

(19)



LE GOUVERNEMENT
DU GRAND-DUCHÉ DE LUXEMBOURG
Ministère de l'Économie

(11)

N° de publication :

LU508957

(12)

BREVET D'INVENTION

B1

(21)

N° de dépôt: LU508957

(51)

Int. Cl.:

B60L 1/00, H02J 1/00, H01M 4/00

(22)

Date de dépôt: 18/11/2024

(30)

Priorité:

30/04/2024 CN 202410541333.9

(72)

Inventeur(s):

CAI Lian – China, CAI Tao – China

(43)

Date de mise à disposition du public: 19/05/2025

(74)

Mandataire(s):

MARKS & CLERK LLP –
1017 LUXEMBOURG (Luxembourg)

(47)

Date de délivrance: 19/05/2025

(73)

Titulaire(s):

SHENZHEN KALAIFU TECHNOLOGY CO., LTD –
518100 Shenzhen (China)

(54)

AUTOMATIC ENERGY-SAVING CONTROL METHOD AND SYSTEM FOR EMERGENCY STARTING POWER SUPPLY OF AUTOMOBILE.

(57)

Provided are an automatic energy-saving control method and system for an emergency starting power supply of an automobile, which relate to the technical field of emergency power supply apparatuses. After detecting a starting instruction, firstly, the system discharges by using an initial starting current and records a discharge duration; when the discharge duration exceeds a threshold and the automobile is not successfully started, discharge is stopped; and then, the starting current is sequentially increased at a preset current increment to perform discharge until the automobile is successfully started or the current exceeds a threshold. By implementing the method and the system, an output current and a discharge duration can be automatically adjusted according to an actual demand of the automobile, so that not only can the electric energy be saved, but also the starting success rate can be increased by adjusting the current and the discharge time when the automobile is poorer in performance and difficult to start.

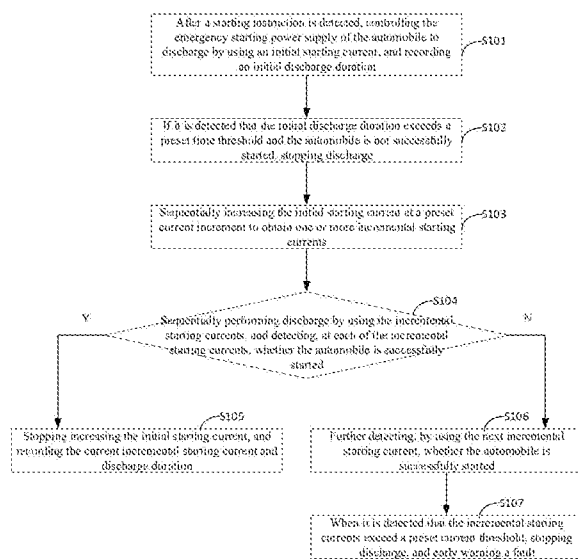


FIG. 1

5

[0001] The present application relates to the technical field of emergency power supply apparatuses, in particular to an automatic energy-saving control method and system for an emergency starting power supply of an automobile.

10

[0002] An emergency starting power supply of an automobile is a portable starting power supply which integrates power supply and charge functions. The main characterized function of such a power supply is to help the automobile start in an emergency when the automobile cannot be started due to power loss or other reasons. For example, when an automobile battery is underpower, an automobile owner can start the automobile by connecting the emergency starting power supply of the automobile. In this process, the emergency starting power supply will supply enough electric energy to the automobile, so that an engine of the automobile can normally run. However, the reason why this process can be performed smoothly mainly lies in a lithium ion battery inside the emergency starting power supply of the automobile. Such a battery has the characteristics such as high energy density, long life and high charge speed and can supply a great deal of electric energy within short time.

[0003] In the related art, when the automobile owner starts the automobile, the emergency starting power supply will detect voltage and current states of the automobile battery. If the battery is underpower, the emergency starting power supply will be started immediately, and electric energy is supplied to the automobile by means of the internal lithium ion battery. This process usually takes a few seconds to a few minutes, and the specific time depends on the

degree of power loss of the automobile battery and the capacity of the emergency starting power supply.

[0004] However, an output current and a discharge duration of a traditional emergency starting power supply of an automobile are generally constant (such as 200-400 A which lasts for 3 s).

5 However, in fact, there are differences in various performance parameters of automobile batteries manufactured in different automobile factories; such a double-constant power supply method of the emergency starting power supply is difficult to meet power supply demands of automobiles with different performances; for an automobile which is good in performance and easy to start, it is possible that a current and a duration exceed demands so as to be wasted; and
10 for an automobile which is poor in performance and difficult to start, it is possible that a voltage and a current cannot meet demands, so that the automobile cannot be successfully started.

SUMMARY

[0005] The present application provides an automatic energy-saving control method and
15 system for an emergency starting power supply of an automobile, by which an output current and a discharge duration can be automatically adjusted according to an actual demand of the automobile, so that not only can the electric energy be saved, but also the starting success rate can be increased by adjusting the current and the discharge time when the automobile is poorer in performance and difficult to start.

20 **[0006]** In a first aspect, the present application provides an automatic energy-saving control method for an emergency starting power supply of an automobile, which is applied to a control system for the emergency starting power supply of the automobile, wherein the method includes:

[0007] after a starting instruction is detected, controlling the emergency starting power supply of the automobile to discharge by using an initial starting current, and recording an initial
25 discharge duration;

[0008] if it is detected that the initial discharge duration exceeds a preset time threshold and

the automobile is not successfully started, stopping discharge;

LU508957

[0009] sequentially increasing the initial starting current at a preset current increment to obtain one or more incremental starting currents;

[0010] sequentially performing discharge by using the incremental starting currents, and

5 detecting, at each of the incremental starting currents, whether the automobile is successfully started;

[0011] if so, stopping increasing the initial starting current, and recording the current incremental starting current and discharge duration;

[0012] if not, further detecting, by using the next incremental starting current, whether the
10 automobile is successfully started; and

[0013] when it is detected that the incremental starting currents exceed a preset current threshold, stopping discharge, and early warning a fault.

[0014] In a second aspect, the present application provides a control system for an emergency starting power supply of an automobile, wherein the system includes one or more processors and
15 a memory;

[0015] the memory is coupled with the one or more processors, the memory is configured to store computer program codes, the computer program codes include computer instructions, and the one or more processors call the computer instructions so that the system can implement the automatic energy-saving control method for the emergency starting power supply of the
20 automobile in the above-mentioned embodiment, which is no longer repeated herein.

