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ELECTRIFIED VEHICLE

Abstract

Electrified vehicle includes a motor connected to drive wheels, an inverter for driving the motor, a power storage device, a boost converter provided between the power storage device and the inverter, and a control device for controlling the inverter and the boost converter. When a predetermined condition is satisfied in which the inverter is controlled by pulse width modulation control and the absolute value of the torque command is equal to or greater than the threshold value, the control device sets the control cycle of the boost converter to be the same as the control cycle of the inverter.

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATION [0001] This application claims priority to Japanese Patent Application No. 2024-019512 filed on Feb. 13, 2024, incorporated herein by reference in its entirety.

BACKGROUND
1. Technical Field
[0002] The present disclosure relates to an electrified vehicle.
2. Description of Related Art
[0003] Conventionally, an electrified vehicle has been proposed (for example, refer to Japanese Unexamined Patent Application Publication No. 2010-263719 (JP 2010-263719 A)), the electrified vehicle including a boost converter that boosts and outputs a voltage from a power storage device, an inverter that converts DC power from the boost converter into multi-phase AC power and outputs the multi-phase AC power, and a motor that is rotationally driven by the multi-phase AC power output from the inverter. In the electrified vehicle, when there is a requirement for a temperature rise control of the power storage device, and when a calculation value of an output voltage of the boost converter that is a minimum limit required for rotational driving of the motor is equal to or less than a temperature rise control voltage for the temperature rise control of the power storage device, the output voltage of the boost converter is set to the temperature rise control voltage, and a carrier frequency of the boost converter is set to a voltage rise control carrier frequency to increase the temperature of the power storage device. On the other hand, in this case, when the calculation value exceeds the temperature rise control voltage, the carrier frequency of the boost converter is set to a normal control carrier frequency, and the output voltage of the boost converter is set to the calculation value to avoid a temperature rise control.
SUMMARY
[0004] In the electrified vehicle, when the inverter is controlled by a pulse width modulation (PWM) control and the torque of the motor is comparatively large, there may be cases in which control of the boost converter is comparatively largely disturbed due to a current ripple of a control cycle of the inverter at an output side (inverter side) of the boost converter, and a current ripple at an input side (power storage device side) of the boost converter becomes comparatively large.
[0005] An objective of the electrified vehicle of the present disclosure is to suppress a current ripple on a power storage device side of a boost converter from becoming comparatively large.
[0006] The electrified vehicle of the present disclosure adopts the following techniques in order to achieve the objective.
[0007] An electrified vehicle of the present disclosure includes a motor connected to a drive wheel, an inverter that drives the motor, a power storage device, a boost converter provided between the power storage device and the inverter, and a control device that controls the inverter and the boost converter based on a torque command of the motor.
When the control device controls the inverter by a pulse width modulation control, and a predetermined condition in which an absolute value of the torque command is equal to or more than a threshold is established, the control device sets a control cycle of the boost converter to be identical to a control cycle of the inverter.
[0008] In the electrified vehicle of the present disclosure, when the control device controls the inverter by a pulse width modulation control and a predetermined condition is established, the predetermined condition being an absolute value of the torque command is equal to or more than a threshold, the control device sets a control cycle of the boost converter to be identical to a control cycle of the inverter. As a result, control of the boost converter can be suppressed from being comparatively largely disturbed due to a current ripple of a control cycle of the inverter on an

