agitation device 3 inside the room.

[0024] The detection device 4 detects in advance that the user coming home from the outside will enter the room. The detection device 4 detects that the user will enter the room by receiving information obtained before the user enters the room. Examples of such information include: an air conditioning operation instruction to the air conditioner 1, which the terminal device 17 receives from the user in a place away from home and transmits to the air conditioner 1; position information provided by the car navigation system installed in the automobile driven by the user or provided by the global positioning system (GPS) function of the terminal device 17 carried by the user; destination information set in the car navigation system; and the like.

[0025] The detection device 4 includes a human detection sensor unit 11. The human detection sensor unit 11 detects the presence of a person in the room that is a target for air conditioning control of the air conditioning system 100. In this example, it is assumed that the person present in the room is the user. The human detection sensor unit 11 transmits the detection result, that is, information on whether or not the user is present in the room, as user presence/absence information to the control unit 5 via a communication line. Note that the user presence/absence information may be referred to as a detection result in some cases. The human detection sensor unit 11 may detect the presence of the user on a regular basis, or may detect the presence of the user in response to receiving, from the control unit 5, a user presence/absence detection instruction for instructing the human detection sensor unit 11 to transmit the user presence/absence information. In the example of FIG. 1, the presence of the user in the room is detected by the human detection sensor unit 11 owned by

the detection device 4, but the present invention is not limited to this example. Instead of the human detection sensor unit 11 owned by the detection device 4, the air conditioning system 100 may use, for example, a human-presence sensor (not illustrated) provided in the air conditioner 1, a human-presence sensor set in indoor lighting equipment, or the like.

[0026] Next, the operation of the air conditioning system 100 will be described. FIG. 2 is a first flowchart illustrating the operation of the air conditioning system 100 according to the present embodiment. FIG. 3 is a second flowchart illustrating the operation of the air conditioning system 100 according to the present embodiment. FIG. 4 is a third flowchart illustrating the operation of the air conditioning system 100 according to the present embodiment. FIG. 5 is a fourth flowchart illustrating the operation of the air conditioning system 100 according to the present embodiment. FIG. 6 is a fifth flowchart illustrating the operation of the air conditioning system 100 according to the present embodiment. The flowcharts illustrated in FIGS. 2 to 6 show a series of operations of the air conditioning system 100. Actually, the flowcharts illustrated in FIGS. 2 to 6 correspond to one showing how is control performed by the control unit 5 configured to control the operation of each device provided in the air conditioning system 100.

[0027] Here, as illustrated in the flowcharts of FIGS. 2 to 6, the operation of the air conditioning system 100 is roughly classified into four patterns A, B, C, and D, depending on the determination results in step S10, step S13, step S15, and step S16 described later. Pattern A corresponds to a flow for the case that the period from the time when the ventilation device 2 suspends the ventilation

[0061] As described above, according to the present embodiment, in the air conditioning system 100, the control unit 5 of the air conditioner 1 determines whether to cause the ventilation device 2 to perform a ventilation operation, whether to cause the air agitation device 3 to perform an agitating operation, and whether to cause the ventilation device 2 and the air agitation device 3 to simultaneously operate on the basis of the difference between the indoor temperature and the outdoor temperature, the magnitude relationship between the indoor temperature and the outdoor temperature, the operation mode of the air conditioner 1 specified by the user using the air conditioning operation instruction, the suspension period and duration of the ventilation operation of the ventilation device 2, etc., so as to cause the ventilation device 2 and the air agitation device 3 to perform the ventilation operation and the agitating operation for an appropriate period of time, respectively. Accordingly, the air conditioning system 100 for controlling air conditioning before the user enters the room can perform the ventilation operation of the ventilation device 2 and the agitating operation of the air agitation device 3 before operating the air conditioner 1.

[0062] Even in a room equipped with a ventilation device that does not support a 24-hour ventilation system, the air conditioning system 100 can let fresh air into the room, equalize the distribution of indoor temperature through the agitating operation of the air agitation device 3, and provide a comfortably air-conditioned space before the user enters the room, without regard to a heating operation or a cooling operation, while reducing the load in operating the air conditioner 1.

[0063] After the user in a place away from home operates the air conditioning system 100 via the terminal device 17,

CLAIMS

1. An air conditioning system for controlling air conditioning in a room in accordance with an air conditioning operation instruction received from a user, the air conditioning system comprising:

a ventilation device to ventilate the room;

an air agitation device to agitate air in the room;

an air conditioner to control the air conditioning of the room and control operations of the ventilation device and the air agitation device; and

a detection device to detect presence of the user in the room, wherein

the air conditioner controls operations of the ventilation device and the air agitation device before the user enters the room on the basis of an indoor temperature that is a temperature inside the room, an outdoor temperature that is a temperature outside the room, an operation mode of air conditioning control performed by the air conditioner included in the air conditioning operation instruction, an operating status of the ventilation device, and a detection result provided by the detection device.

2. The air conditioning system according to claim 1, wherein

the ventilation device includes:

a ventilation unit to ventilate the room;

a suspension period timer unit to measure a suspension period from a time that the ventilation unit stops ventilation operation; and

an operation duration timer unit to measure a duration from a time that the ventilation unit starts ventilation operation;

the air agitation device includes:

an agitation unit to agitate air in the room; and

a floor surface temperature sensor unit to measure a floor temperature in the room, and

the air conditioner includes:

an air conditioning unit to perform air conditioning operation;

an indoor temperature sensor unit to measure an indoor ceiling temperature that is an air temperature near a ceiling of the room;

an outdoor temperature sensor unit to measure the outdoor temperature; and

a control unit to calculate an average value of the indoor ceiling temperature and the floor surface temperature to be set as the indoor temperature, acquire the suspension period and the duration as an operating status of the ventilation device, and control operations of the air conditioning unit, the ventilation unit, and the agitation unit based on the indoor temperature, the outdoor temperature, the air conditioning operation instruction, the operating status of the ventilation device, and the detection result.

