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(54) Title: SYSTEM AND METHOD FOR MANAGING BATTERY OF VEHICLE

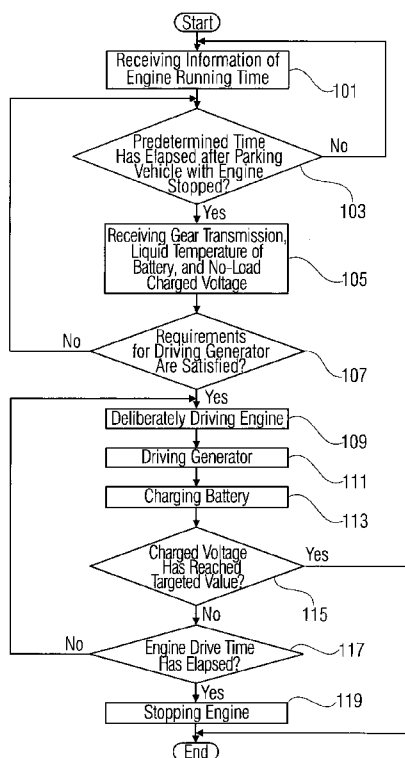


FIG 3

(57) Abstract: Disclosed are a system and method for managing the battery of a vehicle. According to the present invention, an engine control unit is woken up when a vehicle is parked for a long time with the engine stopped, to deliberately start the engine to drive the generator to charge the battery if the requirements set for driving the generator are satisfied based on the information of the gear transmission externally supplied, and the liquid temperature of the battery and no-load voltage received from the battery sensor, so that the starting of the engine is improved by charging the battery that has been discharged when a vehicle has been parked for a long time, and the battery performance too.



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SPECIFICATION**TITLE OF THE INVENTION**

SYSTEM AND METHOD FOR MANAGING BATTERY OF VEHICLE

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TECHNICAL FIELD

The present invention relates to a system and method for managing the battery of a vehicle, and more particularly to a system and method for recharging the battery discharged at a predetermined time after parking a vehicle with the engine stopped.

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BACKGROUND OF THE INVENTION

Generally, the electric source of a vehicle is obtained by using a generator to charge the electric load and battery with the power (the product of voltage and current). If the electric load is too great to supply with the power of the generator, the power of the battery is used to supply the electric load. In a system where the generator is not controlled to produce electricity, the generator usually keeps on generating a given voltage, thus unnecessarily consuming fuel. Hence, a few years ago, a system of variable voltage generation began to be used which intensively operates the generator when cutting off fuel for decreasing the speed of the vehicle, and minimizes the electricity produced by the generator when the vehicle is idled, driven at a constant speed, or with an acceleration.

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Fig. 1 represents correlation of the vehicle speed (a), the voltage produced by the generator (b), and the amount of the fuel injection (c) with reference to the time axis.

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In order to construct the system, a battery sensor is added to detect/calculate the amount of current flowing in or out of the battery, the liquid temperature of the battery, the voltage of the battery, etc. to generate a signal, and to calculate/output the charge rate of the battery by means of charge accumulation based on the current amount received.

The vehicle provided with the system cuts off fuel and sets the voltage produced by the generator as high when

decreasing the vehicle speed with the acceleration pedal released.

In addition, except for decreasing the vehicle speed, a control is made to stop or minimize the operation of the generator so as to minimize the load (electric generation load/reverse electromotive force) of the generator connected to the engine pulley, although it may be different from vehicle to vehicle.

The final generation voltage is set considering the information on the state of decreasing or accelerating the vehicle speed as well as the charge rate of the battery, so that if the charge rate of the battery is high, the generation voltage is set low even if decreasing the speed, and on the contrary, the generation voltage is set high.

The system minimizes the electric generation load of the generator so as to considerably reduce the fuel consumption, thus increasing the fuel efficiency by about 1-3% according to the kind of vehicle.

