



(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
13.04.2016 Bulletin 2016/15

(51) Int Cl.:
F24F 11/02 ^(2006.01) **D06F 58/10** ^(2006.01)
D06F 58/28 ^(2006.01) **F24F 1/02** ^(2006.01)

(21) Application number: **14808468.4**

(86) International application number:
PCT/JP2014/064013

(22) Date of filing: **27.05.2014**

(87) International publication number:
WO 2014/196416 (11.12.2014 Gazette 2014/50)

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

(72) Inventors:
• **KABETA, Noriyoshi**
Tokyo 102-0073 (JP)
• **FUJITA, Yoshiyuki**
Fukaya-shi,
Saitama 369-1295 (JP)
• **SHIBATA, Hideo**
Fukaya-shi,
Saitama 369-1295 (JP)

(30) Priority: **04.06.2013 JP 2013117732**

(71) Applicants:
• **Mitsubishi Electric Corporation**
Tokyo 100-8310 (JP)
• **Mitsubishi Electric Home Appliance Co., Ltd.**
Fukaya-shi, Saitama 369-1295 (JP)

(74) Representative: **Pfenning, Meinig & Partner mbB**
Patent- und Rechtsanwälte
Theresienhöhe 11a
80339 München (DE)

(54) **DEHUMIDIFIER**

(57) To provide a dehumidifier that performs appropriate dehumidification control according to use situations around the dehumidifier.

To achieve the object, the dehumidifier includes: a casing; blowing means for taking indoor air in and blowing the indoor air out of the casing; dehumidification means for dehumidifying the indoor air taken into the casing; air temperature detection means for measuring a temperature of the indoor air; air direction variable means capable of varying an air direction of dry air obtained by dehumidifying the indoor air by the dehumidification means when the dry air is blown out of the casing; surface temperature detection means for detecting a surface temperature of a site located in a blowing direction of the dry air; and control means for controlling the each means, wherein the control means divides a region to which the air direction variable means can blow air into a plurality of blocks, causes the surface temperature detection means to detect the surface temperature of each block, calculates a temperature difference between the temperature of the indoor air and the surface temperature, and compares the temperature difference with a predetermined first determination temperature, thereby determining whether or not an object to be dried is located in the block.

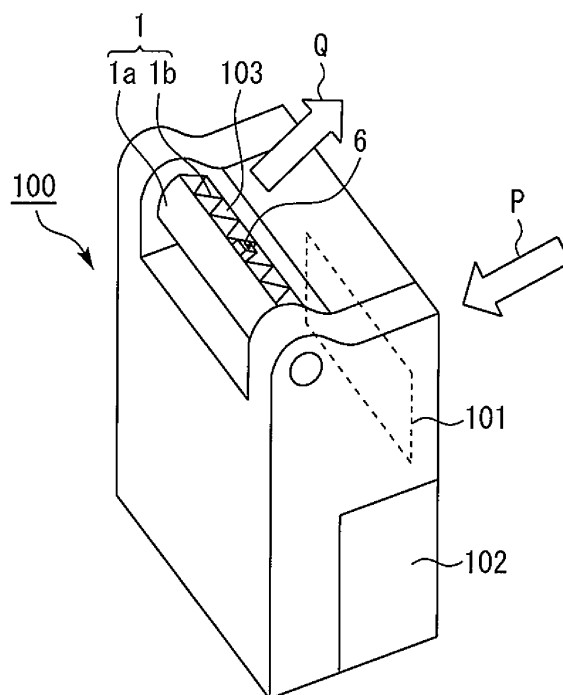


Fig. 1

Description

Technical Field

[0001] The present invention relates to a dehumidifier that dehumidifies a room, and more particularly to a dehumidifier that dries laundry such as clothes to be dried in a room.

Background Art

[0002] Conventionally, a dehumidifier suitable for dehumidifying a room and drying washed clothes has been known (for example, see Patent Literature 1). The dehumidifier includes an inlet and an outlet in a body, and the body includes an evaporator, a condenser, and a sirocco fan that blows out dry air from the outlet. Furthermore, the dehumidifier includes an air direction plate for blowing out the dry air in multiple directions is rotatably provided inside the outlet, and a motor for driving the air direction plate to rotate. With such a configuration, the dry air dehumidified and heated by the evaporator and the condenser is blown out from the outlet into the room.

Citation List

Patent Literature

[0003] Patent Literature 1: Japanese Patent Laid-Open No. 7-139759 (Figure 1)

Summary of Invention

Technical Problem

[0004] However, the configuration described in Patent Literature 1 does not perform appropriate operation control of air blowing or dehumidification according to situations around the dehumidifier, and thus has a problem in energy saving.

[0005] The present invention solves the above described problem, and has an object to provide a dehumidifier that performs appropriate dehumidification control according to use situations around the dehumidifier.

Solution to problem

[0006] To achieve the object, the dehumidifier includes: a casing; blowing means for taking indoor air in and blowing the indoor air out of the casing; dehumidification means for dehumidifying the indoor air taken into the casing; air temperature detection means for measuring a temperature of the indoor air; air direction variable means capable of varying an air direction of dry air obtained by dehumidifying the indoor air by the dehumidification means when the dry air is blown out of the casing; surface temperature detection means for detecting a surface temperature of a site located in a blowing direction

of the dry air; and control means for controlling the each means, wherein the control means divides a region to which the air direction variable means can blow air into a plurality of blocks, causes the surface temperature detection means to detect the surface temperature of each block, calculates a temperature difference between the temperature of the indoor air and the surface temperature, and compares the temperature difference with a predetermined first determination temperature, thereby determining whether or not an object to be dried is located in the block.

Advantageous Effect of Invention

[0007] The present invention can provides a dehumidifier capable of performing appropriate dehumidification control according to use situations around the dehumidifier.

Brief Description of Drawings

[0008]

Figure 1 is a perspective view of an appearance of a dehumidifier according to Embodiment 1.

Figure 2 is a schematic configuration diagram of an internal structure of the dehumidifier according to Embodiment 1.

Figure 3 is a schematic perspective view of air direction variable means according to Embodiment 1.

Figure 4 is a control block diagram of the dehumidifier according to Embodiment 1.

Figure 5 shows a detectable region of an infrared sensor in the dehumidifier according to Embodiment 1.

Figure 6 shows an example of placement of an object to be dried R according to Embodiment 1.

Figure 7(a) is a conceptual view of detection data from the infrared sensor on the object to be dried R before a drying operation according to Embodiment 1, and Figure 7(b) is a conceptual view of detection data from the infrared sensor on the object to be dried R when a predetermined time has passed after the drying operation according to Embodiment 1.

Figure 8 is a first half of a flowchart of an operation during a clothes drying operation of the dehumidifier according to Embodiment 1.

Figure 9 is a latter half of the flowchart of the operation during the clothes drying operation of the dehumidifier according to Embodiment 1.

Figure 10 shows an example of window determination in a normal operation.

Figure 11(a) shows an example of laundry detection through step S4 according to Embodiment 1, and Figure 11(b) shows an example of window determination through step S11.

Figure 12 is a first half of a flowchart of an operation during a clothes drying operation of a dehumidifier

according to Embodiment 2.

Figure 13 is a latter half of the flowchart of the operation during the clothes drying operation of the dehumidifier according to Embodiment 2.

Figure 14 is a first half of a flowchart of an operation during a clothes drying operation of a dehumidifier according to Embodiment 3.

Figure 15 is a latter half of the flowchart of the operation during the clothes drying operation of the dehumidifier according to Embodiment 3.

Description of Embodiments

(Embodiment 1)

[0009] Now, with reference to Figures 1 to 11, Embodiment 1 will be described.

[0010] With reference to Figure 1, an outer shell of a dehumidifier J is constituted by a self-supporting dehumidifier casing 100 (hereinafter, referred to as a casing 100).

[0011] The casing 100 includes an inlet 101 for taking in indoor air P, and an outlet 103 for discharging dry air Q from which moisture is removed from the casing 100 into a room. The casing 100 includes therein a water storage tank 102 that stores moisture removed from air taken into the inlet 101.

[0012] The inlet 101 opens in a back surface of the casing 100, and a filter for preventing dust from entering the casing 100 is provided in the opening.

[0013] Air direction variable means 1 capable of varying an air direction of the dry air Q is provided in the outlet 103. The air direction variable means 1 includes a longitudinal louver 1a capable of varying a vertical air direction, and a lateral louver 1b capable of varying a horizontal air direction. The air direction variable means 1 also includes an infrared sensor 6 (surface temperature detection means) for measuring a surface temperature of an object in a noncontact manner.

[0014] The water storage tank 102 is mounted removably from the casing 100.

[0015] Further, with reference to Figure 2, the dehumidifier J includes therein a blower fan 2 that sucks the indoor air P from the inlet 101, and generates an airflow for discharging the dry air Q from the outlet 103, a fan motor 2a that rotates the blower fan 2, a temperature sensor 3 (air temperature detection means) that detects a temperature of the indoor air P sucked from the inlet 101, a humidity sensor 4 (humidity detection means) that detects a humidity of the indoor air P, dehumidification means 5 for removing moisture contained in the indoor air P and generating the dry air Q, a longitudinally variable motor 1c capable of vertically varying the longitudinal louver 1a, a laterally variable motor 1d capable of horizontally varying the lateral louver 1b, an infrared sensor 6 as surface temperature detection means, and a control circuit 7 as control means for controlling the components.

[0016] The dehumidification means 5 is located in an

air trunk from the inlet 101 to the outlet 103, and removes and condenses moisture in air. An example of a system used in the dehumidification means 5 includes a system in which a heat pump circuit is configured to condense moisture in air using an evaporator, or a desiccant system in which moisture in air removed by an absorbent is condensed using a heat exchanger.

[0017] The moisture removed from the indoor air P by the dehumidification means 5 is stored as condensed water C in the water storage tank 102. The air from which the moisture is removed is the dry air Q.

[0018] Next, with reference to Figures 3 and 4, the longitudinal louver 1a that constitutes the air direction variable means 1 has a rectangular opening extending widthwise of the casing 100, and is vertically variable substantially around a rotary shaft of the longitudinally variable motor 1c described above.

[0019] Thus, the longitudinal louver 1a is configured to be capable of varying an air direction longitudinally (upward and downward).

[0020] The lateral louvers 1b are placed at regular intervals in the longitudinal louver 1a, and horizontally variably journaled on a back opposite to an opening of the longitudinal louver 1a so as to be operated by driving the laterally variable motor 1d described above.

[0021] Thus, the lateral louver 1b is configured to be capable of varying an air direction laterally (leftward and rightward).

[0022] The infrared sensor 6 is mounted to one surface of the lateral louver 1b substantially at a middle placed in the longitudinal louver 1a.

[0023] Thus, a range of a surface temperature detected by the infrared sensor 6 is substantially the same as the blowing direction of the dry air Q variable by the air direction variable means 1. Specifically, the infrared sensor 6 can detect a surface temperature of a region within a range to which the air direction variable means 1 can blow air.

[0024] The infrared sensor 6 uses, for example, an effect of a thermoelectromotive force, and includes an infrared absorbing film 6a that receives heat (infrared) emitted from a surface of a predetermined region, and a thermistor 6b that detects a temperature of the infrared absorbing film 6a (see Figure 3).

[0025] The infrared sensor 6 converts a difference between a temperature (hot junction) of a thermal portion of the infrared absorbing film 6a that absorbs emitted heat and is thus increased in temperature and a temperature (cold junction) of the infrared absorbing film 6a detected by the thermistor 6b into an electric signal such as a voltage, and inputs the electric signal to a control circuit 7 described below. A surface temperature of a predetermined region can be determined from a magnitude of the electric signal.

[0026] In this embodiment, the infrared sensor 6 is used to identify a position of an object to be dried R such as wet laundry and a position of a window as an object not to be dried that is not an object to be dried from a

difference in surface temperature between detected objects.

[0027] Here, as shown in Figure 5, a region detectable by the infrared sensor 6 is a whole scanning range 200. The whole scanning range 200 is a planar range expanding in a lateral (horizontal) direction and a longitudinal (vertical) direction. In the description below, this range is referred to as a detectable region A.

[0028] The infrared sensor 6 is controlled to detect a surface temperature of each of a plurality of divided areas (each block) 201 in the horizontal direction and the vertical direction in the whole scanning range 200. Thus, a detailed temperature map can be made for a broad detectable region A.

[0029] Specifically, with reference to Figures 6 and 7, the control circuit 7 partitions the detectable region A of the infrared sensor 6 into blocks that are squares each having a predetermined size, determines a surface temperature of each block, and thus determines a position of the object to be dried R, a degree of dryness, or the like.

