



(22) Date de dépôt/Filing Date: 2014/01/29

(41) Mise à la disp. pub./Open to Public Insp.: 2014/09/22

(45) Date de délivrance/Issue Date: 2015/11/03

(30) Priorité/Priority: 2013/03/22 (JP2013-060802)

(51) Cl.Int./Int.Cl. *B60W 50/00* (2006.01)

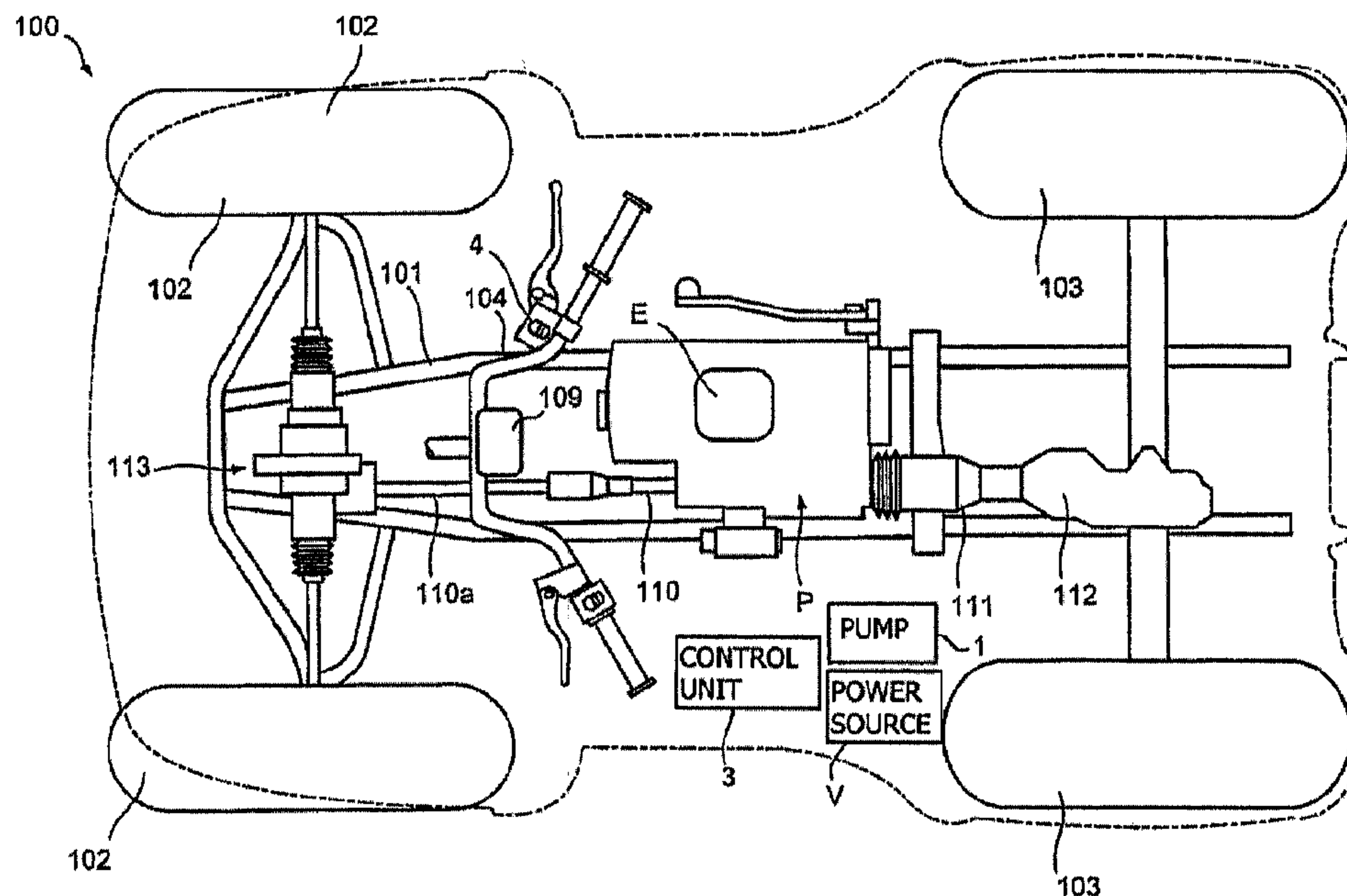
(72) Inventeur/Inventor:
MAKABE, TAKUMI, JP

(73) Propriétaire/Owner:
HONDA MOTOR CO., LTD., JP

(74) Agent: DENNISON ASSOCIATES

(54) Titre : DISPOSITIF DE COMMANDE DE VEHICULE

(54) Title: VEHICLE CONTROL DEVICE



(57) **Abrégé/Abstract:**

The present invention is to eliminate the need for a dedicated port of an engine stop instruction switch to avoid insufficiency in ports. A vehicle control device that controls a vehicle including an engine and an electric pump includes a relay having a contact part that connects and disconnects a power source to and from the electric pump, an engine stop instruction switch that is provided between the power source and a coil part of the relay and connects and disconnects the power source to and from the coil part, and a control unit that controls the engine and the relay and determines whether or not operation of the engine stop instruction switch is made. The control unit includes a port to which the coil part is connected, a drive part that is connected to the port and switches current application of the coil part, a detection part that detects a current flowing to the port, and a determiner that determines whether or not operation of the engine stop instruction switch is made based on a detection result of the detection part.



