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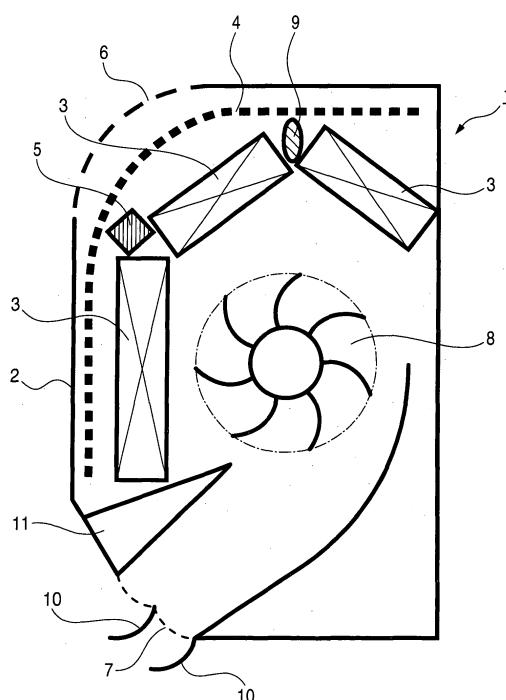
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(54) **Air conditioner and operation method thereof**

(57) An air conditioner includes an indoor unit which houses an air outlet which blows off air into the inside of a room, an air outlet open/close mechanism which opens/closes the air outlet, an air inlet which sucks indoor air, an indoor fan, and an indoor heat exchanger therein. The air conditioner includes: a humidifying mechanism that wets the inside of the indoor unit to bring the inside of the indoor unit into a predetermined humidity; an ozone generator arranged on a windward side of the indoor heat exchanger; and an air conditioning controller having an operation mode in which ozone treatment is performed by allowing the ozone generator to generate ozone in a state that the inside of the indoor unit is held at the predetermined humidity by the humidifying mechanism.

FIG. 1



Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to an air conditioner which sucks indoor air from an air inlet of an indoor unit and blows off the indoor air from an air outlet after air conditioning, and an operation method of the air conditioner.

2. Description of the Related Art

[0002] Recently, an attempt to reduce energy necessary for air conditioning by highly increasing the air-tightness of a residence has been made. However, many reports state that due to the increase of air-tightness, the ventilation with outdoor air becomes insufficient and hence, air in the inside of the residence is contaminated thus ill-affecting residents in various ways.

[0003] An air conditioner of general type includes an outdoor unit and an indoor unit. The indoor unit includes an indoor fan for accelerating a heat exchange between an indoor heat exchanger provided inside the indoor unit and indoor air, wherein the indoor air is sucked into the inside of the indoor unit by the indoor fan, the sucked indoor air is supplied to the indoor heat exchanger for heat exchange, and air after the heat exchange is again blown into the inside of the room.

[0004] Accordingly, there exists a drawback that microorganisms and dusts in the air are sucked into the inside of the indoor unit together with the indoor air, these microorganisms and dusts are adhered to an inner wall surface of the indoor unit, the indoor fan, the indoor heat exchanger and the like mounted in the inside of the indoor unit, and molds and microorganisms such as ferments or bacteria propagate using organic materials adhered to the dusts as nutrient sources. Particularly, after a cooling operation is stopped, a condensate which is condensed by the indoor heat exchanger is evaporated in the inside of the indoor unit and hence, humidity in the inside of the indoor unit is increased thus giving rise to a drawback that the propagation of molds becomes more active.

[0005] In this manner, when the molds, the bacteria or the like propagate in the inside of the indoor unit, besides the possibility of generation of offensive odors when the air conditioner is operated, there also exists a possibility that mold spores and bacteria spread in the inside of the room and hence, the propagation of the molds and bacteria is not desirable from a hygienic viewpoint. Further, when the molds propagate in the indoor heat exchanger or the indoor fan, the molds become a resistance in a ventilation path thus giving rise to a possibility that an air volume of the indoor fan is lowered and performances of the air conditioner are lowered.

[0006] Accordingly, an air conditioner described in JP-

A-2002-323250 adopts a method which makes use of a heating/drying operation as an operation control method for preventing the propagation of molds, bacteria and the like in the inside of an indoor unit. In this method, immediately after finishing a cooling operation, an air outlet vane of the indoor unit is closed, and two heat exchangers are allowed to perform heating on one side and cooling on another side simultaneously using a throttle valve thus simultaneously performing drying by heating and dehumidifying by cooling whereby moisture in the inside of the indoor unit is evaporated to lower the humidity thus preventing the propagation of bacteria and the molds.

[0007] Further, an air conditioner described in JP-A-2003-240313 adopts a method which makes use of ozone as an operation control method for preventing the propagation of molds, bacteria and the like in the inside of an indoor unit. The method increases the ozone concentration in the inside of the indoor unit by providing an ozone generator in the inside of the indoor unit thus preventing the propagation of the molds and the bacteria.

SUMMARY OF THE INVENTION

[0008] In the air conditioner disclosed in JP-A-2002-323250, the indoor heat exchanger is divided into a rear-side heat exchange portion and a front-side heat exchange portion, and the rear-side heat exchange portion and the front-side heat exchange portion are connected to each other by way of an indoor throttle valve which is constituted of a throttle two-way valve and hence, the flow of a coolant between both heat exchange portions can be controlled thus allowing the air conditioner to perform drying by a heating operation and dehumidifying by a cooling operation simultaneously based on an electric control. Accordingly, it is possible to perform the dehumidifying of the inside of the indoor unit without releasing hot air to the outside of the indoor unit thus preventing the propagation of molds and bacteria.

[0009] However, although such a propagation preventing method by drying can eliminate bacteria and the like (extinction by drying), the molds cannot be eliminated. Further, since heating and cooling are simultaneously performed in one space (in the inside of the indoor unit), the air conditioner consumes energy in a wasteful manner. Further, it is necessary to perform a control of the coolant using the throttle two-way valve and hence, a cost is pushed up.

[0010] Further, the air conditioner disclosed in JP-A-2003-240313 increases the ozone concentration in the inside of the indoor unit by providing the ozone generator in the inside of the indoor unit, and prevents the propagation of the molds and bacteria using a sterilizing ability that the ozone possesses.

[0011] In such a propagation preventing method using ozone, the ozone concentration of 0.1ppm which is an environmental reference standard or more is required. However, in the inside of the actual indoor unit, the ozone concentration cannot be highly elevated because of an

oxidizing force which ozone possesses. Therefore, an ability to suppress the propagation of molds and bacteria is small. Further, ozone which remains in the inside of the indoor unit after ozone treatment exhibits a high retention property and hence, when the air conditioner is operated after finishing the ozone treatment, the ozone may be released into the inside of a room. Further, in a considerably large number of cases, for realizing a low-cost production, the ozone generator also functions as an electrostatic filter. However, due to stains on electrodes caused by dusts collected by the electrostatic filter, an ozone generation quantity is not stable, which disturbs the stable ozone treatment.

[0012] The present invention has been made to overcome the above-mentioned problems and has an object to provide an air conditioner and an operation method thereof which can suppress the energy consumption by obviating the necessity of simultaneously performing cooling and heating at the time of ozone treatment and can eliminate not only bacteria but also molds by the ozone treatment.

[0013] According to a first aspect of the invention, there is provided an air conditioner including an indoor unit which houses an air outlet which blows off air into the inside of a room, an air outlet open/close mechanism which opens/closes the air outlet, an air inlet which sucks indoor air, an indoor fan, and an indoor heat exchanger therein, the air conditioner comprising: a humidifying mechanism that wets the inside of the indoor unit to bring the inside of the indoor unit into a predetermined humidity; an ozone generator arranged on a windward side of the indoor heat exchanger; and an air conditioning controller having an operation mode in which ozone treatment is performed by allowing the ozone generator to generate ozone in a state that the inside of the indoor unit is held at the predetermined humidity by the humidifying mechanism.

[0014] According to a second aspect of the invention, there is provided an operation method of an air conditioner comprising performing an inside cleaning operation, wherein the performing inside cleaning operation includes: a humidifying step of wetting the inside of the indoor unit and to maintain predetermined humidity; an ozone treatment step of performing ozone treatment at the predetermined humidity after the humidifying step; and a drying step of drying the inside of the indoor unit after the ozone treatment step.

[0015] According to the air conditioner and the operation method thereof of the present invention, surfaces of respective portions in the inside of the indoor unit are brought into a wet state and, at the same time, the inside of the indoor unit is held at the predetermined humidity, and ozone is generated by operating the ozone generator in such a state. With the use of ozone generated by the ozone generator and radicals generated by ozone and water, it is possible to eliminate molds and bacteria adhered to the inner surfaces of the indoor unit with high efficiency.