[0030] For example, a filled part B in the detectable region A includes blocks at which a temperature lower than other parts is detected. In the drawings, darker parts show lower temperatures.

[0031] The control circuit 7 determines that laundry is located in the part at a low surface temperature, and controls a direction of the air direction variable means 1 or a motion of the fan motor so that dehumidification air is efficiently applied to the position during a dehumidifying operation.

[0032] Moreover, the control circuit 7 stores results of position determination of the laundry and position determination of the window performed in the past for each block (divided area) as described later in detail.

[0033] Next, with reference to Figure 4, the control circuit 7 and various sensors and electronic components connected to the control circuit 7 will be described.

[0034] The control circuit 7 controls an operation of the entire dehumidifier J by inputs from various sensors or switches and predetermined algorithms, and includes an input circuit 7a, an output circuit 7b, a CPU 7c, a storage portion 7d, and a timer portion 7e. The timer portion 7e is operation time measuring means for measuring an operation time from a start of the operation.

[0035] Furthermore, the storage portion 7d stores the algorithms described above for controlling the components of the dehumidifier J. The algorithms include an operation control program for determining operation control based on inputs from various sensors or switches, and an operation time determination program for determining a subsequent operation time based on detection signals from the temperature sensor 3 and the humidity sensor 4 and an output of the timer portion 7e.

[0036] The storage portion 7d further stores data on the position determination of the window and the laundry performed during the past dehumidifying operation as described later in detail.

[0037] To the control circuit 7 thus configured, an op-

eration switch 8 for turning on/off the operation of the dehumidifier J, the temperature sensor 3, the humidity sensor 4, and the infrared sensor 6 are connected through the input circuit 7a.

[0038] Further, to the control circuit 7, electric components such as a display portion 12 for indicating a state of the dehumidifier, the dehumidification device 5, the fan motor 2a, the longitudinally variable motor 1c, and the laterally variable motor 1d are connected through the output circuit 7b.

[0039] When the control circuit 7 detects that a dehumidification mode is selected by an operation of the operation switch 8 that constitutes an operation portion, the control circuit 7 drives the air direction variable means 1 to allow air blowing from the outlet 103, drives the fan motor 2a to rotate the blower fan 2, and drives the dehumidification means 5 so as to provide an optimum humidity in the room.

[0040] Furthermore, the control circuit 7 drives the longitudinally variable motor 1c and the laterally variable motor 1d of the air direction variable means 1 so as to blow air toward a desired region in the room.

[0041] Thus, the indoor air P is taken from the inlet 101 into the dehumidifier casing 100, the temperature sensor 3 and the humidity sensor 4 detect a temperature and a humidity in the room, and then the dehumidification means 5 dehumidifies the indoor air P into the dry air Q, which is blown out from the outlet 103 into the room.

[0042] Next, with reference to Figures 8 and 9, the operation during the clothes drying operation of the dehumidifier J with the components configured as described above will be described. Figures 8 and 9 are flowcharts of a series of operations, and Figure 8 shows a first half of the flowchart and Figure 9 shows a latter half of the flowchart.

[0043] In the description below, time measurement, humidity measurement, and temperature measurement are performed by the timer portion 7e, the humidity sensor 4, the temperature sensor 3, and the infrared sensor 6, respectively, described above, and various arithmetic processing using measured values thereof and operations of the portions are performed by the control circuit 7.

(Laundry detection)

[0044] First, when the clothes drying operation is started, the control circuit 7 starts an initial sampling operation in step S1, and then the process moves to step S2.

[0045] The initial sampling operation is an operation in which the infrared sensor 6 detects a surface temperature of each divided area (block) of the detectable region A, and determines whether or not there is an object to be dried, that is, laundry of which drying is facilitated by positively feeding dry air in each target block.

[0046] Next, in step S2, the control circuit 7 determines whether the number of times of determination that there is laundry in a sampling target block during past clothes drying operations is a prescribed number or more.

[0047] The storage portion 7d accumulates the number of times of determination that there is laundry in each block during the past clothes drying operations and stores the number as data, and the control circuit 7 determines whether or not the number is the prescribed number or more based on the data.

[0048] In step S2, if the number of times of determination that there is laundry in the sampling target block during the past clothes drying operations is less than the prescribed number, the process moves to step S3 to set a determination temperature (first determination temperature) to a normal value T1, and moves to step S5.

[0049] In step S2, if the number of times of determination that there is laundry in the sampling target block during the past clothes drying operations is the prescribed number or more, the process moves to step S4 to set the determination temperature (first determination temperature) to a special value T2 smaller than T1, and moves to step S5 ($T1 > T2$).

[0050] Next, in step S5, " ΔT = room temperature - measured value" for each block is calculated, and compared with the determination temperature set in steps S3, S4 (determination temperature $\leq \Delta T$?), and thus it is determined whether or not there is laundry in the target block.

[0051] The room temperature is a temperature of indoor air measured by the temperature sensor 3. The measured value is a surface temperature of the target block measured by the infrared sensor 6. ΔT is a difference obtained by subtracting the measured value from the room temperature.

[0052] Here, since the laundry is wet, the surface temperature is lower than the room temperature. In particular, drying starts with time, moisture contained in the laundry starts evaporating, and heat of evaporation reduces the surface temperature of the laundry.

[0053] Specifically, there is a difference ΔT between the room temperature and the temperature of the target block as the measured value of the infrared sensor 6, and with a larger difference ΔT , it can be determined that there is more likely to be laundry in a position of the target block.

[0054] Thus, in step S5, ΔT is compared with the determination temperature as a predetermined threshold (determination temperature $\leq \Delta T$?) to determine whether or not there is laundry in the target block.

[0055] If a large value is used as the determination temperature as a threshold for determination of presence or absence of laundry, it is unlikely to be determined that there is laundry. Specifically, only with a larger difference ΔT , it is determined that ΔT is larger than the determination temperature.

[0056] On the other hand, if a small value is used as the determination temperature, it is likely to be determined that there is laundry. Specifically, with a small determination temperature, it is determined that the difference ΔT , which is even not very large, is larger than the determination temperature.

[0057] Thus, for a block in which an accumulated number of times of determination that there is laundry during the past operations is a predetermined number or more, it is likely to be also determined that there is laundry during this operation. Thus, the determination temperature is compared with the difference ΔT at a determination temperature T2 of a special value smaller than the determination temperature T1 of a normal value.

[0058] Thus, for the block in which the accumulated number of times of determination that there is laundry during the past operations is a predetermined number or more, it is likely to be determined that there is laundry even with a small difference ΔT between the room temperature and the temperature of the target block, and thus it can be determined that there is laundry in an early stage of an initial sampling operation.

[0059] In particular, in an early stage of a start of drying, moisture contained in the laundry starts evaporating with time, and heat of evaporation gradually reduces a surface temperature of the laundry.

[0060] Thus, in the early stage of the start of drying, the difference ΔT between the room temperature and the temperature of the block is small, but a small determination temperature as the threshold allows determination that there is laundry in an early stage.

[0061] As described above, in step S5, when the laundry is detected in the target block, the number of times of detection of the laundry in the block is additionally stored, and the process moves to step S6.

[0062] In step S6, it is determined whether or not determination of presence or absence of laundry in all blocks is finished. If the determination of presence or absence of laundry is completed, the process moves to step S7. If the determination is not completed, the process moves to step S2 to perform determination of an undetermined block.

[0063] The initial sampling operation from steps S1 to S6 has been described, but in the initial sampling operation, all the target blocks may be detected a predetermined number of times or repeatedly detected during a predetermined time.

[0064] If all the target blocks are detected a predetermined number of times or repeatedly detected during a predetermined time in the initial sampling operation, the determination of presence or absence of laundry may be performed skipping the block for which it has been determined that there is laundry. This can reduce the operation time.

[0065] Steps S1 to S6 constitute a control procedure for detecting a position of the laundry from the difference between the room temperature and the detected temperature of each block, but a portion at a surface temperature lower than the room temperature like the laundry, for example, a window may be included in a position determined to be laundry. The window is an object not to be dried that is not a target for drying.

[0066] Thus, a control process from steps S7 to S14 is performed to detect a block in which the window is

located to achieve a more efficient clothes drying operation.

[0067] With reference to Figure 9, in step S7, the control circuit 7 starts the clothes drying operation based on the detection results of steps S1 to S6, and the process moves to step 8.

[0068] In the clothes drying operation, a direction of the louver 1 is controlled so that dehumidified dry air Q is blown from the outlet 103 toward the block for which it has been determined that there is laundry. Specifically, the components are controlled so that the dry air is blown to the block for which it has been determined that there is laundry, and thus the dry air Q efficiently flows from the dehumidifier to the position of the laundry.

[0069] Next, in step S8, with the clothes drying operation, a surface temperature of a site located in the block to which the air is blown is measured, and it is determined whether or not the temperature as the measured value is lower than a window determination temperature Tw (second determination temperature) (measured value < Tw?).

[0070] When the measured value is lower than the window determination temperature Tw (window low temperature determination), the process moves to step S9.

[0071] Here, when it is first determined that the measured value is lower than the window determination temperature Tw, the determination activates the timer portion 7e to start measurement of an elapsed time Bx after the determination. When such a determination is performed second and thereafter, measurement is continued to accumulate the elapsed time.

[0072] When the measured value of the surface temperature of the site located in the block to which the air is blown is higher than the window determination temperature Tw, the process moves to step S 14, and it is determined whether or not the clothes drying operation is finished. If finished, the clothes drying operation is stopped, and if not finished, the process moves to step S7 to perform window determination for a block to which air is next blown.

[0073] In step S8, when the surface temperature of the block is higher than the window determination temperature Tw, measurement of the elapsed time Bx is stopped to reset data on the elapsed time Bx.

[0074] Next, in step S9, if the number of times of determination that there is a window in the target block during the past clothes drying operations is less than a prescribed number, the process moves to step S10 to set the window determination time to a normal value B1, and the process moves to step S12.

[0075] In step S9, if the number of times of determination that there is a window in the target block during the past clothes drying operations is the prescribed number or more, the process moves to step S11 to set the window determination time to a special value B2 shorter than the normal value B1, and the process moves to step S12 (B1 > B2).

[0076] Next, in step S12, the window determination

times B1, B2 set in steps S10 and S 11 are compared with the elapsed time Bx from the window low temperature determination. Specifically, it is determined whether or not the surface temperature of the site located in the target block is the window determination temperature or less continuously for a predetermined time or more.

[0077] Here, the surface temperature of the laundry increases as drying proceeds, while the surface temperature of the window does not increase as the clothes drying operation process. Thus, when the surface temperature is the window determination temperature or less (low temperature state) even if the window determination time B or more passes, it is determined that there is a window in the block.

[0078] If the time at the window determination temperature or less (elapsed time Bx) is less than the window determination time B (B1 or B2), the process moves to step S14 to determine whether or not the clothes drying operation is finished. If finished, the clothes drying operation is stopped, and if not finished, the process moves to step S7 to perform window determination for a block to which air is blown next.

[0079] If the time at the window determination temperature or less (elapsed time Bx) is the window determination time B (B1 or B2) or more, the process moves to step S 13. In step S 13, the window is detected in the target block, and the number of times of window detection in the block is additionally stored, and the process moves to step S 14.

[0080] In step S 14, it is determined whether or not the clothes drying operation is finished. If finished, the clothes drying operation is stopped, and if not finished, the process moves to step S7 to perform window determination for a block to which air is blown next.

[0081] The clothes drying operation being performed is controlled so that dry air is not positively fed to the block for which it has been determined that there is a window as described above, but dry air is mainly fed to a block for which it has been determined that there is laundry.

[0082] As described above, as the feature of steps S7 to S13, for the block for which it has been determined that there is a window a predetermined number of times from the results of the past clothes drying operations, it is likely to be also determined that there is a window during this operation. Thus, for such a block, the determination time B2 of the special value shorter than the determination time B1 of the normal value is used and compared with the elapsed time Bx.

[0083] This allows earlier estimation of the defeminized position of the window mixed in the laundry. Thus, during the subsequent clothes drying operation, dry air is not positively fed toward the block for which it has been determined that there is a window, but dry air is mainly fed to the block for which it has been determined that there is laundry, thereby allowing a more efficient clothes drying operation.

[0084] Here, with reference to Figures 10 and 11, the

determination of presence and absence of the window and the laundry will be described. Figures 10 and 11 assume a case where the laundry does not dry after 360 minutes, but the temperature is higher than an initial temperature. In the example in Figures 10 and 11, in the detectable region A constituted by blocks 1 to 25, blocks 9, 12, 13, 14, 17, 18 are positions of the laundry, and blocks 2, 3, 22, 23, 24 are positions of the window.

(Case of normal operation)

[0085] Figure 10 shows an example of window determination during a normal operation. The window determination during the normal operation is a window determination operation without the window determination in the past operation.