However, the electric generation control of the vehicle described above is carried out upon decreasing the vehicle speed, and therefore, when the vehicle is parked for a long time with the engine stopped, and the battery is fully discharged, the engine cannot be started.

CONTENT OF THE INVENTION

Objects of the Invention

The present invention is conceived to resolve the problem with the prior art described above, and an object of the present invention is to provide a system for managing the battery of a vehicle including a generator for both supplying electric power to an electric load and charging the battery; a battery sensor for detecting/calculating the charge rate, voltage, current, and liquid temperature of the battery so as to generate a signal; and an engine control unit which, when a vehicle is parked for a long time after stopping an engine and after woken up, forces an engine to start in order to drive the generator when satisfying the requirements for driving a generator set on the basis of the information of the gear

transmission, the liquid temperature of the battery, and no-load charged voltage which are received from the battery sensor, so that the charged voltage of the battery detected by the battery sensor does not exceed a predetermined target value when a vehicle is parked for a long time after with the engine stopped, the generator is woken up to charge the battery at least to the predetermined value.

The present invention is conceived to resolve the problem with the prior art described above, and another object of the present invention is to provide a method for managing the battery of a vehicle to make an engine control unit wake up to deliberately start the engine so as to charge the battery at a predetermined time after stopping of the engine, comprising the steps of: determining whether a predetermined time is exceeded after stopping of the engine; determining whether the requirements set for driving a generator are satisfied based on the information of the gear transmission externally supplied, and the liquid temperature of the battery and no-load charged voltage received from a battery sensor supplied from the battery sensor; and deliberately starting the engine so as to drive the generator to charge the battery, so that when the charged voltage of the battery detected by the battery sensor does not exceed a predetermined target value when a vehicle is parked for a long time after the engine is stopped, the generator is woken up to charge the battery at least to the predetermined targeted value.

Summary of the Invention

According to an embodiment of the present invention, system for managing the battery of a vehicle comprises: a generator for both supplying electric power to an electric load and charging the battery; a battery sensor for detecting/calculating the charge rate, voltage, current, and liquid temperature of the battery so as to generate a signal; and an engine control unit woken up for driving the generator to charge based on the charged voltage detected by the battery sensor, characterized in that when a vehicle is parked for a long time with the engine stopped, the engine control unit

deliberately starts the engine to drive the generator if the requirements set for driving the generator are satisfied based on the information of the gear transmission, the liquid temperature of the battery, and no-load charged voltage received from the battery sensor.

Preferably, the requirements for driving the generator are characterized by neutrality of the gear transmission, the liquid temperature of the battery not exceeding a predetermined value, and no-load voltage not exceeding a predefined limit value.

Preferably, the engine control unit is characterized by being programmed so as to stop the engine operation if the charged voltage of the battery exceeds the minimum value for driving the engine, or the preset time for driving the engine is exceeded.

According to another embodiment of the present invention, a method for managing the battery of a vehicle to make an engine control unit wake up to deliberately start the engine so as to charge the battery at a predetermined time after stopping of the engine is characterized by comprising the steps of: determining whether a predetermined time is exceeded after stopping of the engine; determining whether the requirements set for driving a generator are satisfied based on the information of the gear transmission externally supplied, and the liquid temperature of the battery and no-load charged voltage supplied from a battery sensor; and deliberately starting the engine so as to drive the generator to charge the battery.

Preferably, the requirements for driving the generator are characterized by neutrality of the gear transmission, the liquid temperature of the battery not exceeding a predetermined value, and no-load voltage not exceeding a predefined limit value.

Preferably, the step of charging the battery includes a further step of stopping the engine operation if the charged voltage of the battery exceeds the minimum value for driving the engine, or the preset time for driving the engine is exceeded.