ABSTRACT OF THE DISCLOSURE

The present invention is to eliminate the need for a dedicated port of an engine stop instruction switch to avoid insufficiency in ports. A vehicle control device that controls a vehicle including an engine and an electric pump includes a relay having a contact part that connects and disconnects a power source to and from the electric pump, an engine stop instruction switch that is provided between the power source and a coil part of the relay and connects and disconnects the power source to and from the coil part, and a control unit that controls the engine and the relay and determines whether or not operation of the engine stop instruction switch is made. The control unit includes a port to which the coil part is connected, a drive part that is connected to the port and switches current application of the coil part, a detection part that detects a current flowing to the port, and a determiner that determines whether or not operation of the engine stop instruction switch is made based on a detection result of the detection part.

VEHICLE CONTROL DEVICE

FIELD OF THE INVENTION

5 The present invention relates to vehicle control devices and particularly to a vehicle control device including an engine stop instruction switch.

BACKGROUND OF THE INVENTION

10 In vehicles typified by two-wheeled vehicles, an engine stop instruction switch is provided (refer to e.g. Japanese Patent No. Hei 4716429). A control unit of the vehicle stops the engine when operation to the engine stop instruction switch is made. To determine whether or not operation to the engine stop instruction switch is made, the control unit is provided with a dedicated port connected to the engine stop instruction switch.

15

Because of diversification of the functions of the control unit of the vehicle, the number of external devices connected to the control unit increases. However, there is a limit to the number of ports of the control unit and it is difficult to achieve an increase in the number of functions due to insufficiency in the number of ports in some cases.

20

An object of the present invention is to eliminate the need for the dedicated port of the engine stop instruction switch to avoid insufficiency in the number of ports.

25 SUMMARY OF THE INVENTION

According to the present invention, a vehicle control device that controls a vehicle including an engine and an electric pump is provided. The vehicle control device is characterized by including a relay having a contact part that connects and disconnects a power source to and from the electric pump, an engine stop instruction switch that is provided between the power source and a coil part of the relay and

30

connects and disconnects the power source to and from the coil part, and a control unit that controls the engine and the relay and determines whether or not operation of the engine stop instruction switch is made. The control unit includes a port to which the coil part is connected, a drive part that is connected to the port and switches current application of the coil part, a detection part that detects a current
5 flowing to the port, and a determiner that determines whether or not operation of the engine stop instruction switch is made based on a detection result of the detection part.

10 According to the present invention, by determining whether or not operation to the engine stop instruction switch is made by utilizing the port to which the drive part is connected, the need for a dedicated port of the engine stop instruction switch can be eliminated and insufficiency in ports can be avoided.

15 In another aspect of the present invention, the detection part may include an amplifier circuit that converts the current to a voltage to amplify the voltage and output the amplified voltage.

20 According to the above aspect of the present invention, due to the provision of the amplifier circuit, it becomes easy to determine whether or not operation of the engine stop instruction switch is made even when the current flowing to the port is weak.

25 In another aspect of the present invention, a fuel injection device and an ignition coil of the engine may be connected on a power supply line between the power source and the coil part and on the upstream side of the engine stop instruction switch, and the control unit may carry out fault diagnosis of the fuel injection device when the vehicle is powered on.

30 According to the above aspect of the present invention, fault diagnosis of the fuel injection device and the ignition coil can be carried out at the initial stage without being affected by the state of the engine stop instruction switch.

35 In another aspect of the present invention, the electric pump may be a fuel pump that supplies a fuel from a fuel tank to the engine.

According to the above aspect of the present invention, by determining whether or not operation of the engine stop instruction switch is made by utilizing the relay for the fuel pump, which is always set to the on-state during the period when the engine is driven, whether or not the operation is made can be determined more surely.

5

In yet another aspect of the present invention, the detection part may include a shunt resistor that is connected to the drive part and through which a current flowing through the coil part flows, and the amplifier circuit may be a differential amplifier circuit that includes an operational amplifier and amplifies the voltage across the

10

shunt resistor.

According to the above aspect of the present invention, the detection part can be formed with a comparatively-simple circuit configuration.