output side (inverter side) of the boost converter. As a result, a current ripple on an input side (power storage device side) of the boost converter can be suppressed from becoming comparatively large.
[0009] In the electrified vehicle of the present disclosure, the control device may control the inverter by the pulse width modulation control in a control cycle corresponding to twice a first carrier frequency and control the boost converter in a control cycle corresponding to a second carrier frequency, and when the predetermined condition is established, the control device may set the second carrier frequency to twice the first carrier frequency. In this case, when the control device controls the inverter by the pulse width modulation control using three-phase modulation, the control device may control the inverter in a control cycle corresponding to twice the first carrier frequency.
[0010] In the electrified vehicle of the present disclosure, the control device may control the inverter by the pulse width modulation control in a control cycle corresponding to twice a first carrier frequency and control the boost converter in a control cycle corresponding to a second carrier frequency, and when the predetermined condition is established, the control device may set the second carrier frequency to be identical to the first carrier frequency. In this case, when the control device controls the inverter by the pulse width modulation control using two-phase modulation, the control device may control the inverter in a control cycle corresponding to the first carrier frequency.
[0011] In the electrified vehicle of the present disclosure, when slippage due to idling of the drive wheel occurs, the control device may shorten a control cycle of the boost converter compared to when slippage due to idling of the drive wheel does not occur.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
[0012] Features, advantages, and technical and industrial significance of exemplary embodiments of the disclosure will be described below with reference to the accompanying drawings, in which like signs denote like elements, and wherein:
[0013] FIG. **1** is a schematic configuration diagram of a battery electric vehicle **20** according to an embodiment of the present disclosure;
[0014] FIG. **2**A is an explanatory diagram showing an embodiment of a state of generating a PWM of the phase voltage command Vu*, Vv*, Vw* and the transistor T**11** of each phase when the inverter **34** is controlled by PWM control using three-phase modulations;
[0015] FIG. **2**B is an explanatory diagram showing an embodiment of a state of generating a PWM of the phase voltage command Vu*, Vv*, Vw* and the transistor T**11** of each phase when the inverter **34** is controlled by PWM control using three-phase modulations;
[0016] FIG. **3** is a flowchart illustrating an example of a processing routine repeatedly executed by the electronic control unit **50**;
[0017] FIG. **4**A is an explanatory diagram showing an exemplary aspect of generating PWM of the phase voltage command Vu*, Vv*, Vw* and the transistor T**11** of each phase when the inverter **34** is controlled by PWM control using the two-phase modulation; and
[0018] FIG. **4**B is an explanatory diagram showing an exemplary aspect of generating a PWM of the phase voltage command Vu*, Vv*, Vw* and the transistor T**11** of each phase when the inverter **34** is controlled by PWM control using a two-phase modulation.
DETAILED DESCRIPTION OF EMBODIMENTS
[0019] Embodiments for carrying out the present disclosure will be described with reference to the drawings. FIG. **1** is a schematic configuration diagram of a battery electric vehicle **20** according to an embodiment of the present disclosure. As illustrated in the drawing, battery electric vehicle **20**

of the embodiment includes a motor **32**, an inverter **34**, a battery **36** as a power storage device, a boost converter **40**, and an electronic control unit **50** as a control device.

[0020] The motor **32** is configured as a three-phase AC motor, and includes a rotor in which a permanent magnet is embedded in a rotor core, and a stator in which a three-phase coil is wound around the stator core. The rotor of the motor **32** is connected to a drive shaft **26** connected to the drive wheel **22***a*, **22***b* via a differential gear **24**.

[0021] The inverter **34** is used to drive the motor **32** and is connected to the boost converter **40** via the high-voltage-side power line **42**. The inverter **34** includes transistors T**11** to T**16** as six switching elements, and six diodes D**11** to D**16** connected in parallel to each of the six transistors T**11** to T**16**. Transistor T**11** to T**16** are arranged in pairs of two so as to be source side and sink side with respect to the positive line and negative line of the high-voltage side power line **42**, respectively. Each of the connecting points of the transistors which are the pair of the transistors T**11** to T**16** is connected to each of the three-phase (U-phase, V-phase, and W-phase) coils of the motor **32**. Therefore, when a voltage is applied to the inverter **34**, the electronic control unit **50** adjusts the ratio of the on-time of T**16** from the pair of transistors T**11**, thereby forming a rotating magnetic field in the three-phase coil of the motor **32** and rotationally driving the motor **32** (rotor). A smoothing capacitor **46** is attached to the positive line and the negative line of the high-voltage-side power line **42**.