BRIEF DESCRIPTION OF THE DRAWINGS

[0016]

- Fig. 1 is a cross-sectional view showing an indoor unit of an air conditioner according to an embodiment 1;
 Fig. 2 is a flowchart of a basic control of the air conditioner in an operation method of the air conditioner according to the embodiment 1;
 Fig. 3 is a flowchart of an inside cleaning operation mode according to the embodiment 1;
 Fig. 4 is a view showing the relative humidity dependency on a mold (black mold) sterilizing effect in ozone treatment;
 Fig. 5 is a view showing the relative humidity dependency on ozone concentration and treatment time with respect to a survival rate of molds;
 Fig. 6 is a flowchart of a basic control in an operation method of an air conditioner according to an embodiment 2;
 Fig. 7 is a flowchart of an inside cleaning operation mode according to the embodiment 2;
 Fig. 8 is a cross-sectional view showing an indoor unit of an air conditioner in an embodiment 3;
 Fig. 9 is a flowchart of an inside cleaning operation mode according to the embodiment 3;
 Fig. 10 is a flowchart of a humidifying operation mode according to the embodiment 3;
 Fig. 11 is a cross-sectional view showing an indoor unit of an air conditioner according to an embodiment 4;
 Fig. 12 is a cross-sectional view showing an indoor unit of an air conditioner according to an embodiment 5;
 Fig. 13 is a flowchart of an inside cleaning operation mode according to the embodiment 5;
 Fig. 14 is a flowchart of a basic control in an operation method of an air conditioner according to an embodiment 6;
 Fig. 15 is a flowchart of an inside cleaning operation mode according to an embodiment 7;
 Fig. 16 is a cross-sectional view of an indoor unit of an air conditioner according to an embodiment 8;
 Fig. 17 is a cross-sectional view of an indoor unit of an air conditioner according to an embodiment 9; and
 Fig. 18 is a flowchart of an operation method of the air conditioner using a human detection system according to the embodiment 9.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0017] Hereinafter, an air conditioner and an operation method thereof according to embodiments of the present invention are explained in conjunction with drawings.

Embodiment 1

[0018] Fig. 1 is a cross-sectional view of an indoor unit of an air conditioner in the embodiment 1 of the present invention, Fig. 2 is a flowchart of a basic control of the air conditioner, Fig. 3 is a flowchart of an inside cleaning operation mode, Fig. 4 is a view showing organism removing property by humidity and ozone treatment, and Fig. 5 is a view showing the relationship between the ozone concentration and a treatment time necessary for reducing a survival rate of molds to 1/10.

[0019] As shown in Fig. 1 which is the cross-sectional view of an indoor unit, numeral 1 indicates the indoor unit, numeral 2 indicates a body casing of the indoor unit 1, numeral 3 indicates a heat exchanger arranged in the inside of the body casing 2, numeral 4 indicates a filter arranged on a windward side of the heat exchanger 3, numeral 5 indicates an ozone generator arranged in the vicinity of the heat exchanger 3, numeral 6 indicates an air inlet formed in an upper portion of the body casing 2 into which air is taken from the inside of a room, numeral 7 indicates an air outlet formed in a lower portion of the body casing 2 for blowing off air whose temperature and humidity are adjusted into the inside of the room, numeral 8 indicates an indoor fan arranged between the heat exchanger 3 and the air outlet 7, numeral 9 indicates a temperature/humidity sensor arranged in the inside of the indoor unit 1, numeral 10 indicates an air outlet open/close device (louver) which opens/closes the air outlet 7, and numeral 11 indicates a partition wall member which separates air taken from the inside of the room and air blown into the inside of the room.

[0020] Usually, the air conditioner is constituted of an outdoor unit (not shown in the drawing) arranged outdoors and the indoor unit 1 which is arranged on an upper portion of a wall surface of a room in which air conditioning is performed. A compressor, a four-way valve, an outdoor heat exchanger and an expansion valve which are mounted in the outdoor unit, and an indoor heat exchanger 3 which is mounted on the indoor unit 1 are connected with each other to form a refrigerating cycle. By changing over the flow direction of a coolant by using the four-way valve, it is possible to perform cooling and heating of a room in which the indoor unit 1 is arranged. Further, the indoor heat exchanger 3 is a so-called fin tube heat exchanger which is constituted of plural sheets of aluminum-made fins and a copper pipe which penetrates the fins in a meandering manner.

[0021] Further, although not shown in the drawing, the outdoor unit and the indoor unit 1 are respectively provided with an outdoor control part and an indoor control part for performing the operation of the above-mentioned refrigerating cycle. The outdoor unit and the indoor unit 1 are respectively connected with the outdoor control part and the indoor control part through connection lines so as to enable an operation control of the outdoor unit and the indoor unit 1 by the controller. Further, the outdoor unit and the indoor unit 1 are operated while performing

the transaction of control signals and data. However, the operations of the outdoor unit and the indoor unit 1 are not directly relevant to the present invention and are equal to operations of the normal air conditioner and hence, the explanation of the operation of the outdoor unit and the indoor unit 1 is omitted here.

[0022] The indoor unit 1 is usually arranged on a wall of the room in which air conditioning is performed in the vicinity of a ceiling of the room. The indoor unit 1 is connected with the outdoor unit by way of a coolant pipe along which the connection line is arranged in parallel through a wall opening formed in the wall. Further, the indoor unit 1 includes the body casing 2 formed of a laterally elongated box. The air inlet 6 is formed by opening upwardly in an upper portion of the body casing 2, and the air outlet 7 is formed by opening downwardly in a lower portion of the body casing 2. The indoor fan 8 is arranged in the body casing 2 and rotatably drives laterally elongated transverse fins having the axial direction thereof directed in the longitudinal direction by an indoor motor (not shown in the drawing). As the indoor motor, a DC motor which can change a speed in a plurality of stages, exhibits high efficiency, and exhibits high stability even at a low speed is used. However, the indoor motor may be an AC motor.

[0023] In the inside of the body casing 2 of the indoor unit 1, an air flow passage which extends from the air inlet 6 to the air outlet 7 is formed by the indoor fan 8. Further, with respect to such an air flow passage, the indoor heat exchanger 3 is arranged on an upstream side of the indoor fan 8. Further, a temperature/humidity sensor 9 is arranged in the air flow passage between the air inlet and the indoor heat exchanger 3.

[0024] The filter 4 is arranged on a windward side of the indoor heat exchanger 3. With the use of the filter 4, dusts and dirt which are contained in air sucked from the air inlet 6 are removed thus preventing the indoor heat exchanger 3 from being stained. Further, although not shown in the drawing, a drain pan is arranged below the indoor heat exchanger 3 and above the partition wall member 11.

[0025] On the other hand, with respect to the air outlet 7, the louver 10 is provided as an air outlet open/close mechanism which opens/closes the air outlet 7. The louver 10 is formed in an elongated shape in the lateral direction and has left and right ends thereof pivotally supported, and the louver 10 is vertically rotated by a louver motor (not shown in the drawing). The air outlet 7 can be opened or closed by rotating the louver 10. Further, the air outlet 7 is closed by rotating the louver 10 in the closing direction.

[0026] In the indoor unit 1, the ozone generator 5 is mounted on a front surface of the indoor heat exchanger 3 at an upper position of the front surface. As the ozone generator 5, a discharge type ozone generator or an ultraviolet type ozone generator is used by taking cost and performance into consideration. The ultraviolet type ozone generator 5 adopts a method which makes ozone

from oxygen by applying ultraviolet rays having a wavelength of 250nm or less discharged from an ultraviolet lamp. Further, the discharge type ozone generator adopts a method in which a discharge is generated between electrodes by applying a high voltage between the electrodes, oxygen molecules are dissociated by electrons discharged in a space, and ozone is produced by bonding oxygen atoms and oxygen molecules generated by dissociation. The discharge type ozone generator is classified into a corona-discharge ozone generator, a creeping discharge ozone generator, a silent discharge ozone generator and the like depending on a discharge mode. In the air conditioner, the corona discharge ozone generator and the creeping discharge ozone generator are mainly used by taking cost and compactness into consideration.

[0027] The corona discharge ozone generator generates ozone by applying a high voltage between electrodes. The corona discharge can generate a relatively stable discharge by ensuring a sufficient insulation support even under high humidity and hence, the corona discharge can generate ozone in a stable manner. The electrode structure is constituted by using needles or fine lines as high voltage electrodes, and a plate (including a perforated plate) or metal mesh as a ground electrode. Accordingly, when the ozone treatment is performed under high humidity as in the case of the embodiments of the invention, the corona discharge ozone generator is appropriately used. Further, as a waveform of the applied voltage, a DC waveform, an AC waveform, a pulse waveform and the like are considered. Since the generation of ozone is determined based on supplied electricity, the generation of ozone is not basically dependent on the waveform. However, when the DC voltage is used, even when the supplied electric powers are equal, the DC voltage of negative polarity can generate ozone more efficiently.

[0028] A recent air conditioner mounts an electrostatic precipitator or an air purifier (a deodorizing device or the like) thereon. Accordingly, when such a device makes use of a discharge, it is needless to say that such a device can be used as the ozone generator. However, the electrostatic precipitator or the air purifier is provided for introducing contaminated air therein and for purifying such air and hence, the generation of stains on the discharge electrode is unavoidable. When the electrode is stained, the discharge becomes unstable which results in that ozone cannot be generated in a stable manner. Accordingly, to perform the stable ozone treatment, it is more effective, in terms of safety and performance, to provide a dedicated ozone generator. Here, it is needless to say that the use of air which is as clean as possible is desirable as air supplied to the ozone generator.