[0016] The present application has the following technical effects:

[0017] 1. By adaptively adjusting the starting current and the discharge duration, the system can automatically supply exact starting currents according to actual starting demands of different vehicles, thereby achieving energy saving while ensuring the starting success rate. For a vehicle
25 easy to start, a current and a duration can be prevented from being wasted; and for a vehicle difficult to start, a starting demand can be met by increasing the current and prolonging the time,

so that the practicability and energy utilization efficiency of the emergency starting power supply of the automobile are significantly improved, not only is the electric energy saved, but also the starting success rate of the automobile is increased.

[0018] 2. The system constructs a starting model on the basis of historical starting data of an engine, the starting model is used for real-time prediction of a current range required for starting the current vehicle, a lower limit of the range is used as the initial starting current, the starting current can be closer to an actual demand of the vehicle at the beginning, and thus, the starting efficiency and success rate can be further increased. A human-computer interaction link can also be introduced, information such as a starting current setting and a power supply state is displayed in real time by means of a display, a user is supported to manually adjust a current intensity and a power supply duration, at the same time, a voice recognition technology can also be used, so that the user can control starting parameters by means of a voice instruction. Such a human-computer cooperation method gives the user more rights to know and control rights, and the user can perform flexible adjustment according to experience and current situations.

[0019] 3. The system automatically detects the power of the emergency starting power supply, when the power is lower than a preset threshold, a vehicle-mounted battery is actively connected for charge, or a temperature of a battery of the emergency power supply is monitored in real time by means of a built-in temperature sensor in a starting process, once the temperature exceeds a safety threshold, a current is cut off immediately, and early warning is performed, so that the safety and reliability of the starting power supply are improved. In addition, the system can directly set the last optimal current as a new initial starting current when it is detected that the same vehicle is connected. Thus, the emergency starting power supply can constantly accumulate and deposit optimal starting parameters of each vehicle model, so that the starting efficiency and precision are constantly increased with the increase of the number of use.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020] FIG. 1 is a schematic diagram of one process of an automatic energy-saving control method for an emergency starting power supply of an automobile in an embodiment of the present application;

[0021] FIG. 2 is a schematic diagram of another process of an automatic energy-saving control method for an emergency starting power supply of an automobile in an embodiment of the present application;

[0022] FIG. 3 is a schematic diagram of a process that a system determines an initial starting current when an emergency starting power supply of an automobile is reconnected to a vehicle in an embodiment of the present application; and

[0023] FIG. 4 is a schematic diagram of a physical apparatus of a system in an embodiment of the present application.

DETAILED DESCRIPTION

[0024] Since a heavier current is required to drive an engine in a starting process of an automobile, demands of different automobile models and engine types on a starting current are also different. There is always a problem in traditional emergency starting power supplies of the automobile that their output currents and discharge durations are both constant, which cannot meet actual demands of the automobile on a starting current and a discharge duration well. This limitation often leads to start failure or power waste, which brings much inconvenience to automobile owners.

[0025] In order to solve the above-mentioned problem, the present application provides an automatic energy-saving control method and system for an emergency starting power supply of an automobile, by which after a starting instruction is detected, firstly, discharge can be performed by using an initial starting current, and a discharge duration is recorded; when the discharge duration exceeds a threshold and the automobile is not successfully started, discharge is stopped; and the starting current is sequentially increased at a preset increment to perform

discharge until the automobile is successfully started or the current exceeds a threshold.

LU508957

[0026] For facilitating understanding, a process of the method provided in the present embodiment will be described. Refer to FIG. 1 which is a schematic diagram of one process of an automatic energy-saving control method for an emergency starting power supply of an automobile in an embodiment of the present application.

[0027] S101, after a starting instruction is detected, the emergency starting power supply of the automobile is controlled to discharge by using an initial starting current, and an initial discharge duration is recorded.

[0028] Specifically, when receiving a starting instruction from a user, an emergency starting power supply system of an automobile will immediately control the emergency starting power supply of the automobile to begin to perform a discharge operation, and selects a preset initial current value to discharge to an automobile battery. This initial current is generally set according to the overall consideration on a common automobile starting current demand and a self-performance of the emergency starting power supply so as to meet starting demands of most of automobiles as much as possible without causing excessive loads on the power supply.

[0029] The system will also start a timer to record discharge lasting time, i.e., the initial discharge duration in real time while discharging. Generally, if the automobile can be successfully started within shorter time, it shows that the initial current basically meets a starting demand; and on the contrary, if the automobile cannot be started for a certain duration, the initial current may be too small, and the current needs to be further increased.

[0030] For example, a rated voltage of an emergency starting power supply is 12 V, a rated current thereof is 600 A, and an initial current selected by comprehensive evaluation is 200 A. When a user presses a starting button, the system begins to discharge to the automobile battery by using a 200 A constant current. At the same time, timing is started to record the discharge duration in real time, which provides the decision basis for the subsequent intelligent adjustment of the current.

[0031] S102, if it is detected that the initial discharge duration exceeds a preset time threshold and the automobile is not successfully started, discharge is stopped.

[0032] After discharging to the automobile battery for a period of time by using the initial starting current, the system needs to determine, according to a relationship between the discharge duration and the preset time threshold, whether a starting strategy needs to be adjusted. The preset time threshold is the longest allowable discharge time at the initial current. Usually, the time threshold is obtained according to statistic analysis for starting current demands of a large number of automobiles, and represents an upper limit of time required for successfully starting most of automobile models at this initial current. If an actual discharge duration exceeds this threshold, it means that the current current may be too small to start the automobile, and if discharge is further performed, electric energy will be wasted. Therefore, once timeout is monitored, the system will decisively stops discharge, thereby reducing the consumption of the electric energy.

[0033] For example, it is found by a large number of experimental statistics that 90% of automobiles can complete starting within 3 s at 200 A current. Therefore, the system sets the time threshold as 3 s. When the initial current is used for discharge, if an automobile has not successfully started after 3 s, the system will immediately stop the discharge and begin to perform an intelligent adjustment strategy on the next stage.

[0034] S103, sequentially increasing the initial starting current at a preset current increment to obtain one or more incremental starting currents.

[0035] When it is detected that the automobile cannot be successfully started within the required time by using the initial current, the system will automatically begin to adjust the starting current and find the most appropriate current value. Specifically, the system controls the emergency starting power supply of the automobile to gradually increase the current at a constant current increment on the basis of the initial current until the automobile is successfully started or an upper limit of the current is reached.

[0036] It should be noted that the current increment is a preset constant value which determines the amplitude of current adjustment performed every time. For the selection of the increment, the starting efficiency and the load of the power supply need to be comprehensively considered, the number of adjustments needs to be reduced as much as possible to increase the starting speed, and the situation that the current exceeds a safe range due to an excessive increase amplitude is avoided.

[0037] For example, the initial starting current of a certain emergency power supply is 200 A, and a current increment selected by evaluation is 50 A. After the initial current fails to start, the system will sequentially try to use an incremental current such as 250 A, 300 A and 350 A until the automobile is successfully started at last. In the whole process, the system may obtain one or more incremental starting current values which provide a plurality of options for the subsequent determination of the optimal starting current.