Effects of the Invention

The system and method for managing the battery of the present invention wake up the engine control unit when a vehicle is parked for a long time with the engine stopped, to deliberately start the engine to drive the generator to charge the battery if the requirements set for driving the generator are satisfied based on the information of the gear transmission externally supplied, and the liquid temperature of the battery and no-load voltage received from the battery sensor, so that the starting of the engine is improved by charging the battery that has been discharged when a vehicle has been parked for a long time, and the battery performance too.

BRIEF DESCRIPTION OF THE DRAWINGS

The drawings attached to this specification only illustrate preferred embodiments of the present invention in order to make the technical concept of the present invention more understandable along with the detailed description of the present invention, and so do not limit the present invention.

Fig. 1 is a graph for showing the amount of electricity generated by a generator and the amount of fuel injection against the vehicle speed and the amount of fuel injection according to prior art;

Fig. 2 illustrates a system for managing the battery of a vehicle according to an embodiment of the present invention; and

Fig. 3 illustrates a process for managing the battery of a vehicle according to another embodiment of the present invention.

DETAILED DESCRIPTION FOR CARRYING OUT THE PRESENT INVENTION

Hereinafter, a system for managing the battery of a vehicle is more specifically described with reference to the attached drawings.

Referring to Fig. 2 illustrating a system for managing the battery of a vehicle according to the present invention, the system of managing the battery of a vehicle includes a battery

11, a generator 13, a battery sensor 15, an engine control unit 17, and an engine 19 in order to deliberately start the engine periodically to charge the battery discharged when the vehicle is parked for a long time.

5 Namely, the system has a generator (alternator 13) connected through a wire to the battery 11. In addition, an electric load is supplied with electric power through an electric wire between the alternator 13 and the battery 11. The battery sensor 15 is arranged between a terminal of the battery
10 and the electric load and the alternator 13 to calculate the charge rate of the battery by means of charge accumulation based on the amount of the charging and discharging current measured of the battery 13. A voltmeter 16 is arranged between the positive and the negative terminal of the battery 11, or
15 instead of it, the engine control unit 17 can measure the voltage from the electric wire connected to the battery 11.

Here, the process for calculating the charge rate of the battery by means of charge accumulation based on the amount of the charging and discharging current measured by the battery
20 sensor is well known in the art, and therefore, the detailed description thereof is omitted.

In addition, the system is designed so that if a predetermined time has elapsed after parking the vehicle for a long time with the engine stopped, and the requirements set for
25 driving the generator are satisfied based on the information of the gear transmission, the liquid temperature of the battery, and no-load charged voltage received from the battery sensor, the engine may be deliberately started to drive the generator to charge the battery.

30 In this case, the requirements for driving said generator are neutrality of the gear transmission, the liquid temperature of the battery not exceeding a predetermined value, and no-load voltage not exceeding a predefined limit value.

Here, the predetermined and the predefined limit value are
35 obtained through performing many experiments to be used to derive the minimum charging voltage of the battery for driving the engine. The predetermined and predefined values

corresponding to the minimum charging voltage of the battery are stored in the engine control unit as a look-up table.

The engine control unit 17 determines whether a predetermined time has elapsed after parking a vehicle with the engine stopped, and if so, is woken up to receive the information of the gear transmission externally supplied, and the liquid temperature and no-load charged voltage of the battery from the battery sensor 15.

Moreover, the engine control unit 17 determines whether predefined requirements for driving the generator are satisfied based on the information of the gear transmission, the liquid temperature of the battery, and no-load charged voltage, and if so, deliberately starts the engine 19 to drive the generator 13 to charge the battery 11.

In addition, the engine control unit 17 ends the program after stopping the engine 19 if the charged voltage of the battery 11 approaches a predetermined targeted value.

In the embodiments of the present invention, the predetermined value, predetermined time, limit value, and target value are obtained through performing many experiments, and stored as a look-up table in order to maintain the generator at the optimal state.

The operation of the system is described with reference to Fig. 3. Fig. 3 is a flow chart for illustrating the process for operating the generator of the engine control unit 17 shown in Fig. 2. The process for operating the generator is described in connection with Fig. 3.