[0086] State 1: In the initial operation, since the laundry (blocks 9, 12, 13, 14, 17, 18) is not distinguished from the window (blocks 2, 3, 22, 23, 24), air is also blown to the window.

[0087] State 2: After 240 minutes, since the laundry (blocks 9, 12, 13, 14, 17, 18) has not yet been distinguished from the window (blocks 2, 3, 22, 23, 24), air is also blown to the window.

[0088] State 3: After 360 minutes, the laundry can be distinguished from the window from a temperature difference therebetween, and air is blown to only the laundry (blocks 9, 12, 13, 14, 17, 18). The blocks having been determined to be the window (blocks 2, 3, 22, 23, 24) are stored.

(Case of laundry detection through step S4)

[0089] Figure 11 (a) shows an example of laundry detection through step S4.

[0090] State 1: An example of a case is shown where the normal value T1 is used as the determination temperature through step S3 for all blocks. In this case, laundry (blocks 13, 14) that should be originally detected is not detected.

[0091] State 2: An example of a case is shown where the special value T2 is used as the determination temperature through step S4 for all blocks. In this case, the window (blocks 2, 3, 22, 23, 24) is also detected and cannot be distinguished from the laundry.

[0092] State 3: An example of a case is shown where the results of determination of presence or absence of laundry performed during the past operations are used to store blocks (for example, blocks 9, 12, 13, 14, 17, 18) that are likely to be laundry, and for the stored blocks, the normal value T2 is used as the determination temperature through step S4, and for the other blocks, the normal value T1 is used as the determination temperature through step S3. In this case, the laundry (blocks 9, 12, 13, 14, 17, 18) is detection with high accuracy.

[0093] As such, when the blocks (for example, the blocks 9, 12, 13, 14, 17, 18) that are likely to be laundry are stored in the determination of presence or absence

of laundry performed during the past operations, a special value is used as the determination value for the blocks (step S4). Thus, it is likely to be determined that there is laundry in the block to be determined.

[0094] This allows control to efficiently blow air to the laundry in an early stage.

(Example of window determination through step S11)

[0095] Figure 11 (b) shows an example in which the special value is used as the window determination time of the blocks 2, 3, 22, 23, 24 for which the window determination has been performed a prescribed number of times or more in the past (step S11).

[0096] State 1: In the initial operation, the laundry (blocks 9, 12, 13, 14, 17, 18) is not distinguished from the window (blocks 2, 3, 22, 23, 24).

[0097] State 2: After 240 minutes, the laundry can be distinguished from the window from a temperature difference therebetween, and only the laundry (blocks 9, 12, 13, 14, 17, 18) is accurately detected.

[0098] As such, for the blocks for which the window determination is performed a prescribed number of times or more in the past, the window determination time is determined using the special value shorter than the normal value (S11). Thus, for example, after 240 minutes earlier than the window determination (360 minutes) in the normal operation, the blocks (blocks 2, 3, 22, 23, 24) for which the window determination is likely to be performed are determined to be the window, and thus thereafter, air is mainly blown to the laundry. Specifically, air can be controlled to be efficiently blown to the laundry in an early stage.

(Embodiment 2)

[0099] With reference to Figures 12 and 13, Embodiment 2 will be described below. Figures 12 and 13 are flowcharts showing a series of operations, and Figure 12 shows a first half of the flowchart, and Figure 13 shows a latter half of the flowchart.

[0100] A configuration of hardware in this embodiment is the same as that of the dehumidifier J in Embodiment 1, and thus descriptions thereof will be omitted.

(Laundry detection)

[0101] First, when the clothes drying operation is started, the control circuit 7 starts an initial sampling operation in step S21, and then the process moves to step S22.

[0102] The initial sampling operation is an operation in which the infrared sensor 6 detects a surface temperature of each divided area (block) of the detectable region A, and determines whether or not there is laundry in a target block.

[0103] Next, in step S22, the control circuit 7 determines whether the number of times of determination that there is laundry in a sampling target block during past

clothes drying operations is a prescribed number or more.

[0104] The storage portion 7d accumulates the number of times of determination that there is laundry in each block during the past clothes drying operations and stores the number as data, and the control circuit 7 determines whether or not the number is the prescribed number or more based on the data.

[0105] In step S22, if the number of times of past determination that there is laundry is less than the prescribed number, the process moves to step S23 to set a determination temperature (first determination temperature) to a normal value T1, and moves to step S5.

[0106] In step S22, if the number of times of past determination that there is laundry is the prescribed number or more, the process moves to step S24 to set the determination temperature (first determination temperature) to a special value T2 smaller than T1, and moves to step S25 (T1 > T2).

[0107] Next, in step S25, " ΔT = room temperature - measured value" for each block is calculated, and compared with the determination temperature set in steps S23, S24 (determination temperature $\leq \Delta T$?), and thus it is determined whether or not there is laundry in the target block.

[0108] The room temperature is a temperature of indoor air measured by the temperature sensor 3. The measured value is a surface temperature of the target block measured by the infrared sensor 6. ΔT is a difference obtained by subtracting the measured value from the room temperature.

[0109] Here, since the laundry is wet, the surface temperature is lower than the room temperature. In particular, drying starts with time, moisture contained in the laundry starts evaporating, and heat of evaporation reduces the surface temperature of the laundry.

[0110] Specifically, there is a difference ΔT between the room temperature and the temperature of the target block as the measured value of the infrared sensor 6, and with a larger difference ΔT , it can be determined that there is more likely to be laundry in a position of the target block.

[0111] Thus, in step S25, ΔT is compared with the determination temperature as a predetermined threshold (determination temperature $\leq \Delta T$?) to determine whether or not there is laundry in the target block.

[0112] If a large value is used as the determination temperature as a threshold for determination of presence or absence of laundry, it is unlikely to be determined that there is laundry. Specifically, only with a larger difference ΔT , it is determined that ΔT is larger than the determination temperature.

[0113] On the other hand, if a small value is used as the determination temperature, it is likely to be determined that there is laundry. Specifically, with a small determination temperature, it is determined that the difference ΔT , which is even not very large, is larger than the determination temperature.

[0114] Thus, for a block in which an accumulated number of times of determination that there is laundry during the past operations is a predetermined number or more, it is likely to be also determined that there is laundry during this operation. Thus, the determination temperature is compared with the difference ΔT at a determination temperature T2 of a special value smaller than the determination temperature T1 of a normal value.

[0115] Thus, for the block in which the accumulated number of times of determination that there is laundry during the past operations is a predetermined number or more, it is likely to be determined that there is laundry even with a small difference ΔT between the room temperature and the temperature of the target block, and thus it can be determined that there is laundry in an early stage of an initial sampling operation.

[0116] In particular, in an early stage of a start of drying, moisture contained in the laundry starts evaporating with time, and heat of evaporation gradually reduces a surface temperature of the laundry.

[0117] Thus, in the early stage of the start of drying, the difference ΔT between the room temperature and the temperature of the block is small, but a small determination temperature as the threshold allows determination that there is laundry in an early stage.

[0118] As described above, in step S25, when the laundry is detected in the target block, the number of times of detection of the laundry in the block is additionally stored, and the process moves to step S26.

[0119] In step S26, it is determined whether or not determination of presence or absence of laundry in all blocks is finished. If the determination of presence or absence of laundry is completed, the process moves to step S27. If the determination is not completed, the process moves to step S22 to perform determination of an undetermined block.

[0120] The initial sampling operation from steps S21 to S26 has been described, but in the initial sampling operation, all the target blocks may be detected a predetermined number of times or repeatedly detected during a predetermined time.

[0121] If all the blocks are detected a predetermined number of times or repeatedly detected during a predetermined time in the initial sampling operation, the determination of presence or absence of laundry may be performed skipping the block for which it has been determined that there is laundry. This can reduce the operation time.

[0122] Steps S21 to S26 constitute a control procedure for detecting a position of the laundry from the difference between the room temperature and the detected temperature of each block, but a portion at a surface temperature lower than the room temperature like the laundry, for example, a window may be included in a position determined to be laundry.

[0123] Thus, a control process from steps S27 to S39 is performed to detect a block in which the window is located to achieve a more efficient clothes drying operation.

ation.

[0124] In step S27, it is determined whether or not the laundry is located in a predetermined percentage (for example, 90%) or more of all the blocks for which it has been determined that there is a window during the previous clothes drying operation.

[0125] When the laundry is located in the predetermined percentage or more of the blocks, the process moves to step S28, it is assumed that this clothes drying operation is performed in the same environment as that of the previous operation, and the process moves to step S30.

[0126] When the laundry is located in less than the predetermined percentage of the blocks, the process moves to step S29, it is assumed that this clothes drying operation is performed in an environment different from that of the previous operation, and the process moves to step S30.

[0127] The environment herein refers to an environment where the dehumidifier J is used. As an example of use in the same environment, a case is assumed where clothes are arranged in a manner similar to that in the previous operation in substantially the same direction in the same room as in the previous operation.

[0128] On the other hand, as a different environment, a case is assumed where the dehumidifier J is used in a room different from that in the previous operation, or clothes are arranged in a manner different from that in the previous operation.

[0129] Next, with reference to Figure 13, in step S30, the control circuit 7 starts the clothes drying operation based on the detection results from steps S21 to S26, and the process moves to step S31.

[0130] Subsequently, in step S31, with the clothes drying operation, a surface temperature of a site located in the block to which the air is blown is measured, and it is determined whether or not the temperature as the measured value is lower than a window determination temperature T_w (second determination temperature) (measured value $< T_w?$).

[0131] When the measured value is lower than the window determination temperature T_w (window low temperature determination), the process moves to step S32.

[0132] Here, when it is first determined that the measured value is lower than the window determination temperature T_w , the determination activates the timer portion 7e to start measurement of an elapsed time B_x after the determination. When such a determination is performed second and thereafter, measurement is continued to accumulate the elapsed time.

[0133] When the measured value of the surface temperature of the site located in the block to which the air is blown is higher than the window determination temperature T_w , the process moves to step S39, and it is determined whether or not the clothes drying operation is finished. If finished, the clothes drying operation is stopped, and if not finished, the process moves to step S30 to perform window determination for a block to which

air is next blown.

[0134] In step S31, when the surface temperature of the block is higher than the window determination temperature T_w , measurement of the elapsed time B_x is stopped to reset data on the elapsed time B_x .

[0135] Next, in step S32, based on the determination in steps S27 to S29, it is determined whether the situation where this clothes drying operation is performed is the same environment as in the past (previous) operation.

[0136] If the situation is not the same environment as in the past operation, the process moves to step S33, the window determination time is set to the normal value B_1 , and the process moves to step S37.

[0137] If the situation is the same environment as in the past operation, the process moves to step S34. In step S34, if the number of times of determination that there is a window in the target block during the past clothes drying operations is less than the prescribed number, the process moves to step S35 to set the window determination time to the normal value B_1 , and the process moves to step S37.

[0138] In step S34, if the number of times of determination that there is a window in the target block during the past clothes drying operations is the prescribed number or more, the process moves to step S36 to set the window determination time to a special value B_2 shorter than the normal value B_1 , and the process moves to step S37 ($B_1 > B_2$).

[0139] Next, in step S37, the window determination times B_1 , B_2 set in steps S33, S35 and S36 are compared with the elapsed time B_x from the window low temperature determination. Specifically, it is determined whether or not the surface temperature of the site located in the target block is the window determination temperature or less continuously for a predetermined time or more.

[0140] Here, the surface temperature of the laundry increases as drying proceeds, while the surface temperature of the window does not increase as the clothes drying operation proceeds. Thus, when the surface temperature is the window determination temperature or less (low temperature state) even if the window determination time B or more passes, it is determined that there is a window in the block.

[0141] If the time at the window determination temperature or less (elapsed time B_x) is less than the window determination time B (B_1 or B_2), the process moves to step S39 to determine whether or not the clothes drying operation is finished. If finished, the clothes drying operation is stopped, and if not finished, the process moves to step S30 to perform window determination for a block to which air is blown next.

[0142] If the time at the window determination temperature or less (elapsed time B_x) is the window determination time B (B_1 or B_2) or more, the process moves to step S38. In step S38, the window is detected in the target block, and the number of times of window detection in the block is additionally stored, and the process moves to step S39.

[0143] In step S39, it is determined whether or not the clothes drying operation is finished. If finished, the clothes drying operation is stopped, and if not finished, the process moves to step S30 to perform window determination for a block to which air is blown next.

[0144] The clothes drying operation being performed is controlled so that dry air is not positively fed to the block for which it has been determined that there is a window as described above, but dry air is mainly fed to a block for which it has been determined that there is laundry.