[0038] S104, discharge is sequentially performed by using the incremental starting currents, and it is detected, at each of the incremental starting currents, whether the automobile is successfully started.

[0039] After a series of incremental starting currents are determined, the system will control the emergency starting power supply of the automobile to perform starting attempt by sequentially using the determined incremental starting current values. Specifically, the system sequentially selects one of the incremental starting currents from small to large to discharge an automobile battery, and detects whether the automobile is successfully started within a preset time threshold corresponding to the incremental starting current value.

[0040] For example, for an automobile difficult to start, the system obtains three alternative incremental current values, i.e., 250 A, 300 A and 350 A, by step S103. Then, the system tries to start by successively using the three currents; if the automobile is not successfully started within the preset time threshold corresponding to the current value when the 250 A current is used, the incremental current value is adjusted as 300 A; and if the automobile is successfully started

when the 300 A current is used, it is unnecessary to further try to use a heavier current, and the system will mark 300 A as the optimal current used for starting this time, and stop the subsequent starting detection.

[0041] S105, if the automobile is successfully started at the current incremental current and discharge duration, increasing the initial starting current is stopped, and the current incremental starting current and discharge duration are recorded.

[0042] When it is detected by the system by step S104 that the automobile can be successfully started at a certain incremental starting current, the current starting detection process can be ended. At the moment, the system has found a relatively optimal starting current value, and it is unnecessary to try to use a heavier current.

[0043] Therefore, the system will immediately stop incremental discharge, store the incremental starting current value used currently and the corresponding discharge duration as optimal starting parameters for the subsequential optimization of a starting strategy.

[0044] For example, for a certain automobile, it is determined by the system by means of early detection that stable starting can be achieved by using a 300 A incremental current, and the discharge duration is 2.5 s. At the moment, the system stops further increasing the current, and the two key parameters, i.e., 300 A and 2.5 s, are recorded in a database so as to be used as the optimal starting reference values of the vehicle model. When the automobile is started again later, the system can directly adopt the set of parameters without re-detection, thereby significantly increasing the starting efficiency.

[0045] S106, if the automobile is not successfully started at the current incremental current and discharge duration, it is further detected, by using the next incremental starting current, whether the automobile is successfully started.

[0046] Specifically, by step S103, the system can obtain one or more incremental currents sequentially arranged from small to large, and after it is detected by step S104 that the automobile cannot be started within the discharge duration corresponding to the current

incremental starting current, the system controls the emergency starting power supply of the automobile to increase the current to the next incremental current and detects again whether the automobile is successfully started. If it is detected that the automobile is successfully started at the next incremental current, step S105 is performed; and on the contrary, if it is detected that the automobile is not successfully started at the next incremental current, step S106 is further performed, and starting detection is performed by selecting the next one from the incremental currents arranged from small to large.

[0047] S107, when it is detected that the incremental starting currents exceed a preset current threshold, discharge is stopped, and a fault is early warned.

[0048] Although the system can effectively make a response to starting demands of most of automobiles by adaptive adjustment for the starting current. However, during actual work, there may be some extreme conditions such as vehicle faults and line failures, which results in the inability to complete the starting by increasing the current anyway. For such abnormal conditions, the system presets a maximum allowable current threshold as an upper limit value for the adjustment of the starting current. When it is detected that the incremental currents exceed this threshold, the system will immediately determines that the automobile has a serious fault, stops the subsequent starting attempt, and sends warning information to a user.

[0049] For example, a rated current of a certain emergency starting power supply is 600 A, and in view of a certain margin, the system sets the maximum current threshold as 550 A. In the detection process in step S104, if the automobile cannot be started even if the 500 A incremental current is used, and the next incremental current is 550 A, the threshold has been reached. At the moment, the system will immediately stop discharge, give a caution to prompt the user that there may be an automobile or line fault, and suggest that the user checks the fault firstly and then perform the starting attempt so as to avoid damage or safety problems caused by blindly increasing the current.

[0050] It should be noted that, for the setting of the above-mentioned preset current threshold,

factors such as the actual output capability of the emergency power supply of the automobile, safety parameters of the battery and the carrying capacity of connecting cables need to be comprehensively considered to ensure the use safety. Specific threshold parameters are determined according to actual situations so as not be limited herein.

5 **[0051]** The more specific process of the method provided in the present embodiment will be further described below. Refer to FIG. 2 which is a schematic diagram of another process of an automatic energy-saving control method for an emergency starting power supply of an automobile in an embodiment of the present application.

10 **[0052]** S201, starting data in a starting process of an engine within a preset time period is monitored.

15 **[0053]** In an actual use process of the emergency starting power supply of the automobile, a plurality of sensors such as a voltage sensor, a current sensor and a rotating speed sensor can be disposed on the emergency starting power supply of the automobile to perform data collection, and the system will collect and analyze key parameters such as a voltage, a current and a rotating speed in a normal starting process of a vehicle by means of the above-mentioned sensors. Specifically, the system will select an appropriate monitoring time period and record all data in a repeated starting process of the vehicle within this time period. The monitored parameters mainly include a battery voltage changing curve, a starting current changing curve, an engine rotating speed changing curve and the like in a starting process.

20 **[0054]** For example, the system can select to continuously monitor 10 vehicle starting processes and record real-time numerical values of the voltage, the current and the rotating speed in the overall process from the beginning of ignition to the stabilization of the engine rotating speed by taking 50 ms as a sampling period every time when the automobile is started. By the 10-times accumulation, the system can obtain a rather complete engine starting database.

25 **[0055]** S202, a starting model is constructed according to the starting data.

[0056] After obtaining a certain quantity of starting data, the system will preprocess the

starting data to obtain a starting data training set. Then, the starting model is trained by using the starting data training set, feature extraction is performed on time series data in the starting data training set by using a data mining and machine learning algorithm, and dynamic changing rules of the parameters such as the voltage, the current and the rotating speed in the starting process are quantitatively described, so that the starting model can predict a required current range according to the current real-time starting data.

[0057] S203, a required current range and a numerical value of the initial starting current are predicted according to real-time starting data and the starting model.

[0058] Specifically, after the emergency starting power supply of the automobile receives the starting instruction, the system will call historical starting data of the vehicle from an internal memory according to connected vehicle model information and the like and generate a corresponding starting model according to the historical starting data, and then, the system inputs the collected real-time data from a vehicle side, including the current battery voltage, ambient temperature and the like as input parameters, to the starting model, and calculates and outputs an optimal starting current range. The optimal starting current range refers to a range of currents required for normally starting the automobile, an upper limit and a lower limit respectively correspond to the maximum current demand and the minimum current demand, and a lower limit value of the optimal starting current range is set as the numerical value of the initial starting current.