15

In a further aspect of the present invention, the drive part may be a switching element, and the shunt resistor may be provided between the switching element and GND.

20

According to the above aspect of the present invention, the detection part can be formed with a comparatively-simple circuit configuration.

25

In a further aspect of the present invention, the determiner may compare a voltage output from the detection part with a threshold to determine whether or not operation of the engine stop instruction switch is made.

According to the above aspect of the present invention, the operation determination can be carried out comparatively easily.

BRIEF DESCRIPTION OF THE DRAWINGS

30

Preferred embodiments of the invention are shown in the drawings, wherein:

FIG. 1 is a schematic side view of a vehicle as an application example of the present invention;

35

FIG. 2 is a schematic plan view of the vehicle as the application example of the present invention;

FIG. 3 is a block diagram of a vehicle control device as one embodiment of the present invention; and

- 5 FIGS. 4(A) and 4(B) are flowcharts of processing examples executed by a control unit in the vehicle control device.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

10 FIGS. 1 and 2 are schematic side view and schematic plan view of a vehicle 100 as an application example of the present invention. The vehicle 100 is a vehicle for traveling on an irregular ground and particularly a saddle-type four-wheeled buggy car. However, the present invention is not limited to the four-wheeled buggy car and can be applied to various kinds of vehicles.

15 In the vehicle 100, front wheels 102 as a pair of left and right wheels serving as both steered wheels and drive wheels are suspended at a front part of a vehicle body frame 101 made by welding pipes and so forth and rear wheels 103 as a pair of left and right drive wheels are suspended at a rear part of the vehicle body frame 101.

20 A handlebar 104 to steer the front wheels 102 is provided at a front end of the vehicle body frame 101. A meter unit 109 is disposed at a center part of the handlebar 104 and allows a driver to be informed of various kinds of information. Furthermore, an engine stop instruction switch 4 operable by the driver is disposed at part of the handlebar 104. The driver operates the engine stop instruction switch 4 and thereby
25 can forcibly stop the engine of the vehicle 100.

A fuel tank 105 is disposed at an intermediate part of the vehicle body frame 101 in the front-rear direction and a straddle-type seat 106 is disposed rearward of this fuel tank 105 and at an upper part of the vehicle body frame 101. Below the seat 106, a
30 power unit P that carries out rotary driving of a driveshaft 110 is mounted. The power unit P has an engine E driven by a fuel supplied from the fuel tank 105 and includes a transmission that reduces the output of the engine E, a clutch that connects and disconnects a drive train between the engine E and the transmission, an electric generator driven by the engine E, and so forth. An exhaust gas of the
35 engine E of the power unit P is discharged from a muffler 108 to the atmospheric air via an exhaust pipe 107.

The driving force of the driveshaft 110 is transmitted to a final reduction gear 112 via a propeller shaft housed in a swing arm 111, so that the rear wheels 103 are driven. It is also possible to provide a differential gear in the final reduction gear 112.

- 5 The driving force of the driveshaft 110 is also transmitted to a final reduction gear 113 via a propeller shaft 110a, so that the front wheels 102 are driven. When the driveshaft 110 and the propeller shaft 110a are connected by a constant velocity joint, full-time four-wheel driving is obtained. When they are connected via a clutch, two-wheel driving and four-wheel driving can be selected.

10

The final reduction gear 113 can include a differential gear of the front wheels 102 and a differential lock for locking the differential gear. An operation button for allowing the driver to instruct whether or not to actuate the differential lock may be provided on the handlebar 104.

15

The vehicle 100 includes a control unit 3. The control unit 3 is an electric circuit responsible for engine control of the power unit P and control of the whole of the vehicle 100.

- 20 FIG. 3 is a block diagram of a vehicle control device A as one embodiment of the present invention. In the case of the present embodiment, the control device A is composed mainly of the control unit 3 and FIG. 3 shows only a configuration relating to the engine stop instruction switch 4 and a configuration relating to a configuration to be described below.

25

The vehicle 100 includes an electric pump 1, a relay 2, and a fuel injection device 5 and an ignition coil 6 that are provided for the engine E. They are connected to a common power supply line L and receive power supply from a power source V such as a power source circuit connected to a battery. In the case of the present
30 embodiment, the electric pump 1 is a fuel pump that supplies a fuel from the fuel tank 105 to the fuel injection device 5 of the engine E.

