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(54) **METHOD AND APPARATUS FOR CONTROLLING ELECTRIC FUEL PUMP, DEVICE, AND STORAGE MEDIUM**

(57) A method for controlling an electric fuel pump is provided, including: acquiring control parameters of an electric fuel pump (410) in a case that a power-on event has been monitored (S110); and in response to the control parameters including a fuel-tank fuel amount and an accumulated mileage, determining, according to at least

one of the fuel-tank fuel amount and the accumulated mileage, whether to control the electric fuel pump to work (S120). An apparatus for controlling an electric fuel pump, an electronic device, and a computer-readable storage medium are further disclosed.

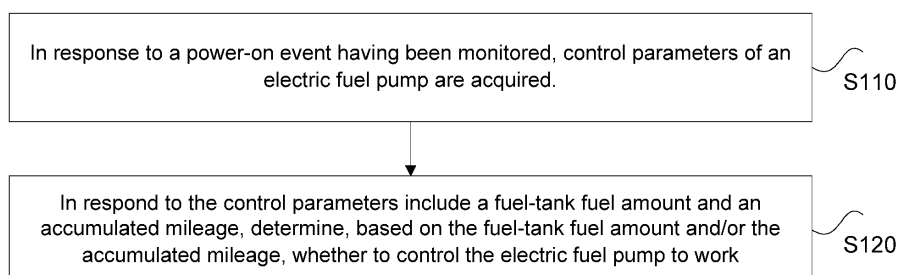


Fig.1A

Description**Cross-Reference to Related Application**

[0001] This application claims priority to Chinese Patent Application No. 202110973043.8, filed with the China National Intellectual Property Administration on Tuesday, August 24, 2021, the disclosure of which is incorporated herein by reference in its entirety.

Technical Field

[0002] Embodiments of the present application relate to the technical field of computers, for example, to a method and apparatus for controlling an electric fuel pump, a device, and a storage medium.

Background

[0003] During production and assembling processes of vehicles, the vehicles need to be powered on to carry out electronic and electrical inspection. Moreover, fuel is usually only filled into fuel tanks after the electronic and electrical inspection is performed on the vehicles.

[0004] However, at present, a controller controls an electric fuel pump to operate as long as the vehicle is powered on. If there is no fuel in the fuel tank, the fuel pump will be in a dry operation state, which will affect the service life of the fuel pump. Therefore, there is an urgent need for a new control logic for the electric fuel pump.

Summary

[0005] Embodiments of the present application provide a method and apparatus for controlling an electric fuel pump, a device, and a storage medium, so as to avoid influence on the service life of the fuel pump.

[0006] According to a first aspect, the embodiments of the present application provide a method for controlling an electric fuel pump. The method includes:

in response to a power-on event having been monitored, acquiring control parameters of an electric fuel pump; and

in response to the control parameters including a fuel-tank fuel amount and an accumulated mileage, determining, according to at least one of the fuel-tank fuel amount and the accumulated mileage, whether to control the electric fuel pump to work.

[0007] According to a second aspect, the embodiments of the present application provide an apparatus for controlling an electric fuel pump. The apparatus includes:

a control parameter determining module, configured to: in a case that a power-on event has been monitored,

acquire control parameters of an electric fuel pump; and

a control module, configured to: in response to the control parameters including a fuel-tank fuel amount and an accumulated mileage, determine, according to at least one of the fuel-tank fuel amount and the accumulated mileage, whether to control the electric fuel pump to work.

[0008] According to a third aspect, the embodiments of this application provide an electronic device. The electronic device includes:

at least one processor; and

a memory, configured to store at least one program,

wherein when the at least one program is executed by the at least one processor, the at least one processor is caused to implement the method for controlling the electric fuel pump as described in any embodiment of the present application.

[0009] According to a fourth aspect, the embodiments of the present application further provide a computer-readable storage medium, storing a computer program. The program, when executed by a processor, implements the method for controlling the electric fuel pump as described in any embodiment of the present application.

Brief Description of the Drawings

[0010]

FIG. 1A is a flowchart of a method for controlling an electric fuel pump according to Embodiment I of the present application;

FIG. 1B is a schematic diagram of a low-pressure fuel control system according to Embodiment I of the present application;

FIG. 2 is a flowchart of a method for controlling an electric fuel pump according to Embodiment II of the present application;

FIG. 3 is a structural block diagram of an apparatus for controlling an electric fuel pump according to Embodiment III of the present application; and

FIG. 4 is a schematic structural diagram of an electronic device according to Embodiment IV of the present application.

Detailed Description of the Embodiments

[0011] The present application will be explained below in detail in conjunction with the accompanying drawings and embodiments.

Embodiment I

[0012] FIG. 1A is a flowchart of a method for controlling an electric fuel pump according to Embodiment I of the present application. This embodiment is applicable to controlling the electric fuel pump in a scene where a vehicle is in production and assembling processes, and is also applicable to controlling the electric fuel pump in a scene where a vehicle is put into use or repaired after leaving the factory. The method can be performed by an apparatus for controlling an electric fuel pump. The apparatus can be implemented in software and/or hardware, and can be configured in a vehicle-mounted device that needs to control the electric fuel pump, such as a low-pressure fuel control system. The low-pressure fuel control system is composed of a low-pressure fuel pump controller 420, a variable low-pressure electric fuel pump 410, a low-pressure fuel pressure sensor, an Engine Control Unit (ECU), a fuel pipeline, a fuel tank, and a Controller Area Network (CAN) bus signal acquisition unit 430. As shown in FIG. 1B, the CAN bus signal acquisition unit 430 transmits data to the ECU; a storage battery provides power to the ECU and the low-pressure fuel pump controller; the ECU sends a Pulse Width Modulation (PWM) signal to the low-pressure fuel pump controller; the low-pressure fuel pump controller controls the electric fuel pump 410 in the fuel tank to work, thereby providing fuel for an engine; and the low-pressure fuel pressure sensor transmits a fuel pressure value to the ECU.