[0059] For example, it is detected by the system that the voltage of the current vehicle battery is 11.5 V and the ambient temperature is -5°C which are substituted into the existing starting model in conjunction with the historical starting data of the vehicle model, and thus, the optimal starting current range under the current condition can be calculated as 220 A to 280 A. The system accordingly generates a recommended value range of the starting current, which is not a simple medium value of the range, instead, the lower limit 220 A of the range is tried to be used for starting firstly, and then it is gradually increased to the upper limit 280 A when 220 A cannot

meet a demand. The dynamic optimization of the starting current is achieved by such progressive adjustment.

[0060] S204, the initial starting current and state information of the emergency starting power supply of the automobile are displayed by means of a display.

5 **[0061]** An intelligent emergency starting control not only needs to achieve adaptive adjustment of the starting current, but also should a good human-computer interaction function, so that a user can intuitively know about a working state of a device and the key parameters in the starting process. Specifically, the system feeds information such as the initial starting current and the state of the device back to the user in real time by means of a display interface carried on
10 the emergency starting power supply of the automobile, which provides necessary monitoring means for the user while improving the use experience.

[0062] S205, when it is detected that the power of the emergency starting power supply of the automobile is lower than a preset power threshold, a vehicle battery is automatically connected for charge.

15 **[0063]** Specifically, the system will set a power threshold of the emergency starting power supply of the automobile and monitor power information of the emergency starting power supply of the automobile in real time, when it is detected that a power state in the power information is lower than the preset power threshold, early warning will be performed, and the early warning can be a text or voice prompt performed by means of the display on the power
20 supply or a short message prompt sent to a terminal device of the user, which is not limited herein. In addition, if it is detected that the emergency starting power supply of the automobile has been connected to the vehicle battery, a power switch of the vehicle battery is turned on, and power is replenished by means of the vehicle battery.

[0064] The system automatically detects the power of the emergency starting power supply,
25 and when the power is lower than the preset threshold, a vehicle-mounted battery is actively connected for charge, which can ensure that the emergency power supply is always in a full

power state or an optimal state and is always ready to perform emergency starting on the vehicle, so that the reliability and real-time availability of the starting power supply are greatly improved, which is particularly important for vehicle owners who go on a trip frequently and have higher demands on standby power supplies.

- 5 **[0065]** S206, a voice recognition system is integrated, and a recognized voice instruction of the user is translated to obtain current setting information.

[0066] Specifically, a set of voice recognition engine will be built in the system, the voice instruction of the user is collected in real time by means of pickup hardware, and analysis and understanding are performed by means of an acoustic model, a language model and the like. The user can directly control the starting current with spoken languages. For example, “the starting current is set as 300 A” or “the charging time is adjusted as 3 s”, the system can accurately extract key numerical value information in the instruction by means of a semantic analysis algorithm and directly apply the same to the adjustment of the starting current, and then, a more natural and efficient control method is provided for the user.

10

- 15 **[0067]** S207, emergency power supply is performed on the automobile according to the received current setting information input by a user.

[0068] Although the emergency starting power supply of the automobile can automatically adjust the optimal starting current by means of intelligent control, under some special conditions, it is very necessary to give the user a certain manual control right. Therefore, the system can receive data by means of a preset interface or receive a user-customized starting current intensity and duration by means of wireless data transmitted by the terminal device of the user so as to make a response to the emergency power supply of the automobile under the special conditions.

20

[0069] Specifically, the system will set a current setting input box on the display interface, so that the user can directly input a desired current intensity and power supply time by means of a physical pressing key or a touch screen. For example, the user can specify that the 250 A current is output, and the lasting time is 2.5 s. After receiving such an instruction, the system will

25

automatically adjust the original starting control strategy and seriously perform starting output according to the numerical value set by the user until the specified time is reached, and then, the power supply is automatically cut off.

[0070] The human-computer interaction function is introduced to the system which displays information such as settings of the starting current and a state of the power supply in real time by means of the display and supports the user to manually adjust the current intensity and the power supply duration, so that more rights to know and control rights are given to the user, and the user can perform flexible adjustment according to the self-experience and the current situation; and particularly for the starting of some special vehicle models or the starting in extreme environments, such manual intervention becomes particularly important, and the applicability of the emergency starting power supply of the automobile is further improved.

[0071] S208, a temperature of a battery of the emergency starting power supply of the automobile is monitored by means of a built-in temperature sensor.

[0072] Specifically, the system will reasonably dispose a set of temperature sensors around a battery pack of the emergency starting power supply of the automobile and collect temperature data of each area in real time by means of the sensors. In view of the possible nonuniformity of temperature distribution in the battery pack, the system will select a multi-point temperature measurement solution in which the surface temperature and internal temperature of the battery are monitored in separate areas and the highest temperature is used as a value representing the temperature of the battery. A temperature signal is transmitted to a controller in a standardized data format after subjected to ADC conversion and digital filtration, so that real-time monitoring for the battery temperature of the emergency starting power supply of the automobile is achieved.

[0073] S209, after it is detected that the temperature of the battery exceeds a preset safety threshold, the current is cut off, and early warning information is sent to the display or a user terminal.

[0074] Specifically, the system will preset a temperature safety threshold as a triggering condition of a starting protection mechanism. For the setting of this threshold, factors from a plurality of aspects such as a material characteristic of the battery, an environmental factor and a use intensity need to be comprehensively considered so as not to be limited herein. After it is monitored that the temperature of the battery continuously exceeds the safety threshold for a certain time (such as 5 s), the system will immediately start power-off protection; and by cutting off a relay or controlling an MOS tube to rapidly cut off a charge/discharge loop, heating the battery by using an external heavy current is stopped, and thus, the temperature is prevented from being further worsen. At the same time, the system will further send a guard signal to the user by means of a buzzer, an indicator lamp, a display and other ways to prompt that the current battery is in an over-temperature state. If the device accesses to a cloud service, the warning will also be synchronously reported to the cloud and be pushed to the user by means of an App to remind the user to stopping using the battery in time and to restart the battery after the battery is cooled.

[0075] The more specific process of the method provided in the present embodiment will be further described below. Refer to FIG. 3 which is a schematic diagram of a process that a system determines an initial starting current when an emergency starting power supply of an automobile is reconnected to a vehicle in an embodiment of the present application.

[0076] S301, currently-connected first vehicle information is acquired and recorded.

[0077] After detecting that the emergency starting power supply of the automobile is connected to a vehicle, the system will read identity information of a currently-connected vehicle. Specifically, the system can read vehicle identification number (VIN) information as a displacement mark of the vehicle by means of an OBD-II (On-Board Diagnostics, the second generation) port connected to the vehicle, and can also acquire vehicle information by means of a special interface, which is not limited herein.