[0022] The battery **36** is configured as, for example, a lithium-ion secondary battery or a nickel-hydrogen secondary battery, and is connected to the boost converter **40** via the low-voltage-side power line **44**. A smoothing capacitor **48** is attached to the positive line and the negative line of the low-voltage-side power line **44**.

[0023] The boost converter **40** is connected to the high-voltage-side power line **42** and the low-voltage-side power line **44**, and includes a transistor T**31**, T**32** as two switching elements, two diode D**31**, D**32** connected in parallel to each of the two transistor T**31**, T**32**, and a reactor L. The transistor T**31** is connected to the positive line of the high-voltage-side power line **42**. The transistor T**32** is connected to the transistor T**31** and the negative line of the high-voltage-side power line **42** and the negative line of the low-voltage-side power line **44**. The reactor L is connected to the connecting points of the two transistors T**31**, T**32** and the positive line of the low-voltage-side power line **44**. As the ratio of an "on" time of the transistors T**31**, T**32** is adjusted by the electronic control unit **50**, the boost converter **40** raises the voltage of electricity in the low voltage-side power lines **44** and supplies this electricity to the high voltage-side power lines **42**, or lowers the voltage of electricity in the high voltage-side power lines **42** and supplies this electricity to the low voltage-side power lines **44**.

[0024] The electronic control unit **50** includes a microcomputer having a CPU **51**, ROM **52**, RAM **53**, a flash memory **54**, an input and output port, and a communication port.

[0025] The electronic control unit **50** receives signals from various sensors via input ports. For example, the electronic control unit **50** receives the rotational speed Nwa, Nwb from the rotational speed sensor **23***a*, **23***b* attached to the drive wheel **22***a*, **22***b*. The electronic control unit **50** also receives the rotational position θm from the rotational position sensor **32***a* for detecting the rotational position of the rotor of the motor **32**, and the phase current Iu, Iv, Iw from the current sensor **32***u*, **32***v*, **32***w* for detecting the phase current of each phase of the motor **32**. The electronic control unit **50** also receives a voltage Vb from a voltage sensor **36***v* mounted between terminals of the battery **36** and a current Ib from a current sensor **36***i* mounted at an output terminal of the battery **36**. The electronic control unit **50** also receives a current IL from a current sensor **40***i* mounted in series with the reactor L of the boost converter **40**, a voltage VH of a capacitor **46** (high-voltage-side power line **42**) from a voltage sensor **46***v* mounted between terminals of the capacitor **46**, and a voltage VL of a capacitor **48** (low-voltage-side power line **44**) from a voltage sensor **48***v* mounted between terminals of the capacitor **48**. The electronic control unit **50** also receives a start signal from the power switch **60**, a shift position SP from the shift sensor **62** for detecting the operation position of the shift lever **61**, an accelerator operation amount Acc from the accelerator pedal position sensor **64** for detecting the depression amount of the accelerator pedal **63**, a brake pedal position BP from the brake pedal position sensor **66** for detecting the depression amount of the brake pedal **65**, and a vehicle speed V from the vehicle speed sensor **67**.

[0026] The electronic control unit **50** outputs various control signals via an output port. For example, the electronic control unit **50** outputs a control signal from the transistor T**11** to T**16** of the inverter **34** and a control signal to the transistor T**31**, T**32** of the boost converter **40**. The electronic control unit **50** calculates the electric angle θe and the rotational speed Nm of the motor **32** based on the rotational position Om of the rotor of the motor **32** from the rotational position sensor **32***a*. The electronic control unit **50** calculates the power storage ratio SOC of the battery **36** based on the integrated value of the current Ib of the battery **36** from the current sensor **36***i*.

[0027] In battery electric vehicle **20** of the embodiment configured in this way, the electronic control unit **50** (CPU **51**) sets the required torque Td* required for the drive shaft **26** based on the accelerator operation amount Acc and the vehicle speed V, sets the set required torque Td* to the torque command Tm* of the motor **32** so as to be outputted to the drive shaft **26**, and performs the switching control of the transistor T**31**,T**32** of the boost converter **40** and the switching control of T**16** from the transistor T**11** of the inverter **34** based on the torque command Tm *.