[0145] As described above, in this embodiment, in order to determine whether or not the environment is the same as the stored environment, it is checked whether 90% or more of the blocks determined to be in a position of the window in the window determination performed during the previous operation are target blocks of the laundry.

[0146] When it is determined that 90% or more of the blocks are the target blocks of the laundry, the environment is highly likely to be the same as the stored environment, and window determination is performed using the special value for the blocks for which the window determination has been performed in the past.

[0147] This can reduce the determination time, and allows an efficient clothes drying operation.

(Embodiment 3)

[0148] Now, with reference to Figures 14 and 15, Embodiment 3 will be described. Figures 14 and 15 are flowcharts showing a series of operations, and Figure 14 shows a first half of the flowchart, and Figure 15 shows a latter half of the flowchart.

[0149] A configuration of hardware in this embodiment is the same as that of the dehumidifier J in Embodiment 1, and thus descriptions thereof will be omitted.

(Laundry detection)

[0150] First, when the clothes drying operation is started, the control circuit 7 starts an initial sampling operation in step S41, and then the process moves to step S42.

[0151] The initial sampling operation is an operation in which the infrared sensor 6 detects a surface temperature of each divided area (block) of the detectable region A, and it is determined whether or not there is laundry in a target block.

[0152] Next, in step S42, the control circuit 7 determines whether the number of times of determination that there is laundry in a sampling target block during past clothes drying operations is a predetermined number or more.

[0153] The storage portion 7d accumulates the number of times of determination that there is laundry in each block during the past clothes drying operations and stores the number as data, and the control circuit 7 determines that the number is the prescribed number or

more based on the data.

[0154] In step S42, if the number of times of determination that there is laundry in the sampling target block during the past clothes drying operations is less than the prescribed number, the process moves to step S43 to set a determination temperature to a normal value T1, and the process moves to step S45.

[0155] In step S42, if the number of times of determination that there is laundry in the sampling target block during the past clothes drying operations is the prescribed number or more, the process moves to step S44 to set the determination temperature to a special value T2 smaller than the normal value T1, and moves to step S45 ($T1 > T2$).

[0156] Next, in step S45, " ΔT =room temperature - measured value" for each block is calculated, and compared with the determination temperature set in steps S43, S44 (determination temperature $\leq \Delta T$?), and thus it is determined whether or not there is laundry in the target block.

[0157] The room temperature is a temperature of indoor air measured by the temperature sensor 3. The measured value is a surface temperature of a target block measured by the infrared sensor 6. ΔT is a difference obtained by subtracting the measured value from the room temperature.

[0158] Here, since the laundry is wet, the surface temperature is lower than the room temperature. In particular, drying starts with time, moisture contained in the laundry starts evaporating, and heat of evaporation reduces the surface temperature of the laundry.

[0159] Specifically, there is a difference ΔT between the room temperature and the temperature of the target block as the measured value of the infrared sensor 6, and with a larger difference ΔT , it can be determined that there is more likely to be laundry in a position of the target block.

[0160] Thus, in step S45, ΔT is compared with the determination temperature as a predetermined threshold (determination temperature $\leq \Delta T$?) to determine whether or not there is laundry in the target block.

[0161] If a large value is used as the determination temperature as a threshold for determination of presence or absence of laundry, it is unlikely to be determined that there is laundry. Specifically, only with a larger difference ΔT , it is determined that ΔT is larger than determination temperature.

[0162] On the other hand, if a small value is used as the determination temperature, it is likely to be determined that there is laundry. Specifically, with a small determination temperature, it is determined that the difference ΔT , which is even not very large, is larger than the determination temperature.

[0163] Thus, for a block in which an accumulated number of times of determination that there is laundry during the past operations is a predetermined number or more, it is likely to be also determined that there is laundry during this operation. Thus, the determination tempera-

ture is compared with the difference ΔT at a determination temperature T_2 of a special value smaller than the determination temperature T_1 of a normal value.

[0164] Thus, for the block in which the accumulated number of times of determination that there is laundry during the past operations is a predetermined number or more, it is likely to be determined that there is laundry even with a small difference ΔT between the room temperature and the temperature of the target block, and thus it can be determined that there is laundry in an early stage of an initial sampling operation.

[0165] In particular, in an early stage of a start of drying, moisture contained in the laundry starts evaporating with time, and heat of evaporation gradually reduces a surface temperature of the laundry.

[0166] Thus, in the early stage of the start of drying, the difference ΔT between the room temperature and the temperature of the block is small, but a small determination temperature as the threshold allows determination that there is laundry in an early stage.

[0167] As described above, in step S45, when the laundry is detected in the target block, the number of times of detection of the laundry in the block is additionally stored, and the process moves to step S46.

[0168] In step S46, it is determined whether or not determination of presence or absence of laundry in all blocks is finished. If the determination of presence or absence of laundry is completed, the process moves to step S47. If the determination is not completed, the process moves to step S42 to perform determination of an undetermined block.

[0169] The initial sampling operation from steps S41 to S46 has been described, but in the initial sampling operation, all the target blocks may be detected a predetermined number of times or repeatedly detected during a predetermined time.

[0170] If all the blocks are detected a predetermined number of times or repeatedly detected during a predetermined time in the initial sampling operation, the determination of presence or absence of laundry may be performed skipping the block for which it has been determined that there is laundry. This can reduce the operation time.

[0171] Steps S41 to S46 constitute a control procedure for detecting a position of the laundry from the difference between the room temperature and the detected temperature of each block, but a portion at a surface temperature lower than the room temperature like the laundry, for example, a window may be included in a position determined to be laundry.

[0172] Thus, a control process from steps S47 to S63 is performed to detect a block in which the window is located to achieve a more efficient clothes drying operation.

[0173] Steps S47 to S63 are steps for comparing various environmental patterns (for example, pattern 1: lavatory, pattern 2: living room, pattern 3: bathroom, or the like) stored in the past clothes drying operations with an

environment of this clothes drying operation to reduce time for window determination.

[0174] The control means can detect the environmental patterns by the storage means storing arrangement of the blocks for which it has been determined that there is a window in the past operations.

[0175] Step S47 is a step for comparing an environmental pattern 1 stored in the past clothes drying operation with the environment of this clothes drying operation.

[0176] Here, for the environment of this clothes drying operation, it is determined whether the laundry is located in a predetermined percentage (for example, 90%) or more of all the blocks for which it has been determined that there is a window in the environmental pattern 1.

[0177] When the laundry is located in the predetermined percentage or more of the blocks, the process moves to step S48, it is assumed that this clothes drying operation is performed in the same environment as that of the environmental pattern 1, and the process moves to step S54. When the laundry is located in less than the predetermined percentage of the blocks, the process moves to step S49.

[0178] Step S49 is a step for comparing an environmental pattern 2 stored in the past clothes drying operation with the environment of this clothes drying operation.

[0179] Here, for the environment of this clothes drying operation, it is determined whether the laundry is located in a predetermined percentage (for example, 90%) or more of all the blocks for which it has been determined that there is a window in the environmental pattern 2.

[0180] When the laundry is located in the predetermined percentage or more of the blocks, the process moves to step S50, it is assumed that this clothes drying operation is performed in the same environment as that of the environmental pattern 2, and the process moves to step S54. When the laundry is located in less than the predetermined percentage of the blocks, the process moves to step S51.

[0181] Step S51 is a step for comparing an environmental pattern 3 stored in the past clothes drying operation with the environment of this clothes drying operation.

[0182] Here, for the environment of this clothes drying operation, it is determined whether the laundry is located in a predetermined percentage (for example, 90%) or more of all the blocks for which it has been determined that there is a window in the environmental pattern 3.

[0183] When the laundry is located in the predetermined percentage or more of the blocks, the process moves to step S52, it is assumed that this clothes drying operation is performed in the same environment as that of the environmental pattern 3, and the process moves to step S54. When the laundry is located in less than the predetermined percentage of the blocks, the process moves to step S53.

[0184] When the process moves to step S53, it is as-

sumed that the stored environmental pattern performed in the past does not match the environment of this clothes drying operation, and clothes drying is performed in a new environment, and the process moves to step S54.

[0185] Next, with reference to Figure 15, in step S54, the control circuit 7 starts the clothes drying operation based on the detection results from steps S41 to S46, and the process moves to step S55.

[0186] Subsequently, in step S55, with the clothes drying operation, a surface temperature of a site located in the block to which the air is blown is measured, and it is determined whether or not a temperature as the measured value is lower than a window determination temperature T_w (measured value $< T_w$?).

[0187] First, when the measured value is lower than the window determination temperature T_w (window low temperature determination), the process moves to step S56. Here, when it is first determined that the measured value is lower than the window determination temperature T_w , the determination activates the timer portion 7e to start measurement of an elapsed time B_x after the determination. When such a determination is performed second and thereafter, measurement is continued to accumulate the elapsed time.

[0188] When the measured value of the surface temperature of the site located in the block to which the air is blown is higher than the window determination temperature T_w , the process moves to step S63, and it is determined whether or not the clothes drying operation is finished. If finished, the clothes drying operation is stopped, and if not finished, the process moves to step S54 to perform window determination for a block to which air is next blown.

[0189] In step S55, when the surface temperature of the block is higher than the window determination temperature T_w , measurement of the elapsed time B_x is stopped to reset data on the elapsed time B_x .

[0190] Next, in step S56, based on steps S47 to S53, it is determined whether or not the situation where this clothes drying operation is performed is the same environment as in the past (previous) operation.

[0191] If the situation is not in the same environment as in the past operation, the process moves to step S57, the window determination time is set to the normal value B_1 , and the process moves to step S61.

[0192] If the situation is the same environment as in the past operation, the process moves to step S58. In step S58, if the number of times of determination that there is a window in the target block during the past clothes drying operations is less than the prescribed number, the process moves to step S59 to set the window determination time to the normal value B_1 , and the process moves to step S61.

[0193] In step S58, if the number of times of determination that there is a window in the target block during the past clothes drying operations is the prescribed number or more, the process moves to step S60 to set the window determination time to a special value B_2

shorter than the normal value B_1 , and the process moves to step S61 ($B_1 > B_2$).

[0194] Next, in step S61, the window determination times B_1 , B_2 set in steps S57, S59 and S60 are compared with the elapsed time B_x from the window low temperature determination. Specifically, it is determined whether or not the surface temperature of the site located in the target block is the window determination temperature or less continuously for a predetermined time or more.

[0195] Here, the surface temperature of the laundry increases as drying proceeds, while the surface temperature of the window does not increase (does not change) as the clothes drying operation proceeds. Thus, when the surface temperature is the window determination temperature or less (low temperature state) even if the window determination time B or more passes, it is determined that there is a window in the block.

[0196] If the time at the window determination temperature or less (elapsed time B_x) is less than the window determination time B (B_1 or B_2), the process moves to step S63 to determine whether or not the clothes drying operation is finished. If finished, the clothes drying operation is stopped, and if not finished, the process moves to step S54 to perform window determination for a block to which air is blown next.

[0197] If the time at the window determination temperature or less (elapsed time B_x) is the window determination time B (B_1 or B_2) or more, the process moves to step S62. In step S62, the window is detected in the target block, and the number of times of window detection in the block is additionally stored, and the process moves to step S63.

[0198] In step S63, it is determined whether or not the clothes drying operation is finished. If finished, the clothes drying operation is stopped, and if not finished, the process moves to step S54 to perform window determination for a block to which air is blown next.

[0199] The clothes drying operation being performed is controlled so that dry air is not positively fed to the block for which it has been determined that there is a window as described above, but dry air is mainly fed to a block for which it has been determined that there is laundry.

[0200] As described above, in this embodiment, in order to determine whether or not the environment is the same as the stored environment, it is checked whether 90% or more of the blocks for which it has been determined to be a position of the window in the window determination performed during the previous operation are target blocks of the laundry.

[0201] When it is determined that 90% or more of the blocks are the target blocks of the laundry, it is determined that the environment is highly likely to be the same as the stored environment, and window determination is performed using the special value for the blocks for which the window determination has been performed in the past.

[0202] This can reduce the determination time of the

position of the window, and allows an efficient clothes drying operation.

[0203] In particular, a plurality of window position determinations performed during the past clothes drying operations are stored for comparison with the environment of this clothes drying operation, and this clothes drying operation is compared therewith, thereby further reducing the determination time.