[0029] Next, the manner of operation of the air conditioner in the embodiment 1 of the present invention is explained in conjunction with the flowchart shown in Fig. 2. The indoor unit 1 includes a microcomputer (CPU) (not shown in the drawing), and is configured to execute an

operation control explained hereinafter using a controller of the air conditioner based on contents which are pre-programmed in the CPU or contents set prior to the operation.

[0030] First of all, the main power source is turned on to bring the air conditioner into an operation preparation state. Using a control setting device which is referred to as a remote controller, an operation start button of the air conditioner is manipulated (S201). Then, an operation mode is selected (S202) and a desired operation mode is set. As typical operation modes, a cooling mode, a heating mode, a dehumidifying mode and the like can be named. Due to such manipulation, the operation of the air conditioner in the desired operation mode is started (S203 to S205). Here, operations up to such steps are equal to operations of a usual air conditioner.

[0031] Next, the manner of operation when the air conditioner is stopped is explained. By manipulating an operation stop button on the remote controller, the desired operation mode is stopped (S206). After confirmation of stopping of the operation mode, it is determined whether the immediate-before operation mode is the cooling operation mode or the dehumidifying operation mode or not (S207). When it is determined that the operation mode is neither the cooling operation mode nor the dehumidifying operation mode (S207: No), the operation finishing processing is performed so as to bring the air conditioner into a stop state (S210). On the other hand, when it is determined that the operation is either one of the cooling operation and the dehumidifying operation (S207: Yes), it is determined whether setting of the operation mode after the cooling operation or the dehumidifying operation set prior to the starting of the operation is an inside cleaning operation mode or a mode non-selected state (S208). When the inside cleaning operation mode is set (S208: set), the inside cleaning operation processing is executed (S209), and the air conditioner is brought into a stop state after finishing the inside cleaning operation processing (S210). Further, when the determination is the mode non-selected state (S208: not set), the air conditioner is brought into a stop state as it is (S210).

[0032] Since the basic control of the air conditioner is executed in the above-mentioned manner, the air conditioner can perform the usual cooling operation, heating operation, and dehumidifying operation and, at the same time, after the cooling operation or the dehumidifying operation, the following inside cleaning operation processing is automatically performed by preliminarily selecting and setting the operation mode. Here, it is also possible to set the program such that the inside cleaning operation processing is not performed.

[0033] Next, the manner of operation of the air conditioner at the time of performing the inside cleaning operation of the air conditioner in the embodiment 1 is explained. That is, a control in the cleaning operation mode when the inside cleaning operation mode is set after the cooling operation or the dehumidifying operation as the operation mode is explained using the flowchart shown

in Fig. 3. First of all, the louver 10 of the indoor unit 1 is moved to a position indicated by a dotted line to bring the air outlet portion in the inside of the indoor unit 1 into a closed state (S301, S302). Then, the ozone generator 5 is driven to supply ozone into the inside of the indoor unit 1 (S303). A time limiting timer for ozone operation treatment (not shown in the drawing) sets a predetermined operation time (e.g., approximately 30 minutes), and the timer is started. Then, it is determined whether the predetermined time elapses or not (S304). At a point of time that the predetermined time elapses, the ozone generator 5 is stopped (S305). After confirmation of the stopping of the ozone generator 5, the heating operation is started (S306). Due to this heating operation, the inside of the indoor unit 1 is dried. The time limiting timer for heating operation processing (not shown in the drawing) sets a predetermined operation time (e.g., approximately 10 minutes), and the timer is started. Then, it is determined whether the predetermined time elapses or not (S307), and the heating operation is stopped at a point of time that the predetermined time elapses (S308). Accordingly, the inside cleaning operation is finished, the control of the air conditioner is shifted to control contents of the operation finishing processing in the basic control flowchart shown in Fig. 2, and the respective parts are brought into a stop state.

[0034] The inside cleaning operation is performed during the ozone treatment operation which constitutes a front half of the inside cleaning operation such that the air outlet 7 of the indoor unit 1 is brought into a closed state by closing the louver 10 and the indoor fan 8 is brought into a stop state. Further, in the heating/drying operation which constitutes a latter half of the inside cleaning operation, a temperature of the indoor heat exchanger 3 is elevated. Due to such temperature elevation, moisture held in the heat exchanger 3 is evaporated. Further, due to the elevation of the temperature of air in the inside of the indoor unit 1, the evaporation of water on an inner surface of the indoor unit 1 is accelerated so that surfaces of respective equipment in the inside of the indoor unit 1 are dried. During such an inside cleaning operation, the operation is executed such that high temperature, high humidity air in the inside of the indoor unit 1 is not scattered in the inside of the room.

[0035] Here, in the embodiment 1, with respect to the heating/drying operation, the explanation has been made with respect to the case in which temperatures of all indoor heat exchangers 3 are elevated. However, the inside heat exchanger 3 may be divided into two sections, wherein the heat exchanging portion in the front section may be operated as an evaporator, and other heat exchanging portion may be operated as a condenser. Due to such constitution, it is possible to circulate air in the inside of the indoor unit 1 only by making use of a natural convection by stopping the indoor fan 8 thus preventing new indoor air from being sucked into the inside of the indoor unit 1. Accordingly, moisture in the inside of the indoor unit 1 can be evaporated and the evaporated mois-

ture is eliminated by the vaporizer and is removed to the outside of the room and hence, humidity in the inside of the indoor unit 1 can be efficiently reduced within a short time.

[0036] Next, a mold sterilizing effect achieved by ozone treatment in a wet state is explained. Fig. 4 is a view showing the influence of relative humidity which affects the mold (black mold) sterilizing performance at the time of performing ozone treatment (ozone concentration: 2ppm). According to the drawing, it is found that the higher the relative humidity, the larger the mold sterilizing effect becomes. Further, it is found that when the relative humidity is 60% or less in the treatment with ozone concentration of 2ppm, the mold sterilizing effect cannot be expected at all. In general, it is known that molds prefer high humidity and propagate when the humidity is increased. Accordingly, it has been considered important to shift the room into a dry state (a state in which relative humidity is low) as soon as possible to prevent the propagation of the molds heretofore. However, based on the experiment carried out this time, it is found that, contrary to the conventional idea, the molds can be effectively sterilized by the ozone treatment in a state where the high humidity is held. It has become apparent that it is sufficient to set the relative humidity to 70% or more for sterilizing molds with the ozone concentration of approximately 2ppm.

[0037] It is considered that such a mold sterilizing mechanism is attributed to a synergistic effect of following two factors. First of all, as one factor, an effect of OH radicals which are generated by a reaction between ozone and water is considered. That is, when the ozone is brought into contact with a water film formed on a surface of an object, the OH radicals having a stronger oxidizing force than ozone are generated, and molds in the water film are efficiently oxidized by the OH radicals and hence, the molds can be extinguished at high efficiency. Further, the property of the molds per se is considered as another factor. That is, the molds propagate under high humidity and hence, when the humidity becomes high, the molds weaken strength of outermost shell films of spores thereof and are liable to be easily germinated. Accordingly, by applying ozone or OH radicals to such weakened outermost shell films, it is possible to efficiently oxidize and to destroy the films. From such a phenomenon, by performing the ozone treatment in the high humidity atmosphere, it is possible to efficiently extinguish the molds.

[0038] From the above, it is found that the step of holding the inner surface of the indoor unit 1 in a wet state at the time of ozone treatment, the step of holding the inner surface of the indoor unit 1 in a state of predetermined humidity (high humidity with at least relative humidity of 70% or more) at the time of ozone treatment, and the step of performing the heating operation after finishing the mold sterilizing treatment by ozone so as to dry the inner surface of the indoor unit 1 are effective in sterilizing the mold. Accordingly, the air conditioner can acquire the

advantageous effects that the ozone treatment can sterilize the molds adhered to the indoor unit 1 and, at the same time, can prevent the propagation of the molds which are not completely sterilized in the inside of the indoor unit 1 thus maintaining the inside of the indoor unit 1 in a hygienic state.

[0039] Fig. 5 is a view showing the relationship between the ozone concentration and a treatment time necessary for decreasing a survival rate of molds to 1/10 using the relative humidity as a parameter. The embodiments relate to the air conditioner for purifying the inside of the indoor unit 1, and the air conditioner is usually used every day. Therefore, it is apparent that it is necessary to set the treatment time to a value less than 24 hours. Further, in generating ozone in the inside of the indoor unit 1 of the air conditioner, by taking a case in which ozone leaks from the indoor unit 1 into consideration, it is desirable to set the ozone concentration to 0.1ppm to 0.2ppm at maximum. Accordingly, under such conditions, a hatched portion in the drawing defines mold sterilizing condition, and it is understood from the drawing that it is preferable to set the relative humidity to 90% at minimum.