[0078] S302, after the automobile is connected next time and the starting instruction is

detected, second vehicle information is acquired.

LU508957

[0079] When a connection established between the emergency starting power supply of the automobile and the automobile is detected again after it is detected that the emergency starting power supply of the automobile has been disconnected to the automobile, the vehicle
5 information will be read again to obtain the second vehicle information. The system compares the second vehicle information with the first vehicle information stored in a database to determine whether the currently-connected vehicle is the vehicle which has been connected before.

[0080] S303, if the second vehicle information is the same as the first vehicle information, the
10 incremental starting current is set as a new initial starting current.

[0081] Specifically, when it is detected by the system that the second vehicle information is the same as the first vehicle information, it is determined whether the currently-connected vehicle is the vehicle which has been connected before, and therefore, the incremental starting current corresponding to a first vehicle is directly set as the initial starting current of the
15 currently-connected vehicle.

[0082] The emergency starting power supply of the automobile in the embodiment of the present invention is an electronic device, and FIG. 4 shows a schematic diagram of an architecture suitable for achieving the electronic device in the embodiment of the present invention.

[0083] It should be noted that the electronic device shown in FIG. 4 is only an example, and should not bring any limitation on the function and application range of the embodiment of the present invention.

[0084] It can be understood by those of ordinary skill in the art that all or parts of steps of the various methods in the above-mentioned embodiments can be completed by instructions
25 (computer programs), or completed by controlling relevant hardware by means of the instructions (the computer programs), and the instructions can be stored in a computer-readable

storage medium and are loaded and executed by a processor. The electronic device in the present embodiment includes a storage medium and a processor, wherein a plurality of instructions are stored in the storage medium, and the instructions can be loaded by the processor so that any step of the method provided in the embodiment of the present invention is performed.

5 **[0085]** Specifically, direct or indirect electric connection between the storage medium and the processor is performed, so that data transmission or interaction is achieved. For example, these elements can be electrically connected by means of one or more signal lines. Computer execution instructions for achieving a data access control method are stored in the storage medium including at least one software functional module stored in the storage medium in a
10 form of software or firmware, and the processor performs various functional applications and data processing by running software programs and modules stored in the storage medium. The storage medium is configured to store the programs, and the processor executes the programs after receiving the execution instructions.

[0086] Further, the software programs and modules in the above-mentioned storage medium
15 can further include an operating system which can include various software modules and/or drivers configured to manage system tasks (such as internal memory management, storage device control and power supply management) and can intercommunicate with various hardware or software modules, thereby providing running environments of other software modules.

[0087] The above descriptions are only preferred specific implementations of the present
20 invention, but the protective scope of the present invention is not limited thereto. Any variations or replacements that can be readily envisioned by those skilled in the art within the technical scope disclosed by the present invention should fall within the protective scope of the present invention. Therefore, the protective scope of the present invention should be subject to the protective scope defined in the claims.

WHAT IS CLAIMED IS:

1. An automatic energy-saving control method for an emergency starting power supply of an automobile, which is applied to a control system for the emergency starting power supply of the automobile, wherein the method comprises:

after a starting instruction is detected, controlling the emergency starting power supply of the automobile to discharge by using an initial starting current, and recording an initial discharge duration;

if it is detected that the initial discharge duration exceeds a preset time threshold and the automobile is not successfully started, stopping discharge;

sequentially increasing the initial starting current at a preset current increment to obtain one or more incremental starting currents;

sequentially performing discharge by using the incremental starting currents, and detecting, at each of the incremental starting currents, whether the automobile is successfully started;

if so, stopping increasing the initial starting current, and recording a current incremental starting current and discharge duration;

if not, further detecting, by using a next incremental starting current, whether the automobile is successfully started; and

when it is detected that the incremental starting current exceed a preset current threshold, stopping discharge, and early warning a fault.

2. The method according to claim 1, wherein before the step of after a starting instruction is detected, controlling the emergency starting power supply of the automobile to discharge by using an initial starting current, and recording an initial discharge duration, the method further comprises:

monitoring a starting data in a starting process of an engine within a preset time period, wherein the starting data comprises a voltage, a current and an engine rotating speed;

constructing a starting model according to the starting data;

LU508957

predicting a required current range according to a real-time starting data and the starting model, wherein the required current range is a current required when the automobile is normally started; and

5 setting a lower limiting value of the required current range as a numerical value of the initial starting current.

3. The method according to claim 1, wherein before the step of after a starting instruction is detected, controlling the emergency starting power supply of the automobile to discharge by using an initial starting current, and recording an initial discharge duration, the method further
10 comprises:

displaying the initial starting current and a state information of the emergency starting power supply of the automobile by means of a display, wherein the state information is factors affecting a normal work of the emergency starting power supply of the automobile;

receiving a current setting information input by a user, wherein the current setting
15 information comprises a current intensity and a power supply duration; and

performing emergency power supply on the automobile according to the current setting information.

4. The method according to claim 3, wherein the step of receiving the current setting information input by a user specifically comprises:

20 integrating a voice recognition system to recognize a voice instruction from the user; and
translating the voice instruction to obtain the current setting information.

5. The method according to claim 3, wherein after the step of displaying the initial starting current and a state information of the emergency starting power supply of the automobile by means of a display, the method further comprises:

25 detecting whether a power of the emergency starting power supply of the automobile is lower than a preset power threshold; and

if so, automatically connecting a vehicle battery for charging.

LU508957

6. The method according to claim 1 or 3, wherein after the step of after a starting instruction is detected, controlling the emergency starting power supply of the automobile to discharge by using an initial starting current, and recording an initial discharge duration, the method further comprises:

monitoring a temperature of a battery of the emergency starting power supply of the automobile by means of a built-in temperature sensor; and

after it is detected that the temperature of the battery exceeds a preset safety threshold, cutting off the current, and sending an early warning information to the display or a user terminal.

7. The method according to claim 1, wherein after the step of stopping increasing the initial starting current, and recording the current incremental starting current and discharge duration, the method further comprises:

acquiring and recording an information of a first vehicle currently connected , wherein the information of the first vehicle comprises a unique identification mark of the automobile;

after the automobile is connected next time and the starting instruction is detected, acquiring an information of a second vehicle; and

if the information of the second vehicle is the same as the information of the first vehicle, setting the incremental starting current as a new initial starting current.

8. A control system for an emergency starting power supply of an automobile, wherein the system comprises one or more processors and a memory;

the memory is coupled with the one or more processors, the memory is configured to store computer program codes, the computer program codes comprise computer instructions, and the one or more processors call the computer instructions so that the system performs the method according to any one of claims 1 to 7.

9. A computer-readable storage medium, comprising instructions, wherein when the

instructions run on a system, the system is enabled to perform the method according to any one
LU508957
of claims 1 to 7.