Reference Signs List

[0204]

1	air direction variable means
1a	longitudinal louver
1b	lateral louver
1c	longitudinally variable motor
1d	laterally variable motor
2	blower fan
2a	fan motor
3	temperature sensor
4	humidity sensor
5	dehumidification device
6	infrared sensor
6a	infrared absorbing film
6b	thermistor
7	microcomputer
7a	input circuit
7b	output circuit
7c	CPU
7d	storage portion
7e	timer portion
8	operation switch
12	display portion
100	dehumidifier casing
101	inlet
102	water storage tank
103	outlet
200	whole scanning range
201	divided area
P	indoor air
Q	dry air

Claims

1. A dehumidifier comprising:

a casing;
 blowing means for taking indoor air in the casing and blowing the indoor air out of the casing;
 dehumidification means for dehumidifying the indoor air taken in the casing;
 air temperature detection means for measuring a temperature of the indoor air;
 air direction variable means capable of varying an air direction of dry air obtained by dehumidifying the indoor air by the dehumidification

means when the dry air is blown out of the casing;

surface temperature detection means for detecting a surface temperature of a site located in a blowing direction of the dry air; and
 control means for controlling the each means, wherein the control means divides a region to which the air direction variable means can blow air into a plurality of blocks, causes the surface temperature detection means to detect the surface temperature of each block, calculates a temperature difference between the temperature of the indoor air and the surface temperature, and compares the temperature difference with a predetermined first determination temperature, thereby determining whether or not an object to be dried is located in the block.

2. The dehumidifier according to claim 1, further comprising storage means for storing a past operation history, wherein the operation history includes a determination history on whether or not the object to be dried is located in each block, and the control means changes a value of the first determination temperature based on the determination history.

3. The dehumidifier according to claim 2, wherein in the determination history, a value of the first determination temperature in a case where it is determined that the object to be dried is located in each block a prescribed number of times or more during a past operation is smaller than that in a case where the number of times of determination is less than the prescribed number.

4. The dehumidifier according to any one of claims 1 to 3, wherein the control means controls a direction of the air direction variable means so as to feed the dry air to the block for which it has been determined that the object to be dried is located.

5. The dehumidifier according to any one of claims 1 to 4, wherein the control means controls the dehumidification means after determination of a position of the object to be dried to perform an dehumidifying operation, causes the surface temperature detection means to detect the surface temperature of each block during the dehumidifying operation, and compares the detected surface temperature with a predetermined second determination temperature, thereby determining whether or not an object not to be dried that is not the object to be dried is located in the block.

6. The dehumidifier according to claim 5, wherein the control means determines that the object not to be

dried that is not the object to be dried is located in the block when the surface temperature is lower than the second determination temperature.

7. The dehumidifier according to claim 6, wherein the control means determines that the object not to be dried that is not the object to be dried is located in the block when a state where the surface temperature is lower than the second determination temperature continues for a predetermined determination time or more. 5
10

8. The dehumidifier according to claim 7, wherein a length of the determination time changes depending on a determination history for each block on whether or not the object not to be dried is located. 15

9. The dehumidifier according to claim 8, wherein in the determination history, a value of the determination time in a case where the control means determines that the object not to be dried is located in each block a prescribed number of times or more during a past operation is smaller than that in a case where the number of times of determination is less than the prescribed number. 20
25

10. The dehumidifier according to any one of claims 7 to 9, wherein the control means determines the determination time according to determination whether or not the object to be dried is present in a predetermined percentage or more of the blocks for which it has been determined to be the object to be dried during the previous operation. 30

11. The dehumidifier according to any one of claims 7 to 10, wherein the control means compares an arrangement pattern of the blocks for which it has been determined that the object not to be dried is located during the past operation with an arrangement pattern of the blocks for which it has been determined that the object not to be dried is located during a current operation, thereby determining whether or not the current operation is performed in the same environment as that of the past operation, and determining the determination time based on the determination. 35
40
45

12. The dehumidifier according to any one of claims 5 to 11, wherein the control means controls the direction of the air direction variable means so that the dry air is not fed to the block for which it has been determined that the object not to be dried is located. 50