[0013] As shown in FIG. 1A, the method can include: S110. In a case that a power-on event has been monitored, control parameters of the electric fuel pump are acquired.

[0014] The power-on event can refer to a complete-vehicle power-on event of a vehicle in production and assembling processes, or can be a complete-vehicle power-on event in a use or maintenance process after a vehicle is put into the market. The control parameters refer to parameters indicating whether to control the electric fuel pump to work, and can include a fuel-tank fuel amount and an accumulated mileage. The fuel-tank fuel amount refers to a current amount of fuel in the fuel tank. The accumulated mileage refers to a current mileage that the vehicle runs.

[0015] In this embodiment, if the power-on event has been monitored in the production and assembling processes of the vehicle, or in the use or maintenance process after the vehicle leaves the factory, the ECU acquires the control parameters of the electric fuel pump through the data acquisition unit. The data acquisition unit can include the CAN bus signal acquisition unit.

[0016] S120. If the control parameters include a fuel-tank fuel amount and an accumulated mileage, whether to control the electric fuel pump to work is determined according to the fuel-tank fuel amount and/or the accumulated mileage.

[0017] Optionally, if the control parameters include a fuel-tank fuel amount and an accumulated mileage, whether to control the electric fuel pump to work can be determined according to the fuel-tank fuel amount. Exemplarily, in response to the fuel-tank fuel amount being greater than a first calibration value, the electric fuel pump is controlled to work. In response to the fuel-tank fuel amount being less than or equal to the first calibration value, the electric fuel pump is controlled to not work. The first calibration value can be set by a person skilled in the art according to an actual situation.

[0018] Optionally, if the control parameters include a fuel-tank fuel amount and an accumulated mileage, whether to control the electric fuel pump to work can be determined according to the accumulated mileage. Exemplarily, in response to the accumulated mileage being greater than a second calibration value, the electric fuel pump is controlled to work. In response to the accumulated mileage being less than or equal to a second calibration value, the electric fuel pump is controlled to not work. The second calibration value can be set by a person skilled in the art according to an actual situation.

[0019] Optionally, if the control parameters include a fuel-tank fuel amount and an accumulated mileage, whether to control the electric fuel pump to work can also be determined according to the fuel-tank fuel amount and the accumulated mileage. Exemplarily, in response to the fuel-tank fuel amount being greater than a first calibration value and the accumulated mileage being greater than a second calibration value, the electric fuel pump is controlled to work. The first calibration value and the second calibration value can be set by a person skilled in the art according to an actual situation.

[0020] Exemplarily, controlling the electric fuel pump to work can be achieved by acquiring an actual fuel pressure value of the fuel pipeline. The fuel pipeline can be a low-pressure fuel pipeline. The actual fuel pressure value refers to an actual fuel pressure value of the fuel pipeline. Exemplarily, the ECU can read the actual fuel pressure value of the fuel pipeline in real time through the low-pressure fuel pressure sensor, and a corresponding duty ratio signal is generated according to a comparison result between the actual fuel pressure value and a target fuel pressure value after the actual fuel pressure value is acquired. The target fuel pressure value refers to a pressure that the fuel pipeline needs to reach. The duty ratio signal can be a PWM signal. Exemplarily, a difference value between the actual fuel pressure value and the target fuel pressure value determines a magnitude of the duty ratio signal. The actual fuel pressure value is much less than the target fuel pressure. If the difference value between the actual fuel pressure value and the target fuel pressure value is larger,

the duty ratio signal is larger. It should be noted that when the actual fuel pressure value is greater than or equal to the target fuel pressure value, a minimum duty ratio signal is generated.

[0021] After the duty ratio signal is acquired, the low-pressure fuel pump controller is controlled to generate a voltage signal according to the duty ratio signal, and the voltage signal is transmitted to the electric fuel pump to enable the electric fuel pump to work. Exemplarily, the duty ratio signal is transmitted to the low-pressure fuel pump controller; the low-pressure fuel pump controller generates the voltage signal according to the duty ratio signal; and the voltage signal is transmitted to the electric fuel pump to enable the electric fuel pump to work. When the duty ratio signal is the minimum, the minimum duty ratio signal is transmitted to the low-pressure fuel pump controller, and the low-pressure fuel pump controller generates the corresponding voltage signal; and even if the low-pressure fuel pump controller transmits the corresponding voltage signal to the electric fuel pump, the electric fuel pump will not work.

[0022] The ECU dynamically adjusts the duty ratio signal by monitoring a change in a fuel pressure of the fuel pipeline in real time through the low-pressure fuel pressure sensor, so as to dynamically adjust a rotating speed of the electric fuel pump, which achieves closed-loop control, on-demand fuel supplying, and energy-saving noise reduction.

[0023] The technical solutions of the embodiments of the present application only determines whether to control the electric fuel pump to work when the complete vehicle is powered on. When the vehicle receives a start request and an engine starts to run, the ECU will control the electric fuel pump to work regardless of whether a condition of the fuel-tank fuel amount or a condition of the accumulated mileage is satisfied, which ensures a successful start of the engine.

[0024] According to the technical solutions of the embodiments of the present application, control parameters of an electric fuel pump are acquired in a case that a power-on event has been monitored; the control parameters include a fuel-tank fuel amount and an accumulated mileage; and whether to control the electric fuel pump to work is determined according to the fuel-tank fuel amount and/or the accumulated mileage. The above technical solutions effectively solve the problem of fuel pump erosion and play a good protection role in the fuel pump. Meanwhile, on the premise of ensuring that a production process and constitutions of the low-pressure fuel system do not change, control of the work of the electric fuel pump can be achieved according to the fuel-tank fuel amount and/or the accumulated mileage, which saves the costs of process adjustment and system change, and provides a new idea for the control of the electric fuel pump.