Firstly, the engine control unit 17 is woken up if the predetermined time has elapsed after parking the vehicle with the engine stopped, and deliberately starts the engine if the requirements for driving the generator are satisfied.

Namely, the engine control unit 17 receives the information of the engine running time from the outside in step 101 to determine in step 103 whether the predetermined time has elapsed after stopping of the engine.

In step 103, if the predetermined time has elapsed after stopping of the engine, the engine control unit 17 wakes up in step 105 to receive the information of the gear transmission

externally supplied, and the liquid temperature of the battery and no-load charged voltage from the battery sensor 15.

The engine control unit 17 determines whether the requirements for driving the generator are satisfied based on the information of the gear transmission, the liquid temperature of the battery, and no-load charged voltage (step 107).

Here, the requirements for driving the generator are neutrality of the gear transmission, the liquid temperature of the battery not exceeding a predetermined value, and no-load voltage not exceeding a predefined limit value.

In step 107, if the requirements for driving the generator are satisfied, the engine control unit 17 deliberately starts the engine to drive the generator 13 to charge the battery 11 (steps 109, 111, and 113).

Then, the engine control unit 17 determines whether the charged voltage of the battery has reached the target value in step 115, and if so, proceeds to step 119 to stop the engine.

In addition, if the charged voltage of the battery has not reached the target value in step 115, the engine control unit 17 determines whether a predefined engine drive time is exceeded, and if so, proceeds to step 119.

According to the embodiments of the present invention, the engine control unit is woken up when a vehicle is parked for a long time with the engine stopped, to deliberately start the engine to drive the generator to charge the battery if the requirements set for driving the generator are satisfied based on the information of the gear transmission externally supplied, and the liquid temperature of the battery and no-load voltage received from the battery sensor, so that the starting of the engine is improved by charging the battery that has been discharged when a vehicle has been parked for a long time, and the battery performance too.

It is understandable that a person skilled in the art can make other embodiments of the present invention without departing from the technical concept or gist of the present invention. Therefore, the embodiments described above are only by way of example, not limiting the present invention. The

scope of the present invention is defined not by the detailed description described above, but by the attached claims. All changes and modifications of the present invention derived from the meaning and scope of the claims and their equivalent should be included in the scope of the present invention.

Industrial Applicability

The engine control unit is woken up when a vehicle is parked for a long time with the engine stopped, to deliberately start the engine to drive the generator to charge the battery if the requirements set for driving the generator are satisfied based on the information of the gear transmission externally supplied, and the liquid temperature of the battery and no-load voltage received from the battery sensor, so that the starting of the engine is improved by charging the battery that has been discharged when a vehicle has been parked for a long time, and the battery performance too. Thus the system and method for managing the battery of the vehicle are significantly improved, which can be readily applied to the vehicles commercially available.

Additional Aspects

A communication module can be provided, which is connected to the engine control unit (ECU). The communication module can be used for communicating an intention to start the engine or the event that the engine has been started by the ECU to a device, in particular a remote device such as a mobile device, in particular a smart phone. The remote device can also be a remote server (e.g. an email server) or a local computer. The communication module is adapted to send a message to the remote device, in particular a message according to a mobile communications protocol or according to an internet protocol, eg. an email. The message contains the information that there is an intention to start the engine or that the engine has been started. In addition, the message can contain data detected by the battery sensor. Further, the ECU can be adapted to start the motor after a start confirmation received via the

communication module has been received by the remote device. In this way, the user can confirm the engine start from remote.