- The relay 2 is a relay that allows and stops the power supply to the electric pump 1 and includes a contact part 2a and a coil part 2b that opens and closes the contact
35 part 2a. One terminal of the contact part 2a is connected to the power supply line L and the other terminal is connected to a motor possessed by the electric pump 1. One end of the coil part 2b is connected to one terminal of a contact part of the

engine stop instruction switch 4 via the power supply line L and the other end is connected to an input/output port 3c of the control unit 3. Based on the output state of the input/output port 3c, the state can be switched to the state in which a current flows through the coil part 2b and the contact part 2a is closed (conductive state) and
5 the state in which the current necessary to close the contact part 2a does not flow through the coil part 2b and the contact part 2a is opened (blocking state). Therefore, the power source V can be connected and disconnected to and from the electric pump 1 by the contact part 2a.

10 The fuel injection device 5 is an electric actuator that injects the fuel into an intake port (or cylinder) of the engine E and is connected to a port 3a of the control unit 3. Based on the output state of the output port 3a, the fuel injection device 5 can be driven to inject the fuel.

15 The ignition coil 6 is an electric actuator that ignites an air-fuel mixture in a combustion chamber of the engine E and is connected to an output port 3b of the control unit 3. Based on the output state of the output port 3b, the ignition coil 6 can be driven to ignite the air-fuel mixture.

20 The engine stop instruction switch 4 is provided on the power supply line L. The engine stop instruction switch is set to the state in which its contact part is closed (conductive state) in the normal state, and enters the state in which its contact part is opened (blocking state) when being operated by the driver to instruct stop. If the power source V is deemed as the element of the most upstream side, in the blocking
25 state, the power supply from the power source V to the configuration on the downstream side of the engine stop instruction switch 4 is stopped.

In the case of the present embodiment, the fuel injection device 5 and the ignition coil 6 are connected to the power supply line L on the upstream side of the engine
30 stop instruction switch 4, whereas the coil part 2b of the relay 2 is connected to the power supply line L on the downstream side of the engine stop instruction switch 4. Therefore, when an instruction to stop the engine is given, the power supply from the power source V to the electric pump 1 and the relay 2 is stopped whereas the power supply from the power source V to the fuel injection device 5 and the ignition
35 coil 6 is continued.

The control unit 3 is e.g. an ASIC integrated into one chip including a microcomputer 31 and includes the above-described ports 3a to 3c as ports for input or output to or from external devices. The operation port 3c (referred to also as the input/output port 3c) is a port serving as both an operation port to drive the coil part 2b of the relay 2 and an input port to which the state of the contact part of the engine stop instruction switch 4 is input.

The microcomputer 31 includes a CPU, storage such as a ROM, an I/O interface, an A/D converter 31e, and so forth and runs a program stored in the internal storage or an external storage not shown. The microcomputer 31 includes output ports 31a to 31c and an input port 31d.

A drive circuit 32 to drive the fuel injection device 5 is provided between the output port 3a and the output port 31a and an ignition circuit 33 is provided between the output port 3b and the output port 31b. This allows driving control of the fuel injection device 5 and the ignition coil 6 based on the output of the microcomputer 31.

A drive part 34 to switch the current application of the coil part 2b of the relay 2 is provided between the input/output port 3c and the output port 31c. In the case of the present embodiment, the drive part 34 is formed of a switching element and particularly an FET. However, the drive part 34 may be formed of another switching element such as a transistor.

The drain of the drive part 34 is connected to the input/output port 3c and the source is grounded via a shunt resistor 35a. The gate is connected to the output port 31c. Therefore, the drive part 34 is switched on and off by a signal output from the output port 31c. When the drive part 34 is in the on-state, a current flows through the coil part 2b of the relay 2 and the contact part 2a is closed. The current flowing through the coil part 2b passes through the shunt resistor 35a to flow to the ground (GND). When the drive part 34 is in the off-state, the contact part 2a is opened.

A detection part 35 that detects the current flowing to the input/output port 3c is provided between the input/output port 3c and the input port 31d. In the case of the present embodiment, the detection part 35 includes the shunt resistor 35a and an amplifier circuit 35b. The shunt resistor 35a is connected to the drive part 34 and the current flowing through the coil part 2b flows through it when the drive part 34 is in

the on-state. The amplifier circuit 35b converts the current flowing through the shunt resistor 35a to a voltage and amplifies it to output the amplified voltage to the input port 31d. Due to the provision of the amplifier circuit 35b, it is easy to determine whether or not operation of the engine stop instruction switch 4 is made
5 even when the current flowing through the shunt resistor 35a is weak.

In the case of the present embodiment, the amplifier circuit 35b is a differential amplifier circuit including an operational amplifier OP and resistors R1 to R4 and amplifies the voltage across the shunt resistor 35a. It does not have a special
10 configuration as an amplifier circuit and the detection part 35 can be formed with a comparatively-simple circuit configuration.