[0025] On the basis of the above embodiments, as an optional implementation of the embodiments of the present application, if the control parameters include the

fuel-tank fuel amount or the accumulated mileage, a missing parameter is determined. The missing parameter refers to a parameter missing in the control parameters. Exemplarily, if the acquired control parameters of the electric fuel pump only include the fuel-tank fuel amount, the missing parameter is the accumulated mileage; and if the acquired control parameters of the electric fuel pump only include the accumulated mileage, the missing parameter is the fuel-tank fuel amount.

[0026] After the missing parameter is determined, a control parameter acquisition instruction of a set cycle is sent to a data acquisition unit. The data acquisition unit refers to an acquisition unit that acquires the fuel-tank fuel amount and the accumulated mileage, and can be the CAN bus signal acquisition unit. The control parameter acquisition instruction refers to a control instruction for acquiring parameters, and can exist in the form of a code. The set cycle can be set by a person skilled in the art according to an actual situation. For example, it can be three cycles.

[0027] Exemplarily, the ECU sends the control parameter acquisition instruction of the set cycle to the CAN bus signal acquisition unit. If the missing parameter is the fuel-tank fuel amount, the ECU sends a fuel-tank fuel amount parameter acquisition instruction of a set cycle to the CAN bus signal acquisition unit. If the missing parameter is the accumulated mileage, the engine control unit sends an accumulated mileage parameter acquisition instruction of a set cycle to the CAN bus signal acquisition unit.

[0028] After the control parameter acquisition instruction of the set cycle is sent to the data acquisition unit, if the ECU identifies that all control parameters acquired by the data acquisition unit within the set cycle do not include the missing parameter, the electric fuel pump is forbidden to work; and in response to the ECU identifying that all control parameters acquired by the data acquisition unit within the set cycle include the missing parameter, the electric fuel pump is controlled to work. Exemplarily, within the set cycle, if the engine control unit identifies that all the control parameters acquired by the data acquisition unit within the set cycle do not include the missing parameter, fault information is generated to forbid the electric fuel pump to work. Further, a fault prompt is sent to a user terminal according to the fault information for timely troubleshooting.

[0029] By identifying whether there is the missing parameter in the control parameters within the set cycle, the electric fuel pump can be more effectively controlled to work, so as to play a protection role in the electric fuel pump.

Embodiment II

[0030] FIG. 2 is a flowchart of a method for controlling an electric fuel pump according to Embodiment II of the present application. Based on the above embodiment, an optional implementation scheme is provided for de-

tailing "whether to control the electric fuel pump to work is determined according to at least one of the fuel-tank fuel amount and the accumulated mileage".

[0031] As shown in FIG. 2, the method may include:

S210. In a case that a power-on event has been monitored, control parameters of the electric fuel pump are acquired.

S220. A required parameter for controlling the electric fuel pump to work is determined from a fuel-tank fuel amount and an accumulated mileage according to a current scene where a vehicle is located.

[0032] The current scene where the vehicle is located can be a scene where the vehicle is in production and assembling processes, or a scene where the vehicle is put on the market after leaving the factory.

[0033] Optionally, if the vehicle is currently in the scene where the vehicle is in the production and assembling processes, as the vehicle has not been put on the market, the accumulated mileage may be low. Therefore, the fuel-tank fuel amount can be used as the required parameter for controlling the electric fuel pump to work.

[0034] Optionally, if the vehicle is currently in the scene where the vehicle is put on the market after leaving the factory, in a case that the fuel-tank fuel amount is less than a first calibration value, in order to ensure a successful start of an engine and improve the user experience, the accumulated mileage can be used as the required parameter for controlling the electric fuel pump to work.

[0035] Optionally, the fuel-tank fuel amount and accumulated mileage can be used as the required parameters for controlling the electric fuel pump to work according to the current scene where the vehicle is located, and priorities are set for the fuel-tank fuel amount and the accumulated mileage of the control parameters. For example, if the vehicle is currently in the scene where the vehicle is in the production and assembling processes, the fuel-tank fuel amount can be set to be at a first priority, and the accumulated mileage can be set to be at a second priority. For another example, if the vehicle is currently in the scene where the vehicle is put on the market after leaving the factory, the accumulated mileage can be set to be at a first priority, and the fuel-tank fuel amount can be set to be at a second priority.

[0036] Optionally, the fuel-tank fuel amount and accumulated mileage can be used as the required parameters for controlling the electric fuel pump to work according to the current scene where the vehicle is located, and weights are set for the fuel-tank fuel amount and the accumulated mileage of the control parameters. The weights can include a first weight and a second weight. The first weight is used for controlling an extent to which the fuel-tank fuel amount is a required parameter, and the second weight is used for controlling an extent to which the accumulated mileage is a required parameter.

The first weight and the second weight can be flexibly set by a person skilled in the art according to the current scene where the vehicle is located. For example, if the vehicle is currently in the scene where the vehicle is in the production and assembling processes, the first weight of the fuel-tank fuel amount can be set to be larger, and the second weight of the accumulated mileage can be set to be smaller. For another example, if the vehicle is currently in the scene where the vehicle is put on the market after leaving the factory, the second weight of the accumulated mileage can be set to be larger, and the first weight of the fuel-tank fuel amount can be set to be smaller.

[0037] S230. Whether to control the electric fuel pump to work is determined according to the required parameter.

[0038] Optional, in response to the required parameter being the fuel-tank fuel amount, whether to control the electric fuel pump to work is determined according to the fuel-tank fuel amount. Exemplarily, in response to the fuel-tank fuel amount being greater than a first calibration value, the electric fuel pump is controlled to work.

