CLAIMS

[Claim 1]

A hot water supply apparatus comprising:

a heat pump unit including a compressor, a water heat exchanger, a pressure reducing device, and an air heat exchanger, the heat pump unit being configured to heat water flowing through the water heat exchanger;

a compressor input power determination unit configured to compare a compressor input power of the compressor with a set threshold, and

a compressor control unit configured to control an operating frequency of the compressor,

wherein, the compressor control unit is configured to, upon start of a defrosting operation in which the pressure reducing device is opened, supply of the water to the water heat exchanger is stopped, and refrigerant discharged from the compressor is caused to flow into the air heat exchanger, in a case where the compressor input power exceeds the set threshold, reduce the operating frequency of the compressor, thereby reducing flow speed of the refrigerant flowing into the pressure reducing device.

[Claim 2]

The hot water supply apparatus of claim 1, further comprising:

a current sensor configured to detect a value of a current through the compressor; and

a compressor input power calculation unit configured to calculate the compressor input power from the value of the current through the compressor detected by the current sensor and a voltage applied to the compressor.

[Claim 3]

The hot water supply apparatus of claim 1, wherein the compressor control unit controls, based on a power consumption of the heat pump unit, the operating frequency of the compressor.

[Claim 4]

The hot water supply apparatus of claim 1, further comprising:

a discharge temperature sensor configured to detect a discharge temperature of the refrigerant discharged from the compressor;

a suction state estimation unit configured to estimate, based on the discharge temperature detected by the discharge temperature sensor, a suction state of the refrigerant to be sucked into the compressor;

a circulation rate calculation unit configured to calculate a refrigerant circulation rate of the refrigerant from the estimated suction state; and

an operating frequency determination unit configured to determine, based on the calculated refrigerant circulation rate, the operating frequency of the compressor,

wherein the compressor control unit sets an operating frequency of the compressor to the operating frequency determined by the operating frequency determination unit upon start of the defrosting operation.

[Claim 5]

The hot water supply apparatus of claim 4, further comprising:

a high-pressure-side pressure sensor configured to detect a high-pressure-side pressure,

wherein the suction state estimation unit estimates the suction state based on the high-pressure-side pressure detected by the high-pressure-side pressure sensor and the discharge temperature detected by the discharge temperature sensor.

[Claim 6]

A hot water supply apparatus comprising:

a heat pump unit including a compressor, a water heat exchanger, a pressure reducing device, and an air heat exchanger, the heat pump unit being configured to heat water flowing through the water heat exchanger;

a refrigerant density estimation unit configured to estimate, based on a discharge temperature of the refrigerant discharged from the compressor and a high-pressure-side pressure, a refrigerant density at an inlet of the pressure reducing device; and

a refrigerant density determination unit configured to compare the estimated refrigerant density with a set threshold,

a pressure reducing device control unit configured to control an opening degree of the pressure reducing device,

wherein, upon start of a defrosting operation in which the pressure reducing device is opened, supply of the water to the water heat exchanger is stopped, and refrigerant discharged from the compressor is caused to flow into the air heat exchanger, in a case where the estimated refrigerant density is less than the set threshold, the pressure reducing device control unit reduces the opening degree of the pressure reducing device, thereby reducing flow speed of the refrigerant flowing into the pressure reducing device.

[Claim 7]

The hot water supply apparatus of any one of claims 1 to 6, further comprising:

a tank unit including

a hot water storage tank having a heated water inlet through which heated water heated by the water heat exchanger flows into the tank, an unheated water outlet through which unheated water flows out of the tank, and a medium temperature water outlet through which medium temperature water having a medium temperature between a temperature of the heated water and that of the unheated water flows out of the tank, and

a flow switching valve having a first inlet port connected to the unheated water outlet, a second inlet port connected to the medium temperature water outlet, and an outlet port connected to an inlet side of the water heat exchanger, the flow switching valve being configured to switch between passages such that either one of the first inlet port and the second inlet port is in communication with the outlet port; and

a switching valve control unit configured to cause, upon start of the defrosting operation, the flow switching valve to switch between the passages such that the second inlet port is in communication with the outlet port.

[Claim 8]

The hot water supply apparatus of claim 7, wherein

the heated water inlet is located in upper part of the hot water storage tank,

the unheated water outlet is located in lower part of the hot water storage tank, and

the medium temperature water outlet is located in middle part of the hot water storage tank.

[Claim 9]

The hot water supply apparatus of any one of claims 1 to 8, wherein the compressor, the water heat exchanger, the pressure reducing device, the air heat exchanger, and the compressor are connected in circuit by refrigerant pipes to form a refrigerant circuit.