The resistor R3 is connected to the non-inverting input of the operational amplifier OP and one end of the shunt resistor 35a and the resistor R4 is connected to the non-
15 inverting input of the operational amplifier OP and GND. The resistor R1 is connected to the inverting input of the operational amplifier OP and the other end of the shunt resistor 35a and the resistor R2 is connected to the inverting input of the operational amplifier OP and the output of the operational amplifier OP. The output of the operational amplifier OP is connected to the input port 31d via a resistor.
20 When the resistance values of the resistors R1 and R3 are set identical (to r_1) and the resistance values of the resistors R2 and R4 are set identical (to r_2), the gain is r_2/r_1 .

When the engine stop instruction switch 4 is in the conductive state and the contact part 2a of the relay 2 is in the closed state, the current flowing from the power source
25 V to the coil part 2b flows through the shunt resistor 35a and the voltage across it is amplified by the amplifier circuit 35b to be measured by the A/D converter 31e. On the other hand, when the engine stop instruction switch 4 enters the blocking state, no current flows from the power source V to the coil part 2b, so that the voltage measured by the A/D converter 31e becomes substantially 0. Thus, the
30 microcomputer 31 can determine whether or not operation of the engine stop instruction switch 4 is made by monitoring the voltage measured by the A/D converter 31e.

As described above, in the present embodiment, the input/output port 3c serves as
35 both a port for detecting operation to the engine stop instruction switch 4 and an operation port for control of the relay 2. This eliminates the need for a dedicated port for detecting operation to the engine stop instruction switch 4 and can avoid the

situation in which ports assigned to other functions are insufficient. Furthermore, the work of wiring between the control unit 3 and external devices can be reduced.

5 The relay 2 to which the engine stop instruction switch 4 is connected may be one for an electric pump other than the fuel pump. However, the fuel pump is always driven during the period when the engine is driven and the relay 2 is always set to the on-state. Thus, by utilizing this to determine whether or not operation of the engine stop instruction switch 4 is made, whether or not the operation is made can be determined more surely.

10

Next, examples of processing executed by the CPU of the microcomputer 31 will be described with reference to FIGS. 4(A) and 4(B). FIG. 4(A) shows a processing example when the vehicle 100 is powered on, and FIG. 4(B) shows an example of determination processing that is executed during the period when the engine E is driven and is to determine whether or not operation of the engine stop instruction switch 4 is made.

15

Referring to FIG. 4(A), processing of fault determination of external devices connected to the control unit 3 is executed in S1. Here, fault determination of the fuel injection device 5 and the ignition coil 6 is carried out for example. A publicly-known method can be employed as the method for the fault determination. Because the fuel injection device 5 and the ignition coil 6 are connected to the power source V on the upstream side of the engine stop instruction switch 4, the fault determination of them is possible even when the engine stop instruction switch 4 is in the blocking state accidentally. A fault occurs in the electric pump 1 less frequently compared with the fuel injection device 5 and the ignition coil 6. Therefore, in the present embodiment, fault determination is not carried out for the electric pump 1. Alternatively, it is carried out after the relay 2 is switched on in S4, whereas the fault determination of the fuel injection device 5 and the ignition coil 6 is carried out at the initial stage.

20

25

If an abnormality is found in S2 as the result of the determination in S1, the processing proceeds to S6 and error processing is executed. If normality is confirmed, the processing proceeds to S3. In the error processing of S6, e.g. processing of informing the driver of the occurrence of a fault is executed.

30

35

P15135CA00
SN 2,841,273

- 10 -

In S3, it is determined whether or not an instruction to start the engine is given by operation of an engine start button or the like. If the instruction is given, the processing proceeds to S4. In S4, the relay 2 is switched on. Specifically, the drive part 34 is switched on to make a current flow through the coil part 2b of the relay 2 and close the contact part 2a. This actuates the electric pump 1. In S5, processing of starting the engine E is executed. Through the above, the processing of one unit ends.

Referring to FIG. 4(B), the state of the input port 31d (voltage measured by the A/D converter 31e) is acquired in S11. In S12, the voltage acquired in S11 is compared with a threshold voltage to determine whether or not operation of the engine stop instruction switch 4 is made. As the threshold voltage, a proper voltage value between the voltage that should be measured when the engine stop instruction switch 4 is in the conductive state and the voltage that should be measured when the engine stop instruction switch 4 is in the blocking state is set. By employing the determination method in which comparison with the threshold voltage is made, determination as to operation of engine stop can be carried out comparatively easily.

In the case of the present embodiment, if the voltage acquired in S11 is lower than the threshold voltage, it is determined that stop operation is made to the engine stop instruction switch 4 and the processing proceeds to S13. If not so, it is determined that stop operation is not made and the processing of one unit is ended.