10. A computer program product, wherein when the computer program product runs on a
system, the system is enabled to perform the method according to any one of claims 1 to 7.

1. Automatisches energiesparendes Steuerverfahren für eine Notstartstromversorgung eines Kraftfahrzeugs, das auf ein Steuersystem für die Notstartstromversorgung des Kraftfahrzeugs angewendet wird, wobei das Verfahren Folgendes umfasst:

nach dem Erkennen eines Startbefehls, Steuern der Notstromversorgung des Kraftfahrzeugs zur Entladung unter Verwendung eines anfänglichen Startstroms und Aufzeichnen einer anfänglichen Entladedauer;

Stoppen der Entladung, wenn festgestellt wird, dass die anfängliche Entladungsdauer einen voreingestellten Zeitschwellenwert überschreitet und das Fahrzeug nicht erfolgreich gestartet werden kann,

sequentielles Erhöhen des anfänglichen Startstroms mit einem voreingestellten Strominkrement, um einen oder mehrere inkrementelle Startströme zu erhalten;

sequentielle Durchführen der Entladung unter Verwendung der inkrementellen Startströme und Erfassen bei jedem der inkrementellen Startströme, ob das Fahrzeug erfolgreich gestartet wurde;

wenn ja, Stoppen der Erhöhung des anfänglichen Startstroms und Aufzeichnen des aktuellen inkrementellen Startstroms und der Entladedauer;

falls nicht, weiteres Erfassen, unter Verwendung des nächsten inkrementellen Startstroms, ob das Fahrzeug erfolgreich gestartet wurde; und

Stoppen der Entladung gestoppt und Durchführen einer Fehlerfrühwarnung, wenn festgestellt wird, dass die inkrementellen Startströme einen voreingestellten Stromschwellenwert überschreiten.

2. Verfahren nach Anspruch 1, wobei vor dem Schritt des Erkennens eines Startbefehls Steuern der Notstromversorgung des Kraftfahrzeugs zur Entladung unter Verwendung eines anfänglichen Startstroms und Aufzeichnen einer anfänglichen Entladedauer, das Verfahren außerdem Folgendes umfasst:

Überwachen von Startdaten bei einem Startvorgang eines Motors innerhalb einer vorgegebenen Zeitspanne, wobei die Startdaten eine Spannung, einen Strom und eine Motordrehzahl umfassen;

Erstellen eines Ausgangsmodells auf der Grundlage der Startdaten;

Vorhersagen einer erforderlichen Stromreichweite gemäß Echtzeit-Startdaten und dem Startmodell, wobei die erforderliche Stromreichweite ein Strom ist, der erforderlich ist, wenn das Fahrzeug normal gestartet wird; Und

Festlegen eines unteren Grenzwerts der erforderlichen Stromreichweite als Zahlenwert des anfänglichen Startstroms.

3. Verfahren nach Anspruch 1, wobei vor dem Schritt des Erkennens eines Startbefehls Steuern der Notstromversorgung des Kraftfahrzeugs zur Entladung unter Verwendung eines anfänglichen Startstroms und Aufzeichnen einer anfänglichen Entladedauer, das Verfahren außerdem Folgendes umfasst:

Anzeigen des anfänglichen Startstroms und von Zustandsinformationen der Notstartstromversorgung des Kraftfahrzeugs mittels einer Anzeige, wobei es sich bei den Zustandsinformationen um Faktoren handelt, die den normalen Betrieb der Notstartstromversorgung des Kraftfahrzeugs beeinflussen;

Empfangen der von einem Benutzer eingegebenen aktuellen Einstellungsinformationen, wobei die aktuellen Einstellungsinformationen eine Stromstärke und eine Stromversorgungsdauer umfassen; und

Durchführen einer Notstromversorgung des Kraftfahrzeugs gemäß den aktuellen Einstellungsinformationen.

4. Verfahren nach Anspruch 3, wobei der Schritt des Empfangens der von einem Benutzer

einggegebenen aktuellen Einstellungsinformationen insbesondere Folgendes umfasst:

Integrieren eines Spracherkennungssystems, um eine Sprachanweisung des Benutzers zu erkennen; und LU508957

Übersetzen der Sprachanweisung, um die aktuellen Einstellungsinformationen zu erhalten.

5 5. Verfahren nach Anspruch 3, wobei das Verfahren nach dem Schritt des Anzeigens des anfänglichen Startstroms und von Zustandsinformationen der Notstartstromversorgung des Kraftfahrzeugs mittels einer Anzeige weiterhin Folgendes umfasst:

Erkennen, ob die Leistung der Notstartstromversorgung des Kraftfahrzeugs niedriger als ein voreingestellter Leistungsschwellenwert ist; Und

10 wenn ja, automatisch Anschließen einer Fahrzeugbatterie zum Laden .

6. Verfahren nach Anspruch 1 oder 3, wobei nach dem Schritt des Erkennens eines Startbefehls, des Steuerns der Notstromversorgung des Kraftfahrzeugs zum Entladen unter Verwendung eines anfänglichen Startstroms und des Aufzeichnens einer anfänglichen Entladedauer, das Verfahren ferner umfasst:

15 Überwachen einer Temperatur einer Batterie der Notstartstromversorgung des Kraftfahrzeugs mittels eines eingebauten Temperatursensors; und

Abschalten der Strom und Senden der Frühwarninformationen an die Anzeige oder ein Benutzerterminal, nachdem erkannt wurde, dass die Temperatur der Batterie einen voreingestellten Sicherheitsschwellenwert überschreitet

20 7. Verfahren nach Anspruch 1, wobei nach dem Schritt des Stoppens der Erhöhung des anfänglichen Startstroms und Aufzeichnen des aktuellen inkrementellen Startstroms und der Entladedauer, das Verfahren ferner umfasst:

25 Erfassen und Aufzeichnen von aktuell verbundenen ersten Fahrzeuginformationen, wobei die ersten Fahrzeuginformationen eine eindeutige Identifikationsmarke des Kraftfahrzeugs umfassen;

nach dem nächsten Anschließen des Kraftfahrzeugs und dem Erkennen des Startbefehls, Erfassen einer zweiten Fahrzeuginformation; und

wenn die zweite Fahrzeuginformation mit der ersten Fahrzeuginformation übereinstimmt, Festlegen des inkrementellen Startstroms als neuen anfänglichen Startstrom.

30 8. Steuersystem für eine Notstartstromversorgung eines Kraftfahrzeugs, wobei das System einen oder mehrere Prozessoren und einen Speicher umfasst;

35 der Speicher mit dem einen oder den mehreren Prozessoren gekoppelt ist, der Speicher so konfiguriert ist, dass er Computerprogrammcodes speichert, die Computerprogrammcodes Computerbefehle umfassen, und der eine oder die mehreren Prozessoren die Computerbefehle aufrufen, so dass das System das Verfahren nach einem der Ansprüche 1 bis 7 durchführt.