13. The dehumidifier according to any one of claims 5 to 12, wherein the object not to be dried is a window. 55

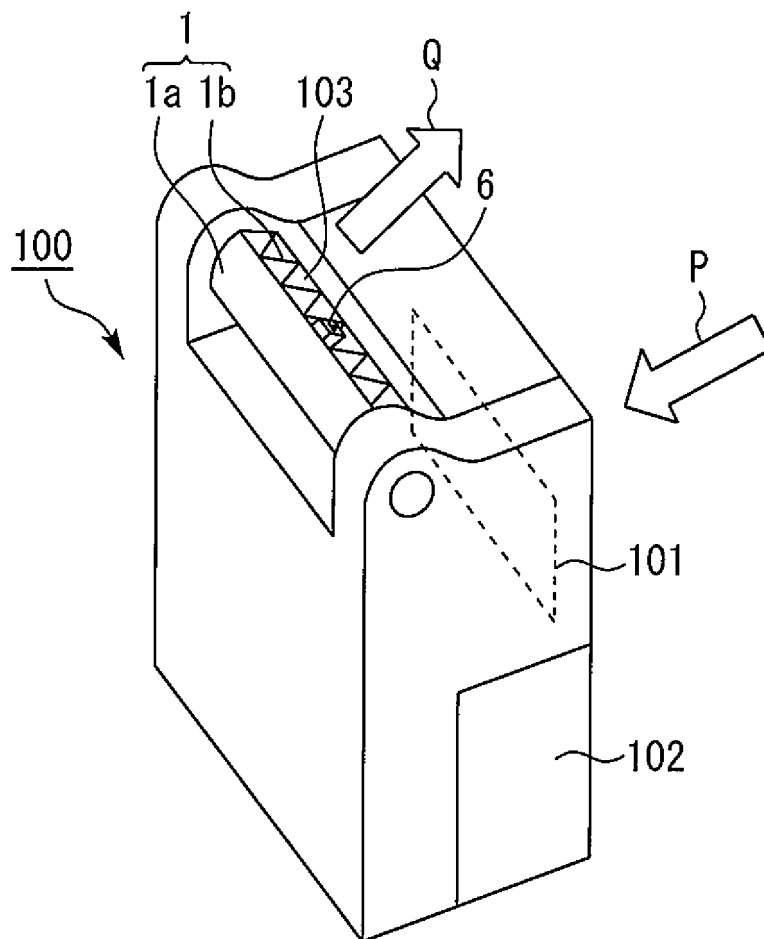


Fig. 1

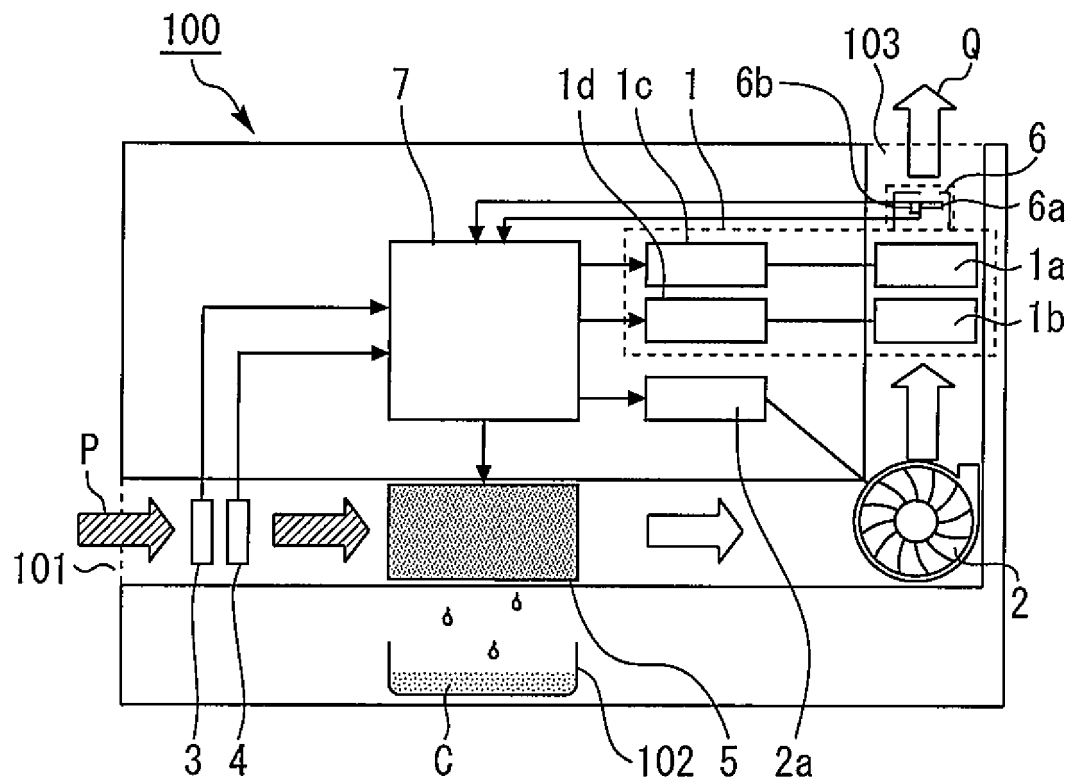


Fig. 2

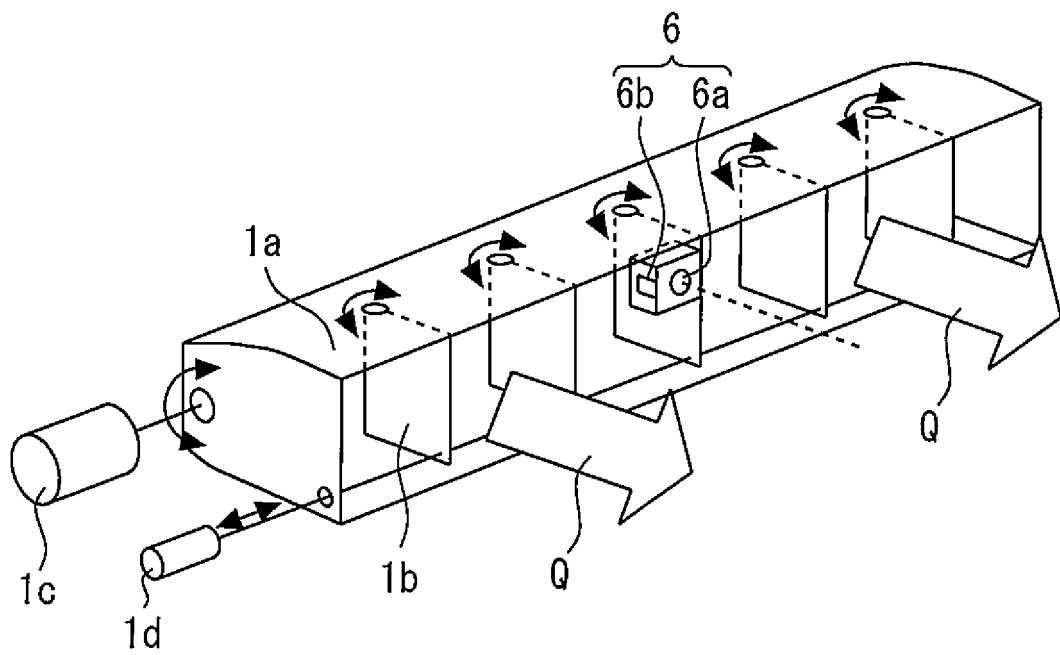


Fig. 3

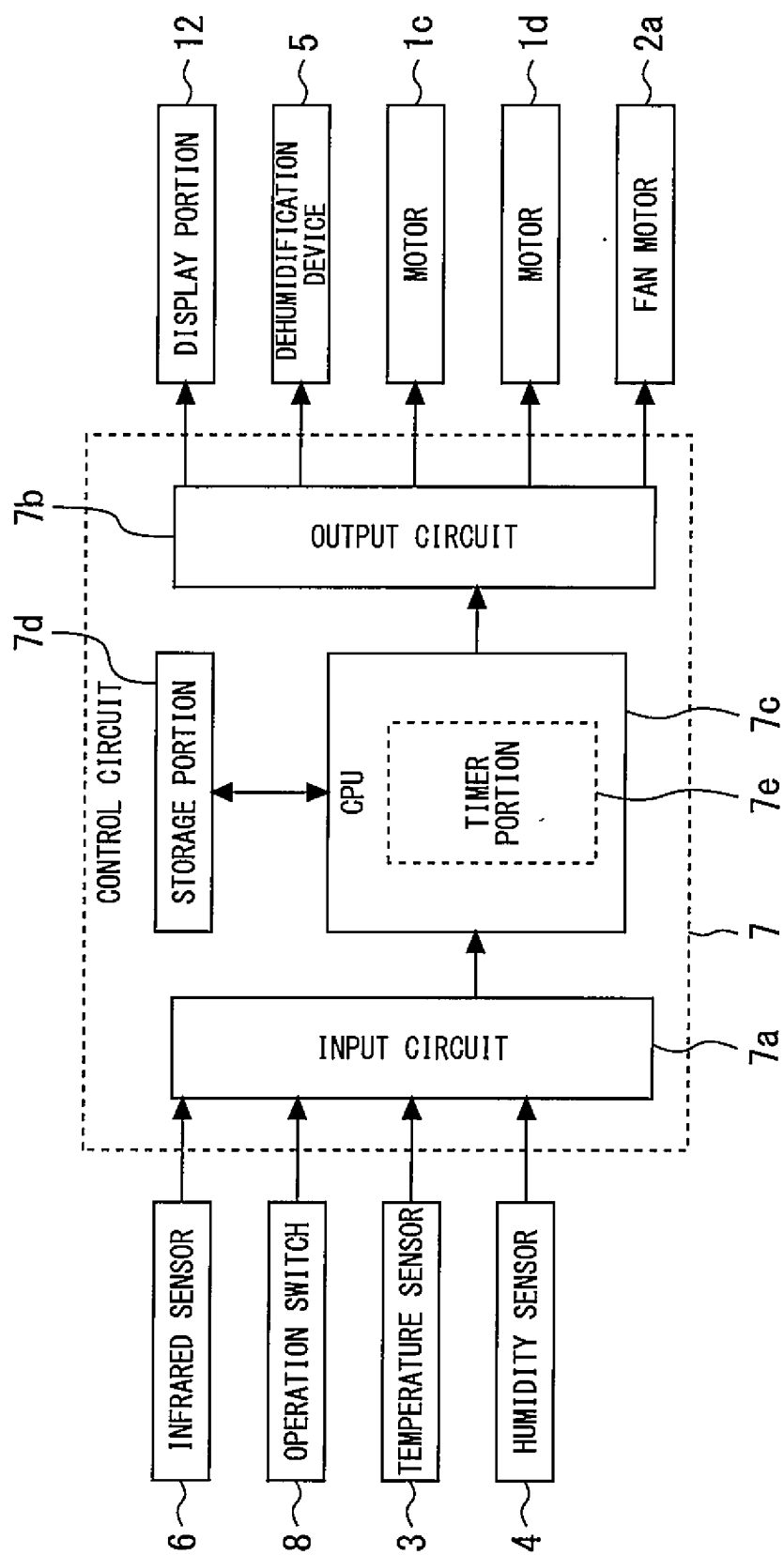


Fig. 4

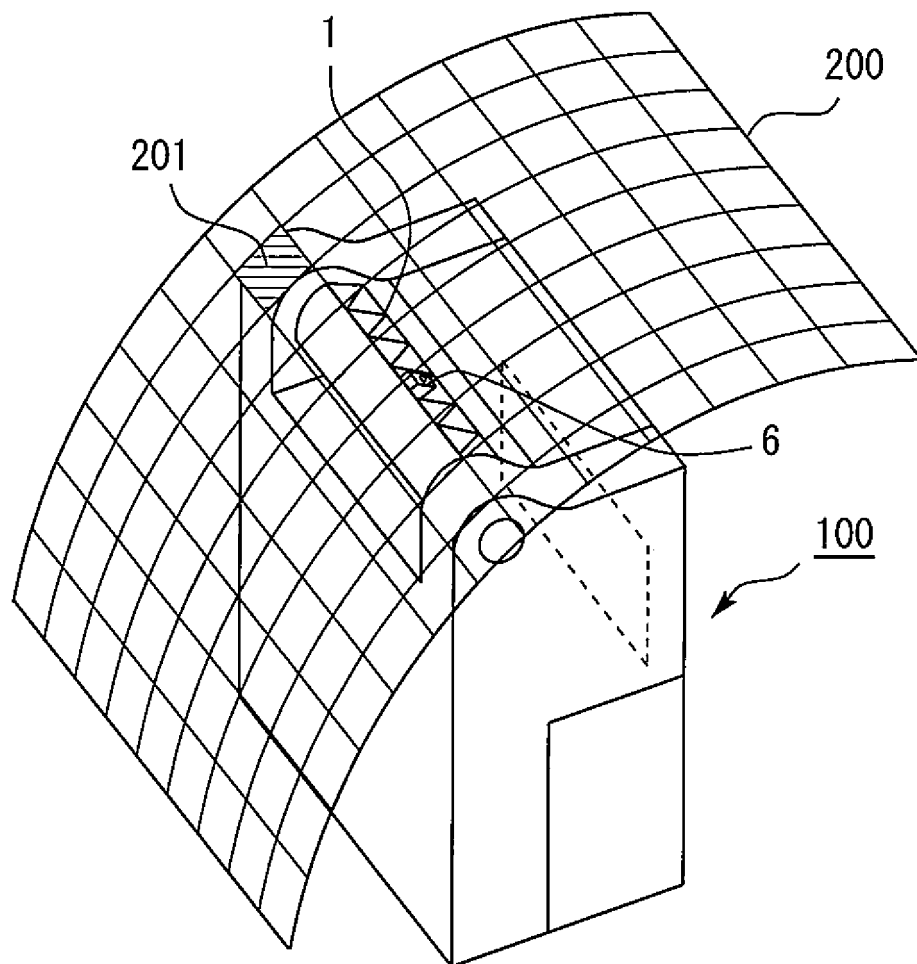
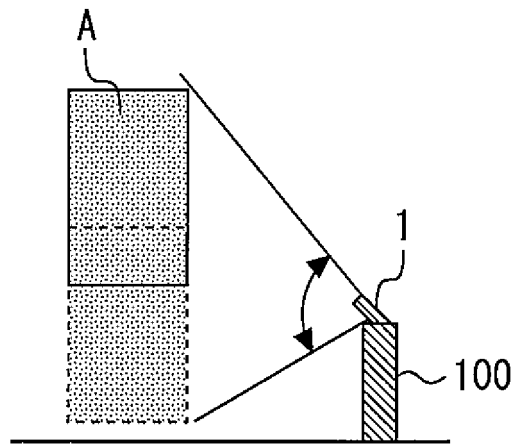
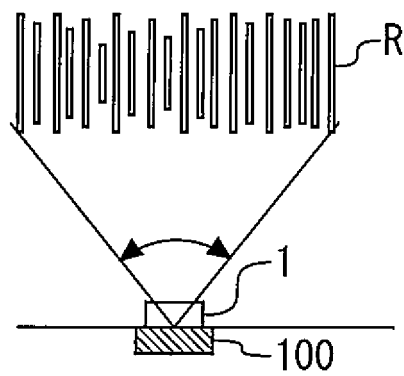


Fig. 5



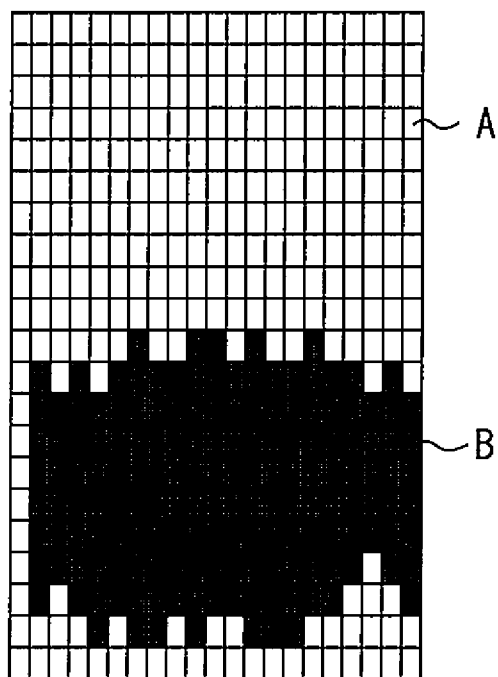
(a) LONGITUDINAL LOUVER DIRECTION



(b) LATERAL LOUVER DIRECTION

Fig. 6

(a) STATE BEFORE DRYING OPERATION



(b) STATE AFTER PREDETERMINED TIME FROM START OF DRYING OPERATION

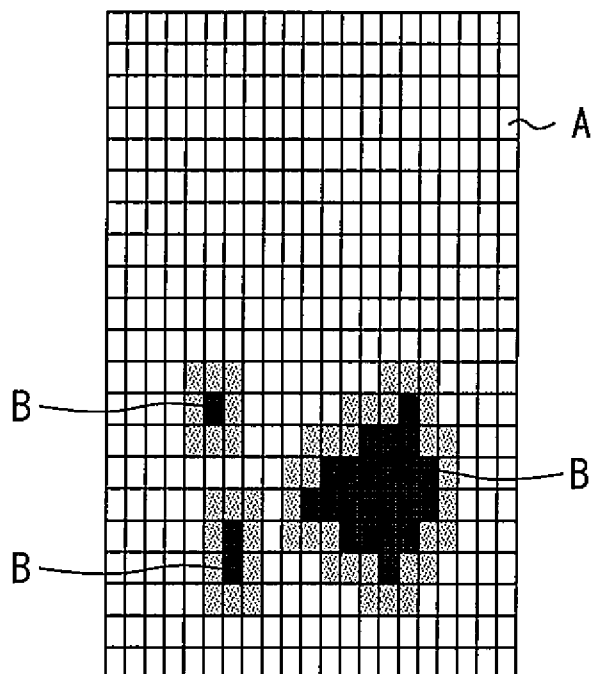
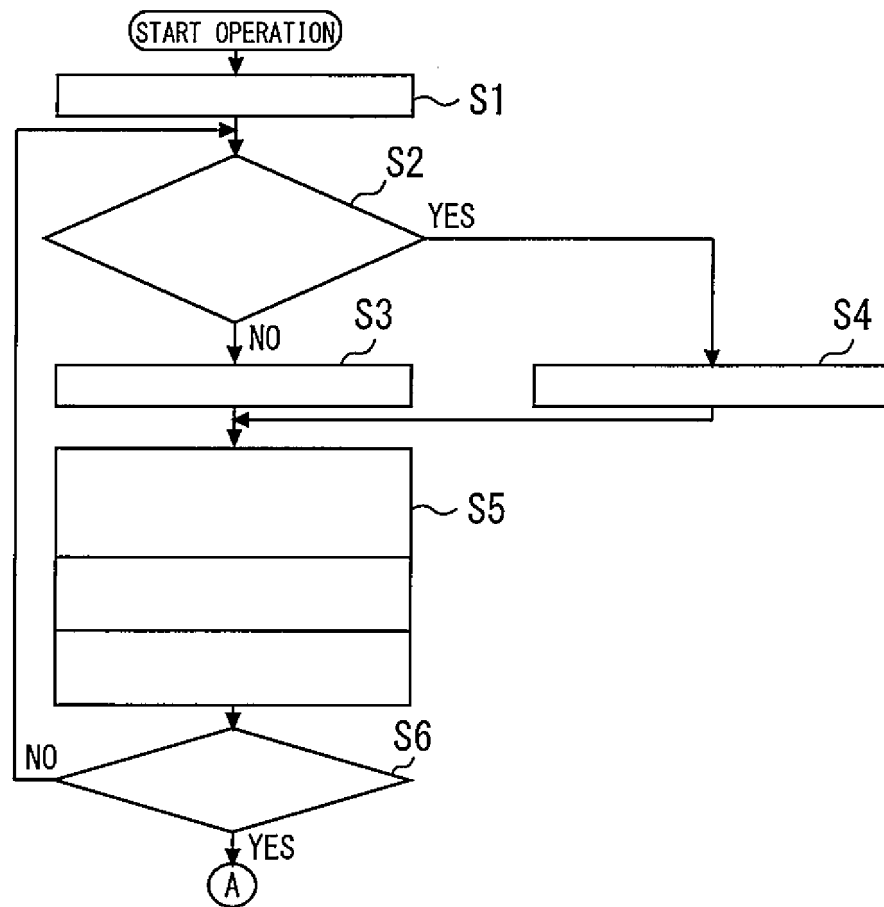


Fig. 7



S1: INITIAL SAMPLING OPERATION

S2: IS THERE LAUNDRY IN TARGET BLOCK
PRESCRIBED NUMBER OF TIMES OR MORE IN THE PAST ?

S3: DETERMINATION TEMPERATURE $\leftarrow$ NORMAL VALUE T1

S4: DETERMINATION TEMPERATURE $\leftarrow$ SPECIAL VALUE T2

S5: DETERMINE PRESENCE OR ABSENCE OF LAUNDRY
IN EACH BLOCK AT ΔT
 $\Delta T = \text{ROOM TEMPERATURE} - \text{MEASURED VALUE}$

THERE IS LAUNDRY IN TARGET BLOCK
WHEN DETERMINATION TEMPERATURE $\leq \Delta T$

LAUNDRY DETECTION BLOCK IS
NUMBER OF TIMES OF SELECTION DETECTION + 1

S6: IS DETERMINATION FOR ALL BLOCKS COMPLETED ?