[0039] Optionally, in response to the required parameter being the accumulated mileage, whether to control the electric fuel pump to work is determined according to the accumulated mileage. Exemplarily, in response to the accumulated mileage being greater than a second calibration value, the electric fuel pump is controlled to work.

[0040] Optional, in response to the required parameter being the fuel-tank fuel amount and the accumulated mileage, whether to control the electric fuel pump to work is determined according to the fuel-tank fuel amount and the accumulated mileage. Exemplarily, in response to the fuel-tank fuel amount being greater than a first calibration value and the accumulated mileage being greater than a second calibration value, the electric fuel pump is controlled to work.

[0041] Exemplarily, controlling the electric fuel pump to work can be achieved by acquiring an actual fuel pressure value of the fuel pipeline. The fuel pipeline can be a low-pressure fuel pipeline. Exemplarily, the ECU can read the actual fuel pressure value of the fuel pipeline in real time through the low-pressure fuel pressure sensor, and generate a corresponding duty ratio signal according to a comparison result between the actual fuel pressure value and a target fuel pressure value after acquiring the actual fuel pressure value. The target fuel pressure value refers to a pressure that the fuel pipeline needs to reach. The duty ratio signal can be a PWM signal. Exemplarily, a difference value between the actual fuel pressure value and the target fuel pressure value determines a magnitude of the duty ratio signal. If the actual fuel pressure value is much less than the target fuel pressure, the difference value between the actual fuel pressure value and the target fuel pressure value is larger, and the duty ratio signal is larger. It should be noted that when the actual

fuel pressure value is greater than or equal to the target fuel pressure value, a minimum duty ratio signal is generated.

[0042] After the duty ratio signal is acquired, the low-pressure fuel pump controller is controlled to generate a voltage signal according to the duty ratio signal, and the voltage signal is transmitted to the electric fuel pump to enable the electric fuel pump to work. Exemplarily, the ECU transmits the duty ratio signal to the low-pressure fuel pump controller; the low-pressure fuel pump controller generates the voltage signal according to the duty ratio signal; and the voltage signal is transmitted to the electric fuel pump to enable the electric fuel pump to work. When the duty ratio signal is the minimum, the ECU transmits the minimum duty ratio signal to the low-pressure fuel pump controller, and the low-pressure fuel pump controller generates the corresponding voltage signal; and even if the low-pressure fuel pump controller transmits the corresponding voltage signal to the electric fuel pump, the electric fuel pump will not work.

[0043] According to the technical solutions of the embodiments of the present application, in a case that a power-on event has been monitored, control parameters of the electric fuel pump are acquired; and afterwards, a required parameter for controlling the electric fuel pump to work is determined from a fuel-tank fuel amount and an accumulated mileage according to a current scene where a vehicle is located, so that whether to control the electric fuel pump to work is determined according to the required parameter. According to the above technical solutions, in conjunction with the scene where the vehicle is located, the required parameter for controlling the electric fuel pump to work is set and determined, thereby determining whether the electric fuel pump works, so that the control of the electric fuel pump is more flexible, and the service life of the electric fuel pump is prolonged while a requirement of a user is met.

Embodiment III

[0044] FIG. 3 is a structural block diagram of an apparatus for controlling an electric fuel pump according to Embodiment III of the present application. This embodiment is applicable to controlling the electric fuel pump in a scene where a vehicle is in production and assembling processes, and is also applicable to controlling the electric fuel pump in a scene where a vehicle is put into use or repaired after leaving the factory. The apparatus can be implemented in software and/or hardware, and can be configured in a computing device that needs to control the electric fuel pump, such as an ECU.

[0045] As shown in FIG. 3, the apparatus can include a control parameter determining module 310 and a control module 320.

[0046] The control parameter determining module 310 is configured to: in a case that a power-on event has been monitored, acquire control parameters of an electric fuel pump; and

the control module 320 is configured to: in response to the control parameters including a fuel-tank fuel amount and an accumulated mileage, determine, according to at least one of the fuel-tank fuel amount and the accumulated mileage, whether to control the electric fuel pump to work.

[0047] According to the technical solutions of the embodiments of the present application, control parameters of an electric fuel pump are acquired in a case that a power-on event has been monitored; and afterwards, in response to the control parameters including a fuel-tank fuel amount and an accumulated mileage, whether to control the electric fuel pump to work is determined according to the fuel-tank fuel amount and/or the accumulated mileage. The above technical solutions effectively solve the problem of fuel pump erosion and play a good protection role in the fuel pump. Meanwhile, on the premise of ensuring that a production process and constitutions of the low-pressure fuel system do not change, control of the work of the electric fuel pump can be achieved according to the fuel-tank fuel amount and/or the accumulated mileage, which saves the costs of process adjustment and system change, solves the problem of erosion of the electric fuel pump, plays a good protection role in the electric fuel pump, and provides a new idea for the control of the electric fuel pump.

[0048] Exemplarily, the control module 320 is configured to:

determine, from the fuel-tank fuel amount and the accumulated mileage according to a current scene where a vehicle is located, a required parameter for controlling the electric fuel pump to work; and determine, according to the required parameter, whether to control the electric fuel pump to work.

[0049] Exemplarily, the control module 320 is configured to:

in response to satisfying at least one of the fuel-tank fuel amount being greater than a first calibration value and the accumulated mileage being greater than a second calibration value, control the electric fuel pump to work.

[0050] Exemplarily, the control module 320 includes an actual fuel pressure value acquisition unit, a duty ratio information generation unit, and a control unit, wherein

the actual fuel pressure value acquisition unit is configured to acquire an actual fuel pressure value of a fuel pipeline;

the duty ratio information generation unit is configured to generate a corresponding duty ratio signal according to a comparison result between the actual fuel pressure value and a target fuel pressure value; and

the control unit is configured to: control a low-pressure fuel pump controller to generate a voltage signal

according to the duty ratio signal, and transmit the voltage signal to the electric fuel pump to enable the electric fuel pump to work.

