CONTROL DEVICE FOR AIR-CONDITIONING SYSTEM

FIELD OF THE INVENTION

[0001] The present invention relates to a control device, and more particularly, to a control device for an air-conditioning system.

BACKGROUND OF THE INVENTION

[0002] A conventional bus air-conditioning system comprises an air conditioner and a heater. The bus driver sets a desired temperature through the control device of the air-conditioning system according to the outdoor temperature and the use experience. The driver sets and activates the air-conditioning refrigeration mode or the air-conditioning constant temperature mode, and then the driver manually changes the set temperature or change the air-conditioning mode according to the outdoor temperature or the feedback from the passengers.

[0003] However, in the conventional air-conditioning system, the air-conditioning mode and temperature is set by the driver through the control device. If the air-conditioning temperature is set too high or too low, the air volume is set too high or the air-conditioning mode is changed in response to the external environment, the air-conditioning system will have the problems, such as fuel consumption, heavy power load and discomfort. Accordingly, the inventor of the present invention has devoted himself based on his many years of practical experiences to solve these problems.

SUMMARY OF THE INVENTION

[0004] The primary object of the present invention is to provide a control device for an air-conditioning system, which has the effects of fuel saving, light power load and good comfort.

[0005] In order to achieve the above object, the present invention provides a control device for an air-conditioning system. The control device is installed in an air-conditioning system of a vehicle. The air-conditioning system comprises an air conditioner and a heater. The control device comprises an outdoor temperature sensor, an indoor temperature sensor, and a controller. The outdoor temperature sensor is disposed outside the vehicle for detecting an outdoor temperature. The indoor temperature sensor is disposed inside the vehicle for detecting an indoor temperature. The controller is electrically connected to the outdoor temperature

sensor and the indoor temperature sensor. The controller includes an indoor temperature setting unit, a refrigeration drive control unit, a heating drive control unit, and an air volume drive control unit. The indoor temperature setting unit automatically sets a set temperature according to the outdoor temperature. The controller controls operation of the air conditioner through the refrigeration drive control unit according to the indoor temperature and controls operation of the heater through the heating drive control unit.

[0006] The control device of the air-conditioning system provided by the present invention can repeatedly, automatically adjust the set temperature according to the change of the outdoor temperature and the indoor temperature, control the operation of the air conditioner and the heater according to the difference between the outdoor temperature, the set temperature and the indoor temperature, control or adjust the air conditioner, and adjust the output mode of the air conditioner, the heater and the blower at any time, having the effects of fuel saving, light power load and good comfort.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] FIG. 1 is a schematic diagram showing the configuration of the system according to a preferred embodiment of the present invention, and

[0008] FIG. 2 is a block diagram of the system according to the preferred embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0009] Embodiments of the present invention will now be described, by way of example only, with reference to the accompanying drawings.

[0010] FIG. 1 is a schematic diagram showing the configuration of the system according to a preferred embodiment of the present invention. FIG. 2 is a block diagram of the system according to the preferred embodiment of the present invention. The present invention discloses a control device 100 for an air-conditioning system. The control device 100 is installed in an air-conditioning system 201 of a vehicle 200. The vehicle 200 is a bus or a coach. The air-conditioning system 201 comprises an air conditioner 202 and a heater 208. The air conditioner 202 includes a compressor 203, a condenser 204, and an evaporator 205. The compressor 203 is a compressor that is driven by an engine or an electric compressor that is driven electrically. The compressor 203 is connected to the condenser 204. The condenser 204 is connected to the

evaporator 205. A blower 206 is provided on one side of the evaporator 205. An air outlet 207 is disposed on the other side of the evaporator 205. The heater 208 is a hot water radiator or an electric heater. The heater 208 is disposed between the evaporator 205 and the blower 206.

[0011] The control device 100 of the air-conditioning system comprises an outdoor temperature sensor 10, an indoor temperature sensor 20, and a controller 30.

[0012] The outdoor temperature sensor 10 is disposed outside the vehicle 200 for detecting the outdoor temperature and outputting an outdoor temperature signal.

[0013] The indoor temperature sensor 20 is disposed inside the vehicle 200 for detecting the indoor temperature and outputting an indoor temperature signal.

[0014] The controller 30 is a panel controller 30. The controller 30 is electrically connected to the air-conditioning system 201, the outdoor temperature sensor 10 and the indoor temperature sensor 20, and automatically sets a set temperature. The controller 30 includes an indoor temperature setting unit 31, a refrigeration drive control unit 32, a heating drive control unit 33, and an air volume drive control unit 34. During initial start-up or use, the indoor temperature setting unit 31 will automatically set the set temperature according to the outdoor temperature. The controller 30 controls the operation of the compressor 203 of the air conditioner 202 through the refrigeration drive control unit 32 according to the indoor temperature, and controls the operation of the heater 208 through the heating drive control unit 33.

[0015] The refrigeration drive control unit 32 is electrically connected to the compressor 203 of the air conditioner 202. The refrigeration drive control unit 32 will output a command to control the compressor 203 according to the difference between the outdoor temperature, the set temperature and the indoor temperature, so as to adjust the output mode of the compressor 203. When the compressor is driven by an engine, the refrigeration drive control unit 32 is configured to output a speed command to control the operation of the compressor. The output mode of the compressor may be continuous, stop or intermittent. When the compressor is an electric compressor, the refrigeration drive control unit is configured to output a speed command to control the rotational speed of the compressor. The output mode of the compressor may be continuous, stop, intermittent or frequency conversion speed reduction. Intermittent is also called frequency conversion speed reduction, so as to adjust the air-conditioning temperature of the air outlet 207.