Fig. 8

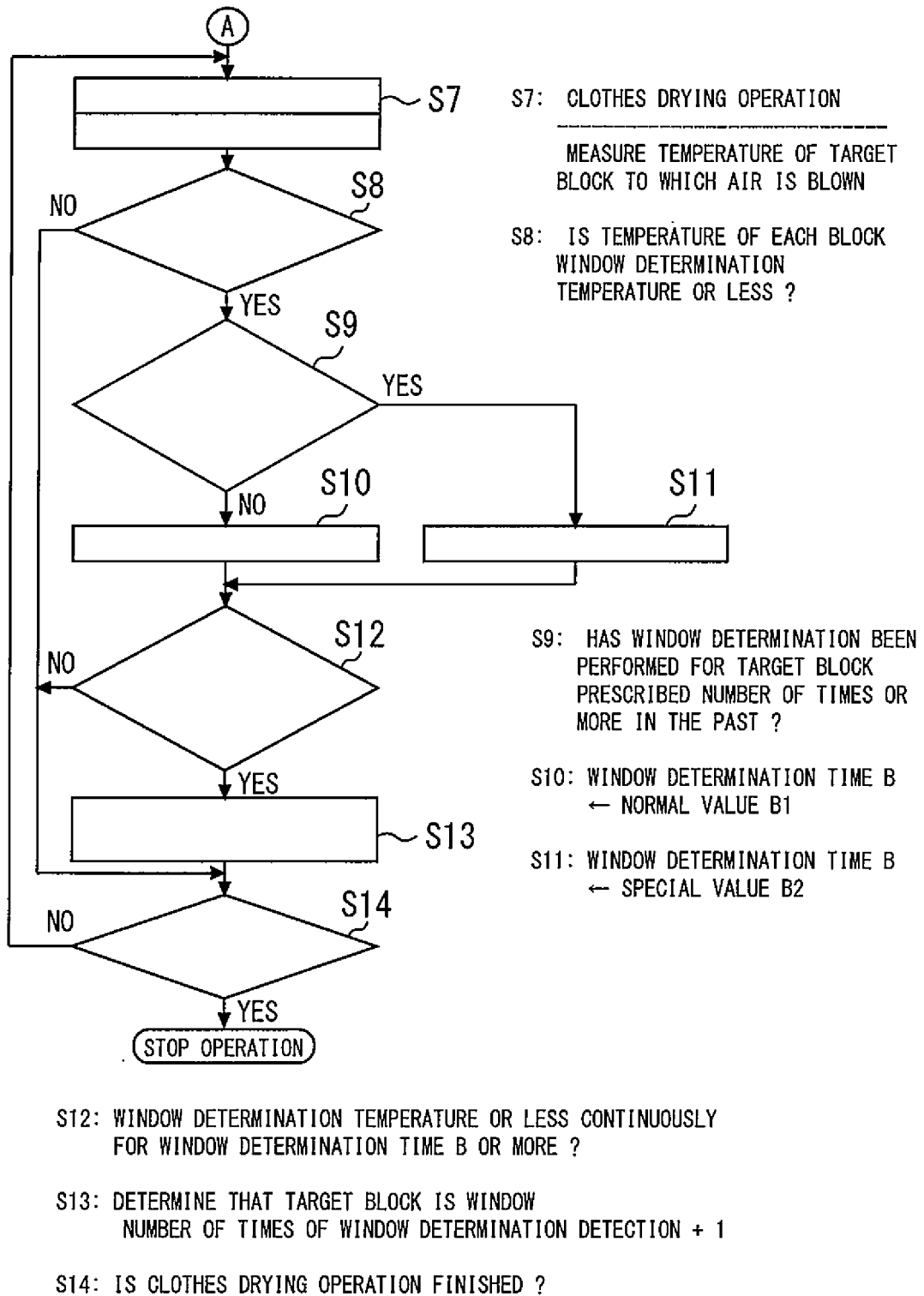


Fig. 9

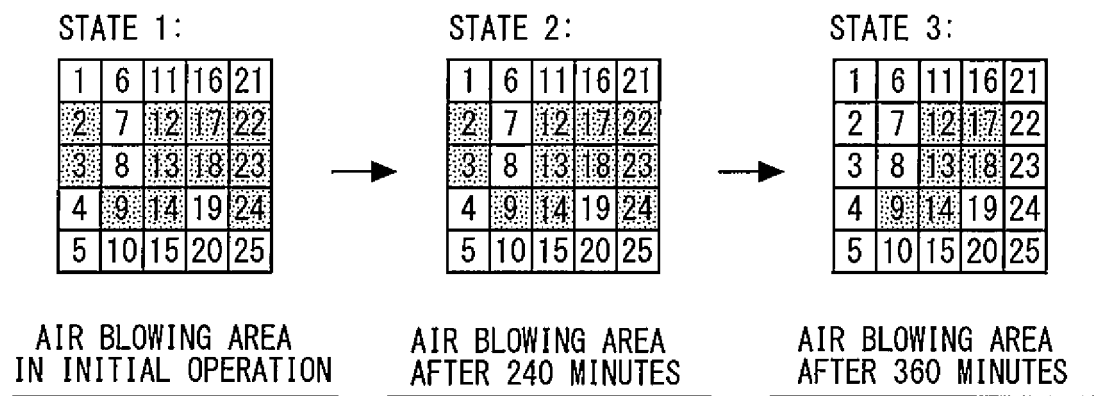
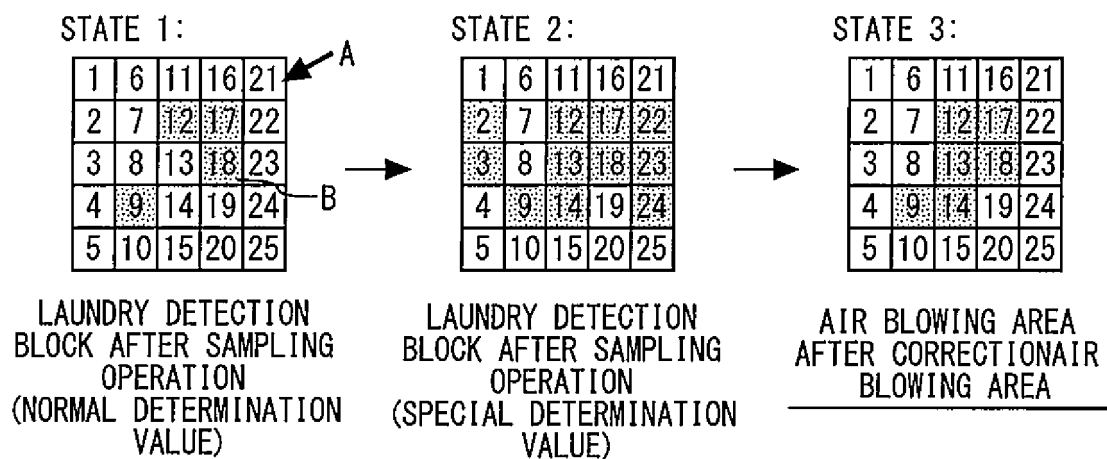


Fig. 10

(a)



(b)