[0040] As has been described above, according to the embodiment 1, the air conditioner can acquire the advantageous effects that the mold sterilizing function attributed to the wet ozone and the cleaning function which is performed after the mold sterilizing function in combination with the drying operation can sterilize the molds adhered to the indoor unit 1 and, at the same time, can prevent the propagation of the molds which cannot be completely sterilized in the inside of the indoor unit 1. Further, the air conditioner can acquire the advantageous effects that, due to the contact of ozone with the water film formed on the surface of the object, ozone is decomposed and the OH radicals which exhibit the extremely high reaction property but have an extremely short lifetime are generated and hence, ozone generated in the inside of the indoor unit 1 can be efficiently decomposed thus further reducing a risk that ozone leaks to the inside of the room. Here, the ozone treatment is performed in a state that the air outlet 7 is closed and hence, ozone which leaks to the inside of the room is little whereby there is no possibility of spreading of ozone odor into the inside of the room. Since leaking of ozone into the inside of the room can be decreased in this manner, it is possible to increase the ozone concentration in the inside of the indoor unit 1 thus realizing a more efficient mold sterilizing effect.

[0041] Further, although the mold sterilizing effect has been described in the explanation of the embodiment 1, it is also confirmed that this embodiment can also acquire an advantageous effect of decomposing and eliminating odor materials adhered to the inside of the indoor unit 1 as a secondary effect or a side effect. That is, the odor materials such as ammonia, an acetic acid or acetaldehyde are decomposed by the OH radicals generated due to the contact of the ozone with the water film on the

surface of the object and hence, it is also possible to deodorize the inner surface of the indoor unit 1. Accordingly, by performing the ozone treatment under the high humidity atmosphere, it is also possible to decompose and eliminate the odor materials besides the molds adhered to the inside of the indoor unit 1 and hence, the deodorizing effect of the indoor unit 1 can be also expected.

[0042] Here, in the embodiment 1, the explanation is made with respect to the case in which the ozone treatment is performed in a state that the surfaces of the parts in the indoor unit 1 are in a wet state after finishing the cooling/dehumidifying operations. However, even when the ozone treatment is performed in a state that the temperature of the indoor heat exchanger 3 is elevated to approximately 25°C after cooling/dehumidifying operations and the temperature in the inside of the indoor unit 1 is held at approximately 25°C, it is possible to obtain substantially equal advantageous effects. This is because that by providing a state in which molds can propagate more easily, the strength of the outermost shell films of the spores of the molds can be further weakened and hence, it is possible to extinguish the molds more easily using ozone. Further, by slightly elevating the temperature, it is possible to accelerate the reaction between the ozone and the water film. The elevation of temperature is also effective from this viewpoint. Here, it is considered that the temperature of the indoor heat exchanger 3 at the time of finishing the cooling/dehumidifying operations is approximately 15°C and the humidity is lowered by increasing the temperature to approximately 25°C. However, an extremely large quantity of water is stored in the inside of the indoor unit 1 at the time of finishing the cooling/dehumidifying operation and hence, the temperature elevation of such a level hardly brings about lowering of the relative humidity and the dissipation of the wet surface whereby ozone treatment can be performed in a state that the relative humidity is held at a high level. Accordingly even when the ozone treatment is performed by setting the temperature of the indoor unit 1 to approximately 25°C after finishing the cooling/dehumidifying operation, it is possible to extinguish the molds more efficiently.

Embodiment 2

[0043] Fig. 6 is a flowchart of an operation method of the air conditioner in the embodiment 2 of the present invention, and Fig. 7 is a view showing the inside cleaning operation mode in the embodiment 2. In Figs. 6 and 7, the same reference signs are denoted for the same steps as in the Embodiment 1.

[0044] The constitution which makes the embodiment 2 differ from the embodiment 1 lies in that, when the operation of the air conditioner is finished in any operation mode as shown in Fig. 6 (S601), the inside cleaning operation treatment can be performed (S209). That is, by preliminarily setting a program such that the inside clean-

ing operation treatment is executed, it is possible to perform the inside cleaning operation treatment also at the time of finishing the heating operation in addition to the finishing of the cooling operation and the dehumidifying operation.

[0045] Next, the manner of operation of the inside cleaning operation according to the embodiment 2 is explained. That is, a control in the cleaning operation mode when the inside cleaning operation mode is set is explained using the flowchart shown in Fig. 7.

[0046] First of all, the louver 10 of the indoor unit 1 is moved to a position indicated by a dotted line to bring the air outlet portion in the inside of the indoor unit 1 into a closed state (S301, S302). Then, a temperature in the inside of the indoor unit 1 is measured. When the temperature falls within a preset predetermined range (S701: Yes), the processing advances to a next step. However, when the temperature does not fall within the predetermined range (S701: No), the cooling operation or the dehumidifying operation is started (S702), and the operation is continued until the temperature in the inside of the indoor unit 1 falls within the predetermined range. Next, humidity in the inside of the indoor unit 1 is measured. When the humidity falls within a predetermined range (S703: Yes), the processing smoothly advances to a next step. However, when the humidity does not fall within the predetermined range (S703: No), the cooling operation or the dehumidifying operation is continued as it is (S704), and the operation is continued until the humidity in the inside of the indoor unit 1 falls within a predetermined range. When the temperature and the humidity in the inside of the indoor unit 1 fall within the predetermined ranges, the cooling operation or the dehumidifying operation is stopped (S705). Then, the ozone generator 5 is driven to supply ozone into the inside of the indoor unit 1 (S303). A time limiting timer for ozone operation treatment (not shown in the drawing) sets a predetermined operation time (e.g., approximately 30 minutes), and the timer is started. Then, it is determined whether the predetermined time elapses or not (S304). At a point of time that the predetermined time elapses, the ozone generator 5 is stopped (S305). After confirmation of the stopping of the ozone generator 5, the heating operation is started (S306). Due to this heating operation, the inside of the indoor unit 1 is dried. The time limiting timer for heating operation processing (not shown in the drawing) sets a predetermined operation time (e.g., approximately 10 minutes), and the timer is started. Then, it is determined whether the predetermined time elapses or not (S307), and the heating operation is stopped at a point of time that the predetermined time elapses (S308). Accordingly, the inside cleaning operation treatment is finished, the control of the air conditioner is shifted to control contents of the operation finishing processing in the basic control flowchart shown in Fig. 6, and the respective parts are brought into a stop state.

[0047] Accordingly, in the air conditioner of the embodiment 2, irrespective of the kind of the operation mode,

the inside cleaning operation never fails to be executed (except for setting a period in which the inside cleaning operation is inhibited) and hence, the air conditioner can acquire an advantageous effect that the generation of molds in the indoor unit and the adhesion of odor materials to the indoor unit can be always prevented. Further, the air conditioner can acquire the advantageous effects that the operation requires no user's manipulation due to the automatic operation (realization of maintenance-free operation), and clean air can be always supplied to the inside of the room to maintain the inside of the room in a comfortable state.

Embodiment 3

[0048] Fig. 8 is a cross-sectional view of the indoor unit of the air conditioner according to the embodiment 3 of the present invention, Fig. 9 is a flowchart of the inside cleaning operation mode, and Fig. 10 is a flowchart of a humidifying operation. In Figs. 8 to 10, the same reference signs are denoted for the same elements and steps as in the previous embodiments.

[0049] The constitution which makes the embodiment 3 differ from the embodiment 1 lies in that the air conditioner includes a humidifier 12 as shown in Fig. 8. That is, the inside of the indoor unit 1 is forcibly humidified and the sterilization of the inside of the indoor unit 1 by ozone is efficiently performed.

[0050] Next, the manner of operation of the inside cleaning operation in the embodiment 3 is explained. That is, a control in the cleaning operation mode when the inside cleaning operation mode is set is explained using the flowchart shown in Fig. 9. First of all, the louver 10 of the indoor unit 1 is moved to a position indicated by a dotted line to bring the air outlet portion in the inside of the indoor unit 1 into a closed state (S301, S302). Thereafter, the humidity in the inside of the indoor unit 1 is measured. When the humidity falls within a preset predetermined range (S901: Yes), the air conditioner is operated based on the flow shown in the embodiment 1. However, when the humidity does not fall within the preset predetermined range (S901: No), a humidifying operation mode (S902) shown in Fig. 10 is started. In the humidifying operation mode, first of all, it is determined whether a water level in a humidifier 12 falls within a predetermined range or not (S1001). When the water level in the humidifier 12 falls within the predetermined range (S1001: Yes), an operation of the humidifier 12 is started (S1003). On the other hand, when the water level in the humidifier 12 does not fall within the predetermined range (S1001: No), the cooling operation or the dehumidifying operation is performed and water is supplied to the humidifier 12 until the water level falls within the predetermined range (S1002). When the water level in the humidifier 12 falls within the predetermined range (S1001: Yes), the operation of the humidifier 12 is started (S1003). When the humidity in the inside of the indoor unit 1 falls within the predetermined range (S1004), the

humidifier 12 is stopped (S1005) and the humidifying operation mode is finished (S903).

