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(54) **Programmable on-board vehicle diagnostic system**

(57) A programmable vehicle diagnostic system (1) comprising: a diagnostic device (2) installed on board a vehicle (3) and configured in such a way as to generate vehicle data through a diagnostic connector (4) provided with a plurality of pins for access to the data (10); an on-board diagnostic module (5) for acquiring the vehicle data, which includes a connector (12) comprising a plurality of pins (13) and designed to be connected in a stable but readily removable way to said diagnostic connector (4); a control unit (14) comprising a plurality of terminals (15)

for exchange of vehicle data with the pins (13) of the connector (12); and an electronic switching matrix (16) comprising a plurality of selective interconnection devices (17), each of which can be operated to connect each of the pins (13) of the connector (12) to any one of the terminals (15) of the control unit (14); and an external programming system (6), configured in such a way as to govern via the on-board diagnostic module (5) selective switching of interconnection devices (17) of the electronic switching matrix (16).

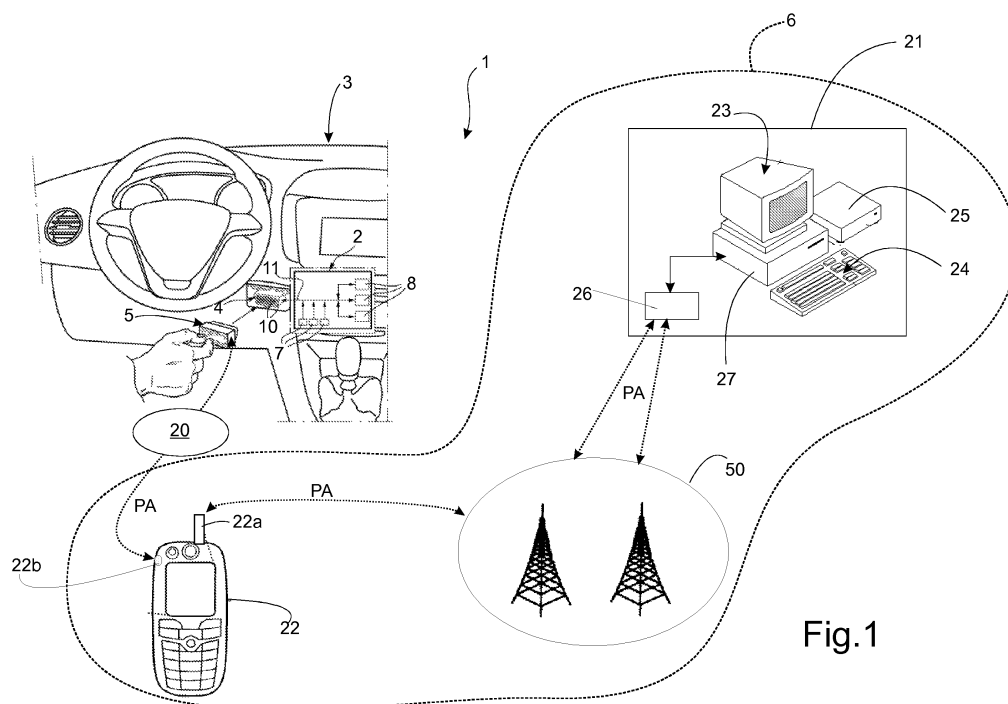


Fig.1

Description

[0001] The present invention relates to a programmable on-board vehicle diagnostic system.

[0002] As is known, on-board diagnostic modules are apparatuses of small dimensions, which, unlike portable vehicle diagnostic instruments, are configured to be connected to a diagnostic connector installed in a vehicle in such a way as to form an integral part of the vehicle so that they can be transported thereby.

[0003] In other words, unlike traditional portable vehicle diagnostic instruments that can be connected to the vehicle for acquiring the data thereof only when the vehicle is unmoving, on-board diagnostic modules, thanks to their own integration with the vehicle, can be configured to acquire and store advantageously the vehicle data generated by the on-board computer, i.e., by the vehicle diagnostic device, also during movement of the vehicle itself.

[0004] The on-board diagnostic modules referred to above are typically referred to as "OBD modules" or "E-OBD modules" or "OBD-II modules" in so far as they are configured to meet certain technical-functional specifications established by vehicle diagnostic standards known as the generic standard OBD (On-Board Diagnostic), the specific standard E-OBD (European On-Board Diagnostic) adopted in Europe, or the specific standard OBD-II, adopted in the USA.

[0005] The OBD vehicle standard and the corresponding E-OBD and OBD-II specific standards impose common technical-functional constraints regarding implementation of the communication of the vehicle data by the vehicle diagnostic systems to the external devices.

[0006] In particular, said constraints establish a specific geometrical distribution of the pins in the vehicle diagnostic connector, and a limited list of communication protocols that can be used for implementing exchange of vehicle data containing information on the exhaust-gas emissions by the vehicle.

[0007] However, the generic OBD standard and the corresponding E-OBD and OBD-II specific standards do not impose any common rule regarding communication of additional vehicle data, which do not regard exhaust-gas emissions, but can be used for carrying out vehicle diagnoses different from the emissions-gas diagnostic analysis.

[0008] In detail, the OBD standard and the corresponding E-OBD and OBD-II specific standards do not impose any common rule that establishes a unique association between: a type of additional vehicle data accessible by the diagnostic device; the pin of the diagnostic connector through which it is possible to access the additional vehicle data; and the type of communication protocol to be implemented in order to access the additional vehicle data through the pin itself.

[0009] Consequently, up to now the configuration implemented on vehicle diagnostic systems by automobile manufacturers is such as to meet the requirements of

the OBD/E-OBD/OBD-II standards so as to render possible a "standardized" access to the vehicle data regarding exhaust-gas emission, but, as regards access to the remaining further vehicle data other than gasemission data, the same is not true.