DESCRIPTION OF REFERENCE NUMERALS

- 5 11 BATTERY
- 13 ELECTRIC GENERATOR
- 15 BATTERY SENSOR
- 17 ENGINE CONTROL UNIT
- 19 ENGINE

CLAIMS:

1. A system for managing the battery of a vehicle comprising:
a generator for both supplying electric power to an
electric load and charging the battery; a battery sensor
for detecting/calculating the charge rate, voltage,
current, and liquid temperature of said battery so as to
generate a signal; and an engine control unit which wakes
up and drives said generator to charge the battery based
on the charged voltage detected by said battery sensor,
characterized in that when a vehicle is parked for a long
time with the engine stopped, said engine control unit
deliberately starts the engine to drive said generator if
the requirements set for driving said generator are
satisfied based on the information of the gear
transmission, the liquid temperature of said battery, and
no-load charged voltage received from said battery
sensor.
2. The system for managing the battery of a vehicle as
claimed in claim 1, characterized in that when a vehicle
is parked for a long time after the engine is stopped,
the requirements for driving said generator are
neutrality of the gear transmission, the liquid
temperature of said battery not exceeding a predetermined
value, and no-load voltage not exceeding a predefined
limit value.
3. The system for managing the battery of a vehicle as
claimed in claim 2, characterized in that said engine
control unit is programmed so as to stop the engine
operation if the charged voltage of said battery exceeds
the minimum value for driving the engine, or the preset
time for driving the engine is exceeded.
4. A method for managing the battery of a vehicle to make an
engine control unit wake up to deliberately start the
engine so as to charge the battery at a predetermined

time after stopping of the engine, comprising the steps of: determining whether a predetermined time is exceeded after stopping of the engine; determining whether the requirements set for driving a generator are satisfied based on the information of the gear transmission externally supplied, and the liquid temperature of the battery and no-load charged voltage supplied from a battery sensor; and deliberately starting the engine so as to drive said generator to charge the battery.

5. The method for managing the battery of a vehicle as claimed in claim 4, characterized in that the requirements for driving said generator are neutrality of the gear transmission, the liquid temperature of said battery not exceeding a predetermined value, and no-load voltage not exceeding a predefined limit value.

6. The method for managing the battery of a vehicle as claimed in claim 5, characterized in that the step of charging the battery includes a further step of stopping the engine operation if the charged voltage of said battery exceeds the minimum value for driving the engine, or the preset time for driving the engine is exceeded.