[0051] Exemplarily, the apparatus further includes a missing parameter determining module and an instruction sending module, wherein

the missing parameter determining module is configured to: in response to the control parameters including the fuel-tank fuel amount or the accumulated mileage, determine a missing parameter;

the instruction sending module is configured to send a control parameter acquisition instruction of a set cycle to a data acquisition unit; and

the control module is further configured to: in response to identification that all control parameters acquired by the data acquisition unit within the set cycle do not include the missing parameter, forbid the electric fuel pump to work.

[0052] The aforementioned apparatus for controlling the electric fuel pump can perform the method for controlling the electric fuel pump provided by any embodiment of the present application and include the corresponding functional modules for performing the method.

Embodiment IV

[0053] FIG. 4 is a schematic structural diagram of an electronic device according to Embodiment IV of the present application. FIG. 4 shows a block diagram of an exemplary device suitable for implementing the implementations of the embodiments of the present application. The device shown in FIG. 4 is only an example and should not impose any limitations on the functionality and scope of use of the embodiments of the present application.

[0054] As shown in FIG. 4, an electronic device 12 is embodied in the form of a general-purpose computing device. Components of the electronic device 12 may include but are not limited to: at least one processor or a processing unit 16, a system memory 28, and a bus 18 for connecting different system components (including the system memory 28 and the processing unit 16).

[0055] The bus 18 represents at least one of several types of bus structures, including a memory bus or a memory controller, a peripheral bus, a graphics acceleration port, a processor, or a local bus using any of the various bus structures. For example, these system architectures include but are not limited to an Industry Standard Architecture (ISA) bus, a Micro Channel Architecture (MCA) bus, an enhanced ISA bus, a Video Electronics Standards Association (VESA) local area bus, and a Peripheral Component Interconnect (PCI) bus.

[0056] The electronic device 12 typically includes var-

ious computer system readable media. These media can be any available media that can be accessed by the electronic device 12, including volatile and non-volatile media, and removable and non-removable media.

[0057] The system memory 28 may include computer system readable media in the form of volatile memory, such as a Random Access Memory (RAM) 30 and/or a cache 32. The electronic device 12 may include other removable/immovable and volatile/non-volatile computer system storage media. As an example, the storage system 34 can be configured to read and write non-removable and non-volatile magnetic media (not shown in FIG. 4, commonly referred to as "hard disk drive"). Although not shown in FIG. 4, a disk drive for reading and writing removable non-volatile magnetic disks (such as "floppy disk"), as well as an optical drive for reading and writing removable non-volatile optical disks (such as a Compact Disk-Read Only Memory (CD-ROM), a Digital Versatile Disc-Read Only Memory (DVD-ROM), or other optical media) can be provided. In these cases, each drive can be connected to the bus 18 through at least one data medium interface. The system memory 28 may include at least one program product. The program product has a group of (for example, at least one) program modules configured to perform the functions of the various embodiments of the present application.

[0058] A program/utility tool 40 with a group of (or at least one) program modules 42 can be stored in, for example, the system memory 28, and the program modules 42 include but are not limited to an operating system, at least one application program, other program modules, and program data. Each or a certain combination of these examples may include an implementation of a network environment. The program modules 42 typically perform the functions and/or methods described in the embodiments of the present application.

[0059] The electronic device 12 can also communicate with at least one external device 14 (for example, a keyboard, a pointing device, and a display 24), and can also communicate with at least one device that enables a user to interact with the electronic device 12, and/or communicate with any device (such as a network card and a modem) that enables the electronic device 12 to communicate with at least one other computing device. This communication can be carried out through an Input/Output (I/O) interface 22. Moreover, the electronic device 12 can also communicate with at least one network (such as a Local Area Network (LAN), a Wide Area Network (WAN), and/or a public network, such as an Internet) through a network adapter 20. As shown in the figure, the network adapter 20 communicates with other modules of the electronic device 12 through the bus 18. It should be understood that although not shown in the figure, other hardware and/or software modules can be used in conjunction with the electronic device 12, including but not limited to: a microcode, a device driver, a redundant processing unit, an external disk drive array, a Redundant Arrays of Independent Disks (RAID) sys-

tem, a tape drive, a data backup storage system, and the like.

[0060] The processing unit 16 performs various functional applications and data processing by running the programs stored in the system memory 28, for example, implementing the method for controlling the electric fuel pump provided by the embodiments of the present application.

Embodiment V

[0061] The embodiments of the present application further provide a computer-readable storage medium, storing a computer program (or referred to as a computer-executable instruction). The program, when executed by a processor, can be used for performing the method for controlling the electric fuel pump provided by any one of the above embodiments of the present application. The method includes:

in a case that a power-on event has been monitored, acquiring control parameters of an electric fuel pump; and

in response to the control parameters including a fuel-tank fuel amount and an accumulated mileage, determining, according to at least one of the fuel-tank fuel amount and the accumulated mileage, whether to control the electric fuel pump to work.

[0062] The computer storage medium of the embodiments of the present application can use any combination of at least one computer-readable medium. The computer-readable medium can be a computer-readable signal medium or a computer-readable storage medium. The computer-readable storage medium can be, for example, but not limited to, electric, magnetic, optical, electromagnetic, infrared, or semiconductor systems, apparatuses, or devices, or any combination of the above. Examples of computer-readable storage media (a non-exhaustive list) include: an electrical connection with at least one wire, a portable computer disk, a hard disk drive, a RAM, a ROM, an Erasable Programmable Read-Only Memory (EPROM) or a flash memory, an optical fiber, a portable CD-ROM, an optical storage device, a magnetic storage device, or any suitable combination of the above. In this article, the computer-readable storage medium may be any tangible medium that contains or stores a program, and the program can be used by or in combination with an instruction execution system, apparatus, or device.