[0010] In other words, the configurations of the vehicle diagnostic systems used by automobile manufacturers are different from one another; namely, they present different associations both as regards the function of access of the pins to the vehicle data made available by the diagnostic device and as regards the association between each pin and the communication protocol to be implemented for exchange of the data through the pin itself.

[0011] The use by automobile manufacturers of different configurations for exchange of data of the vehicle diagnostic systems has consequently rendered necessary production of on-board diagnostic modules purposely designed for each type of vehicle.

[0012] In detail, an on-board diagnostic module can be used only to a limited extent for accessing the additional vehicle data of specific models of vehicle, but is incompatible with acquisition of said additional vehicle data from different models of vehicle in so far as its hardware/software architecture is designed to communicate specifically with the diagnostic system of said specific model of vehicle.

[0013] The patent application No. US2006/0217855 A1 discloses a vehicle diagnostic system provided with an on-board computer and a portable vehicle diagnostic instrument of a traditional type, which is used outside the vehicle and is provided with a cable connected to a vehicle connector of the on-board computer so as to receive vehicle data. The system comprises an adapter module, which is set between the manual portable vehicle diagnostic instrument and the vehicle connector, and is provided with a series of switches that can be controlled for appropriately switching the signals of the on-board computer onto the portable vehicle diagnostic instrument.

[0014] It should be pointed out that, unlike the on-board diagnostic modules referred to above and forming the subject matter of the present invention, the portable vehicle diagnostic instrument described in US2006/0217855 cannot be integrated in the vehicle in such a way as to remain fixed thereto when it is moving and consequently acquires only the vehicle data when the vehicle stationary, but not when it is moving.

[0015] It is moreover known that some vehicle diagnostic systems communicate the vehicle data acquired by the on-board diagnostic module to a remote processing and diagnostics station, through a long-range wireless communication system, typically a telephone communication system of a GSM and/or GPRS type.

[0016] The long-range telephone communication system currently used requires installation of a GSM or GPRS transceiver within the on-board diagnostic module.

[0017] However, the use of a GSM or GPRS transceiver in the on-board diagnostic module proves disadvan-

tageous in so far as the transceiver, in addition to being cumbersome and hence increasing the dimensions of the diagnostic module, has a marked incidence the overall costs of production of the on-board diagnostic module itself.

[0018] The patent application No. US2006/0122746 A1 describes a vehicle communication system MVCS for updating a vehicle diagnostic software.

[0019] The patent application No. US2006/0156311 A1 describes a system for communication of vehicle data between an OBD communication module and on-board vehicle computer.

[0020] The aim of the present invention is consequently to provide a system that on the one hand will enable reduction of costs and overall dimensions of the on-board diagnostic module associated to the use of a GSM or GPRS transceiver, and on the other will enable programming, each time, of the on-board diagnostic module according to the vehicle diagnostic system on which it is to be installed.

[0021] According to the present invention, a programmable vehicle diagnostic system is provided, as specified in Claim 1 and preferably, but not necessarily, in any one of the claims that depend either directly or indirectly upon Claim 1.

[0022] The present invention will now be described with reference to the annexed drawings, which illustrate a non-limiting example of embodiment thereof and in which:

- Figure 1 is a schematic illustration of a programmable vehicle diagnostic system provided according to the teachings of the present invention;
- Figure 2 shows a block diagram of the programmable vehicle diagnostic system illustrated in Figure 1;
- Figure 3 shows the on-board diagnostic module of the programmable vehicle diagnostic system during connection to the diagnostic connector installed in the vehicle;
- Figure 4 shows a flowchart of operation of the programmable vehicle diagnostic system illustrated in Figure 1; and
- Figure 5 shows a variant of the operation of the programmable vehicle diagnostic system illustrated in Figure 1.

[0023] With reference to Figure 1, designated as a whole by 1 is a programmable vehicle diagnostic system comprising an on-board computer, i.e., a diagnostic device 2, which is installed on board a vehicle 3 for generating vehicle data and is provided with a diagnostic connector 4, through which it is possible to access the vehicle data.

[0024] The programmable vehicle diagnostic system 1 further comprises: an on-board diagnostic module 5, which can be connected in a stable but readily removable way to the diagnostic connector 4 and has a hardware/software architecture of a programmable type configured

for implementing acquisition and temporary storage of the vehicle data supplied by the diagnostic device 2; and an external programming system 6, which is configured to modify the internal hardware/software architecture of the on-board diagnostic module 5 in such a way as to cause it compatible with acquisition of the vehicle data generated by the diagnostic device 2.

[0025] With reference to Figure 1, the on-board diagnostic device 2 comprises measurement systems 7 and/or control and processing systems 8, which are configured to control the members/units installed on board the vehicle 3, such as, for example, the supply/exhaust members, the engine unit, safety devices such as ABS, airbags, comfort devices, and/or similar vehicle units/members/devices, and are able to make accessible vehicle data, associated to the operation of the vehicle devices/units/members, through the diagnostic connector 4.

[0026] As regards the diagnostic connector 4, it is installed preferably, but not necessarily, within the passenger compartment of the vehicle 3 and has a plurality of connection pins 10, which are connected to the on-board diagnostic device 2 through corresponding data-communication lines or buses 11.

[0027] The diagnostic connector 4 is known and will not be described further other than to point out that the spatial distribution of the pins 10 in the vehicle diagnostic connector 4 may preferably correspond to the spatial distribution of the pins of a diagnostic connector provided according to the standards OBD, E-OBD, or OBD-II.

[0028] In the example illustrated in Figure 3, the diagnostic connector 4 has a side edge in relief having a substantially trapezoidal shape and is provided with sixteen connection pins 10 arranged in two parallel rows in groups of eight in positions facing one another.

[0029] As regards, instead, the measurement systems 7 and/or the control and processing systems 8, they are configured to communicate vehicle data with the on-board diagnostic module 5 implementing one or more pre-set communication protocols.

