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(54) **CLOTHES TREATING APPARATUS AND METHOD OF THE SAME**

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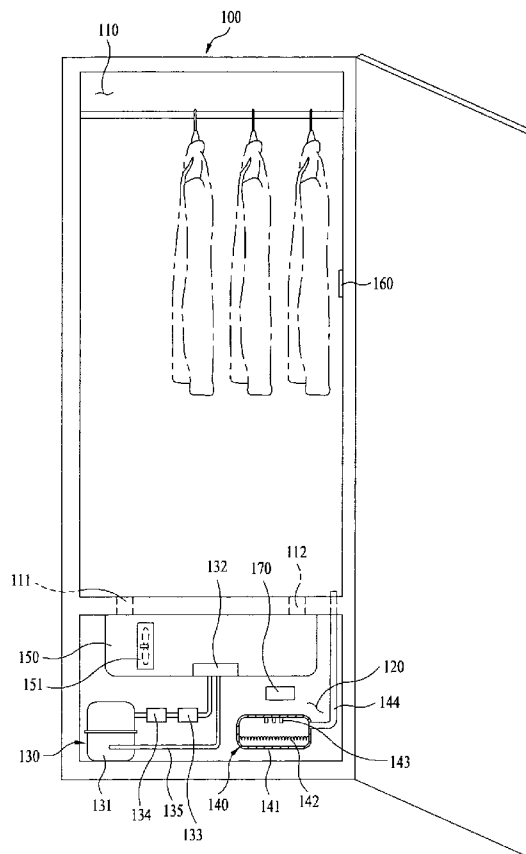
(57) **ABSTRACT**

The present invention relates to apparatus and method for treating clothes, which can prevent an operation pressure of a compressor of a heat pump from rising, excessively. The clothes treating apparatus includes a housing which forms a holding space for holding clothes, a heat pump for generating hot air for drying laundry in the holding space, a sensing unit mounted to a circulation passage of air being supplied to the holding space or an inlet passage of air introduced to the heat pump for measuring a temperature of the air, and a control unit for controlling a temperature of the housing to drop below a preset temperature if the temperature of the holding space is higher than a preset temperature.