9. Computerlesbares Speichermedium, das Befehle umfasst, wobei, wenn die Befehle auf einem System laufen, das System in die Lage ist, das Verfahren nach einem der Ansprüche 1 bis 7 durchzuführen.

40 10. Computerprogrammprodukt, wobei, wenn das Computerprogrammprodukt auf einem System läuft, das System in der Lage ist, das Verfahren nach einem der Ansprüche 1 bis 7 durchzuführen.

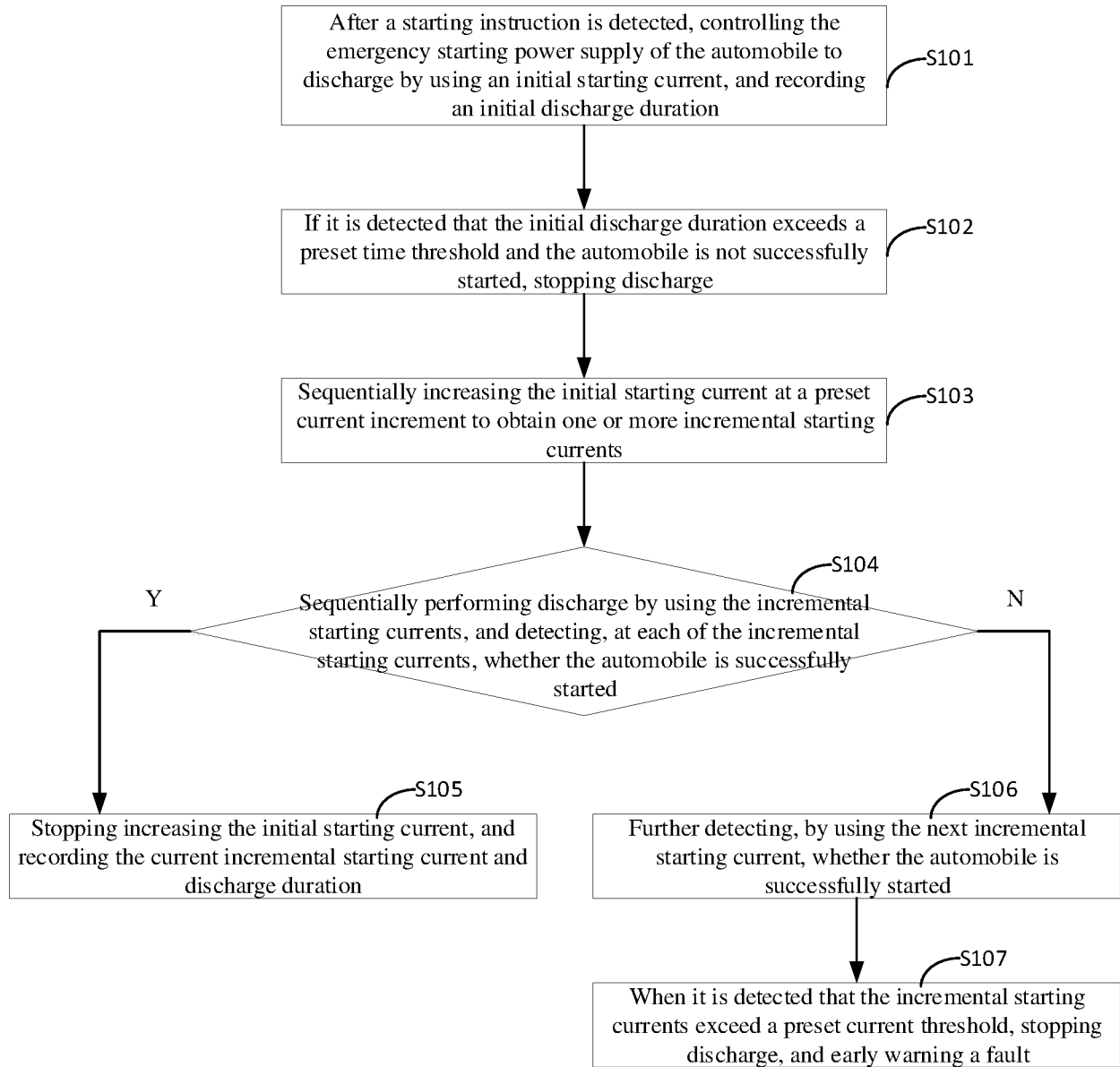


FIG. 1

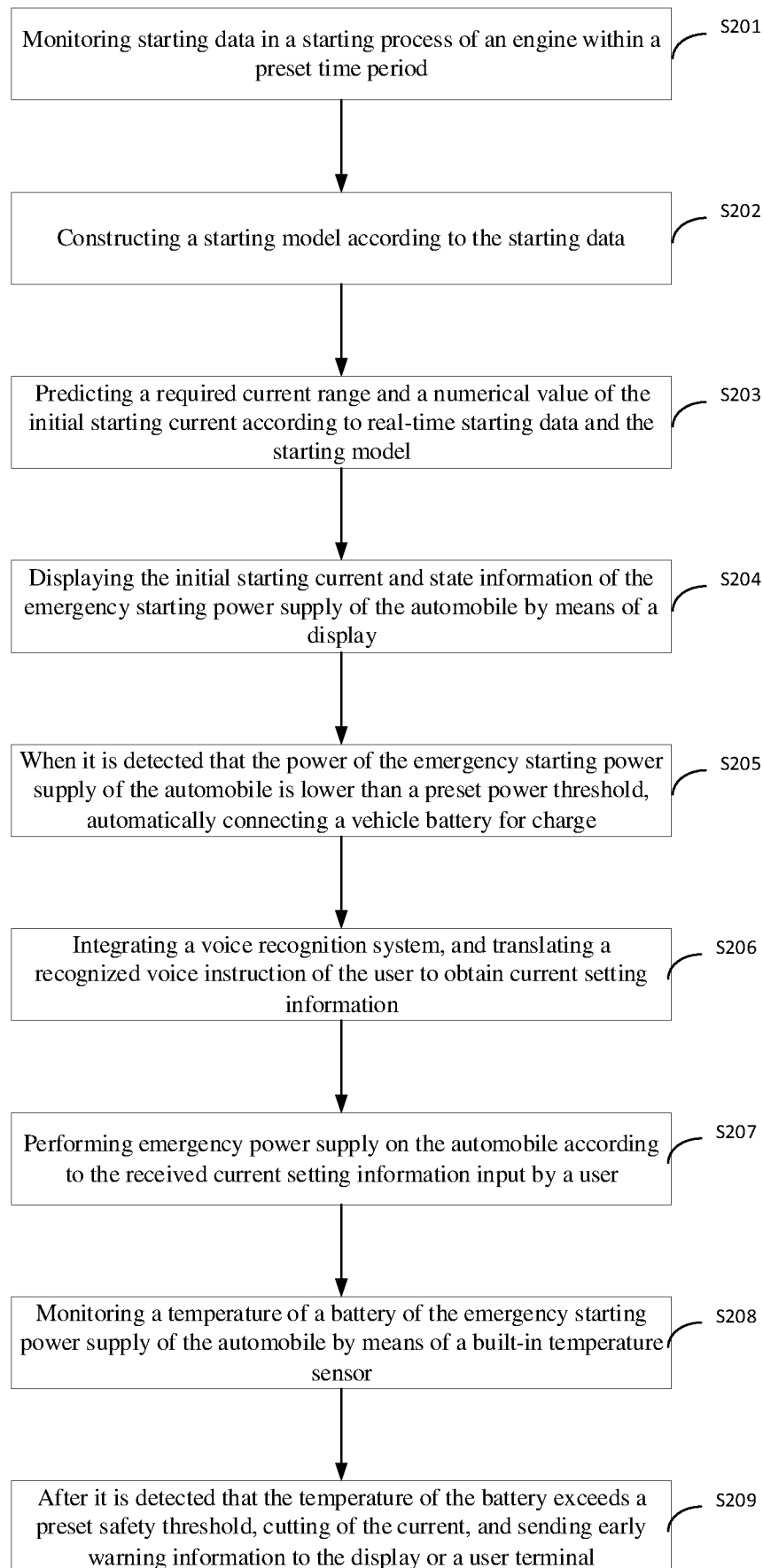


FIG. 2

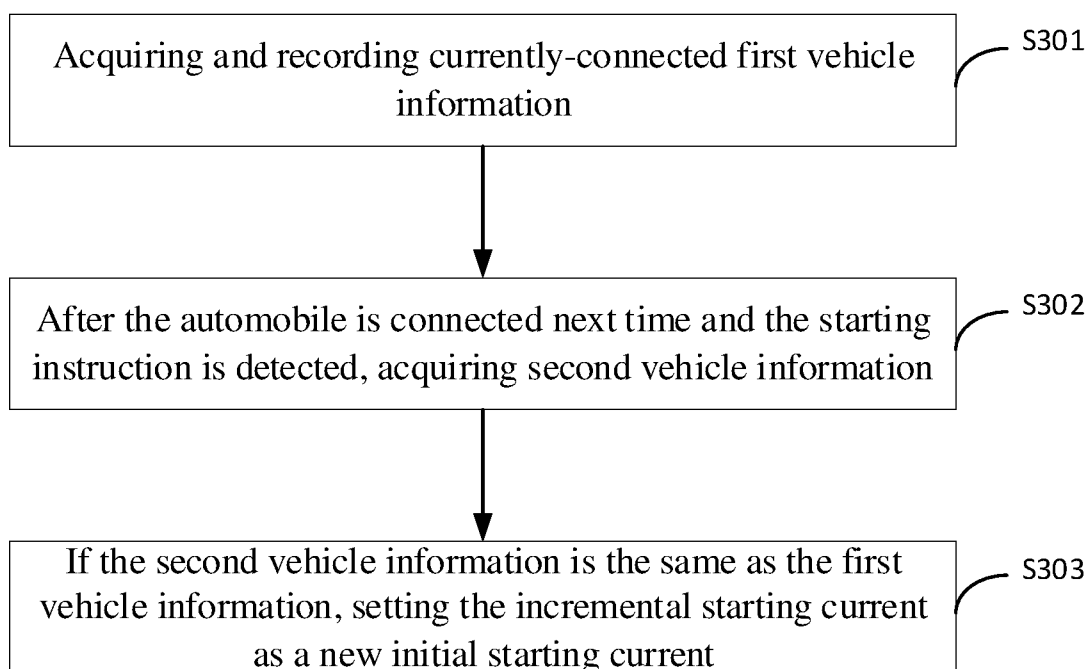


FIG. 3

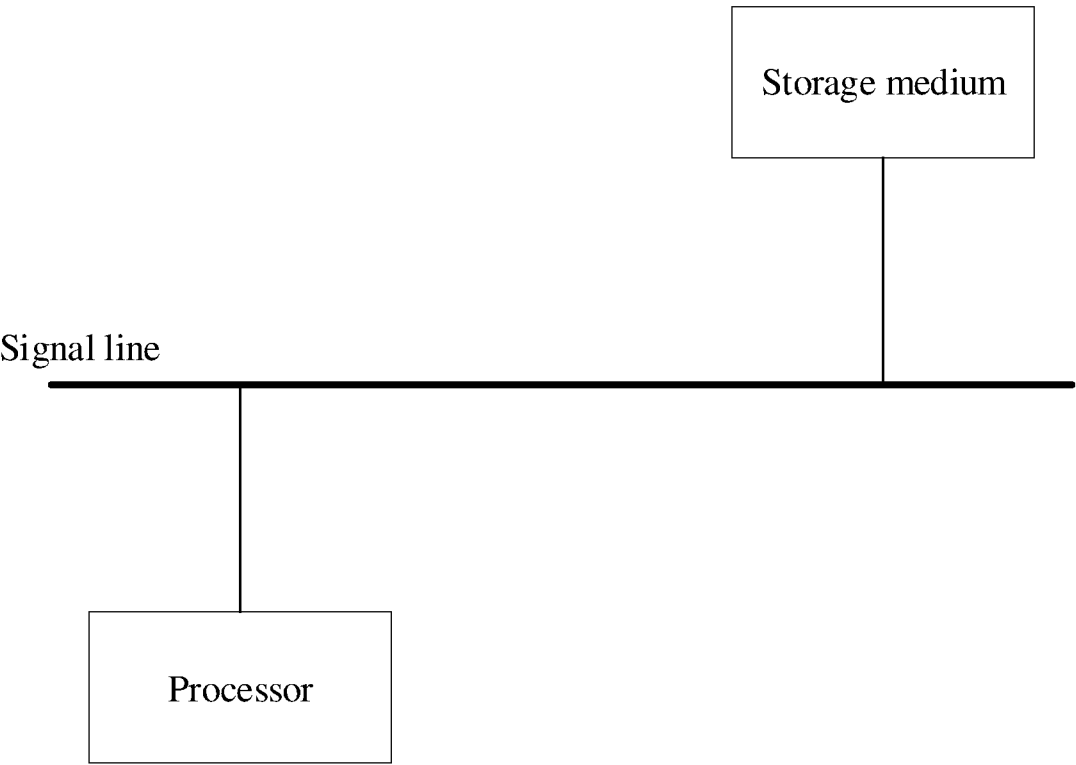


FIG. 4