mutual shape-coupling with said first connecting socket 101.

[0045] More in detail, the first adapter 12 comprises a control microprocessor 123 connected to the connectors 122 of the second connecting plug 121 and to the com-

munication unit 120.

[0046] The first adapter 12 further comprises a second switch 124 configured for selectively defining the interconnection between the control microprocessor 123 and the connectors 122 of the second connecting plug 121.

[0047] In particular, the second switch 124 is configured for selectively programming the interconnection between the control microprocessor 123 and the connectors 122 of the second connecting plug 121 according to a programming profile corresponding to the particular standard of the vehicle 2. More in detail, as better described hereinafter, the second switch 124 is configured for selectively programming the interconnection between the control microprocessor 123 and the connectors 122 upon receiving a command from the testing device 11.

[0048] The communication unit 120 of the first adapter 12 is preferably a wireless communication unit, for example an antenna or Bluetooth and/or WiFi card.

[0049] It cannot be ruled out that the first adapter 12 may comprise several communication units, for example different from each other, and that it may comprise, besides a wireless communication unit, even one or more communication units via cable, for example a USB or mini USB port.

[0050] The communication unit 120 is connected to the control microprocessor 123 and it is configured for sending the signal Y representing the vehicle status 2 outside the first adapter and/or for transmitting to the microprocessor 123 a command for controlling the second switch 124 received from the testing device 12.

[0051] Preferably, the first adapter 12 is provided with a voltage regulator 125 connected to the connectors 122 (or at least to some of the connectors 122) of the second connecting plug 121 for the electrical supply of the first adapter 12.

[0052] The system 1 further comprises a second adapter 13 configured to be removably associated to the first connecting plug 111 of the testing device 11 and to receive the signal Y representing the vehicle status 2 from the first adapter 12 and transmit it to the testing device 11.

[0053] The second adapter 13 is provided with a communication unit 130, configured for receiving the signal Y, and connected to a second connecting socket 131 provided with connectors 132 and configured for replicating the first connecting socket 101 of the diagnostic unit 10.

[0054] The expression replicate is used to indicate that the second connecting socket 131 is a replica of the first connecting socket 101, i.e. identical to the latter or of the same type, so as to be directly mechanically coupled/fitted to/with the first connecting plug 110 of the testing device 11.

[0055] More in detail, the second adapter 13 comprises a control microprocessor 133 connected to the connectors 132 of the second connecting socket 131 and to the communication unit 130.

[0056] The second adapter 13 further comprises a

switch 134 configured for selectively defining the interconnection between the control microprocessor 133 and the connectors 132 of the second connecting socket 131.

[0057] In particular, the second switch 134 is configured for selectively programming the interconnection between the control microprocessor 133 and the connectors 132 of the second connecting plug 131 of the second adapter 13, according to a programming profile corresponding to the particular standard of the vehicle 2.

[0058] More in detail, the switch 134 of the second adapter 13 is configured for selectively programming the interconnection between the control microprocessor 133 and the connectors 132 upon receiving a command from the testing device 11.

[0059] The communication unit 130 of the second adapter 13 is preferably a wireless communication unit, for example an antenna or Bluetooth and/or WiFi card.

[0060] It cannot be ruled out that the second adapter 13 may comprise several communication units, for example different from each other, and that it may comprise, besides a wireless communication unit, even one or more communication units via cable, for example a USB or mini USB port.

[0061] The communication unit 130, of the second adapter 13, is connected to the control microprocessor 133 and it is configured for receiving the signal Y representing the vehicle status 2 from the first adapter 12 and/or for transmitting to the first adapter 12 a command for controlling the second switch 124, of the first adapter 12 received from the testing device 11. Preferably, the second adapter 13 is provided with a voltage regulator 135 connected to an external electrical supply device and to the connectors 132 (or at least to some of the connectors 122) of the second connecting socket 131 for the electrical supply of the testing device 12.