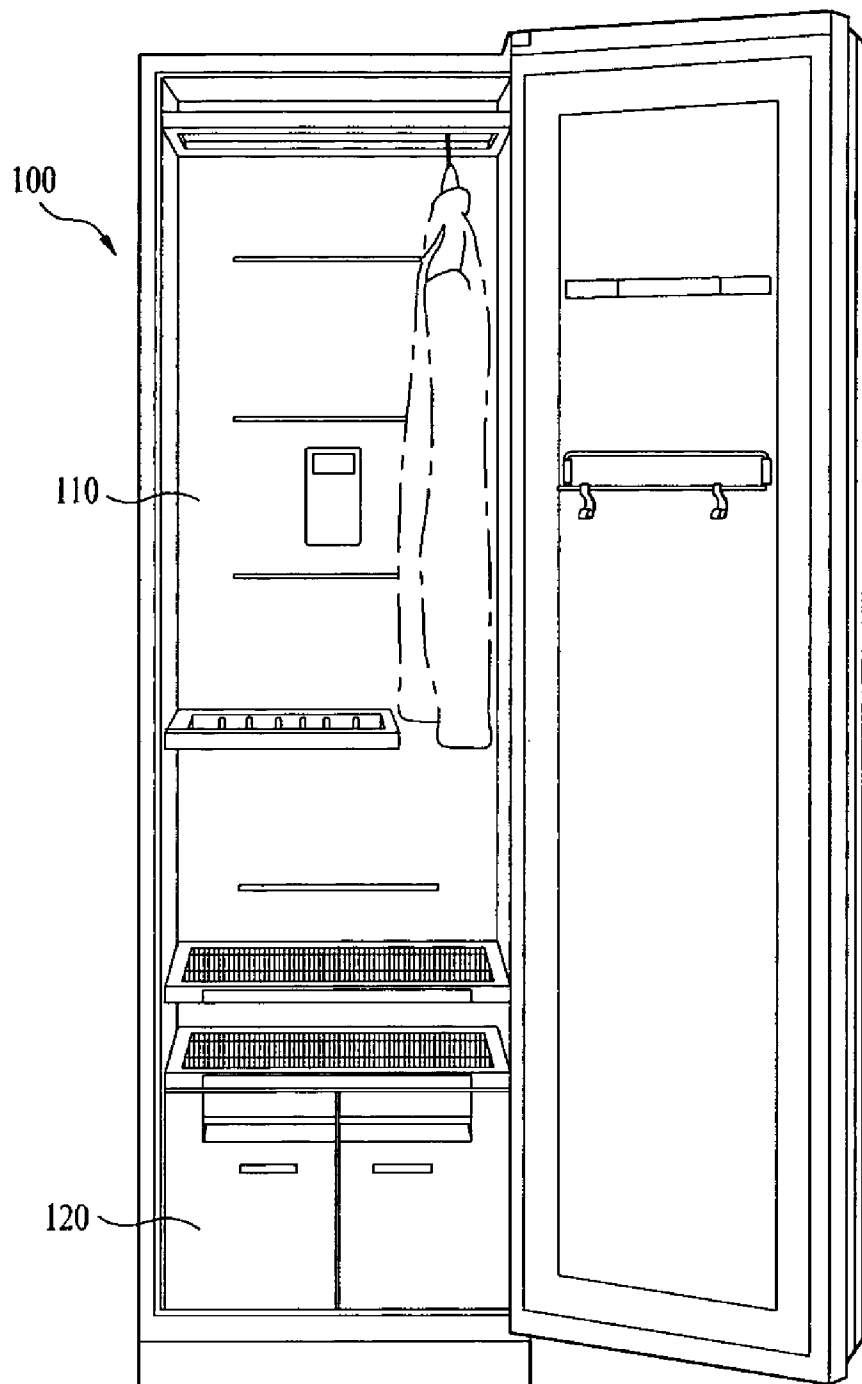
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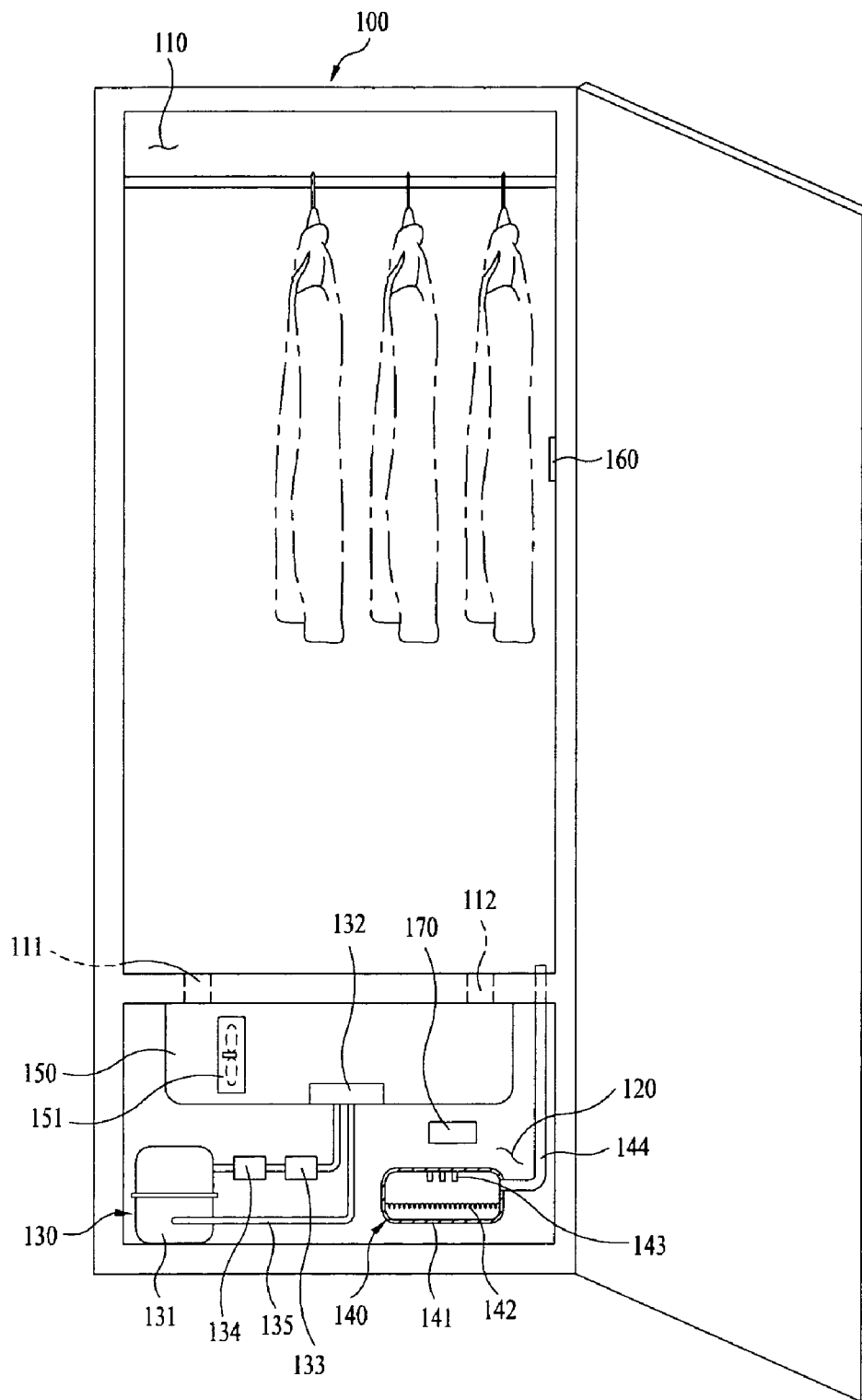
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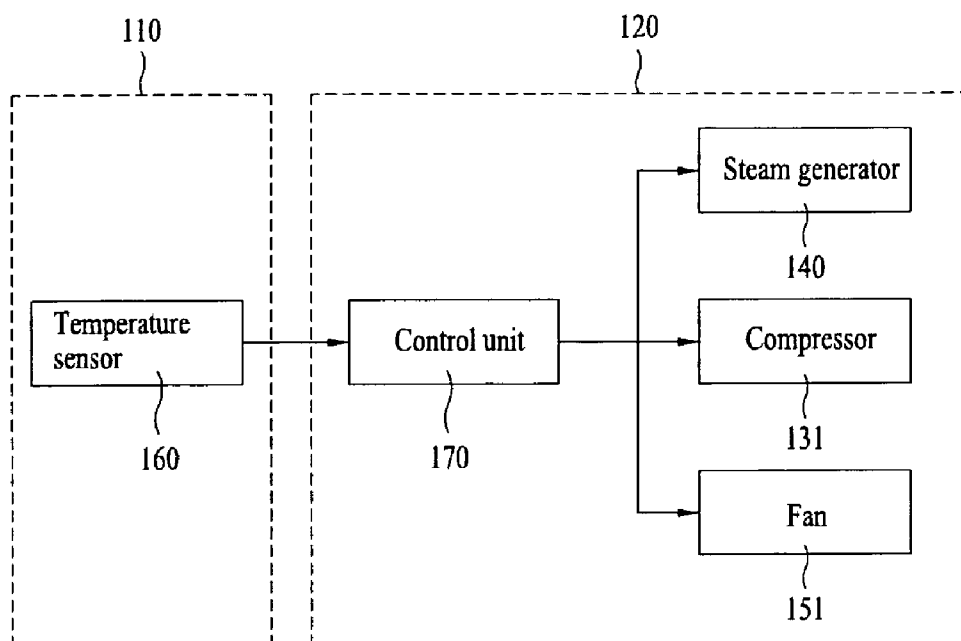
[Fig. 1]