[0030] In particular, communication protocols may comprise preferably, but not necessarily, the SAEJ1850 protocol (PWM/VPW), and/or the SAEJ2284 protocol (CAN-H/CAN-L), and/or the ISO9141-2 protocol or the ISO14230 protocol or any other similar protocol comprised in the standards OBD, E-OBD, or OBD-II.

[0031] It should be pointed out that the measurement systems 7 and/or the control and processing systems 8 can be configured to implement additional communication protocols established, preferably but not necessarily, by vehicle diagnostic standards deriving from, or substantially equivalent to, the OBD protocol, or the E-OBD protocol, or the OBD-II protocol, or any other standard deriving from a technical evolution of the OBD standard.

[0032] With reference to Figure 2, as regards the on-board diagnostic module 5, it comprises a connector 12 shaped in such a way that it can be connected in a stable but readily removable way to the vehicle diagnostic con-

nector 4.

[0033] In particular, with reference to Figures 2 and 3, the connector 12 of the on-board diagnostic module 5 is provided with a plurality of connection pins 13, which are structured to be connected to the respective pins 10 of the diagnostic connector 4.

[0034] With reference to Figure 2, the on-board diagnostic module 5 further comprises a control unit 14, for example a microprocessor, which is configured to implement a program of acquisition/storage of the vehicle data.

[0035] In detail, the control unit 14 has a plurality of communication terminals 15 designed to be connected to the connection pins 13 to implement acquisition of the vehicle data on the basis of at least one given data-communication protocol.

[0036] Unlike known on-board diagnostic modules, the on-board diagnostic module 5 comprises an electronic switching matrix 16, which comprises a plurality of selective interconnection devices 17 (only some of which are illustrated in Figure 2 for simplicity of representation), each of which is designed to be commanded for connecting/disconnecting each of the communication terminals 15 of the control unit 14 to/from any one of the connection pins 13 of the connector 12.

[0037] In particular, in the embodiment illustrated in Figure 2, the on-board diagnostic module 5 is configured to be programmed by the external programming system 6 and connects/disconnects, on the basis of said programming, each communication terminal 15 of the control unit 14 to/from one and only one connection pin 13 of the connector 12.

[0038] According to a different embodiment, the on-board diagnostic module 5 is configured to be programmed by the external programming system 6 so that it can connect each communication terminal 15 to a number of connection pins 13.

[0039] According to a different embodiment, the diagnostic module 5 is configured to be programmed by the external programming system 6 so as to connect each connection pin 13 to one or more communication terminals 15 of the control unit 14.

[0040] As regards the selective interconnection devices 17 of the electronic switching matrix 16, they can comprise, for example, electronic microswitches that can be commanded in a reversible way through respective command signals Ci. In the case in point, the electronic microswitches that make up the electronic switching matrix 16 can be, for example, optically controlled electronic switches, such as photo-MOSFETs, or electrically controlled transistors of a MOSFET or BJT type, or any other type of similar transistor appropriately miniaturized. The miniaturization of electronic microswitches advantageously enables an electronic switching matrix 16 to be obtained having small dimensions corresponding, for example, to the dimensions of a microchip.

[0041] With reference to Figure 2, the control unit 14 is configured to receive at input a programming profile PA for data acquisition, which contains a series of com-

mands/operations for hardware/software programming of the diagnostic module 5.

[0042] In particular, the programming profile PA for data acquisition contains: a set of information indicating the states of opening/closing to be imparted to each selective interconnection device 17, on the basis of which the control unit 14 generates the command signals Ci; and a software containing the operations that the control unit 14 must implement for acquiring the vehicle data from the on-board diagnostic device 2.

[0043] In detail, on the basis of the programming profile PA, the control unit 14 controls the selective interconnection devices 17 of the electronic switching matrix 16 so as to modify the "hardware" configuration of the connections between its communication terminals 15 and the connection pins 13.

[0044] The control unit 14 is configured to determine, on the basis of the data contained in the programming profile PA: the type of communication protocols to be used for acquisition of vehicle data; the communication terminals 15 to be used during acquisition for interfacing the control unit 14 correctly with the on-board diagnostic device 2; and the operations to be implemented during acquisition of the data.

[0045] With reference to Figure 2, the on-board diagnostic module 5 further comprises a storage device 18, configured to store the vehicle data acquired, and a transceiver device 19 configured to communicate with the external programming system 6 through a short-range communication system 20.

[0046] In particular, the transceiver device 19 is configured to communicate with the external programming system 6 through a communication system 20 implementing a short-range wireless communication protocol. In the case in point, the communication system 20 can perform a short-range communication implementing preferably the Bluetooth protocol, or the IEEE 802.11p protocol, or similar protocols.

[0047] With reference to Figures 1 and 2, the external programming system 6 comprises a remote processing and diagnostics station 21, which is configured to supply the programming profile PA, and a user portable communication apparatus 22, which is configured to carry out a long-range transmission/reception with the remote processing and diagnostics station 21 through a communication system 20 so as to receive the programming profile PA, and carries out a short-range transmission/reception with the transceiver device 19 of the on-board diagnostic module 5, through the communication system 20, so as to supply thereto the programming profile PA itself.

[0048] The user portable communication apparatus 22 is moreover preferably configured to carry out short-range transmission/reception with the transceiver device 19 of the on-board diagnostic module 5, through the communication system 20, so as to receive the stored/acquired vehicle data and carries out long-range transmission/reception with the remote processing and diagnos-

tics station 21 through the communication system 50 so as to supply said vehicle data thereto.

[0049] With reference to Figure 1, the remote processing and diagnostics station 21 can comprise, for example, a computer 23, which is configured to determine the programming profile PA to be imparted to the on-board diagnostic module 5 according to a series of data imparted by a user. Said data can comprise, for example, the model of vehicle and/or the type of vehicle data to be acquired and/or the diagnosis to be performed.