In S13, the relay 2 is switched off. Specifically, the drive part 34 is switched off to prevent a current from flowing through the coil part 2b of the relay 2 and open the contact part 2a. Although the relay 2 should be already in the off-state if stop operation has been made to the engine stop instruction switch 4, the relay 2 is switched off in terms of the control. In S14, the engine E is stopped. For example, stopping of driving of the fuel injection device 5, stopping of driving of the ignition coil 6, and so forth are carried out. This stops the engine E. Through the above, the processing of one unit ends.

Although various preferred embodiments of the present invention have been described herein in detail, it will be appreciated by those skilled in the art, that variations may be made thereto without departing from the claimed invention.

**THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE
PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:**

1. A vehicle control device that controls a vehicle including an engine and an
5 electric pump, the vehicle control device being characterized by comprising
a relay having a contact part that connects and disconnects a power source to
and from the electric pump,
an engine stop instruction switch that is provided between the power source
and a coil part of the relay and connects and disconnects the power source to and
10 from the coil part, and
a control unit that controls the engine and the relay and determines whether
or not operation of the engine stop instruction switch is made, wherein
the control unit includes a port to which the coil part is connected,
a drive part that is connected to the port and switches current application of
15 the coil part,
a detection part that detects a current flowing to the port, and
a determiner that determines whether or not operation of the engine stop
instruction switch is made based on a detection result of the detection part.
- 20 2. The vehicle control device according to claim 1, characterized in that the
detection part includes an amplifier circuit that converts the current to a voltage to
amplify the voltage and output the amplified voltage.
3. The vehicle control device according to claim 1 or 2, characterized in that
25 a fuel injection device and an ignition coil of the engine are connected on a
power supply line between the power source and the coil part and on an upstream
side of the engine stop instruction switch, and
the control unit carries out fault diagnosis of the fuel injection device when
the vehicle is powered on.
30
4. The vehicle control device according to claim 1, characterized in that the
electric pump is a fuel pump that supplies a fuel from a fuel tank to the engine.
5. The vehicle control device according to claim 2, characterized in that
35 the detection part includes a shunt resistor that is connected to the drive part
and through which a current flowing through the coil part flows, and

- 12 -

the amplifier circuit is a differential amplifier circuit that includes an operational amplifier and amplifies a voltage across the shunt resistor.

6. The vehicle control device according to claim 5, characterized in that the drive
5 part is a switching element, and the shunt resistor is provided between the switching
element and GND.

7. The vehicle control device according to claim 2, characterized in that the
determiner compares a voltage output from the detection part with a threshold to
10 determine whether or not operation of the engine stop instruction switch is made.