[0062] According to a first embodiment, the system 1 further comprises at least one communication device 14 configured to place the first and the second adapter 12, 13 in mutual communication.

[0063] According to such embodiment, the first communication device 14 is a wireless device, for example a WiFi router, configured for mutually connecting the first and the second adapter 12, 13 via a wireless network, for example a WiFi network.

[0064] According to other embodiments, the system 1 may comprise a plurality of communication devices, for example, a first and a second communication device 14, 15.

[0065] For example, according to a preferred embodiment, the first and the second communication device 14, 15 comprise a modem for connecting to a telephone or internet network and, for example, they are smartphones or tablets.

[0066] Each communication device 14, 15 further comprises a communication unit, preferably wireless, for example Bluetooth, configured for connecting the communication device 14, 15 to a respective adapter 12, 13, for example the first communication device 14 with the first

adapter 12 and the second communication device 15 with the second adapter 13.

[0067] As described above, the testing system 1 operates as follows.

[0068] In use, the first adapter 12 is coupled to the diagnostic unit 10 of the vehicle 2 and, in particular, the second connecting plug 121 of the first adapter 12 is coupled with a stable and releasable connection directly to the first connecting socket 101 of the diagnostic unit 10.

[0069] The first adapter 13 is also connected to the first communication device 14 (for example a smartphone) by means of the communication unit 120 thereof, for example by means of a Bluetooth connection.

[0070] The second adapter 13 is coupled to the testing device 11, in particular, the second connecting socket 131 of the second adapter 13 is coupled with a stable and releasable connection to the first connecting plug 111 of the testing device 11.

[0071] The second adapter 13 is also connected to the second communication device 15 (for example a smartphone) by means of the communication unit 130 thereof, for example by means of a Bluetooth connection.

[0072] The first and the second communication device 14, 15 are mutually connected by means of a wireless network, for example a telephone connector.

[0073] Using the testing device 11, an operator selects the standard corresponding to the type of vehicle 2 so as to send to the switch 113 a programming command to modify the interconnections between the connectors 111 of the first connecting plug 110 and the control means 112 of the first connecting plug 110.

[0074] Such programming control is sent to the second adapter 13, for example through the plug-socket connection, so as to modify the interconnections between the connectors 132 of the second connecting socket 131 and the means 133 for controlling the second connecting socket 131.

[0075] In particular, such interconnections are modified so that the second connecting socket 131 takes a configuration such to replicate the first connecting socket 101 of the diagnostic unit 10.

[0076] The second adapter 13 sends the programming command to the first adapter 12 by means of the communication unit 130 thereof and through the wireless network provided by the communication devices 14, 15.

[0077] The first adapter 12 receives the programming command through the communication unit 120 thereof and the switch 124 modifies the interconnections between the connectors 122 of the second connecting plug 121 and the microprocessor 123 of the second connecting plug 121 so as to adapt them to the standard of the first connecting socket 101 of the diagnostic unit 10. Thus, the first adapter 12 obtains access to the signal Y representing the vehicle status 2.

[0078] The first adapter 12 sends the signal Y to the second adapter 13 by means of the communication unit 132 thereof and through the wireless network provided by the communication devices 14, 15.

[0079] Thus, the testing device 11 may receive the signal Y from the second adapter 13 which precisely replicates the first connecting socket of the diagnostic unit 10. Upon receiving the signal Y, the testing device 11 may process it to enable the operator to assess the vehicle status 2.

[0080] The invention thus conceived is susceptible to numerous modifications and variants all falling within the inventive concept.

[0081] In addition, all details can be replaced by other technically equivalent elements.

[0082] Basically, the materials used as well as the shapes and contingent dimensions, may vary according to the needs without departing from the scope of protection of the claims that follow.