[0050] The computer 23 is moreover provided with: a user command interface 24; and a memory 25, which stores a database containing preferably, for each model of vehicle, a series of types of vehicle data that can be acquired and, for each type of vehicle data that can be acquired and/or model of vehicle, a programming profile PA to be imparted to the on-board diagnostic module 5.

[0051] The computer 23 is moreover provided with a long-range communication device 26 configured to communicate with the user portable communication apparatus 22, through the communication system 50. The long-range communication device 26 can comprise, for example, a GSM or GPRS or similar telephone transceiver, whilst the long-range communication system 50 can comprise, for example, a mobile phone network or any similar long-range network.

[0052] The computer 23 also comprises a processing device 27, which is configured to: identify the programming profile PA in a database contained in the memory 25 on the basis of the user data; control transmission of the programming profile PA through the communication system 50; receive the vehicle data generated by the on-board diagnostic module 5; and process the vehicle data received so as to supply a vehicle diagnosis.

[0053] As regards the user portable communication apparatus 22, it can comprise for example a cellphone (illustrated by way of example in Figures 1 and 2) or a smart phone, or a personal digital assistant (PDA), a pocket PC (personal computer) or any other similar user portable communication electronic device.

[0054] The user portable communication apparatus 22 comprises: a long-range communication device 22a, configured to communicate with the remote processing and diagnostics station 21 through the long-range communication system 50; and a short-range communication device 22b to communicate with the on-board diagnostic module 5, through the short-range wireless communication system 20.

[0055] In the example illustrated in Figures 1 and 2, the user portable communication apparatus 22 performs a function similar to that of an "electronic bridge", which in this case is able to transfer data, in a bidirectional way, between the short-range wireless communication system 20 and the long-range wireless communication system 50.

[0056] With reference to Figure 4, a method for remote programming of the on-board diagnostic module 5 will be described hereinafter.

[0057] The user selects through the command interface 24 of the remote processing and diagnostics station 21 the model of the vehicle (for example FIAT CROMA) (block 100), and the vehicle data to be acquired (for example ENGINE R.P.M.) (block 110) and/or the diagnosis.

[0058] At this point, the processing device 27 determines in the database contained in the memory 25 the programming profile PA that is associated to acquisition of the ENGINE R.P.M. in a FIAT CROMA (block 120) or that regards the diagnosis selected previously.

[0059] Once the programming profile PA has been identified, the processing device 27 commands the communication device 26 so as to make the long-range transmission of the programming profile PA itself to the user portable communication apparatus 22 (block 130).

[0060] The user portable communication apparatus 22 receives the programming profile PA from the long-range wireless communication system 50 (block 140) and communicates the programming profile PA received to the on-board diagnostic module 5, through the short-range wireless communication system 20 (block 150).

[0061] At this point, the control unit 14 of the on-board diagnostic module 5 receives the programming profile PA (block 160) and modifies the configuration of the electronic switching matrix 16, i.e., its own hardware configuration, according to the programming profile PA itself (block 170).

[0062] In particular, the control unit 14 processes the programming profile PA to determine the interconnection devices 17 to be governed in opening/closing and generates the command signals Ci, consequently determining switching thereof (block 170).

[0063] The control unit 14 of the on-board diagnostic module 5 moreover modifies its own software configuration defining the communication protocols to be used for communication of data on each communication terminal 15 activated and the operations of data acquisition to be implemented on the basis of the programming profile PA received (block 180).

[0064] Following upon completion of the hardware/software programming, the on-board diagnostic module 5 acquires the ENGINE R.P.M. from the on-board diagnostic device 2 (block 190) and stores the data and/or transmits them to the remote processing and diagnostics station 21 through the user portable communication apparatus 22 following the same communication procedure as the one described above for communication of the programming profile PA, i.e., through short-range and long-range sequential communication.

[0065] Following upon reception of the vehicle data corresponding to the ENGINE R.P.M., the remote processing and diagnostics station 21 is able to process the ENGINE R.P.M. itself to perform the vehicle diagnostics selected by the user.

[0066] The programmable vehicle diagnostic system described above is extremely advantageous in so far as it enables remote configuration of the modalities of logic and physical communication of an on-board diagnostic

module, i.e., the OBD communication protocols and connections, according to any model of vehicle, even when the vehicle is moving, consequently rendering the diagnostic module versatile and universal.

[0067] In addition, the use of the user portable apparatus for communication of the data to the remote station enables elimination of the long-range communication module within the on-board diagnostic module, thus obtaining an evident saving in costs and a reduction in the encumbrance inside the vehicle.

[0068] Finally, it is clear that modifications and variations may be made to the programmable vehicle diagnostic system described above, without thereby departing from the scope of the present invention defined by the annexed claims.

[0069] In particular, Figure 5 shows a variant of the operation of the programmable vehicle diagnostic system 1, in which the user portable communication apparatus 22 is configured to perform the function of command interface through which a user can select commands to the vehicle and/or receive, and then display, specific requested vehicle data, and/or implement a specific vehicle diagnosis on the vehicle data received.

[0070] For this purpose, each of the programming profiles PA stored in the remote diagnostics station 21 can comprise, in addition to the data described above necessary for configuration of the on-board diagnostic module 5, also an auxiliary program of vehicle control, which is configured to be implemented by the on-board diagnostic module 5 and by the user portable communication apparatus 22 so as to enable the on-board diagnostic module 5 to impart to the vehicle vehicle-commands transmitted by the user portable communication apparatus 22.

[0071] The auxiliary vehicle-control program contained in the programming profile PA is moreover configured to enable the user to control, via the on-board diagnostic module 5, acquisition of specific vehicle data to be displayed through the user portable communication apparatus 22, and/or to implement a specific vehicle diagnostics on the vehicle data themselves.