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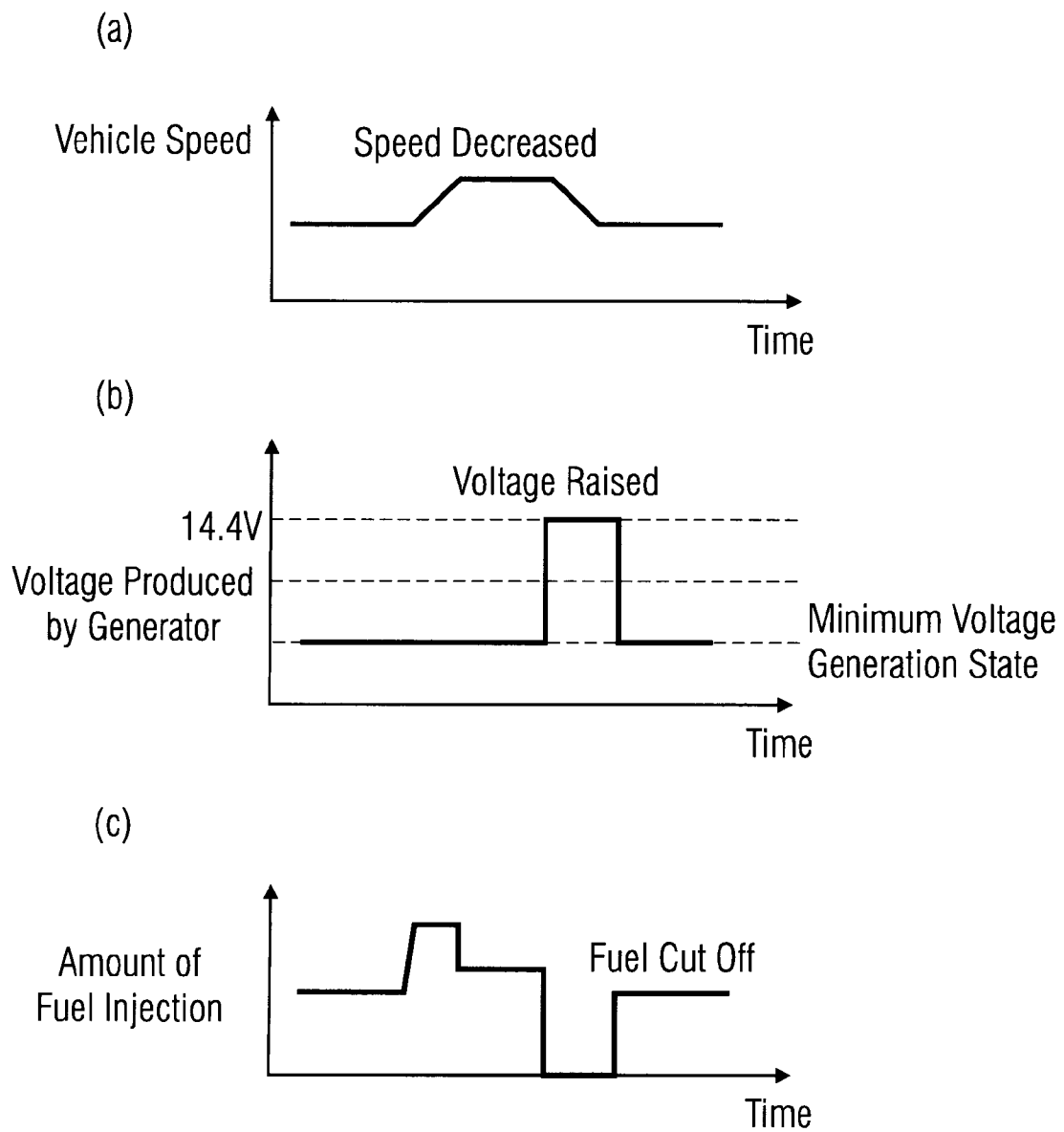


FIG 1

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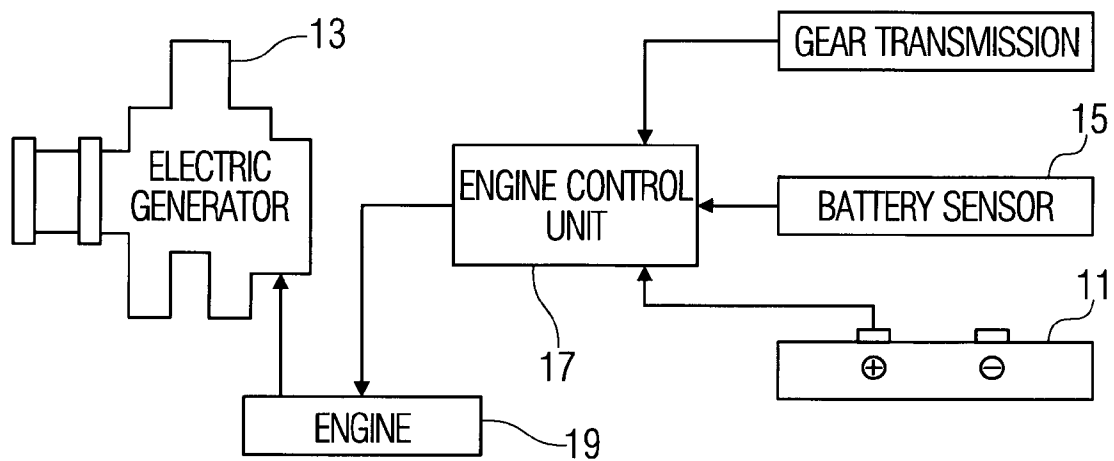