[0028] The electronic control unit **50** controls the inverters **34** by pulse-width modulation (PWM) control or square-wave control based on the modulation factor Rm. Here, the modulation factor Rm is defined as the ratio of the effective value of the output voltage (the applied voltage of the motor **32**) to the input voltage of the inverter **34** (the voltage VH of the high-voltage-side power line **42**). Instead of the modulation factor Rm, PWM control or the square-wave control may be selected based on the torque command Tm* and the rotational speed Nm. Hereinafter, PWM control will be described. Since the rectangular wave control is not the core of the present disclosure, a detailed description thereof will be omitted.

[0029] In PWM control, the electronic control unit **50** generates the PWM signal from the transistors T**11** to T**16** using a first PWM signal generating process, and performs the switching control from the transistors T**11** to T**16** using the generated PWM signal from the transistors T**11** to T**16**. In the first PWM signal-generating process, the phase current Iu,Iv,Iw of each phase of the motor **32** is coordinate-transformed (three-phase-two-phase transformation) using the electric angle θe of the motor **32** to calculate the current Id, Iq of the d-axis and the q-axis. Subsequently, the current command Id*, Iq* of the d-axis and the q-axis is set based on the torque command Tm* of the motor **32**. Then, the d-axis, the difference between the current Id,Iq and the current command Id*, Iq* of the q-axis is canceled by the current feedback control d-axis, calculates the voltage command Vd*, Vq* of the q-axis, the calculated d-axis, the voltage command Vd*, Vq* of the q-axis coordinate conversion by three-phase modulation using the electric angle θe of the motor **32** (2-3-phase conversion) to calculate the phase voltage command Vu*, Vv*, Vw* of each phase. PWM of T**16** is generated from the transistor T**11** by using the phase-voltage command Vu*, Vv*, Vw* of each phase and the first carrier wave (triangular wave) of the first carrier frequency fa obtained in this manner. As the first carrier frequency fa, for example, a 2.5 kHz to 5 kHz degree is used. FIGS. **2**A and **2**B are explanatory diagrams illustrating an exemplary manner of generating the phase-voltage command Vu*, Vv*, Vw* of each phase and PWM of the transistor T**11** when the inverter **34** is controlled by PWM control using two-phase modulation. FIG. **2**A shows the phase-voltage command Vu*, Vv*, Vw* of each phase, FIG. **2**B shows how to generate PWM of the transistor T**11**. In the embodiment, the first PWM signal generating process is executed at timings of peaks and valleys of the first carrier wave, that is, at a control cycle (1/(2.Math.fa)) corresponding to twice the first carrier frequency fa.

[0030] In the control of the boost converter **40**, the electronic control unit **50** generates a second PWM signal generating process to generate the transistor T**31**,T**32**'s PWM signal, and performs the switching control of the transistor T**31**, T**32** using the generated PWM signal of the transistor T**31**,