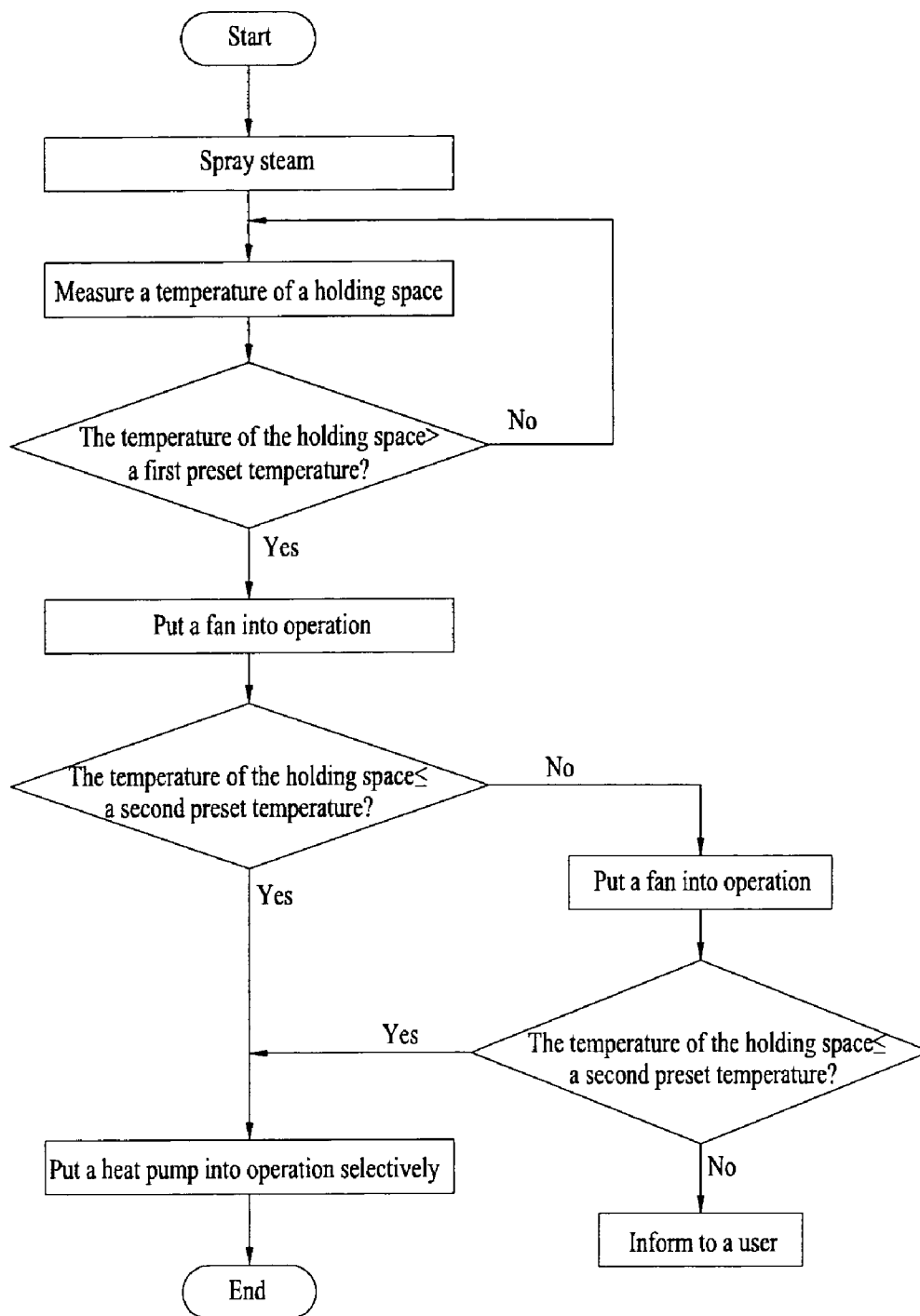
[Fig. 2]