[0016] The heating drive control unit 33 is electrically connected to the heater 208. In this embodiment of the present invention, the heater 208 is a hot water radiator. The heating drive control unit 33 is electrically connected to a control valve 209 of the heater 208. The heating drive control unit 33 will output a command to control the switch or output ratio of the control valve 209 according to the difference between the outdoor temperature, the set temperature and the indoor temperature, so as to adjust the output mode of the control valve 209. The control valve 209 is a solenoid valve or proportional valve. The solenoid valve is controlled by switching, and is fully opened or fully closed according to the control command. The output mode may be continuous or stop. The proportional valve is a continuous opening control of the valve port, and the valve port is opened to a certain angle according to the control command, so as to control the flow change continuously. The output mode may be continuous, stop or intermittent. The intermittent is also called adjusting the output ratio, so as to adjust the air-conditioning temperature of the air outlet 207.

[0017] The air volume drive control unit 34 is electrically connected to the blower 206. The air volume drive control unit 34 will output a speed command to control the rotational speed of the blower 206 according to the difference between the outdoor temperature, the set temperature and the indoor temperature, so as to adjust the air volume of the blower 206.

[0018] Please refer to FIG. 1and FIG. 2. When the control device 100 of the air-conditioning system is actuated, the controller 30 will automatically set the set temperature according to the outdoor temperature, control the operation of the air-conditioning system and the heater 208 according to the indoor temperature, and control the rotational speed of the blower 206 according to the difference between the outdoor temperature, the set temperature and the indoor temperature, so as to adjust the air volume of the blower 206. When the compressor 203 of the air-conditioning system is running, the blower 206 will drive the return air through the evaporator 205 to reduce the air temperature, so as to supply cold air via the air outlet 207. When the heater 208 is running, the blower 206 will drive the return air through the hot water radiator of the heater 208 to raise the air temperature, so as to discharge warm air via the air outlet 207. Thereby, the control device 100 of the air-conditioning system of the present invention can automatically set a comfortable indoor temperature, having the effects of fuel saving, light power load and good comfort, so as to overcome the problems of fuel consumption, heavy power load and discomfort caused by the prior art.

[0019] When in use, the control device 100 of the air-conditioning system will repeatedly, automatically adjust the set temperature according to the change of the outdoor temperature and the indoor temperature, and automatically adjust the operation mode of the air conditioner 202, the heater 208 and the blower 206 according to the difference between the outdoor temperature, the set temperature and the indoor temperature. The output mode of the compressor 203 of the air conditioner 202 and the control valve 209 of the heater 208 may be continuous, stop or intermittent. The blower 206 adjusts the rotational speed to control the air volume of the air outlet 207. Thereby, the control device 100 of the air-conditioning system of the present invention can repeatedly, automatically set the temperature and output mode according to the external environment of the vehicle or the temperature change, having the effects of fuel saving, light power load and good comfort. The present invention overcomes the problem of discomfort caused by the prior art that the air-conditioning mode is set by the driver.

[0020] Although particular embodiments of the present invention have been described in detail for purposes of illustration, various modifications and enhancements may be made without departing from the spirit and scope of the present invention. Accordingly, the present invention is not to be limited except as by the appended claims.

WHAT IS CLAIMED IS:

1. A control device for an air-conditioning system, installed in an air-conditioning system of a vehicle, the air-conditioning system comprising an air conditioner and a heater, the control device comprising:

an outdoor temperature sensor, disposed outside the vehicle for detecting an outdoor temperature;

an indoor temperature sensor, disposed inside the vehicle for detecting an indoor temperature;

a controller, electrically connected to the outdoor temperature sensor and the indoor temperature sensor, the controller including an indoor temperature setting unit, a refrigeration drive control unit, a heating drive control unit and an air volume drive control unit, wherein the indoor temperature setting unit automatically sets a set temperature according to the outdoor temperature, and the controller controls operation of the air conditioner through the refrigeration drive control unit according to the indoor temperature and controls operation of the heater through the heating drive control unit.

2. The control device as claimed in claim 1, wherein the air conditioner includes a compressor, the refrigeration drive control unit is electrically connected to the compressor of the air conditioner, and the refrigeration drive control unit outputs a command to control the compressor according to a difference between the outdoor temperature, the set temperature and the indoor temperature, so as to adjust an output mode of the compressor.

3. The control device as claimed in claim 2, wherein the compressor is a compressor driven by an engine, and the refrigeration drive control unit is configured to output a speed command to control operation of the compressor.

4. The control device as claimed in claim 2, wherein the compressor is an electric compressor, and the refrigeration drive control unit is configured to output a speed command to control a rotational speed of the compressor.

5. The control device as claimed in claim 3, wherein the output mode of the compressor is continuous, stop or intermittent.

6. The control device as claimed in claim 4, wherein the output mode of the compressor is continuous, stop, intermittent or frequency conversion speed reduction.

7. The control device as claimed in claim 1, wherein the heating drive control unit is electrically connected to the heater, the heating drive control unit is configured to output a command to control a switch or output ratio of a control valve according to a difference between the outdoor temperature, the set temperature and the indoor temperature, so as to adjust an output mode of the control valve.

8. The control device as claimed in claim 7, wherein the control valve is a solenoid valve, and an output mode of the heating drive control unit is continuous or stop.

9. The control device as claimed in claim 7, wherein the control valve is a proportional valve, and an output mode of the heating drive control unit is continuous, stop or intermittent.

10. The control device as claimed in claim 1, wherein the air-conditioning system comprises a blower, the air volume drive control unit is electrically connected to the blower, the air volume drive control unit is configured to output a speed command to control a rotational speed of the blower according to a difference between the outdoor temperature, the set temperature and the indoor temperature, so as to adjust an air volume of the blower.