T**32**. In the second PWM signal generating process, first, the target voltage VHtag of the high-voltage-side power line **42** is set based on the torque command Tm* and the rotational speed Nm of the motor **32**, and the target current ILtag of the reactor L is calculated by the voltage feedback control so that the difference between the voltage VH of the high-voltage-side power line **42** and the target voltage VH* is canceled out. Subsequently, the duty command D* is calculated by the current feedback control so that the difference between the current IL of the reactor L and the target current IL* is canceled out, and PWM of the transistor T**31**, T**32** is generated using the calculated duty command D* and the second carrier wave (triangular wave) of the second carrier frequency fb. In the embodiment, the second PWM generating process is executed at the timings of peaks or valleys of the second carrier wave, that is, at the control cycle (1/fb) corresponding to the second carrier frequency fb.
[0031] Next, the operation of battery electric vehicle **20** according to the embodiment, in particular, the setting process of the second carrier frequency fb will be described. FIG. **3** is a flow chart illustrating an exemplary process routine that is repeatedly executed by the electronic control unit **50** (CPU **51**).
[0032] When the process of FIG. **3** is executed, the electronic control unit **50** first determines whether the drive wheel **22***a*, **22***b* slippage occurs due to idling (S**100**). This determination process can be performed, for example, by comparing the rotational speed change rates ΔNwa and ΔNwb, which are changes in the rotational speed Nwa, Nwb of the drive wheel **22***a*, **22***b* per unit time, with the thresholds ΔNwref. It should be noted that the rotation speed change rate ΔNm, which is a change amount of the rotational speed Nm of the motor **32** per unit time, may be compared with the threshold value ΔNmref.
[0033] When the electronic control unit **50** determines that slippage due to idling of the drive wheel **22***a*, **22***b* has not occurred in S**100**, it determines which of PWM control and the square-wave control the inverter **34** is controlling (S**110**), and determines whether or not the absolute value of the torque command Tm* of the motor **32** is equal to or greater than the threshold Tmref (S**120**). S**110**, S**120** process is a process of determining whether or not there is a possibility that the control of the boost converter **40** is disturbed relatively greatly by the current ripple of the control cycle (1/(2.fa)) of the inverter **34** at the output side of the boost converter **40** (the inverter **34** side), and the current ripple at the input side of the boost converter **40** (the battery **36** side) becomes relatively large.
[0034] Electronic control unit **50**, when it is determined that the inverter **34** is controlled by the rectangular wave control in S**110**, or when it is determined that the absolute value of the torque command Tm* of the motor **32** in S**120** is less than the threshold Tmref, the input side of the boost converter **40** (battery **36** side) current ripple is determined to be relatively low, set a predetermined frequency fb**1** to the second carrier frequency fb (S**130**), the routine ends. Here, as the predetermined frequency fb**1**, for example, a 10 kHz to a 15 kHz degree is used.
[0035] The electronic control unit **50** determines that the inverter **34** is controlled by PWM control in S**110**, and when S**120** determines that the absolute value of the torque command Tm* of the motor **32** is equal to or larger than the threshold Tmref, it determines that there is a possibility that the current ripple on the input side (the battery **36** side) of the boost converter **40** is relatively large, sets the frequency twice the first carrier frequency fa in the second carrier frequency fb (S**140**), and ends the routine. That is, the control cycle (1/fb) of the boost converter **40** is the same as the control cycle (1/(2.Math.fa)) of the inverter **34**. As a result, it is possible to suppress the control of the boost converter **40** from being disturbed by the current ripple of the control cycle (1/(2.Math.fa)) of the inverter **34** at the output side of the boost converter **40** (the inverter **34** side). As a result, it is possible to suppress the current ripple on the input side (the battery **36** side) of the boost converter **40** from becoming relatively large. The inventors also confirmed this by analysis and experiments.
[0036] When the electronic control unit **50** determines that slippage due to idling of the drive wheel **22***a*, **22***b* has occurred in S**100**, a predetermined frequency fb**2** higher than the predetermined

frequency fb**1** is set in the second carrier frequency fb (S**150**), and the routine ends. That is, when slippage due to idling of the drive wheel **22***a*, **22***b* is occurring, the control cycle (1/fb) of the boost converter **40** is made shorter than when slippage due to idling of the drive wheel **22***a*, **22***b* is not occurring. Thus, the control stability of the boost converter **40** can be ensured. As the predetermined frequency fb**2**, for example, a value larger than the predetermined frequency fb**1** by several kHz to about 10 kHz is used.