[Fig. 3]



[Fig. 4]



CLOTHES TREATING APPARATUS AND METHOD OF THE SAME

TECHNICAL FIELD

[0001] The present invention relates to apparatus and method for treating clothes. More specifically, the present invention relates to apparatus and method for treating clothes, which can prevent an operation pressure of a compressor of a heat pump from rising, excessively.

BACKGROUND ART

[0002] In general, the clothes treating apparatus washes, dries, or washes or dries laundry. Recently, a clothes treating apparatus is available, which is provided with a steam generator to have a refreshing function for removing crumples, smells, and static electricity from the clothes.

[0003] In the clothes treating apparatuses, there is a clothes treating apparatus provided with a heat pump which utilizes heat discharged from a condenser in a refrigerating cycle in which refrigerant circulates through a compressor, the condenser, an expansion valve, and an evaporator are connected with a refrigerating pipe line, for supplying hot air to the space for holding the clothes to dry the laundry, or a steam generator for spraying steam to the holding space for removing crumples from and sterilizing laundry to refresh the laundry.

[0004] General operation of the clothes treating apparatus provided both with the steam generator and the heat pump for treating laundry will be described.

[0005] If the user puts the clothes treating apparatus into operation, the steam generator generates steam and supplies the steam to the clothes holding space. Once the steam is sprayed to the holding space, the crumples are removed from the laundry and the laundry is sterilized. By discharging heat to the holding space with the heat pump put into operation in a state the steam is sprayed to the holding space, the laundry is dried.