[0051] Then, the ozone generator 5 is driven to supply ozone into the inside of the indoor unit 1 (S303). A time limiting timer for ozone operation treatment (not shown in the drawing) sets a predetermined operation time (e.g., approximately 30 minutes), and the timer is started. Then, it is determined whether the predetermined time elapses or not (S304). At a point of time that the predetermined time elapses, the ozone generator 5 is stopped (S305). After confirmation of the stopping of the ozone generator 5, the heating operation is started (S306). Due to this heating operation, the inside of the indoor unit 1 is dried. The time limiting timer for heating operation processing (not shown in the drawing) sets a predetermined operation time (e.g., approximately 10 minutes) and the timer is started. Then, it is determined whether the predetermined time elapses or not (S307), and the heating operation is stopped at a point of time that the predetermined time elapses (S308). Accordingly, the inside cleaning operation is finished, the control of the air conditioner is shifted to control contents of the operation finishing processing in the basic control flowchart, and the respective parts are brought into a stop state.

[0052] Here, as the humidifier 12, a heater-type humidifier, an ultrasonic-type humidifier, a liquid spray humidifier (including a two-phase fluid spray humidifier), a vaporizing humidifier, an osmosis-membrane-type humidifier or the like can be used. However, it is important to wet the inside of the indoor unit 1 in the humidifying according to the present embodiment and hence, the ultrasonic-type humidifier and the spray-type humidifier are considered suitable as the humidifier 12 of the present embodiment.

[0053] Due to such a constitution, the air conditioner of the embodiment 3 can efficiently humidify the inside of the indoor unit 1 having the humidifying mechanism and, at the same time, can wet the surface of the inner equipment thus acquiring an advantageous effect that the generation of molds and the adhesion of odor materials in the indoor unit can be efficiently prevented. Further, the air conditioner can acquire the advantageous effects that the operation requires no user's manipulation (realization of maintenance-free operation), and clean air can be always supplied to the inside of the room to maintain the inside of the room in a comfortable state.

Embodiment 4

[0054] Fig. 11 is a cross-sectional view of the indoor unit of the air conditioner in the embodiment 4 of the present invention. In Fig. 11, the same reference signs are denoted for the same elements as in the previous embodiments.

[0055] The constitution which makes the embodiment 4 differ from the embodiment 3 lies in that water supplied to the humidifier 12 can be supplied from the outside. That is, when the humidifying is necessary, it is unnecessary

to perform the cooling operation or the dehumidifying operation to produce water and the humidifying can be performed readily. As water which is supplied to the humidifier 12, water may be preliminarily supplied to a water supply tank 13 which has a predetermined volume. Further, although not shown in the drawing, a water pipe may be directly connected to the water supply tank 13 so as to automatically supply water when no water is reserved in the water supply tank 13. Due to such a constitution, it is possible to obtain an advantageous effect that a time necessary for performing a water supply operation to the humidifier 12 can be shortened and hence, an inside cleaning operation time can be shortened. Accordingly, the air conditioner can acquire an advantageous effect that the inside cleaning operation time can be shortened and hence, a standby time until the air conditioner can be operated again can be shortened.

Embodiment 5

[0056] Fig. 12 is a cross-sectional view of the indoor unit of the air conditioner in the embodiment 5 of the present invention, and Fig. 13 is a flowchart of the inside cleaning operation mode. In Figs. 12 and 13, the same reference signs are denoted for the same elements and steps as in the previous embodiments.

[0057] The constitution which makes the embodiment 5 differ from the embodiment 3 lies in that different from simply spraying water from the humidifier 12 as shown in Fig. 12, ozone water is sprayed. That is, this embodiment is configured such that that molds in the inside of the indoor unit 1 can be efficiently extinguished using ozone water.

[0058] Next, the manner of operation of the inside cleaning operation in the embodiment 5 is explained. That is, a control in the cleaning operation mode when the inside cleaning operation mode is set is explained using the flowchart shown in Fig. 13. The louver 10 of the indoor unit 1 is moved to a position indicated by a dotted line to bring the air outlet portion in the inside of the indoor unit 1 into a closed state (S301, S302). Thereafter, it is determined whether a water level in a humidifier 12 falls within a predetermined range or not (S1301). When the water level in the humidifier 12 falls within the predetermined range (S1301: Yes), an operation of an air pump 14 is started. When the operation of the air pump 14 is confirmed, the ozone generator 5 is operated. On the other hand, when the water level in the humidifier 12 does not fall within the predetermined range (S1301: No), the cooling operation or the dehumidifying operation is performed (S1302) and water is supplied to the humidifier 12 until the water level falls within the predetermined range. When the water level in the humidifier 12 falls within the predetermined range, in accordance with the above-mentioned flow, the ozone generator 5 is operated. Due to such a manipulation, ozone is supplied to the humidifier 12 by way of an ozone supply pipe 15 so as to produce ozone water in the inside of the humidifier 12.

Here, when the operation of the ozone generator 5 is confirmed (S1303: Yes), the operation of the humidifier 12 is started (S1304).

[0059] A time limiting timer for ozone water operation processing (not shown in the drawing) sets a predetermined operation time (e.g., approximately 30 minutes), and the timer is started. Then, it is determined whether the predetermined time elapses or not (S1305). At a point of time that the predetermined time elapses, the humidifier 12, the ozone generator 5 and the air pump 14 are stopped in this order (S1306 to S1308). After confirmation of the stopping of these devices, the heating operation is started (S306). Due to this heating operation, the inside of the indoor unit 1 is dried. The time limiting timer for heating operation processing (not shown in the drawing) sets a predetermined operation time of (e.g., 10 minutes), and the timer is started. Then, it is determined whether the predetermined time elapses or not (S307), and the heating operation is stopped at a point of time that the predetermined time elapses (S308). Accordingly, the inside cleaning operation is finished, the control of the air conditioner is shifted to control contents of the operation finishing processing in the basic control flowchart, and the respective parts are brought into a stop state.

[0060] As the humidifier 12, in the same manner as the embodiment 3, the ultrasonic-type humidifier and the spray-type humidifier are considered suitable. Here, since the ozone water is sprayed, it is desirable that parts such as a water reservoir and a spray mechanism are made of stainless steel which possesses large ozone resistance.

[0061] Accordingly, the air conditioner of the embodiment 5 can acquire an advantageous effect that the inside of the indoor unit 1 can be efficiently treated using ozone water and hence, the generation of molds and the adhesion of odor materials in the indoor unit can be efficiently prevented.

Embodiment 6

[0062] Fig. 14 is a flowchart of a basic control in the embodiment 6 of the present invention. In Fig. 14, the same reference signs are denoted for the same steps as in the previous embodiments.

[0063] The constitution which makes this embodiment 6 differ from the embodiment 1 lies in that, when the air conditioner is operated for a fixed time irrelevant to an operation mode as shown in Fig. 14, it is determined whether a cumulative operation time exceeds a preset predetermined time or not (S1401). At a point of time that the cumulative operation time exceeds the predetermined time (S1401: Yes), when the internal clean mode is set (S1042: set), the operation of the air conditioner is stopped and the inside cleaning operation is forcibly started (S209).

[0064] Due to such a constitution, the air conditioner of the embodiment 6 can acquire the advantageous effect

that the inside of the indoor unit 1 can be automatically cleaned and hence, the generation of molds and the adhesion of odor material in the indoor unit can be efficiently prevented in a state that stains are not worsened.

Embodiment 7

[0065] Fig. 15 is a flowchart of the inside cleaning operation mode of the air conditioner in the embodiment 7 of the present invention. In Fig. 15, the same reference signs are denoted for the same steps as in the previous embodiments.

[0066] The constitution which makes this embodiment 7 differ from the embodiment 1 lies in that, the indoor fan 8 is operated after the operation of the ozone generator 5 is started as shown in Fig. 15. That is, due to the dispersion of ozone generated by the ozone generator 5 in the inside of the indoor unit 1 due to the indoor fan 8, the inside of the indoor unit 1 can be uniformly treated.

[0067] Next, the manner of operation of the air conditioner at the time of performing the inside cleaning operation of the air conditioner in the embodiment 7 is explained. That is, a control in the cleaning operation processing mode when the inside cleaning operation mode is set is explained using the flowchart shown in Fig. 15. The louver 10 of the indoor unit 1 is moved to a position indicated by a dotted line to bring the air outlet portion in the inside of the indoor unit 1 into a closed state (S301, S302). Then, the ozone generator 5 is operated (S303) and the indoor fan 8 is operated together with the operation of the ozone generator 5 (S1501). Here, the indoor fan 8 is rotated at a low speed or intermittently. Due to such an operation, it is possible to efficiently disperse only ozone while reducing wasteful power. A time limiting timer for ozone operation treatment (not shown in the drawing) sets a predetermined operation time (e.g., approximately 30 minutes), and the timer is started. Then, it is determined whether the predetermined time elapses or not (S1502). At a point of time that the predetermined time elapses, the ozone generator 5 and the indoor fan 8 are stopped (S1503). After confirmation of the stopping of these devices, the heating operation is started (S306). Due to this heating operation, the inside of the indoor unit 1 is dried. The time limiting timer for heating operation processing (not shown in the drawing) sets a predetermined operation time (e.g., approximately 10 minutes), and the timer is started. Then, it is determined whether the predetermined time elapses or not (S307), and the heating operation is stopped at a point of time that the predetermined time elapses (S308). Accordingly, the inside cleaning operation is finished, the control of the air conditioner is shifted to control contents of the operation finishing processing in the basic control flowchart, and the respective parts are brought into a stop state.