[0037] In battery electric vehicle **20** of the above-described embodiment, when the drive wheel **22***a*, **22***b* does not slippage due to idling and the inverter **34** is controlled by PWM control and the absolute value of the torque command Tm* of the motor **32** is equal to or larger than the threshold Tmref, the control cycle (1/fb) of the boost converter **40** is made equal to the control cycle (1/(2.Math.fa)) of the inverter **34**. As a result, it is possible to suppress the control of the boost converter **40** from being disturbed by the current ripple of the control cycle (1/(2.fa)) of the inverter **34** at the output side of the boost converter **40** (the inverter **34** side). As a result, it is possible to prevent the current ripple on the input side (the battery **36** side) of the boost converter **40** from becoming relatively large.

[0038] In the above-described embodiment, the electronic control unit **50** executes the first PWM signal generating process at the timings of the peaks and valleys of the first carrier wave, that is, at the control cycle (1/(2.Math.fa)) corresponding to twice the first carrier frequency fa, but is not limited thereto. For example, the first PWM signal generating process may be performed at a peak timing or a valley timing of the first carrier wave, that is, at a control cycle (1/fa) corresponding to the first carrier frequency fa. In this case, when the drive wheel **22***a*, **22***b* does not slippage due to idling and the inverter **34** is controlled by PWM control and the absolute value of the torque command Tm* of the motor **32** is equal to or larger than the threshold Tmref, the control cycle (1/fb) of the boost converter **40** may be made equal to the control cycle (1/fa) of the inverter **34** by setting the first carrier frequency fa in the second carrier frequency fb.

[0039] In the above-described embodiment, the electronic control unit **50** controls the inverters **34** by PWM control using three-phase modulations, but the present disclosure is not limited thereto. For example, the inverters **34** may be controlled by PWM control using two-phase modulations. In this case, in the first PWM signal generating process, in place of calculating the phase voltage command Vu*, Vv*, Vw* of each phase by coordinate conversion of the voltage command Vd*, Vq* of the d-axis, q-axis (2-phase-3-phase conversion) by three-phase modulation using the electric angle θe of the motor **32**, the phase voltage command Vu*, Vv*, Vw* of each phase is calculated by coordinate conversion of the voltage command Vd*, Vq* of the d-axis, q-axis (2-phase-3-phase conversion) by two-phase modulation using the electric angle θe of the motor **32**. FIGS. **4**A and **4**B are explanatory diagrams illustrating an exemplary manner of generating the phase-voltage command Vu*, Vv*, Vw* of each phase and PWM of the transistor T**11** when the inverter **34** is controlled by PWM control using two-phase modulation. FIG. **4**A shows the phase-voltage command Vu*, Vv*, Vw* of each phase, FIG. **4**B shows how to generate PWM of the transistor T**11**. When the inverter **34** is controlled by PWM control using two-phase modulation, the first PWM signal generating process may be executed at the control cycle corresponding to twice the first carrier frequency fa (1/(2.Math.fa)), or the first PWM signal generating process may be executed at the control cycle corresponding to the first carrier frequency fa (1/fa). In either case, when the drive wheel **22***a*, **22***b* is not slippage due to idling and the inverter **34** is controlled by PWM control and the absolute value of the torque command Tm* of the motor **32** is equal to or larger than the threshold Tmref, the control cycle (1/fb) of the boost converter **40** may be the same as the control cycle (1/(2 fa) or 1/fa) of the inverter **34**.

[0040] In the above-described embodiment, the electronic control unit **50** controls the inverters **34** by PWM control using three-phase modulations. In the above-described modification, the electronic control unit **50** controls the inverters **34** by PWM control using two-phase modulations. In general, the three-phase modulation can improve the controllability of the inverter **34** as compared with the two-phase modulation. On the other hand, the two-phase modulation can reduce the switching-loss of T**16** from the transistor T**11** of the inverter **34** as compared with the three-phase modulation. Therefore, three-phase modulation or two-phase modulation may be selected based on the temperature of the inverter **34** or the like.