[0006] However, if the steam is sprayed from the steam generator to the holding space, an inside of the holding space becomes a high temperature state of 60~80° C. If the heat pump is operated in such a high temperature state of the inside of the holding space, an operation condition of the compressor which compresses refrigerant in the heat pump is affected.

[0007] That is, since the high temperature operation condition of the holding space influences a temperature of a machinery room having the compressor mounted therein, and an operation condition of the compressor, the operation pressure of the compressor becomes higher than a proper temperature range, to cause the compressor to be out of order.

[0008] Therefore, it is necessary to control the temperature of the machinery room which influences the operation condition of the compressor, and a temperature of the holding space which influences to the machinery room temperature directly before putting the compressor into operation.

DISCLOSURE OF INVENTION

Technical Problem

[0009] The problem is that the high temperature operation condition of the holding space influences a temperature of a machinery room having the compressor mounted therein, and an operation condition of the compressor, the operation pres-

sure of the compressor becomes higher than a proper temperature range, to cause the compressor to be out of order.

Technical Solution

[0010] To solve the problems, an object of the present invention is to provide apparatus and method for treating clothes, which can prevent an operation pressure of a compressor of a heat pump from rising, excessively.

[0011] To achieve these objects and other advantages and in accordance with the purpose of the invention, as embodied and broadly described herein, a clothes treating apparatus includes a housing which forms a holding space for holding clothes, a heat pump for generating hot air for drying laundry in the holding space, a sensing unit mounted to a circulation passage of air being supplied to the holding space or an inlet passage of air introduced to the heat pump for measuring a temperature of the air, and a control unit for controlling a temperature of the housing to drop below a preset temperature if the temperature of the holding space is higher than a preset temperature.

[0012] The sensing unit is a temperature sensor.

[0013] The heat pump includes a compressor, a condenser, an expansion valve, an evaporator, and a fan for blowing heat from the condenser.

[0014] The apparatus further includes a steam generator for generating and supplying steam to the holding space.

[0015] The control unit rotates the fan for dropping the temperature of the holding space below a preset temperature if the temperature of the holding space is higher than the preset temperature due to the heat pump or the steam generator.

[0016] In another aspect of the present invention, a method for controlling a clothes treating apparatus, includes a temperature measuring step for measuring a temperature of a holding space in a housing for holding clothes, an adjusting step for adjusting the temperature of the holding space to be below a preset temperature if the temperature of the holding space measured in the temperature measuring step is higher than the preset temperature, and supplying hot air to the holding space by selectively putting a heatpump into operation according to a temperature adjusted at the time the temperature of the holding space measured in the temperature measuring step is dropped below the preset temperature.

[0017] The adjusting step further includes the step of determining the temperature of the holding space of being below the preset temperature.

[0018] The adjusting step further includes the step of adjusting the temperature of the holding space by putting the fan of the heat pump into operation.

[0019] The temperature measuring step includes the step of measuring a temperature of a circulation passage of air being supplied to the holding space.

[0020] The temperature measuring step includes the step of measuring a temperature of an inlet passage of air being introduced to the heat pump.

[0021] The determining step further includes a re-adjusting step for adjusting the temperature of the holding space by putting the fan into operation after a preset time period if the temperature of the holding space measured after the adjusting step does not drop below the preset temperature.

[0022] The re-adjusting step further includes an alarming step for informing a user if the temperature of the holding space does not drop below the preset temperature.

[0023] The method further includes a steam spray step for supplying steam to the holding space before the temperature measuring step.

ADVANTAGEOUS EFFECTS

[0024] The present invention has following advantageous effects.

[0025] The putting of the heat pump into operation after dropping the temperature of the holding space down to the preset temperature permits to prevent the operation pressure of the compressor from being over pressurized, thereby preventing the compressor from becoming out of order, and efficiency of the heat pump from dropping.

BRIEF DESCRIPTION OF THE DRAWINGS

[0026] The accompanying drawings, which are included to provide further understanding of the disclosure and are incorporated in and constitute a part of this application, illustrate embodiments of the disclosure and together with the description serve to explain the principle of the disclosure.

[0027] In the drawings:

[0028] FIG. 1 illustrates a front view of a clothes treating apparatus in accordance with a preferred embodiment of the present invention;

[0029] FIG. 2 illustrates a front of an inside of the clothes treating apparatus shown in FIG. 1;

[0030] FIG. 3 illustrates a block diagram of the clothes treating apparatus shown in FIG. 1; and

[0031] FIG. 4 illustrates a flow chart showing the steps of a method for controlling a clothes treating apparatus in accordance with a preferred embodiment of the present invention.