[0063] The computer-readable signal media may include data signals propagated in a baseband or as part of a carrier wave, which carries computer-readable program codes. The propagated data signals can be in various forms, including but not limited to: electromagnetic signals, optical signals, or any suitable combination of the above. The computer-readable signal medium may also be any computer-readable medium other than a

computer-readable storage medium. The computer-readable medium can send, propagate, or transmit programs for use by or in combination with an instruction execution system, apparatus, or device.

[0064] The program codes contained in the computer-readable medium can be transmitted using any suitable medium, including but not limited to: radio, a wire, an optical cable, a Radio Frequency (RF), and the like, or any suitable combination of the above.

[0065] Computer program codes for performing the operations of the embodiments of the present application may be written in one or more programming languages or a combination thereof. The above programming languages include an object-oriented programming language (such as Java, Smalltalk, and C++), and conventional procedural programming languages (such as "C" language or similar programming languages). The program codes may be executed entirely on a user computer, partly on a user computer, as a stand-alone software package, partly on a user computer and partly on a remote computer, or entirely on a remote computer or a server. In a case where a remote computer is involved, the remote computer can be connected to a user computer through any kind of networks, including a LAN or a WAN, or can be connected to an external computer (for example, through an Internet using an Internet service provider).

Claims

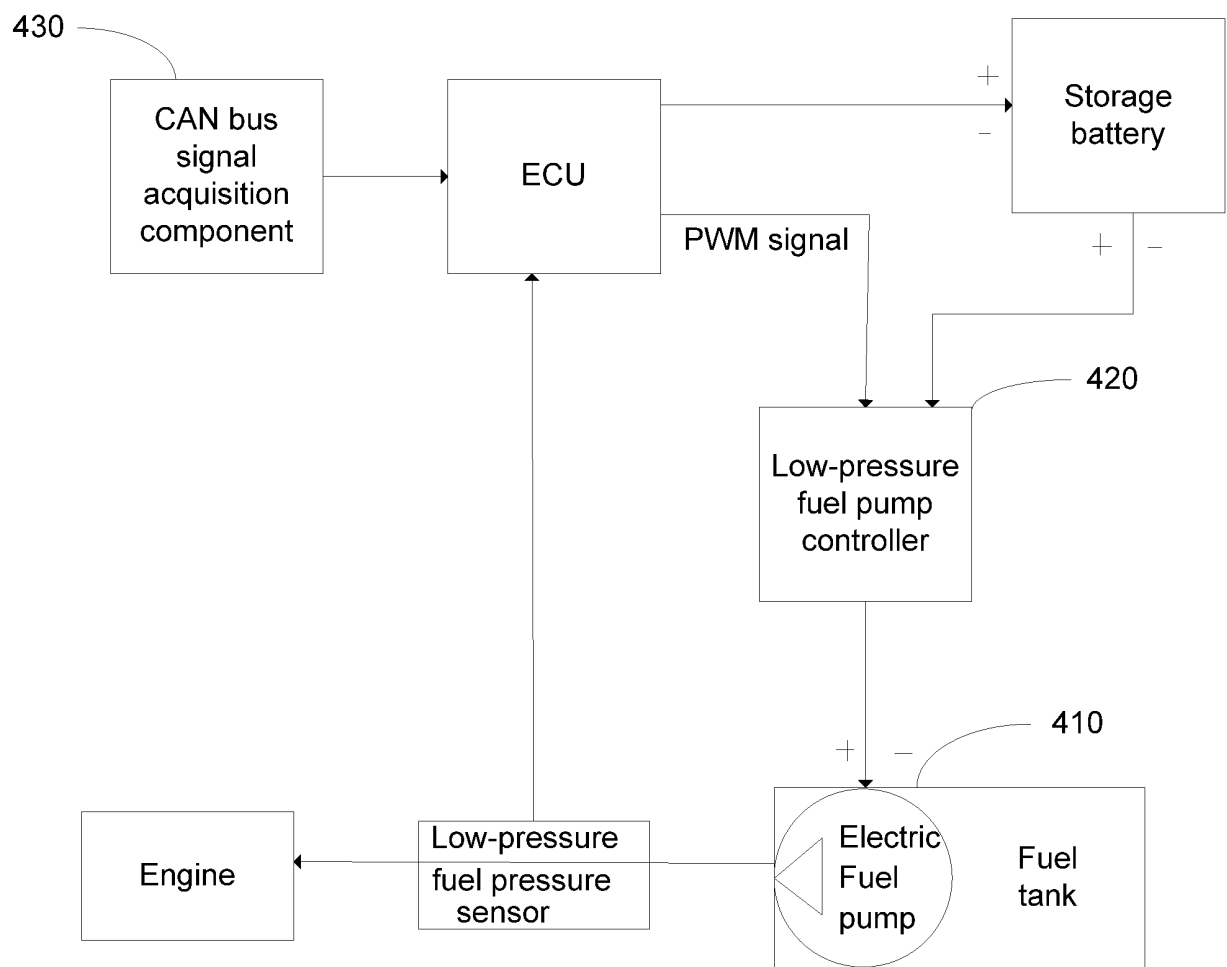
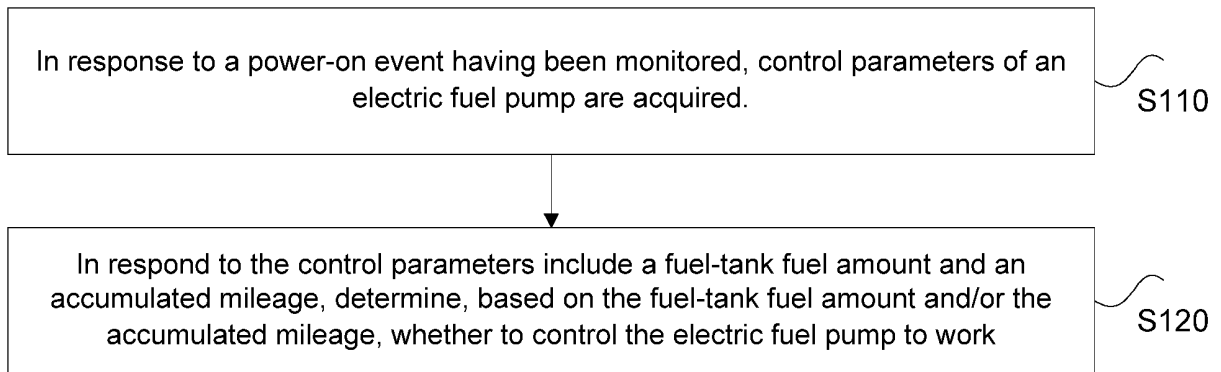
1. A method for controlling an electric fuel pump, comprising:

in response to a power-on event having been monitored, acquiring control parameters of an electric fuel pump (410); and
in response to the control parameters comprising a fuel-tank fuel amount and an accumulated mileage, determining, according to at least one of the fuel-tank fuel amount and the accumulated mileage, whether to control the electric fuel pump (410) to work.

2. The method according to claim 1, wherein the determining, according to at least one of the fuel-tank fuel amount and the accumulated mileage, whether to control the electric fuel pump (410) to work comprises:

determining, from the fuel-tank fuel amount and the accumulated mileage according to a current scene where a vehicle is located, a required parameter for controlling the electric fuel pump (410) to work; and
determining, according to the required parameter, whether to control the electric fuel pump (410) to work.

3. The method according to claim 1 or 2, wherein the determining, according to at least one of the fuel-tank fuel amount and the accumulated mileage, whether to control the electric fuel pump (410) to work comprises:
 - in response to satisfying at least one of the fuel-tank fuel amount being greater than a first calibration value and the accumulated mileage being greater than a second calibration value, controlling the electric fuel pump (410) to work.
4. The method according to claim 3, wherein the controlling the electric fuel pump (410) to work comprises:
 - acquiring an actual fuel pressure value of a fuel pipeline;
 - generating a corresponding duty ratio signal according to a comparison result between the actual fuel pressure value and a target fuel pressure value; and
 - controlling a fuel pump controller (420) to generate a voltage signal according to the duty ratio signal, and transmitting the voltage signal to the electric fuel pump (410) to enable the electric fuel pump (410) to work.
5. The method according to claim 1, further comprising:
 - in response to the control parameters comprising the fuel-tank fuel amount or the accumulated mileage, determining a missing parameter;
 - sending a control parameter acquisition instruction of a set cycle to a data acquisition unit (430); and
 - in response to identification that all control parameters acquired by the data acquisition unit (430) within the set cycle do not comprise the missing parameter, forbidding the electric fuel pump (410) to work.
6. An apparatus for controlling an electric fuel pump, comprising:
 - a control parameter determining module (310), configured to: in a case that a power-on event has been monitored, acquire control parameters of an electric fuel pump (410); and
 - a control module (320), configured to: in response to the control parameters comprising a fuel-tank fuel amount and an accumulated mileage, determine, according to at least one of the fuel-tank fuel amount and the accumulated mileage, whether to control the electric fuel pump (410) to work.
7. The apparatus according to claim 6, wherein the control module (320) is configured to:
 - determine, from the fuel-tank fuel amount and the accumulated mileage according to a current scene where a vehicle is located, a required parameter for controlling the electric fuel pump (410) to work; and
 - determine, according to the required parameter, whether to control the electric fuel pump (410) to work.
8. The apparatus according to claim 6 or 7, wherein the control module (320) is configured to:
 - in response to satisfying at least one of the fuel-tank fuel amount being greater than a first calibration value and the accumulated mileage being greater than a second calibration value, control the electric fuel pump (410) to work.
9. An electronic device, comprising:
 - at least one processor (16); and
 - a memory (28), configured to store at least one program,
 wherein when the at least one program is executed by the at least one processor (16), the at least one processor (16) is caused to implement the method for controlling the electric fuel pump according to any one of claims 1 to 5.
10. A computer-readable storage medium, wherein the computer-readable storage medium stores a computer program, and the computer program, when executed by a processor, implements the method for controlling the electric fuel pump according to any one of claims 1 to 5.