[0041] In the above-described embodiment, the electronic control unit **50** sets the predetermined frequency fb**1** to the second carrier frequency fb when the inverter **34** is controlled by the square-wave control or when the absolute value of the torque command Tm* of the motor **32** is less than the threshold Tmref when the slippage due to idling of the drive wheel **22***a*, **22***b* is not occurring. Further, the electronic control unit **50** sets the second carrier frequency fb to a predetermined frequency fb**2** higher than the predetermined frequency fb**1** when slippage due to idling of the drive wheel **22***a*, **22***b* occurs. However, the same frequency may be used as the predetermined frequency fb**1** and the predetermined frequency fb**2**.

[0042] In the above-described embodiment, the battery **36** is used as the power storage device, but the present disclosure is not limited thereto. For example, a capacitor or the like may be used as the power storage device.

[0043] In the above-described embodiment, the configuration of battery electric vehicle **20** including the motor **32**, the inverter **34**, the battery **36**, and the boost converter **40** has been described, but the configuration is not limited thereto. For example, in addition to a hardware configuration similar to that of battery electric vehicle **20**, a hybrid electric vehicle configuration including an engine may be employed, or a fuel cell electric vehicle configuration including a fuel-cell in addition to a hardware configuration similar to that of battery electric vehicle **20** may be employed. For hybrid electric vehicle configurations, the drive shaft connected to the first motor and the engine and the drive wheel may be connected to the sun gear and the carrier and the ring gear of the planetary gear respectively, a second motor may be connected to the drive shaft, and a boost converter may be provided between the first, second inverters for driving the first, second motors respectively and the battery Further, a boost converter may be provided between an inverter that drives a motor and a battery by connecting a motor to a drive shaft connected to the drive wheels via a transmission and connecting an engine to the motor via a clutch.

[0044] The correspondence between the main elements of the embodiments and the main elements of the disclosure described in the column of the means for solving the problem will be described. In the embodiment, the motor **32** corresponds to the “motor”, the inverter **34** corresponds to the “inverter”, the battery **36** corresponds to the “power storage device”, the boost converter **40** corresponds to the “boost converter”, and the electronic control unit **50** corresponds to the “control device”.

[0045] Note that the correspondence between the main elements of the embodiment and the main elements of the disclosure described in the section of the means for solving the problem is an example for specifically explaining the embodiment of the disclosure described in the section of the means for solving the problem, and therefore the elements of the disclosure described in the section of the means for solving the problem are not limited. That is, the interpretation of the disclosure described in the section of the means for solving the problem should be performed based on the description in the section, and the embodiments are only specific examples of the disclosure described in the section of the means for solving the problem.

[0046] Hereinafter, while embodiments for carrying out the present disclosure are described by using embodiments, it is needless to say that the present disclosure is not limited to such embodiments, and can be implemented in various forms without departing from the gist of the present disclosure.

[0047] The present disclosure is applicable to a manufacturing industry of an electrified vehicle and the like.

Claims

1. An electrified vehicle comprising: a motor connected to a drive wheel; an inverter that drives the motor; a power storage device; a boost converter provided between the power storage device and the inverter; and a control device that controls the inverter and the boost converter based on a torque command of the motor, wherein when the control device controls the inverter by a pulse width modulation control, and a predetermined condition in which an absolute value of the torque command is equal to or more than a threshold is established, the control device sets a control cycle of the boost converter to be identical to a control cycle of the inverter.
2. The electrified vehicle according to claim 1, wherein the control device controls the inverter by the pulse width modulation control in a control cycle corresponding to twice a first carrier frequency and controls the boost converter in a control cycle corresponding to a second carrier frequency, and when the predetermined condition is established, the control device sets the second carrier frequency to twice the first carrier frequency.
3. The electrified vehicle according to claim 1, wherein the control device controls the inverter by the pulse width modulation control in a control cycle corresponding to a first carrier frequency and controls the boost converter in a control cycle corresponding to a second carrier frequency, and when the predetermined condition is established, the control device sets the second carrier frequency to be identical to the first carrier frequency.
4. The electrified vehicle according to claim 1, wherein when slippage due to idling of the drive wheel occurs, the control device shortens a control cycle of the boost converter compared to when slippage due to idling of the drive wheel does not occur.