BEST MODE FOR CARRYING OUT THE INVENTION

[0032] Reference will now be made in detail to the specific embodiments of the present invention, examples of which are illustrated in the accompanying drawings. Wherever possible, the same reference numbers will be used throughout the drawings to refer to the same or like parts.

[0033] FIG. 1 illustrates a front view of a clothes treating apparatus in accordance with a preferred embodiment of the present invention, FIG. 2 illustrates a front of an inside of the clothes treating apparatus shown in FIG. 1. FIG. 3 illustrates a block diagram of the clothes treating apparatus shown in FIG. 1, and FIG. 4 illustrates a flow chart showing the steps of a method for controlling a clothes treating apparatus in accordance with a preferred embodiment of the present invention.

[0034] A clothes treating apparatus in accordance with a preferred embodiment of the present invention will be described with reference to FIGS. 1 to 3.

[0035] Referring to FIGS. 1 and 2, the clothes treating apparatus has a housing 100 which forms an overall exterior appearance of the clothes treating apparatus. The housing 100 has a holding space 110 formed therein on an upper side thereof for holding clothes, and a machinery room 120 formed therein on a lower side thereof for mounting various units therein required for treating the clothes in the holding space 110.

[0036] The machinery room 120 has a heat pump 130 mounted therein for forming a refrigerating cycle for treating the clothes in the holding space 110, and a steam generator 140 mounted therein for generating steam and spraying the steam to the holding space 110.

[0037] The heat pump 130 includes a compressor 131, a first heat exchanger 132, an expansion valve 133, and a second heat exchanger 134, which are connected with a refrigerant pipe line to one another to form a refrigerating cycle.

[0038] There is a supply duct 150 mounted in the machinery room for supplying heat from the first heat exchanger 132 to the holding space 110. In one side of a bottom surface of the holding space 110, there is an inlet 111 for introducing air to the holding space 110 for circulation in the holding space 110.

[0039] In the other side of the bottom surface of the holding space 110, there is an outlet 112 for discharging air from the holding space 110. The inlet 111 and outlet 112 are in communication with one side and the other side of the supply duct 150, respectively.

[0040] The supply duct 150 has a fan 151 mounted therein for blowing the heat from the first heat exchanger 132 to the holding space 110.

[0041] Mounted in the machinery room 120, there is the steam generator 140 for generating steam and spraying the steam to the holding space 110 for removing crumples from the clothes, and sterilizing the clothes.

[0042] There is a steam supply pipe 144 at one side of the steam generator 140 connected between the steam generator 140 and the holding space 110 for guiding the steam to the holding space 110.

[0043] The steam generator 140 includes a case 141 for holding water, a heater 142 mounted in the case 141, and a water level sensor 143 for sensing a water level of the case 141. The steam generator 140 may use a direct connection system in which the steam generator 140 receives the water from a water supply source directly, and a cartridge system in which the user introduces the water to the case 141.

[0044] In the meantime, the housing 100 has a sensing unit with a temperature sensor 160 provided therein for measuring a temperature of the holding space 110. For measuring the temperature of the holding space 110, the temperature sensor 160 is mounted to a circulation passage of air supplied to the holding space 110, or an inlet passage of air introduced to the heat pump 130 after circulation through the holding space 110.

[0045] That is, since hot air having moisture removed therefrom as the air passes through the heat pump 130 is supplied to the holding space 110, it is preferable that the temperature sensor 160 is mounted to the circulation passage of the air being introduced to the holding space 110 for measuring the temperature of the holding space 110.

[0046] Accordingly, a mounting position of the temperature sensor 160 can be one point of the holding space 110 or an inside of the outlet 112 or an inside of the duct 150 through which the hot air is discharged to the holding space 110.

[0047] Since the air circulating in the holding space 110 is introduced to the heat pump 130 again after the air passes through the duct 150 via the inlet 111, it is preferable that the temperature sensor 160 is mounted to an inlet passage of the air being introduced to the heat pump 130 for measuring the temperature of the holding space 110.

[0048] Accordingly, the temperature sensor 160 can be mounted to the inside of the inlet 111 or the inside of the supply duct 150 where the air is introduced from the holding space 110 to the supply duct 150.