[0068] Due to such a constitution, the air conditioner of the embodiment 7 can acquire an advantageous effect that it is possible to efficiently supply ozone to every cor-

ner of the inside of the indoor unit 1 and hence, the treatment of the inside of the indoor unit 1 can be uniformly performed thus preventing the generation of molds and the adhesion of odor materials in any places including corners of the indoor unit 1.

Embodiment 8

[0069] Fig. 16 is a cross-sectional view of the indoor unit of the air conditioner in the embodiment 8 of the present invention. In Fig. 16, the same reference signs are denoted for the same elements as in the previous embodiments.

[0070] The constitution which makes this embodiment 8 differ from the embodiment 1 lies in that, the air conditioner includes a honeycomb filter 16 which absorbs and removes odor materials as shown in Fig. 16. That is, the odor materials which are removed from air sucked in the usual air conditioning operation using the honeycomb filter 16 is subject to ozone treatment after wetting the honeycomb filter 16 with water. Due to such ozone treatment, the odor materials are decomposed and removed by OH radicals generated by a water film and ozone thus regenerating the honeycomb filter 16.

[0071] Accordingly, the air conditioner of the embodiment 8 can acquire the advantageous effect that the odor materials absorbed in the honeycomb filter 16 mounted in the indoor unit 1 can be removed thus maintaining a deodorizing ability at the time of operating the air conditioner.

Embodiment 9

[0072] Fig. 17 is a cross-sectional view of the indoor unit of the air conditioner in the embodiment 9 of the present invention. Fig. 18 is a flowchart of an operation method using a human detection system. In Figs. 17 and 18, the same reference signs are denoted for the same elements and steps as in the previous embodiments.

[0073] The constitution which makes this embodiment 9 differ from the embodiment 6 lies in that, the inside cleaning operation is not operated when a human is present in the inside of a room as described in a flowchart shown in Fig. 18.

[0074] Next, the manner of operation of the human detection system of the air conditioner according to the embodiment 9 is explained. That is, the manner of operation before advancing the inside cleaning operation mode is explained using the flowchart of the operation method by the human detection system in Fig. 18. First of all, the main power source is turned on to bring the air conditioner into an operation preparation state. Using a control setting device which is referred to as a remote controller, an operation start button of the air conditioner is manipulated (S201). Then, an operation mode is selected and a desired operation mode is set (S202). As typical operation modes, a cooling mode, a heating mode, a dehumidifying mode and the like can be named. Due to such manipu-

lation, the operation of the air conditioner in the desired operation mode is started (S203 to S205). Here, operations up to such steps are equal to operations of a usual air conditioner.

[0075] When the air conditioner is operated for a fixed time, it is determined whether a cumulative operation time exceeds a preset predetermined time or not (S1801). Next, at a point of time that the cumulative operation time exceeds the predetermined time, it is determined whether a human is present in a room or not by a human detection sensor 17 (S1802). When it is determined that the human is not present (S1802: No), and when the internal clean mode is set (S1803: set), the operation of the air conditioner is stopped, and the inside cleaning operation is forcibly started (S209). Further, when it is determined that the human is present in the inside of the room by the human detection sensor 17 (S1802: Yes), after a lapse of a predetermined time, the determination of presence/non-presence of a human is executed again by the human detection sensor 17. When it is determined that the human is not present, the inner cleaning operation is started. When it is determined that the human is present, the above-mentioned operations are repeated.

[0076] Due to such a constitution, the air conditioner according to the embodiment 9 acquires the following advantageous effect. That is, when it is determined that the human is present in the room by the human detection device, the inside cleaning operation is not performed and hence, a possibility that ozone odor and ozone ill-affects the human body can be minimized.

Claims

1. An air conditioner including an indoor unit which houses an air outlet which blows off air into the inside of a room, an air outlet open/close mechanism which opens/closes the air outlet, an air inlet which sucks indoor air, an indoor fan, and an indoor heat exchanger therein, the air conditioner comprising:
 - a humidifying mechanism that wets the inside of the indoor unit to bring the inside of the indoor unit into a predetermined humidity;
 - an ozone generator arranged on a windward side of the indoor heat exchanger; and
 - an air conditioning controller having an operation mode in which ozone treatment is performed by allowing the ozone generator to generate ozone in a state that the inside of the indoor unit is held at the predetermined humidity by the humidifying mechanism.
2. The air conditioner according to claim 1, wherein the indoor heat exchanger constitutes the humidifying mechanism.

3. The air conditioner according to claim 1, wherein the humidifying mechanism includes an ultrasonic humidifier or a spray humidifier.

4. The air conditioner according to any one of claims 1 to 3, wherein the ozone treatment is performed in a state that relative humidity in the inside of the indoor unit is held at 70% or more by the humidifying mechanism. 5

5. The air conditioner according to any one of claims 1 to 3, wherein the ozone treatment is performed in a state that relative humidity in the inside of the indoor unit is held at 90% or more by the humidifying mechanism. 10

6. The air conditioner according to any one of claims 1 to 5, further comprising a honeycomb filter arranged in the indoor unit. 15

7. The air conditioner according to any one of claims 1 to 6, further comprising a human detection sensor. 20

8. The air conditioner according to any one of claims 1 to 7, wherein the air conditioner has a function of supplying ozone generated by the ozone generator to the humidifying mechanism thus simultaneously supplying ozone and the moisture into the inside of the indoor unit as ozone water or ozone fumes. 25

9. An operation method of an air conditioner comprising performing an inside cleaning operation, wherein the performing inside cleaning operation includes: 30
 - a humidifying step of wetting the inside of the indoor unit and to maintain predetermined humidity; 35
 - an ozone treatment step of performing ozone treatment at the predetermined humidity after the humidifying step; and 40
 - a drying step of drying the inside of the indoor unit after the ozone treatment step.

10. The operation method of the air conditioner according to claim 9, further comprising: 45
 - measuring and recording an operation time of the air conditioner; and
 - automatically performing the inside cleaning operation when a predetermined time of the operation time elapses. 50

11. The operation method of the air conditioner according to claim 9 or 10, further comprising operating a fan provided in the air conditioner during the ozone treatment step. 55