FIG. 1

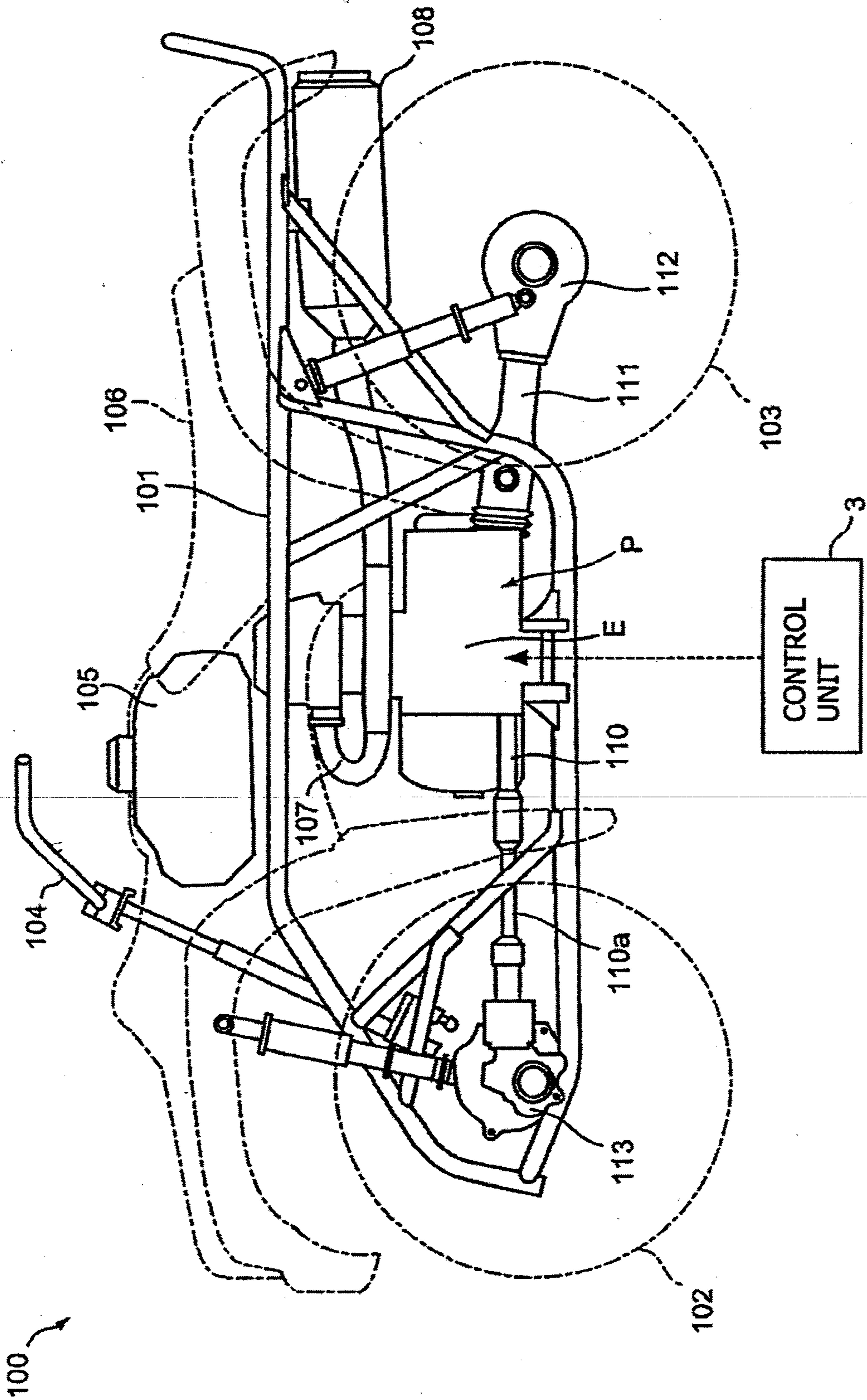


FIG. 2

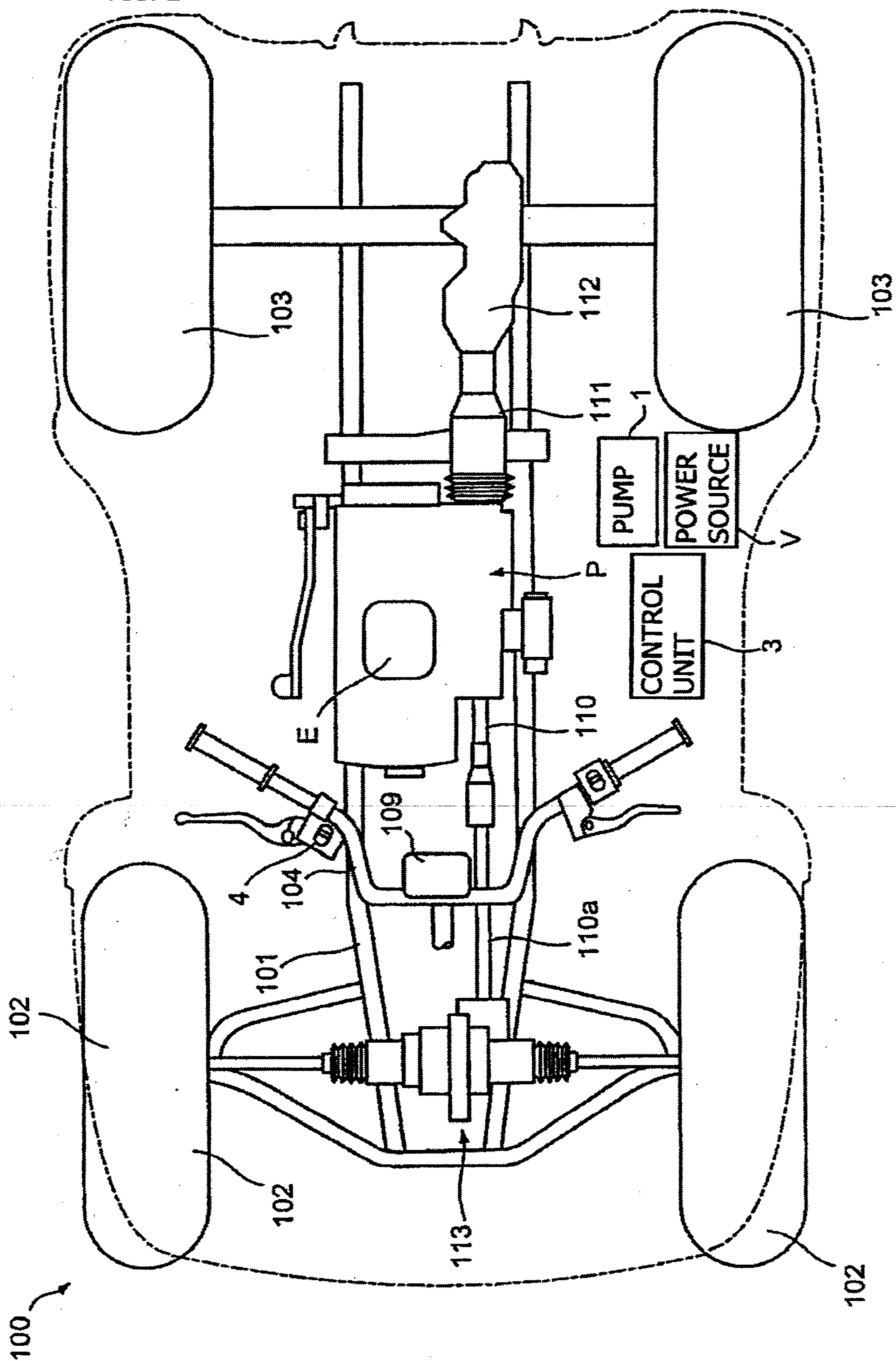