[0049] The machinery room 120 has a control unit 170 mounted therein for receiving information on the temperature of the holding space 110 from the temperature sensor 160 to

control operation of the heat pump 130 and the fan 151. The control unit 170 also controls operation of the steam generator 140.

[0050] Referring to FIG. 3, upon reception of information on the temperature of the holding space 110 from the temperature sensor 160, the controller 170 controls the compressor 131, the steam generator 140, and the fan 151 with reference to the information on the temperature of the holding space 110. In the meantime, the control unit 170 makes wire or wireless communications with the temperature sensor 160, the compressor 131, the steam generator 140, and the fan 151.

[0051] The operation and control method of the clothes treating apparatus in accordance with a preferred embodiment of the present invention will be described, with reference to FIGS. 3 and 4.

[0052] If the user puts the clothes treating apparatus into operation after introducing clothes to the holding space 110, the control unit 170 puts the steam generator 140 into operation, then, the steam is sprayed from the steam generator 140 to the holding space 110. The steam sprayed to the holding space 110 thus removes crumples from the clothes and sterilizes the clothes.

[0053] Not the steam generator 140, but the heat pump 130, may be put into operation only for drying the clothes.

[0054] If a time period of refreshing with the steam sprayed into the holding space 110 or drying with the hot air becomes long, the temperature of the holding space 110 can rise even up to 60~70° C.

[0055] If the compressor 131 of the heat pump 130 is put into operation in a state the holding space 110 is at a high temperature, an operation pressure of the compressor 131 can rise excessively, to affect reliability of the compressor 131. In order to prevent this, it is necessary for the control unit 170 to control the temperature of the holding space 110.

[0056] The temperature of the holding space 110 changed by the steam and the hot air after the steam spray or the hot air supply step is measured with the temperature sensor 160. Once the temperature of the holding space 110 is measured in the temperature measuring step, the control unit 170 determines if the temperature of the holding space 110 is higher than a preset temperature or not.

[0057] The preset temperature, which is a first preset temperature, may be set, for an example, in a range of 60~70° C. If the temperature of the holding space 110 measured with the temperature sensor 160 is higher than the first set temperature, the control unit 170 puts the fan 151 into operation, for adjusting the temperature of the holding space 110 to be below a predetermined temperature.

[0058] As the temperature of the holding space 110 is adjusted downward following putting the fan 151 into operation, the excessive rise of the operation pressure of the compressor 131 to a high temperature operational condition can be prevented.

[0059] For an example, if the temperature of the holding space 110 is at a high temperature of 60~70° C., the control unit 170 puts, not the compressor 131 into operation to run the heat pump 130, but only the fan 151 in the supply duct 150 for a preset time period t. If the fan 151 is put into operation thus, the heat in the holding space 110 circulates to drop the temperature of the holding space 110 below a preset temperature (for an example, 45° C.).

[0060] If the temperature sensor 160 senses that the temperature of the holding space 110 drops down below the preset temperature following operation of the fan 151, the

control unit 170 puts the compressor 131 into operation selectively to operate the heat pump 130. The preset temperature which is a second preset temperature, for an example, may be set to 45° C.

[0061] If the heat pump 130 is put into operation, the refrigerant flows in an order of the compressor 131, the first heat exchanger 132, the expansion valve 133, and the second heat exchanger 134. The refrigerant is compressed at the compressor 131, and the high temperature, high pressure refrigerant compressed thus at the compressor 131 heat exchanges with air at the first heat exchanger 132. In this instance, the first heat exchanger 132 serves as a condenser, to discharge heat to heat the air.

[0062] If the pressure of the refrigerant passed through the first heat exchanger 132 is dropped by using the expansion valve 133, the temperature of the refrigerant drops sharply such that the refrigerant becomes saturated refrigerant which is at a low pressure and a low temperature. Since the low temperature refrigerant can absorb heat, the refrigerant becomes low temperature and low pressure gaseous refrigerant as the refrigerant absorbs heat at the second heat exchanger 134 from the air. If such refrigerant is forwarded to the compressor 131 again, a heat pump cycle is completed, in which the heat absorbed at the second heat exchanger 134 is discharged to the first heat exchanger 132, at the end.

[0063] The air heated by the heat from the first heat exchanger 132 is forwarded to the holding space 110 by the fan 151, and dries the clothes in the holding space 110.