FIG. 1

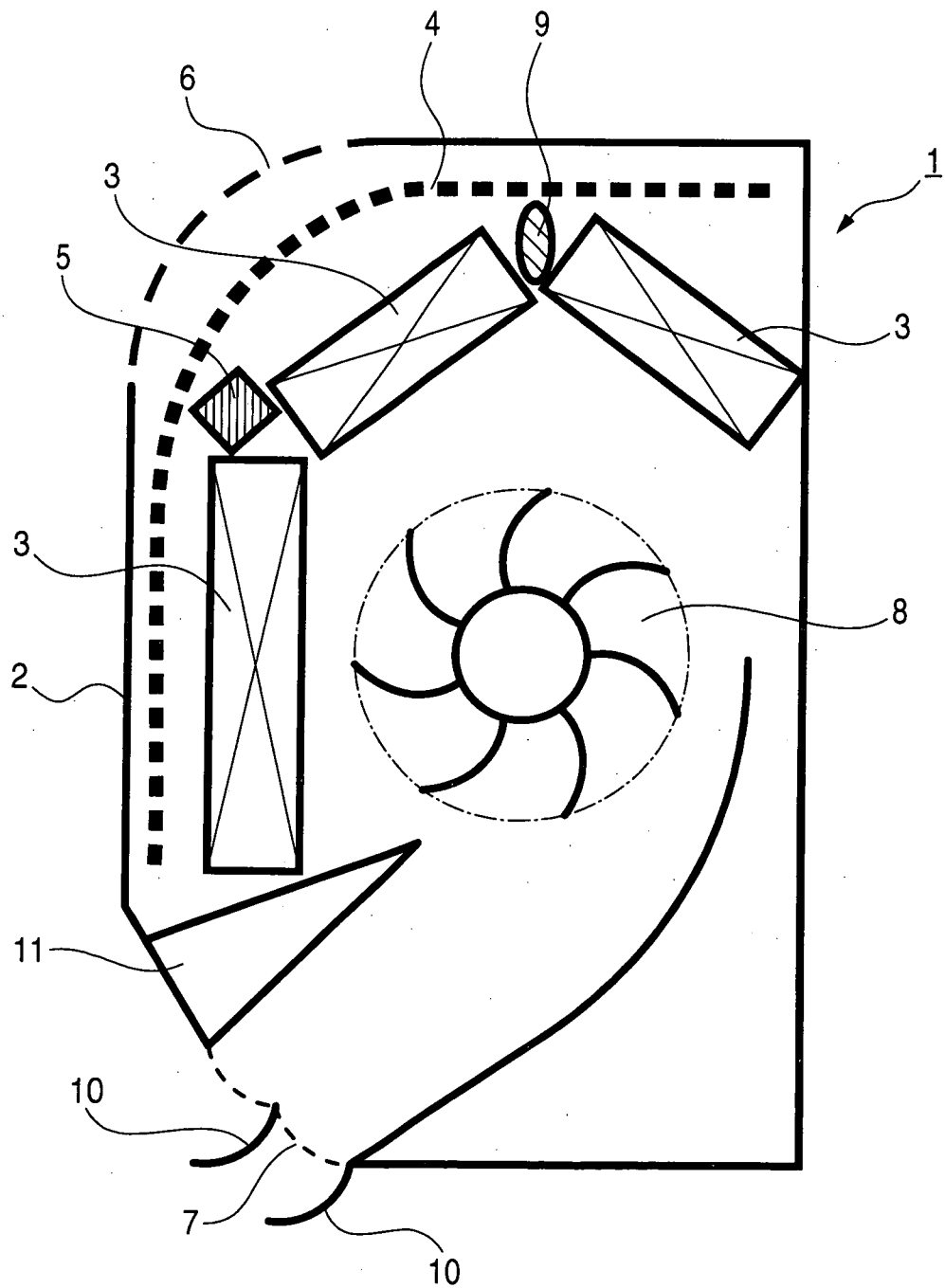


FIG. 2

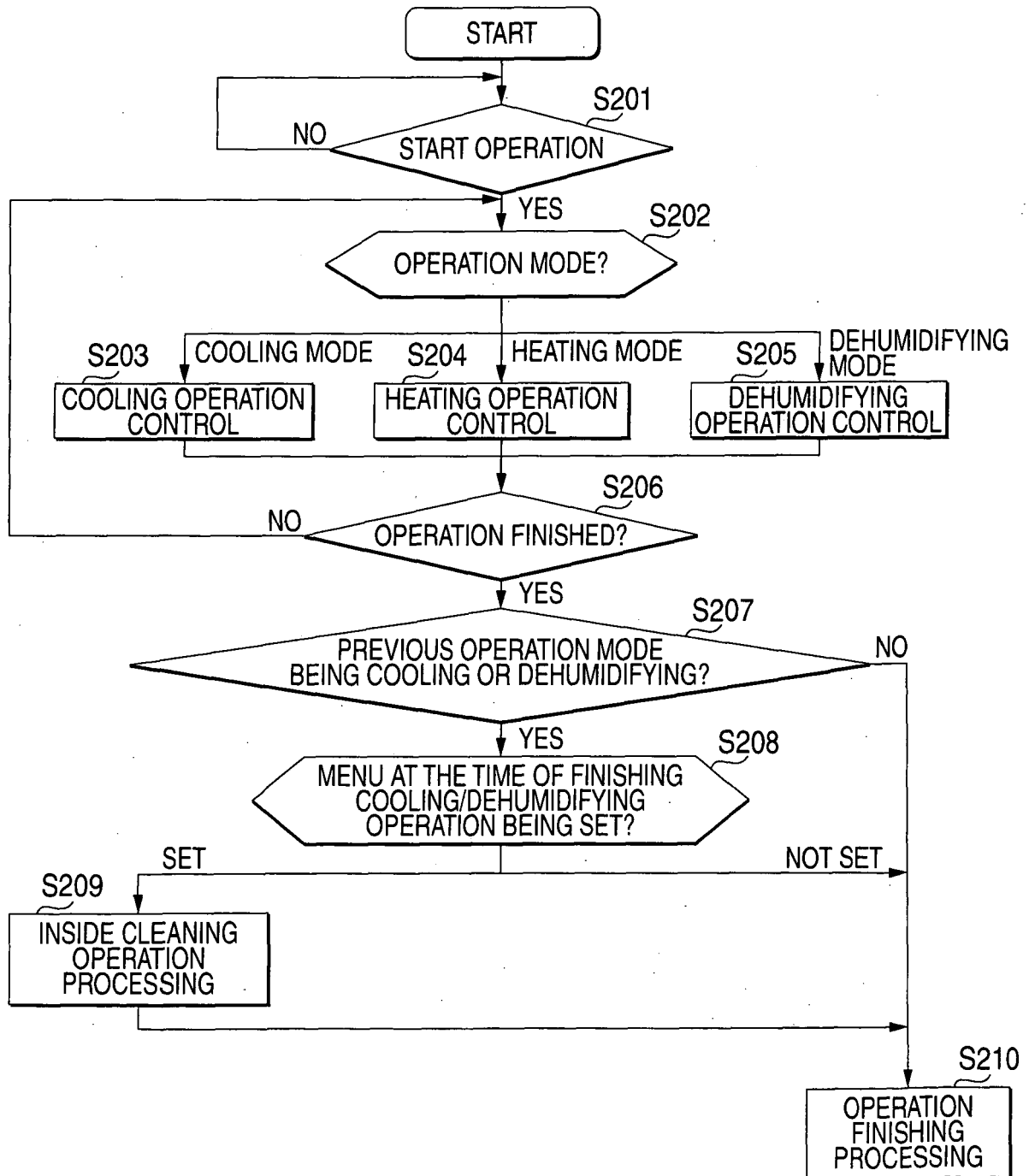


FIG. 3

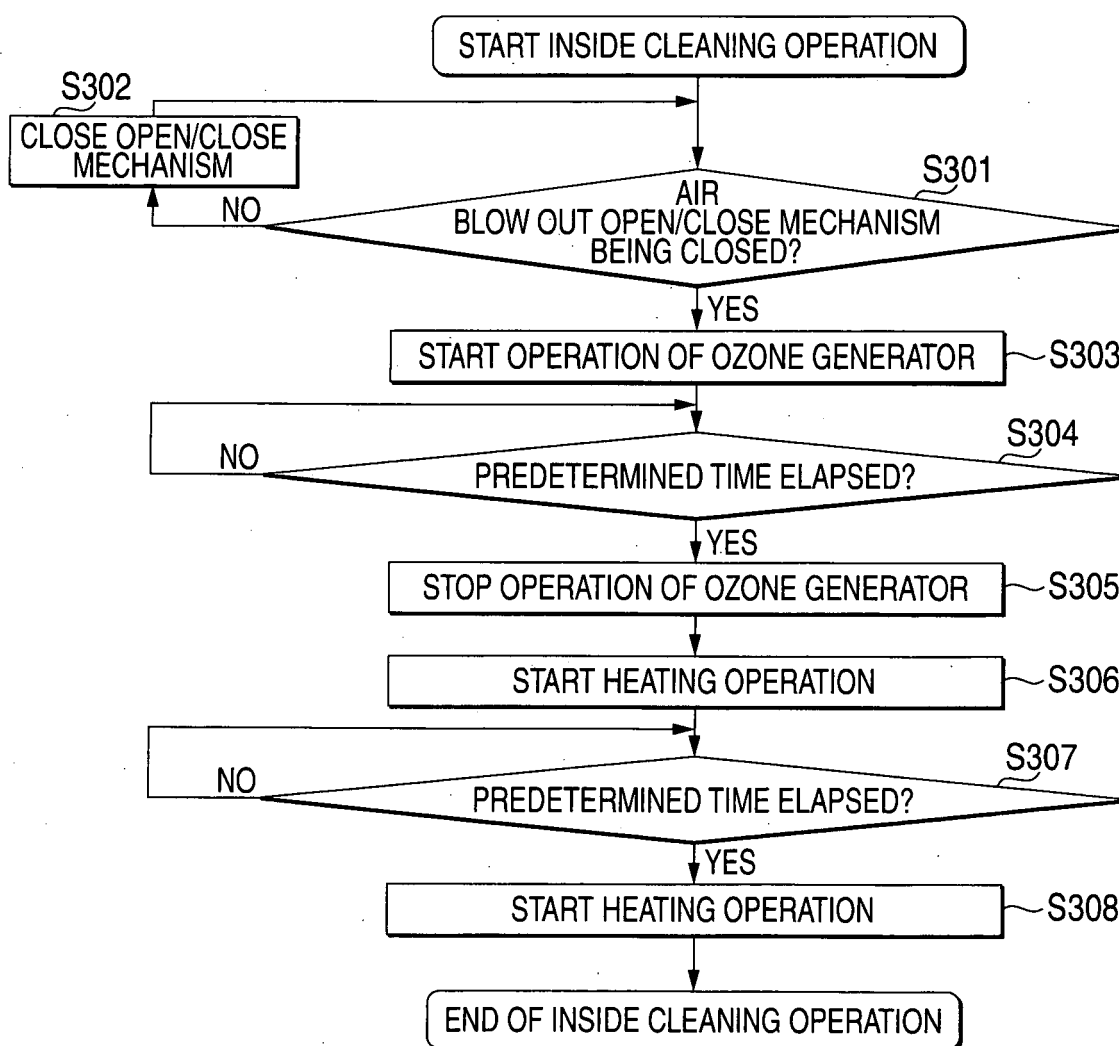