Claims

1. A remote testing system (1) for a vehicle (2) comprising:

- a diagnostic unit (10) installed on-board the vehicle (2) and configured for generating a signal (Y) representing a vehicle status (2) and for sending said signal outside the vehicle via a first connecting socket (101);
- a testing device (11) configured for receiving and processing the signal (Y) representing the vehicle status and provided with a first connecting plug (110) configured to be coupled with the first connecting socket (101) of the diagnostic unit (10);

characterised in that it comprises:

- a first adapter (12) comprising a second connecting plug (121) configured for coupling with the first connecting socket (101) of the diagnostic unit (10), and a remote communication unit (120) configured for transmitting the signal (Y) representing the vehicle status outside the first adapter (12);

a second adapter (13) comprising a remote communication unit (130) configured for receiving the signal (Y) representing the vehicle status from the communication unit (120) of the first adapter (12), and a second connecting socket (131) configured for coupling with the first connecting plug (111) of the testing device (11).

2. The system (1) according to claim 1, **characterised in that** it comprises at least a communication device (14, 15) configured for placing the communication units (120, 130) of the first and the second adapter (12, 13) in mutual communication by means of a wireless network.

3. The system (1) according to claim 2, comprising at least one first communication device (14) configured for connecting to the first adapter (12), and at least one second communication device (15) configured for connecting to the second adapter (13), said first and second communication device (14, 15) being configured for establishing mutual communication via a wireless network.
4. The system (1) according to claim 2 or 3, wherein said at least one communication device (14, 15) comprises a router or a modem.
5. The system (1) according to any one of claims 2 to 4, wherein said at least one communication device (14, 15) is a mobile communication device.
6. The system (1) according to any one of claims 2 to 5, wherein the at least one communication device (14, 15) is configured for connecting to the first and/or the second adapter (12, 13) via a Bluetooth or wi-fi connection.
7. The system (1) according to claim 1, wherein at least one from among the first and the second adapter (12, 13) comprises a voltage regulator connected to the respective second connecting plug (121) and/or the second connecting socket (131) and configured for enabling electrical supply to the respective adapter (12, 13) from an external source.
8. The system (1) according to claim 1, wherein the diagnostic unit is configured for generating a signal (Y) according to a predetermined standard, the second adapter (13) being configured for replicating said standard.
9. The system (1) according to claim 8, wherein the second adapter (13) comprises a control microprocessor (133) connected to connectors (132) of the second connecting socket (131) according to an interconnection diagram that is a function of the standard of the signal, the second adapter (13) further comprising a switch (134) configured for selectively modifying the interconnection between the control microprocessor (133) and the connectors (132) of the second connecting socket (131) as a function of a command received from the testing device (11) adapting the interconnection diagram to the particular standard of the vehicle (2).