FIG. 3

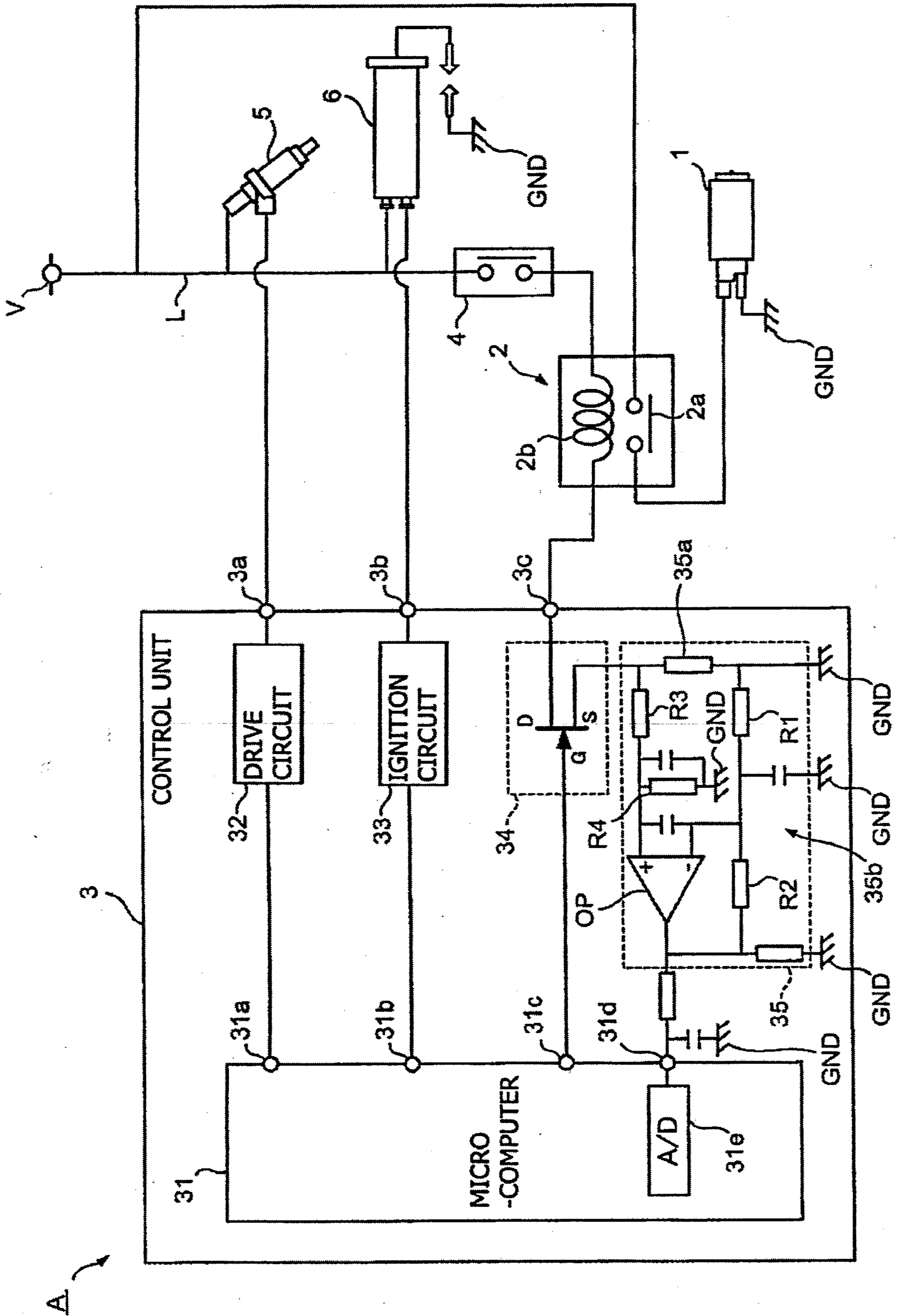


FIG. 4