[0072] With reference to Figure 5, the user portable communication apparatus 22 is configured to enable the user to select a model of vehicle (block 300). For this purpose, the user portable communication apparatus 22 can be provided with a specific pre-installed interface program capable of managing the operations of selection of the model of vehicle by the user and of performing long-range transmission of the model selected to the remote processing station 21.

[0073] In response to the vehicle model selected transmitted by the user portable communication apparatus 22, the remote processing and diagnostics station 21 identifies in the database of the memory 25 the programming profile PA containing the control program and transmits it to the user portable communication apparatus 22 (block 310).

[0074] At this point, the user portable communication

apparatus 22 stores within it the control program contained in the programming profile PA and at the same time transmits the latter to the on-board diagnostic module 5 through the short-range communication (block 320).

[0075] The on-board diagnostic module 5, following upon reception of the programming profile PA, programs the switching matrix 16, stores the data-acquisition software, and implements the auxiliary vehicle-control program on the basis of the information contained in the programming profile PA received.

[0076] The user portable communication apparatus 22 implements the control program downloaded for configuring its own keypad and/or its own display in such a way as to be able to display: one or more graphic interfaces dedicated to the selection of the commands that can be imparted to the vehicle; one or more graphic interfaces dedicated to the selection of the vehicle data to be acquired; and one or more graphic interfaces dedicated to the selection of the diagnosis of the vehicle data.

[0077] The graphic interface of the user portable communication apparatus 22 dedicated to the selection of the commands to be imparted to the vehicle can comprise, for example, commands for turning on/turning off the vehicle lights, and/or commands for turning on/turning off the vehicle alarm system, and/or commands associated to closing/opening of the doors or any similar vehicle command. It is evident that the control program contained in the programming profile PA can envisage management of any vehicle command.

[0078] With reference to the above description, it should be pointed out that the programming profile PA downloaded in the on-board diagnostic module 5, when implemented by the control unit 14, is designed to convert each vehicle command encoded according to the protocol implemented by the user portable communication apparatus 22 into a corresponding vehicle command encoded according to what is envisaged by the communication protocols implemented by the on-board diagnostic device 2.

[0079] The graphic interfaces dedicated to selection of the vehicle data to be stored/acquired or dedicated to selection of the diagnosis can, instead, be configured in such a way that the user portable communication apparatus 22 receives from the on-board diagnostic module 5 any type of vehicle data in a way altogether equivalent to the acquisition carried out by the remote diagnostics station 21.

[0080] It should be pointed out that, unlike the embodiment illustrated in Figure 4, the vehicle data transmitted by the on-board diagnostic module 5 to the portable communication apparatus 22 are directly displayed to the user.

[0081] In the case where the user has selected a diagnosis, the control program implemented by the user portable communication apparatus 22 requests vehicle data specific to the on-board diagnostic module 5 and, once these have been received, processes them so as to supply to the user the vehicle diagnosis requested.

[0082] With reference to Figure 3, in use, the user selects, through the user portable communication apparatus 22, a command for closing the window and transmits it to the on-board diagnostic module 5 through the communication system 20 (block 330).

[0083] At this point, the on-board diagnostic module 5, thanks to the control program, imparts the window-closing command to the diagnostic device 2. At this point, the diagnostic device 2 issues the window-closing command to the member for closing the window of the vehicle 3 (block 340).

Claims

1. A programmable vehicle diagnostic system (1), comprising:

- a diagnostic device (2), installed on board a vehicle (3) and configured to generate vehicle data through a diagnostic connector (4) provided with a plurality of pins for access to the data (10);

said system being **characterized in that** it comprises:

- an on-board diagnostic module (5), which is configured to be connected to the vehicle (3) in such a way as to remain stably integrated in the vehicle during displacement of the vehicle itself; the on-board diagnostic module (5) being configured in such a way as to implement a program of acquisition and storage of the vehicle data generated by the diagnostic device (2) during displacement of the vehicle (3); the on-board diagnostic module (5) comprising:

- a connector (12), which is provided with a plurality of pins (13) and is structured for being connected in a stable but readily removable way to the diagnostic connector (4) so as to connect each of its own pins (13) to a corresponding pin for access to the data (10) of the diagnostic connector (4);

- electronic control means (14), which are configured to implement a communication protocol so as to exchange data with said diagnostic device (2) and have a plurality of data-acquisition terminals (15);

- and an electronic switching matrix (16), in turn comprising a plurality of selective interconnection means (17), each of which can be operated to connect each of the pins (13) of the connector (12) to any one of the terminals (15) of the electronic control means (14);

and

- an external programming system (6), config-

ured to program the on-board diagnostic module (5) on the basis of a programming profile (PA), which is associated to a corresponding type of vehicle (3) and contains indications regarding one or more communication protocols to be implemented and regarding the switchings to be imparted on the selective interconnection means (17) to cause said electronic control means (14) of the on-board diagnostic module (5) to communicate with said diagnostic device (2) during implementation of said protocols so as to acquire and store the vehicle data; said external programming system (6) comprising:

- a remote diagnostics station (21), which is configured in such a way as to store a plurality of said programming profiles (PA) associated to corresponding types of vehicles (3), and is designed, upon command, to communicate a given programming profile (PA) through a long-range wireless communication system (50); and

- a portable communication apparatus (22), which is configured in such a way as to receive said programming profile (PA) from the long-range wireless communication system (50) and transmits the same to the on-board diagnostic module (5) through a short-range wireless communication system (20);

2. A system according to Claim 1, wherein said programming profile (PA) comprises the operations that said electronic control means (14) must implement for acquiring the vehicle data from said diagnostic device (2); said electronic control means (14) being configured to:

- switch said selective interconnection means (17) on the basis of said programming profile (PA);
- implement said communication protocol comprised in said programming profile (PA); and
- execute the operations of data acquisition comprised in said programming profile (PA).