3. The air conditioning system according to claim 2, wherein

in a case where the suspension period is equal to or longer than an upper limit suspension period and the detection result indicates that the user is not present in the room, the control unit causes the ventilation unit to perform a ventilation operation, and

in a case where a first difference between the indoor temperature and the outdoor temperature is equal to or larger than a first temperature difference threshold and

the operation mode is a heating operation mode, the control unit causes the ventilation unit to perform a ventilation operation based on a comparison result between the first difference and a second temperature difference threshold, and thereafter causes the ventilation unit to stop the ventilation operation.

4. The air conditioning system according to claim 2, wherein

in a case where the suspension period is equal to or longer than an upper limit suspension period and the detection result indicates that the user is not present in the room, the control unit causes the ventilation unit to perform the ventilation operation, and

in a case where a first difference between the indoor temperature and the outdoor temperature is equal to or larger than a first temperature difference threshold, the operation mode is a cooling operation mode, and the indoor temperature is equal to or less than the outdoor temperature, the control unit causes the ventilation unit to perform a ventilation operation based on a comparison result between the first difference and a second temperature difference threshold, and thereafter causes the ventilation unit to stop the ventilation operation.

5. The air conditioning system according to claim 3 or 4, wherein

the control unit causes the ventilation unit to stop the ventilation operation in response to receiving, during the ventilation operation of the ventilation unit, a detection result indicating that the user is present in the room.

6. The air conditioning system according to claim 3 or 4, wherein

in a case where a second difference between the floor surface temperature and the indoor ceiling temperature is equal to or larger than a third temperature difference threshold, the control unit causes the agitation unit to perform an agitating operation.

7. The air conditioning system according to claim 6, wherein

the control unit causes the agitation unit to stop the agitating operation in response to receiving, during the agitating operation of the agitation unit, a detection result indicating that the user is present in the room.

8. The air conditioning system according to claim 2, wherein

in a case where the suspension period is equal to or longer than an upper limit suspension period and the detection result indicates that the user is not present in the room, the control unit causes the ventilation unit to perform the ventilation operation, and

during a ventilation operation of the ventilation unit, in a case where a first difference between the indoor temperature and the outdoor temperature is less than a first temperature difference threshold and a second difference between the floor surface temperature and the indoor ceiling temperature is equal to or larger than a third temperature difference threshold, the control unit causes the agitation unit to perform an agitating operation.

9. The air conditioning system according to claim 2, wherein

in a case where the suspension period is equal to or longer than an upper limit suspension period and the detection result indicates that the user is not present in the room, the control unit causes the ventilation unit to perform a ventilation operation, and

during the ventilation operation of the ventilation unit, in a case where a first difference between the indoor temperature and the outdoor temperature is equal to or larger than a first temperature difference threshold, the operation mode is a cooling operation mode, the indoor temperature is higher than the outdoor temperature, and a second difference between the floor surface temperature and the indoor ceiling temperature is equal to or larger than a third temperature difference threshold, the control unit causes the agitation unit to perform an agitating operation.

10. The air conditioning system according to claim 8 or 9, wherein

the control unit causes the ventilation unit to stop the ventilation operation and causes the agitation unit to stop the agitating operation in response to receiving, during the ventilation operation of the ventilation unit and the agitating operation of the agitation unit, a detection result indicating that the user is present in the room.

11. The air conditioning system according to any one of claims 2 to 10, wherein

the detection device includes a human detection sensor unit to detect the presence of the user in the room.

12. The air conditioning system according to any one of claims 2 to 11, wherein

in response to determining that a current time has reached an operation start time included in the air conditioning operation instruction, the control unit starts to control the air conditioning unit, the ventilation unit, and the agitation unit.

13. The air conditioning system according to any one of claims 2 to 11, wherein

in a case where the air conditioning operation instruction does not include an operation start time, the control unit starts to control the air conditioning unit, the ventilation unit, and the agitation unit after receiving the air conditioning operation instruction.

14. The air conditioning system according to claim 12 or 13, wherein

the control unit controls an air conditioning operation of the air conditioning unit in a state in which the ventilation unit is not performing the ventilation operation and the agitation unit is not performing the agitating operation.

15. The air conditioning system according to any one of claims 12 to 14, wherein

in response to determining that the indoor ceiling temperature has reached a target temperature included in the air conditioning operation instruction, the control unit transmits, to a terminal device that is a transmission source of the air conditioning operation instruction, a first notification indicating that the indoor temperature has reached the target temperature.

16. The air conditioning system according to claim 15,

wherein

the air conditioner includes a post-environment-construction timer unit to measure an elapsed time from a time that the indoor ceiling temperature reaches the target temperature included in the air conditioning operation instruction, and

in response to determining that the elapsed time has reached or exceeded a waiting time, the control unit transmits a second notification that reminds the user to return home to the terminal device, or causes the air conditioning unit to stop the air conditioning operation.

17. The air conditioning system according to any one of claims 1 to 16, wherein

the air conditioner receives the air conditioning operation instruction from at least one of a terminal device usable in the room and outside the room and a remote controller usable in the room.