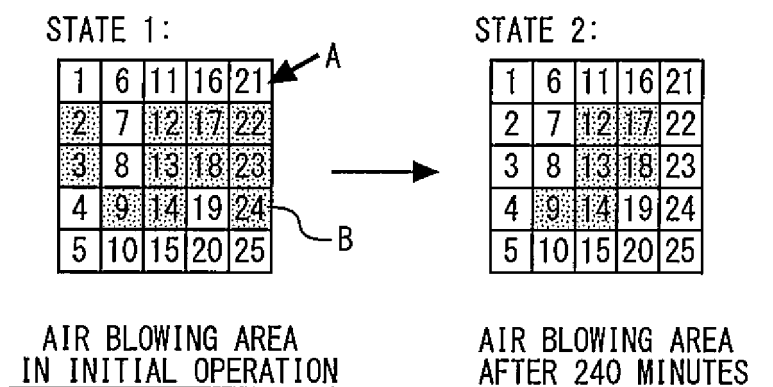


Fig. 11

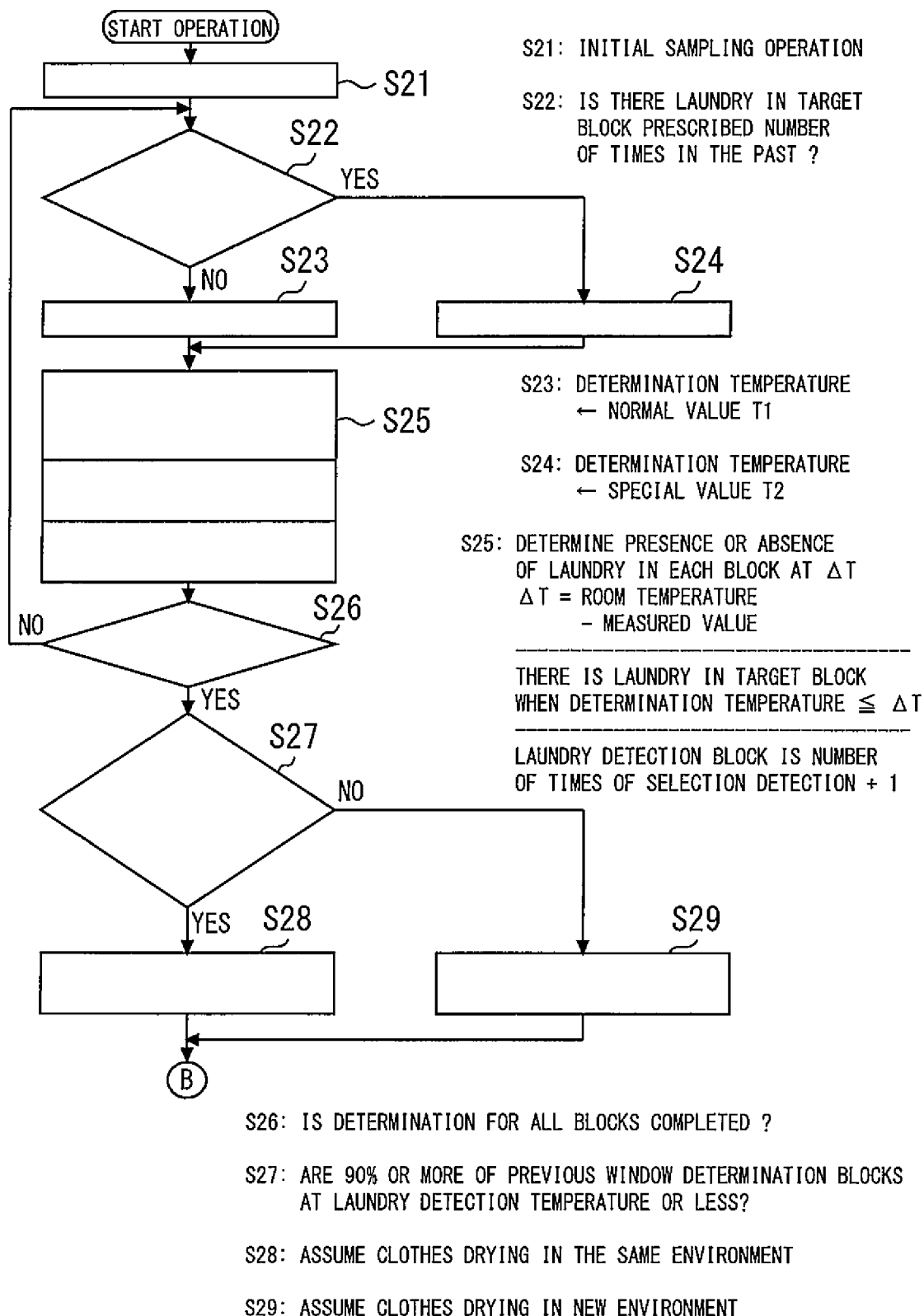


Fig. 12

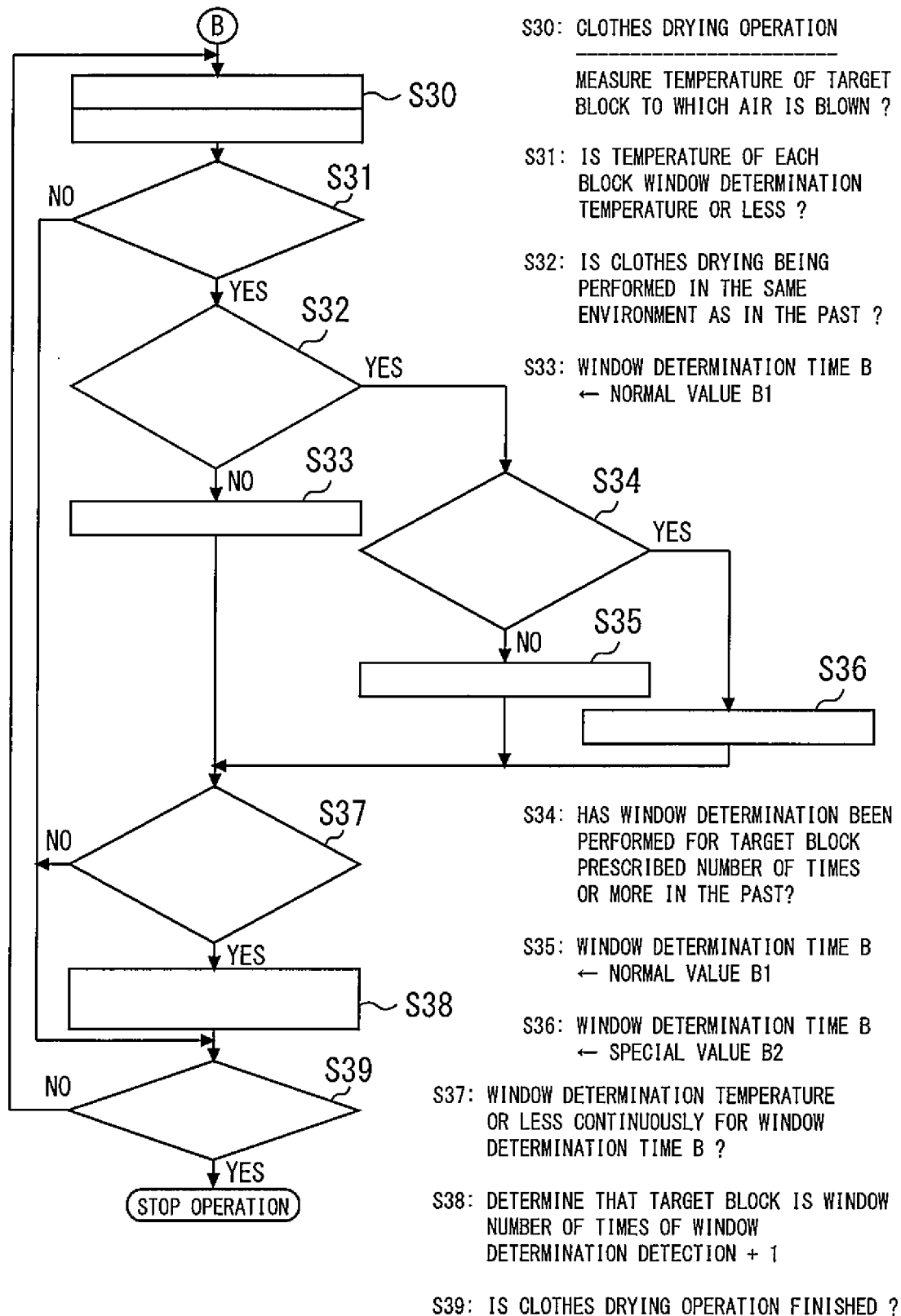


Fig. 13

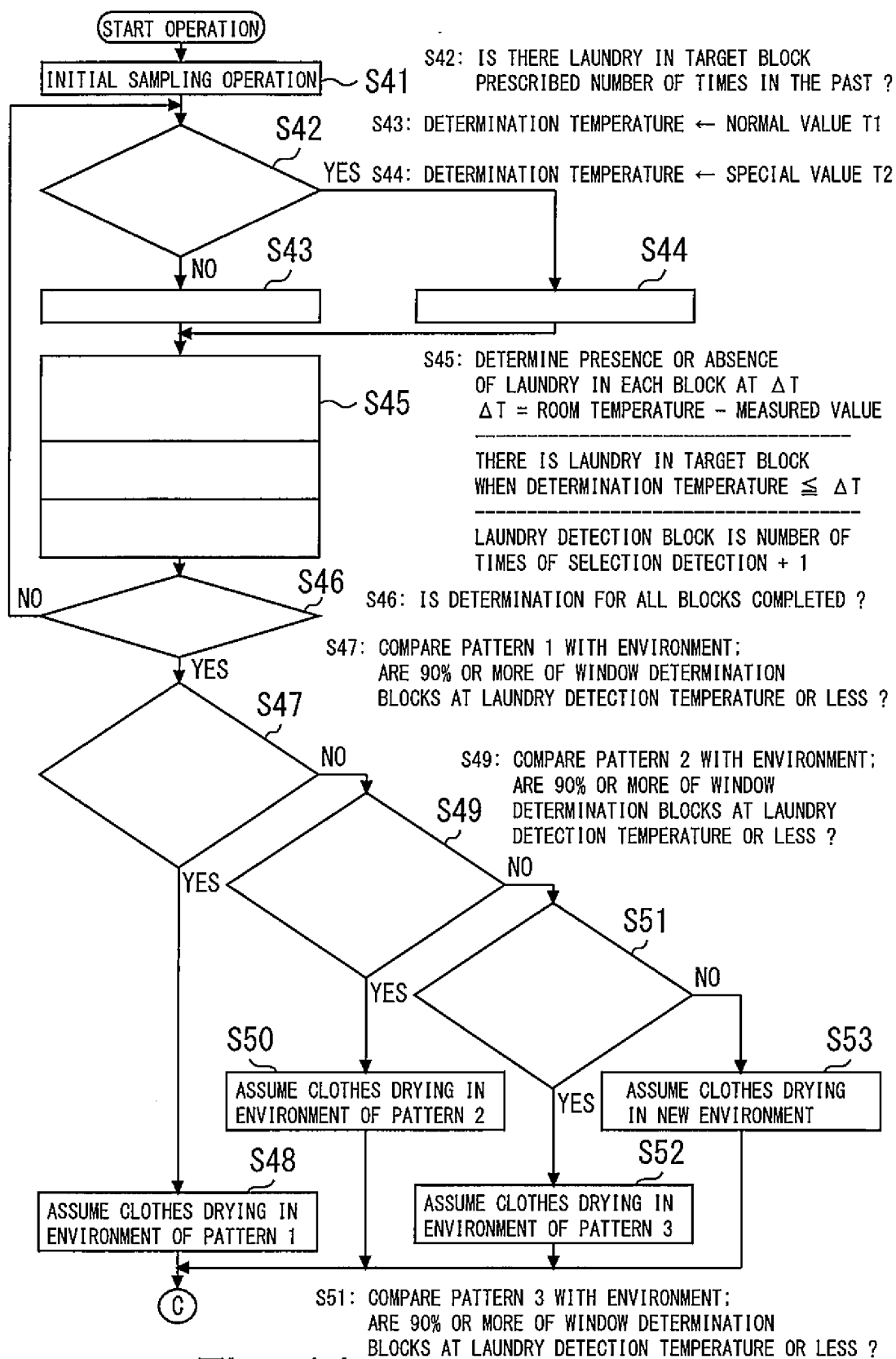


Fig. 14

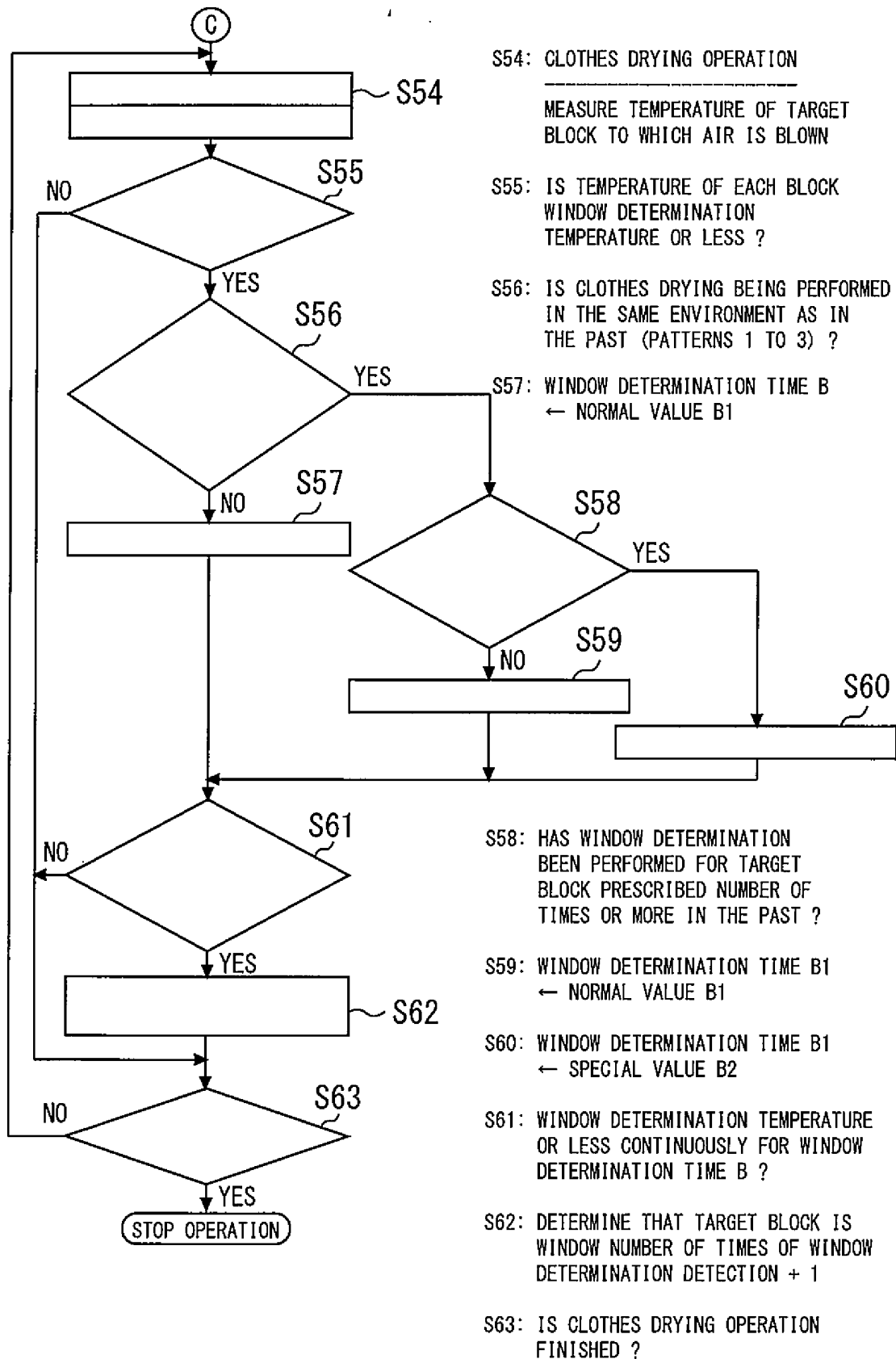


Fig. 15

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2014/064013

A. CLASSIFICATION OF SUBJECT MATTER

F24F11/02(2006.01)i, D06F58/10(2006.01)i, D06F58/28(2006.01)i, F24F1/02(2011.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

F24F11/02, D06F58/10, D06F58/28, F24F1/02

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2014

Kokai Jitsuyo Shinan Koho 1971-2014 Toroku Jitsuyo Shinan Koho 1994-2014

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 2011-149693 A (Panasonic Corp.),	1, 4
Y	04 August 2011 (04.08.2011),	5-7, 12-13
A	entire text; all drawings (Family: none)	2-3, 8-11
Y	JP 2011-190980 A (Mitsubishi Electric Corp.),	5-7, 12-13
	29 September 2011 (29.09.2011),	
	paragraphs [0018], [0037] (Family: none)	
A	JP 2011-214825 A (Mitsubishi Electric Corp.),	1-13
	27 October 2011 (27.10.2011),	
	paragraphs [0024], [0046], [0059] (Family: none)	

☒ Further documents are listed in the continuation of Box C.

☐ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search
16 July, 2014 (16.07.14)

Date of mailing of the international search report
29 July, 2014 (29.07.14)

Name and mailing address of the ISA/
Japanese Patent Office

Authorized officer

Facsimile No.

Telephone No.

Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2014/064013

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2007-240100 A (Matsushita Electric Industrial Co., Ltd.), 20 September 2007 (20.09.2007), paragraph [0052] (Family: none)	1-13
A	JP 2012-242062 A (Panasonic Corp.), 10 December 2012 (10.12.2012), entire text; all drawings (Family: none)	1-13
A	JP 2010-69286 A (Panasonic Corp.), 02 April 2010 (02.04.2010), paragraph [0028] (Family: none)	1-13
A	EP 2545980 A1 (Mitsubishi Electric Corp.), 16 January 2013 (16.01.2013), entire text; all drawings & WO 2011/111515 A1 & TW 201200816 A & CN 102762280 A & NZ 601218 A	1-13

Form PCT/ISA/210 (continuation of second sheet) (July 2009)

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- JP 7139759 A [0003]