[0064] Or, instead of the heat pump 130, the steam generator 140 is put into operation, to supply steam to the holding space 110. In this case, not a clothes drying process, but a clothes refreshing process, is performed.

[0065] If the temperature of the holding space 110 does not drop below the second preset temperature even if the fan 151 is operated for a preset time period, the control unit 170 controls the fan 151 to keep operation for dropping the temperature of the holding space 110.

[0066] Because the temperature sensor 160 keeps sensing the temperature of the holding space 110, the control unit 170 keeps comparing the temperature measured at the temperature sensor 160 to the second preset temperature. If the temperature of the holding space 110 becomes below the second preset temperature, the control unit 170 puts the heat pump 130 or the steam generator 140 into operation selectively, for treating the clothes.

[0067] If the temperature of the holding space 110 does not drop below the second preset temperature even if the fan 151 is kept operation, the control unit 170 informs to the user with a separate alarm, or through a control panel from which functions of the clothes treating apparatus can be selected.

[0068] By informing the user the operation condition of the compressor 131 being a high load condition due to high temperature of the holding space 110, it is possible for the user not to select a function that makes the temperature of the holding space 110 to rise.

[0069] As has been described, the clothes treating apparatus of the present invention puts the heat pump 130 into operation, not right after spray of the steam to the holding space 110, but after dropping the temperature of the holding space 110 to the preset temperature. Eventually, overpressure of the compressor 131 can be prevented, permitting to prevent the compressor from becoming out of order. And, the efficiency drop of the heat pump 130 can be prevented.

[0070] It will be apparent to those skilled in the art that various modifications and variations can be made in the present invention without departing from the spirit or scope of the invention. Thus, it is intended that the present invention cover the modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents.

- 1. A clothes treating apparatus comprising:
 - a housing which forms a holding space for holding clothes;
 - a heat pump for generating hot air for drying laundry in the holding space;
 - a sensing unit mounted to a circulation passage of air being supplied to the holding space or an inlet passage of air introduced to the heat pump for measuring a temperature of the air; and
 - a control unit for controlling a temperature of the housing to drop below a preset temperature if the temperature of the holding space is higher than a preset temperature.
- 2. The apparatus as claimed in claim 1, wherein the sensing unit is a temperature sensor.
- 3. The apparatus as claimed in claim 1, wherein the heat pump includes a compressor, a condenser, an expansion valve, an evaporator, and a fan for blowing heat from the condenser.
- 4. The apparatus as claimed in claim 3, further comprising a steam generator for generating and supplying steam to the holding space.
- 5. The apparatus as claimed in claim 4, wherein the control unit rotates the fan for dropping the temperature of the holding space below a preset temperature if the temperature of the holding space is higher than the preset temperature due to the heat pump or the steam generator.
- 6. A method for controlling a clothes treating apparatus, comprising:
 - a temperature measuring step for measuring a temperature of a holding space in a housing for holding clothes;
 - an adjusting step for adjusting the temperature of the holding space to be below a preset temperature if the tem-

- perature of the holding space measured in the temperature measuring step is higher than the preset temperature; and
- supplying hot air step for supplying hot air to the holding space by selectively putting a heat pump into operation according to a temperature adjusted at the time the temperature of the holding space measured in the temperature measuring step is dropped below the preset temperature.
- 7. The method as claimed in claim 6, wherein the adjusting step further includes the step of determining the temperature of the holding space of being below the preset temperature.
- 8. The method as claimed in claim 6, wherein the adjusting step further includes the step of adjusting the temperature of the holding space by putting the fan of the heat pump into operation.
- 9. The method as claimed in claim 6, wherein the temperature measuring step includes the step of measuring a temperature of a circulation passage of air being supplied to the holding space.
- 10. The method as claimed in claim 9, wherein the temperature measuring step includes the step of measuring a temperature of an inlet passage of air being introduced to the heat pump.
- 11. The method as claimed in claim 8, wherein the determining step further includes a re-adjusting step for adjusting the temperature of the holding space by putting the fan into operation after a preset time period if the temperature of the holding space measured after the adjusting step does not drop below the preset temperature.
- 12. The method as claimed in claim 11, wherein the re-adjusting step further includes an alarming step for informing a user if the temperature of the holding space does not drop below the preset temperature.
- 13. The method as claimed in claim 6, further comprising a steam spray step for supplying steam to the holding space before the temperature measuring step.

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