3. A system according to Claim 1 or Claim 2, wherein said on-board diagnostic module (5) is configured to transmit vehicle data to said portable communication apparatus (22) through said short-range wireless communication system (20); said portable communication apparatus (22) being designed to transmit the vehicle data to said remote diagnostics station (21) through said long-range wireless communication system (50).

4. A system according to Claim 3, wherein said remote diagnostics station (21) is configured to proc-

ess the vehicle data received for supplying a vehicle diagnostics.

5. A system according to Claim 3 or Claim 4, wherein said remote diagnostics station (21) is configured to generate and transmit said programming profile (PA) on the basis of a command imparted by a user through said portable communication apparatus (22).

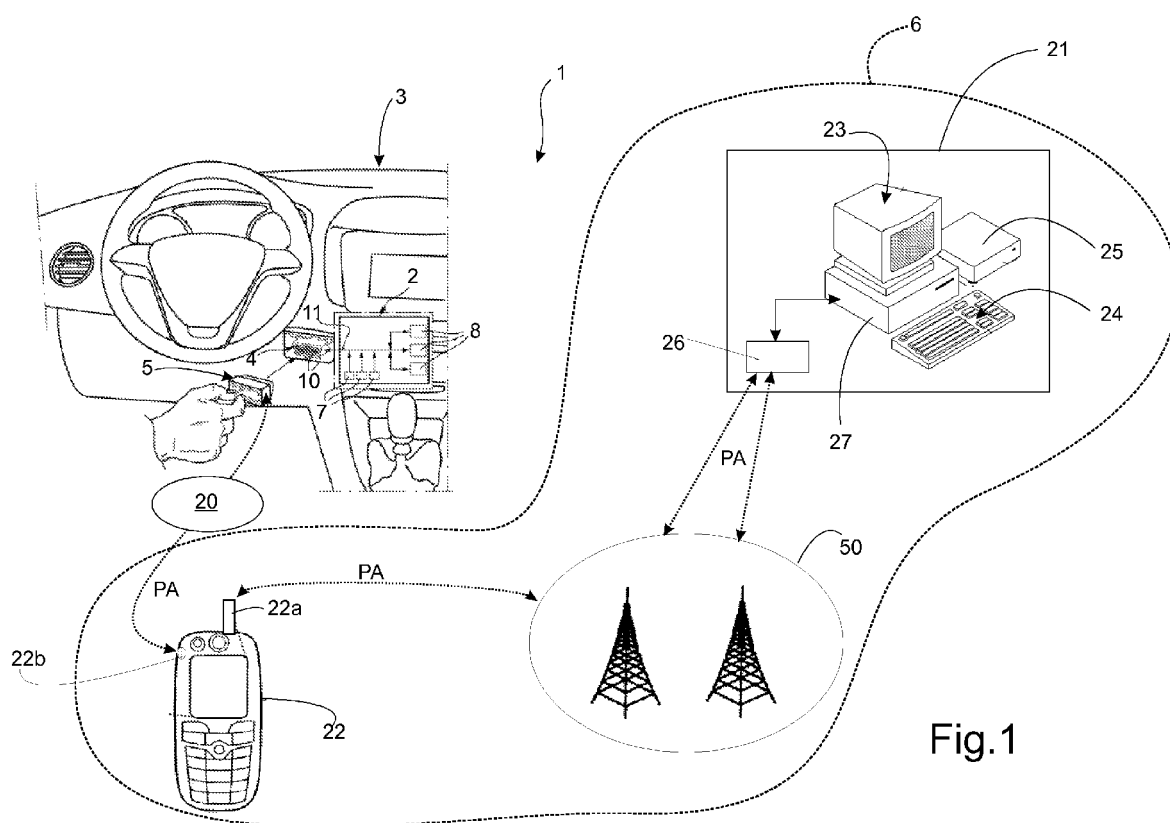
6. A system according to any one of the preceding claims, wherein said programming profile (PA) comprises an auxiliary vehicle-control program; said portable communication apparatus (22) being designed to implement said auxiliary vehicle-control program so as to enable a user to select vehicle-user commands, and being configured to transmit the vehicle-user commands through said short-range wireless communication system (20); an on-board diagnostic module (5) being designed to implement said auxiliary vehicle-control program for receiving the vehicle-user commands and is configured to provide the vehicle-user commands to the vehicle (3) through the diagnostic device (2).

7. A system according to any one of Claims 1 to 5, wherein said programming profile (PA) comprises an auxiliary data-acquisition program; said portable communication apparatus (22) being designed to implement said auxiliary data-acquisition program for receiving from a user a request for acquisition of a type of vehicle data and being configured to transmit said request through said short-range wireless communication system (20); said on-board diagnostic module (5) being designed to implement said auxiliary data-acquisition program for receiving said request and being configured in such a way as to acquire the vehicle data on the basis of said request.

8. A system according to Claim 6 or Claim 7, wherein said auxiliary vehicle-control program is configured in such a way that, when it is implemented by said portable communication apparatus (22), it enables the latter to receive the vehicle data acquired by the on-board diagnostic module (5), to communicate the vehicle data acquired to the user, and/or to implement on the vehicle data themselves a vehicle diagnostics so as to communicate to the user the result of the vehicle diagnostics itself.

9. The system according to any one of the preceding claims, wherein said short-range wireless communication is a Bluetooth communication.

10. The system according to any one of the preceding claims, wherein said on-board diagnostic module (5) is an OBD diagnostic module or an E-OBD diagnostic module or an OBD-II diagnostic module.