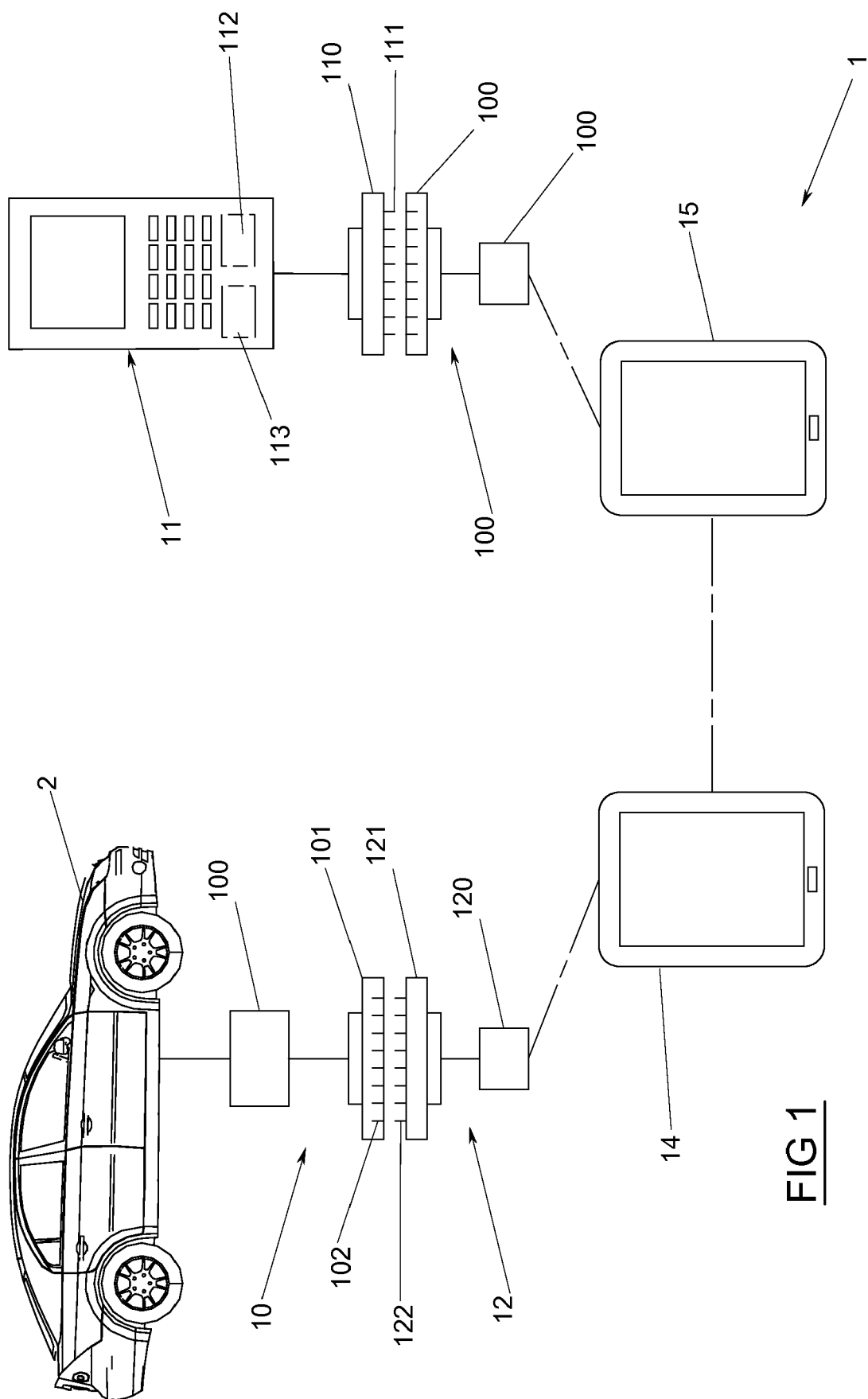


FIG 1

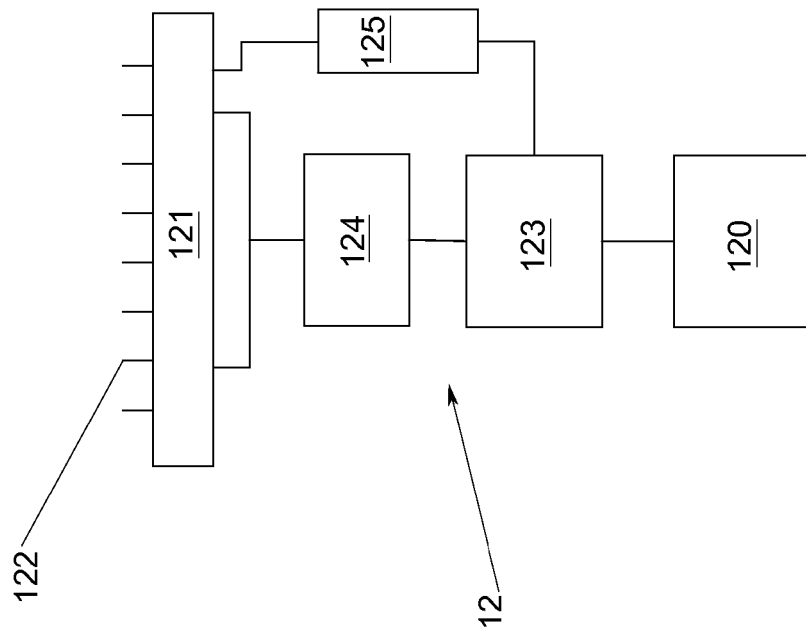


FIG 2

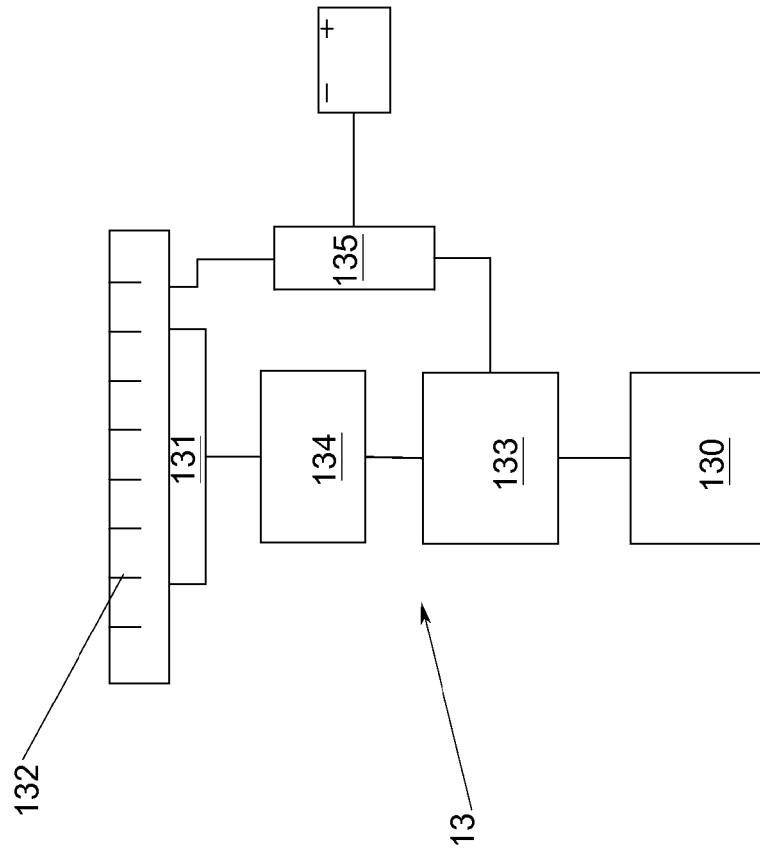


FIG 3



EUROPEAN SEARCH REPORT

 Application Number
 EP 17 16 5309

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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 2006/101311 A1 (LIPSCOMB EDWARD [US] ET AL) 11 May 2006 (2006-05-11) * paragraph [0001] * * paragraph [0059] * * paragraph [0065] - paragraph [0066] * * figure 11 *	1-9	INV. G07C5/08 G07C5/00
X	US 2010/273477 A1 (NAMAKY HAMID [US]) 28 October 2010 (2010-10-28) * figure 1A * * paragraph [0032] - paragraph [0033] *	1-9	
A	US 2008/195271 A1 (BERTOSA THOMAS [US] ET AL) 14 August 2008 (2008-08-14) * paragraph [0020] - paragraph [0021] *	9	
			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 6 July 2017	Examiner Bohn, Patrice
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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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 17 16 5309

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2006101311 A1	11-05-2006	NONE	

US 2010273477 A1	28-10-2010	US 2004227523 A1	18-11-2004
		US 2007198148 A1	23-08-2007
		US 2009076678 A1	19-03-2009
		US 2010273477 A1	28-10-2010
		US 2012053781 A1	01-03-2012
		US 2012215400 A1	23-08-2012
		US 2014032038 A1	30-01-2014

US 2008195271 A1	14-08-2008	NONE	