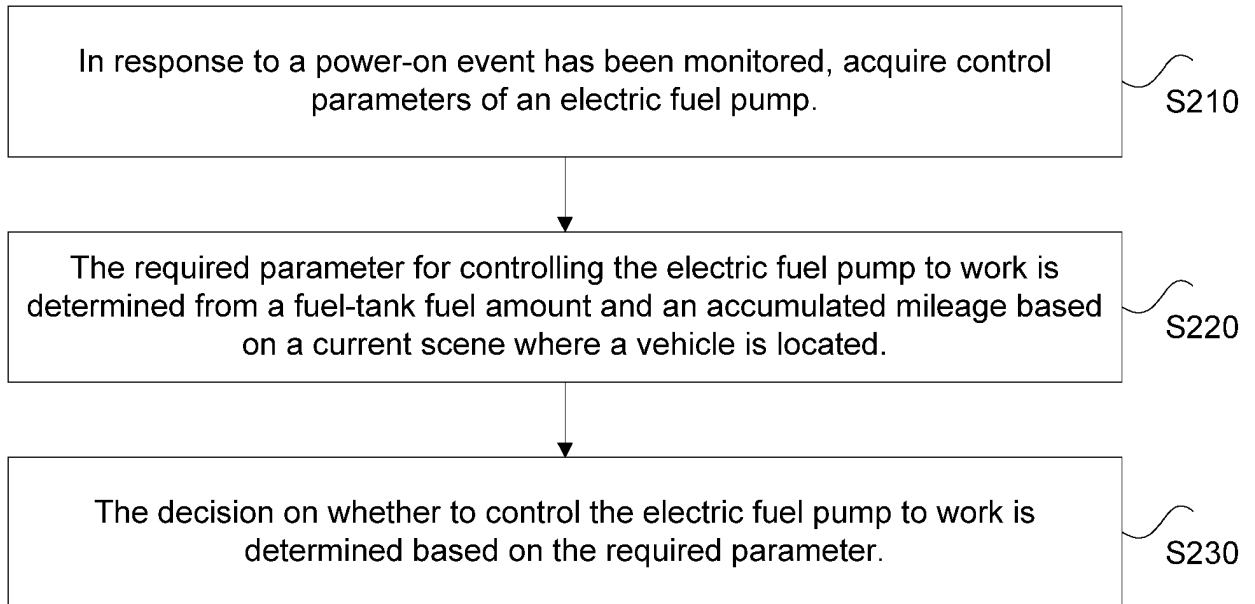


Fig.2

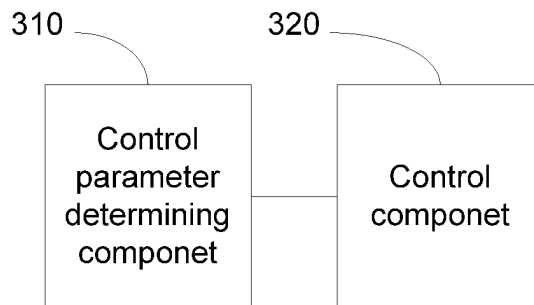


Fig.3

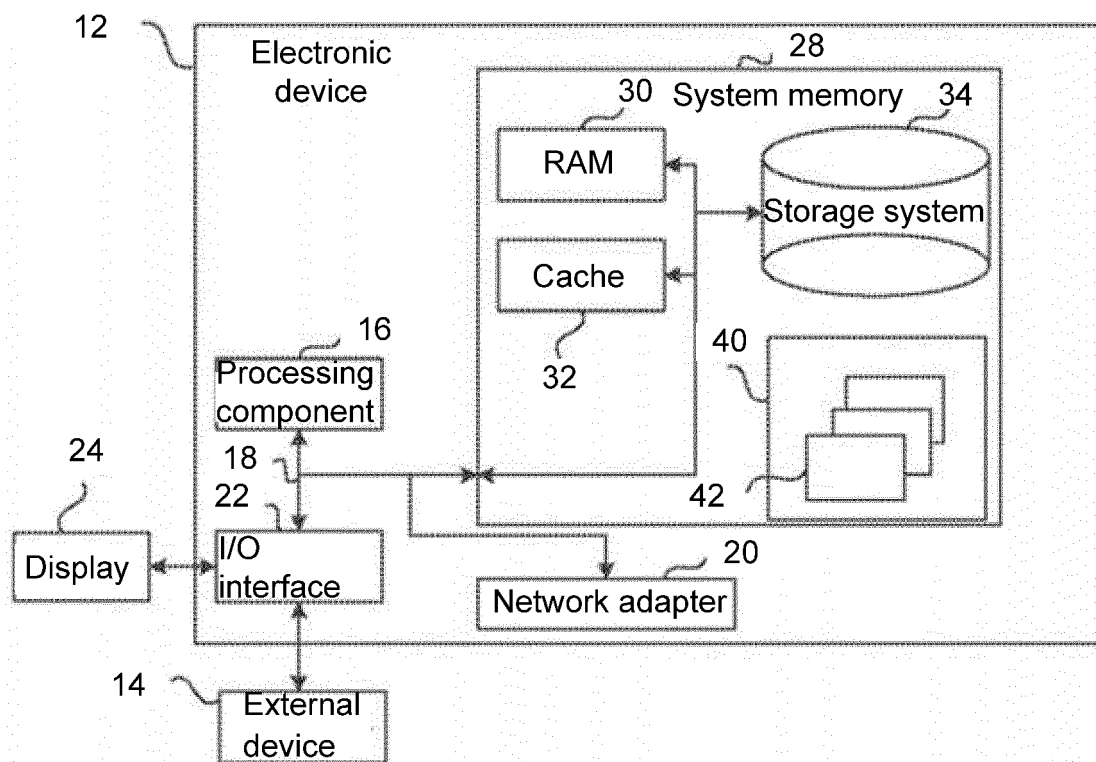


Fig.4

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2022/112653

A. CLASSIFICATION OF SUBJECT MATTER

F02D 41/32(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

F02D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNTXT, ENTXT, ENTXTC, CNKI: 油泵, 油量, 上电, 保护, pump, oil, level, electric+, protect+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 113685284 A (CHINA FAW CO., LTD.) 23 November 2021 (2021-11-23) claims 1-10	1-10
X	CN 111348031 A (ZHEJIANG GEELY AUTOMOBILE RESEARCH INSTITUTE CO., LTD. et al.) 30 June 2020 (2020-06-30) description, paragraphs [0044]-[0069], and figures 1-4	1-10
A	CN 101936232 A (GM GLOBAL TECHNOLOGY OPERATION) 05 January 2011 (2011-01-05) entire document	1-10
A	US 2020095948 A1 (DENSO CORP.) 26 March 2020 (2020-03-26) entire document	1-10

☐ Further documents are listed in the continuation of Box C.
 ☒ See patent family annex.

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"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

31 October 2022

Date of mailing of the international search report

17 November 2022

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2022/112653

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
CN 113685284 A	23 November 2021	None	
CN 111348031 A	30 June 2020	None	
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		US 2010326413 A1	30 December 2010
US 2020095948 A1	26 March 2020	JP 2020051286 A	02 April 2020

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REFERENCES CITED IN THE DESCRIPTION

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