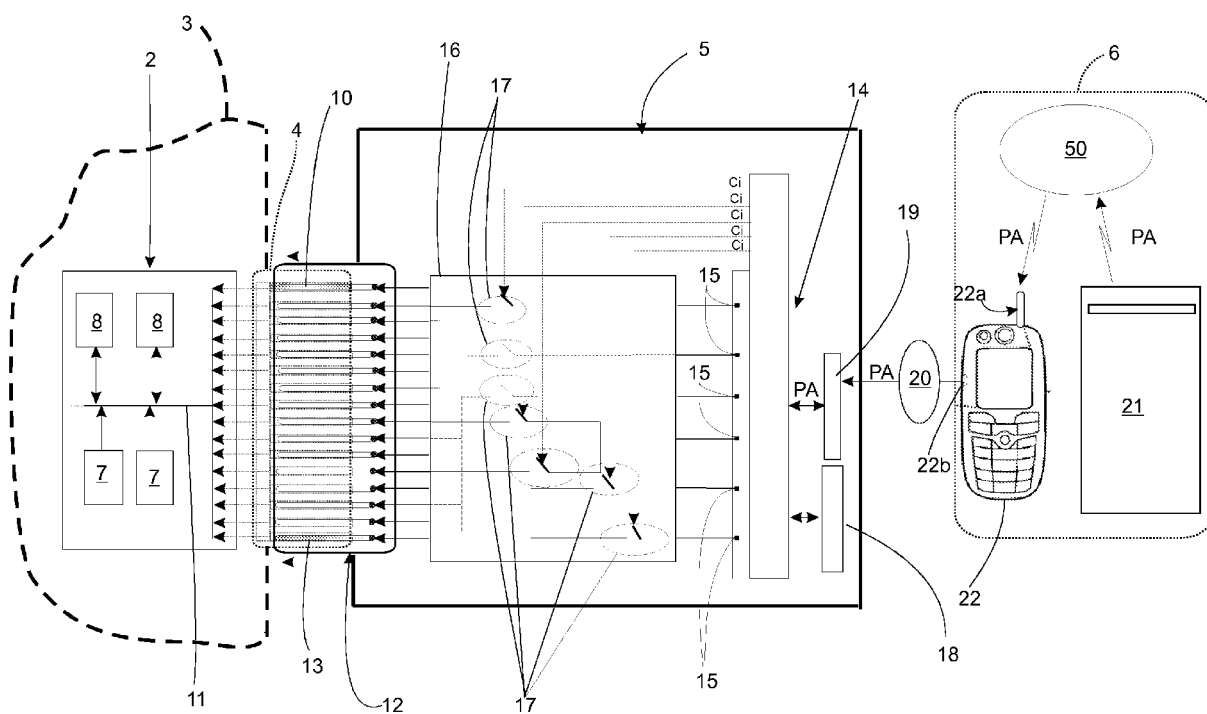
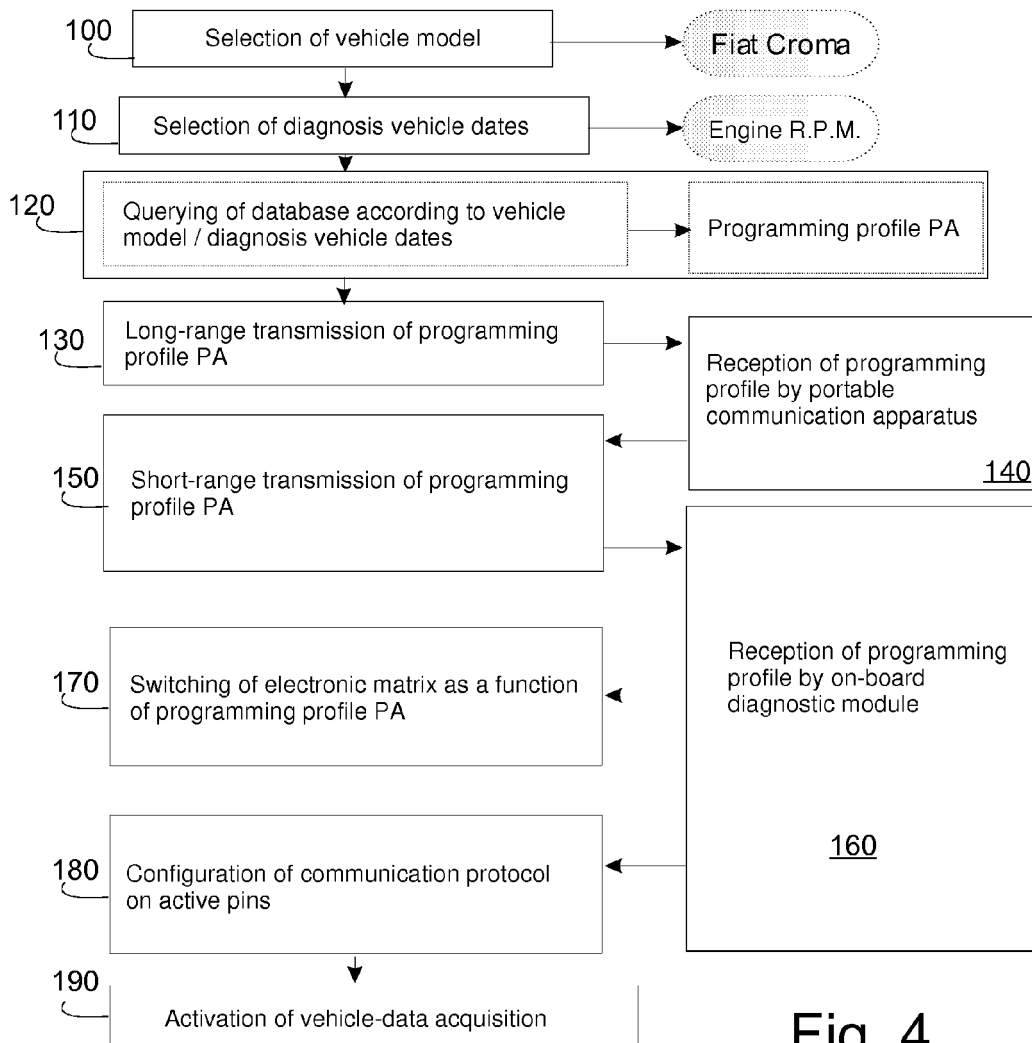
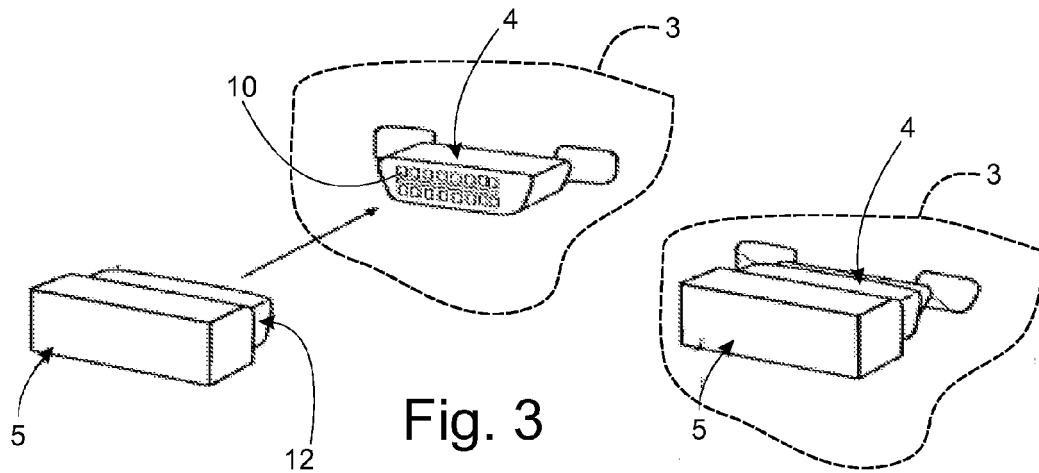