FIG 2

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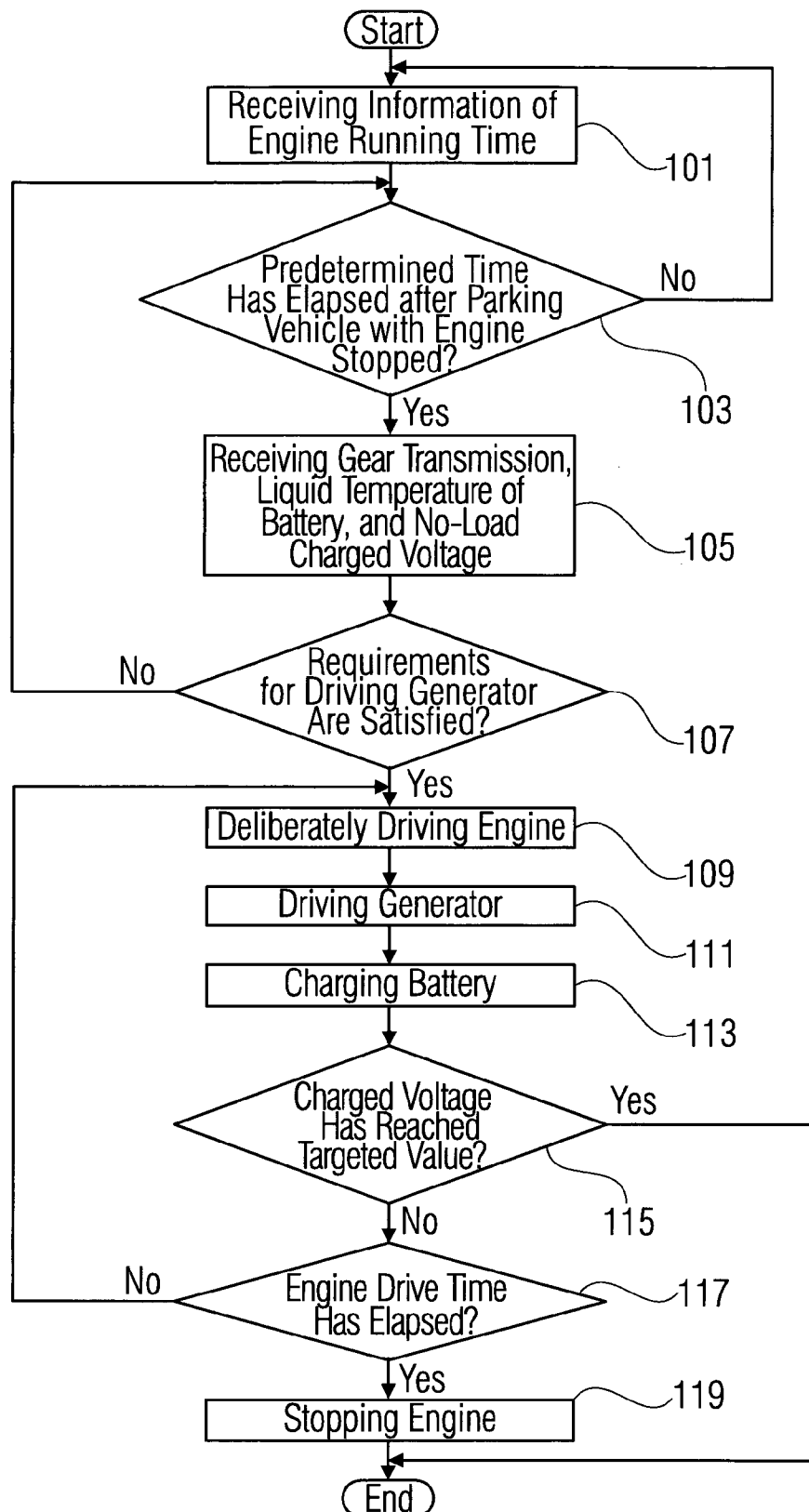


FIG 3