determine the polarity of the magnetic pole of the brushless motor, based on the differences between current amplitudes in the positive and negative directions of the d- and q-axes, the differences being detected by the current detector by superimposing voltages in the positive and negative directions of the d- and q-axes, respectively, and correct the initial phase.

[0005a] In one aspect, the present disclosure refers to a motor control device configured to control a brushless motor, the brushless motor including a rotor with a salient pole structure and being configured to be driven by an inverter circuit, the motor control device comprising the inverter circuit, a current detector configured to detect a current flowing through the brushless motor, an initial phase estimation unit configured to estimate an initial phase of the brushless motor, based on the current detected by the current detector; and a polarity determination unit configured to determine a polarity of a magnetic pole of the brushless motor, based on the current detected by the current detector, wherein, for the initial phase estimated by the initial phase estimation unit, the polarity determination unit determines the polarity of the magnetic pole of the brushless motor, based on a difference between a current amplitude in a positive direction of a d-axis and a current amplitude in a negative direction of the d-axis, the difference being detected by the current detector by superimposing a voltage in the positive direction of the d-axis and a voltage in the negative direction of the d-axis, respectively, and a difference between a current amplitude in a positive direction of a q-axis and a current amplitude in a negative direction of the q-axis, the difference being detected by the current detector by superimposing a voltage in the positive direction of the q-axis and a voltage in the negative direction of the q-axis, respectively, and corrects the initial phase.

[0006] The washing machine or the washing and drying machine in the present disclosure has the motor control device in the present disclosure installed therein.

[0007] The motor control device in the present disclosure is capable of correctly detecting magnetic poles even when an initially estimated d-axis direction is incorrectly shifted by 90° or 270° with respect to a correct direction.

[0008] Furthermore, since the washing machine or the washing and drying machine in the present disclosure has the above-described motor control device in the present disclosure installed therein, the washing machine or the washing and drying machine is capable of smoothly rotating a washing tub or a drum, for example.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] FIG. 1 is a diagram illustrating the configuration of a motor control device in Embodiment 1.

FIG. 2 is a block diagram illustrating the configuration of a sensorless estimation unit of the motor control device in Embodiment 1.

FIG. 3 is a block diagram illustrating the detailed configuration of an inductance driver of the motor control device in Embodiment 1.

FIG. 4 is a block diagram illustrating the detailed configuration of an induced voltage driver of the motor control device in Embodiment 1.

FIG. 5 is a flow chart illustrating a flow of motor drive control processing of the motor control device in Embodiment 1.

FIG. 6A is a diagram for explaining problems about estimation of an initial phase of a rotor.

FIG. 6B is a diagram for explaining the problems about the estimation of the initial phase of the rotor.

FIG. 6C is a diagram for explaining the problems about the estimation of the initial phase of the rotor.

FIG. 7 is a diagram illustrating a magnetic saturation characteristic of an electromagnetic steel sheet used for common brushless motors.