Fig. 2



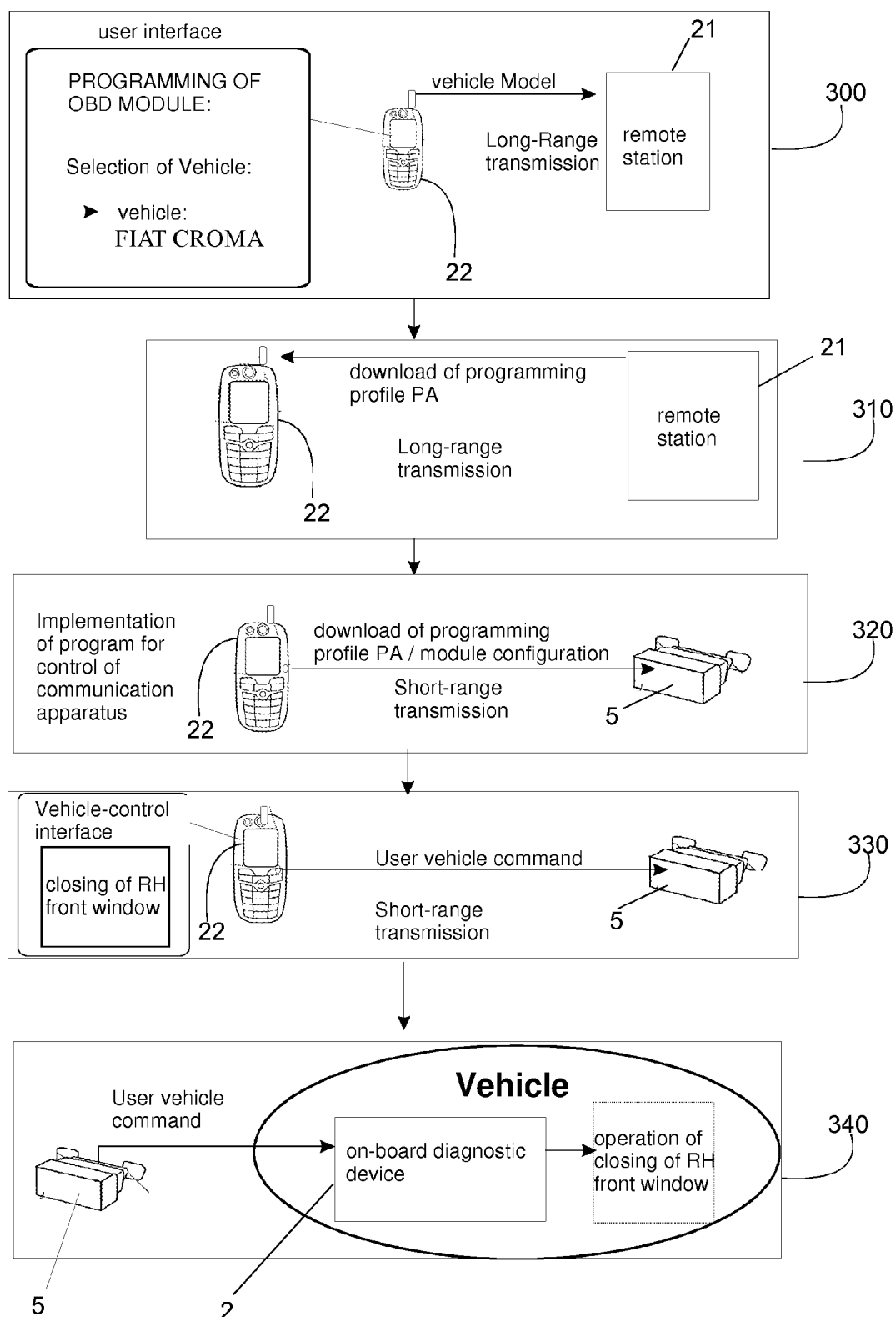


Fig.5



EUROPEAN SEARCH REPORT

Application Number
EP 10 17 7504

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