FIG. 4

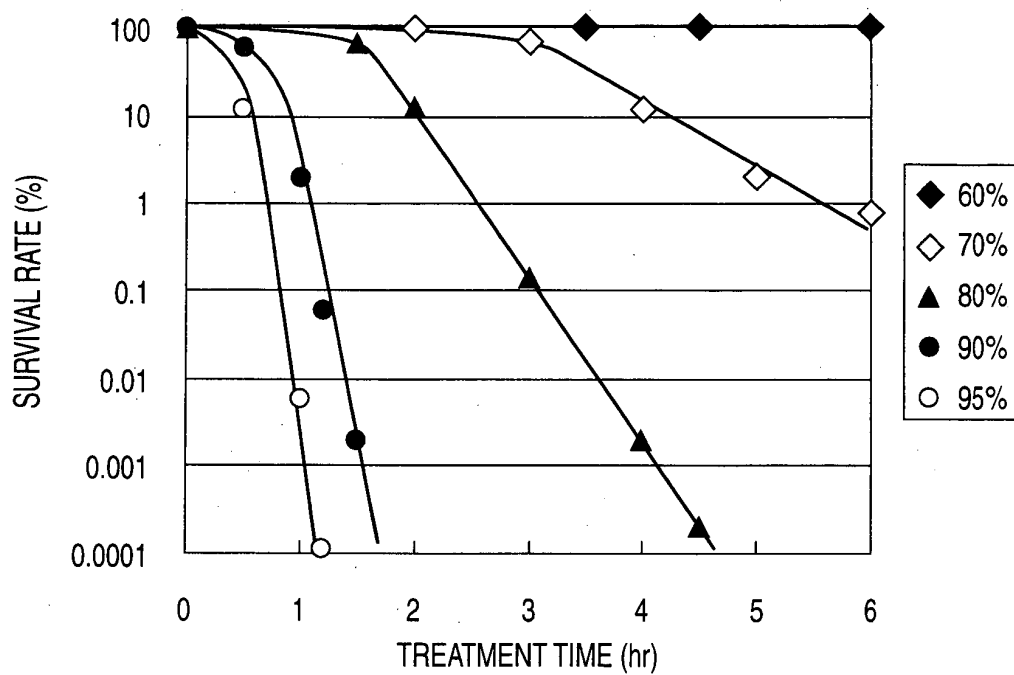


FIG. 5

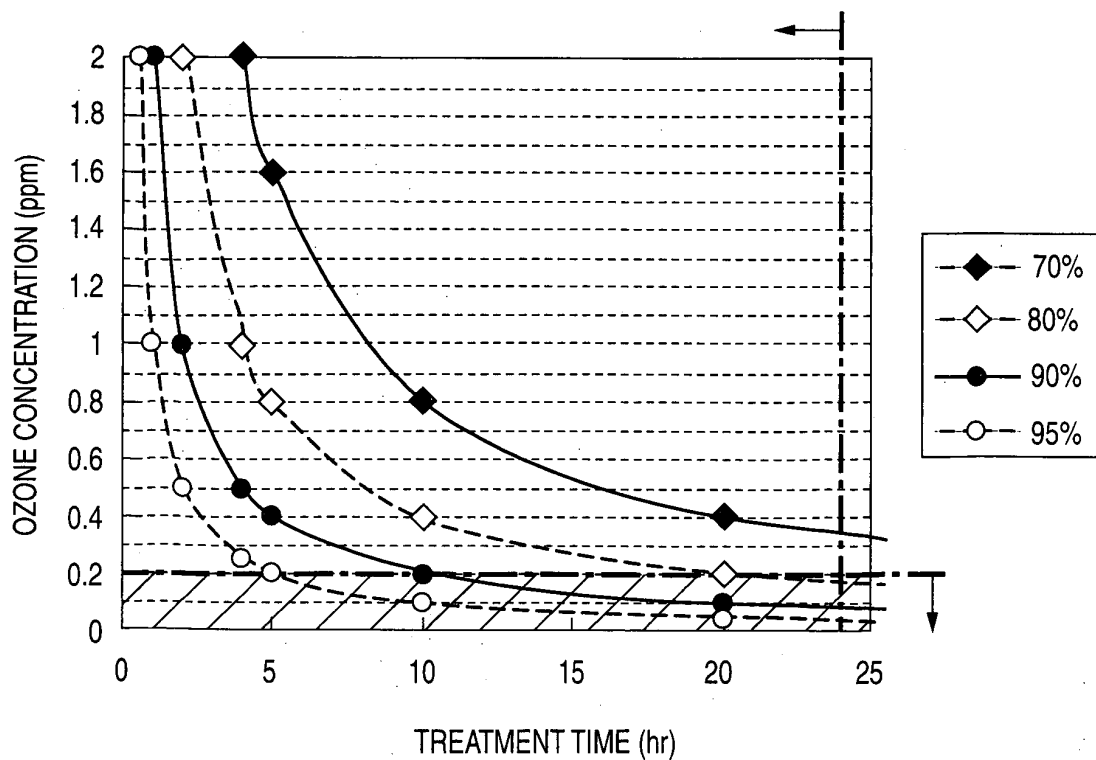


FIG. 6

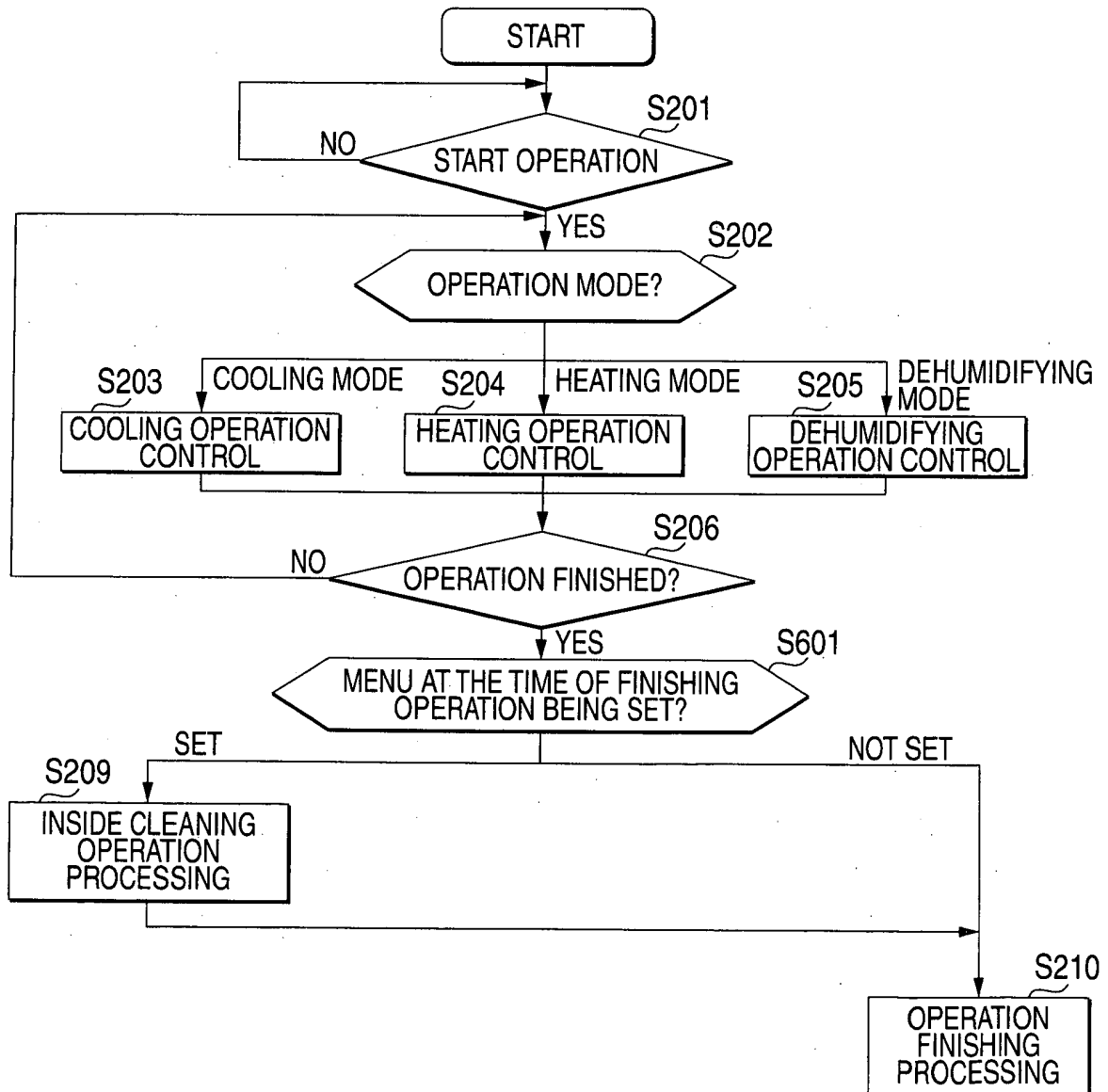


FIG. 7

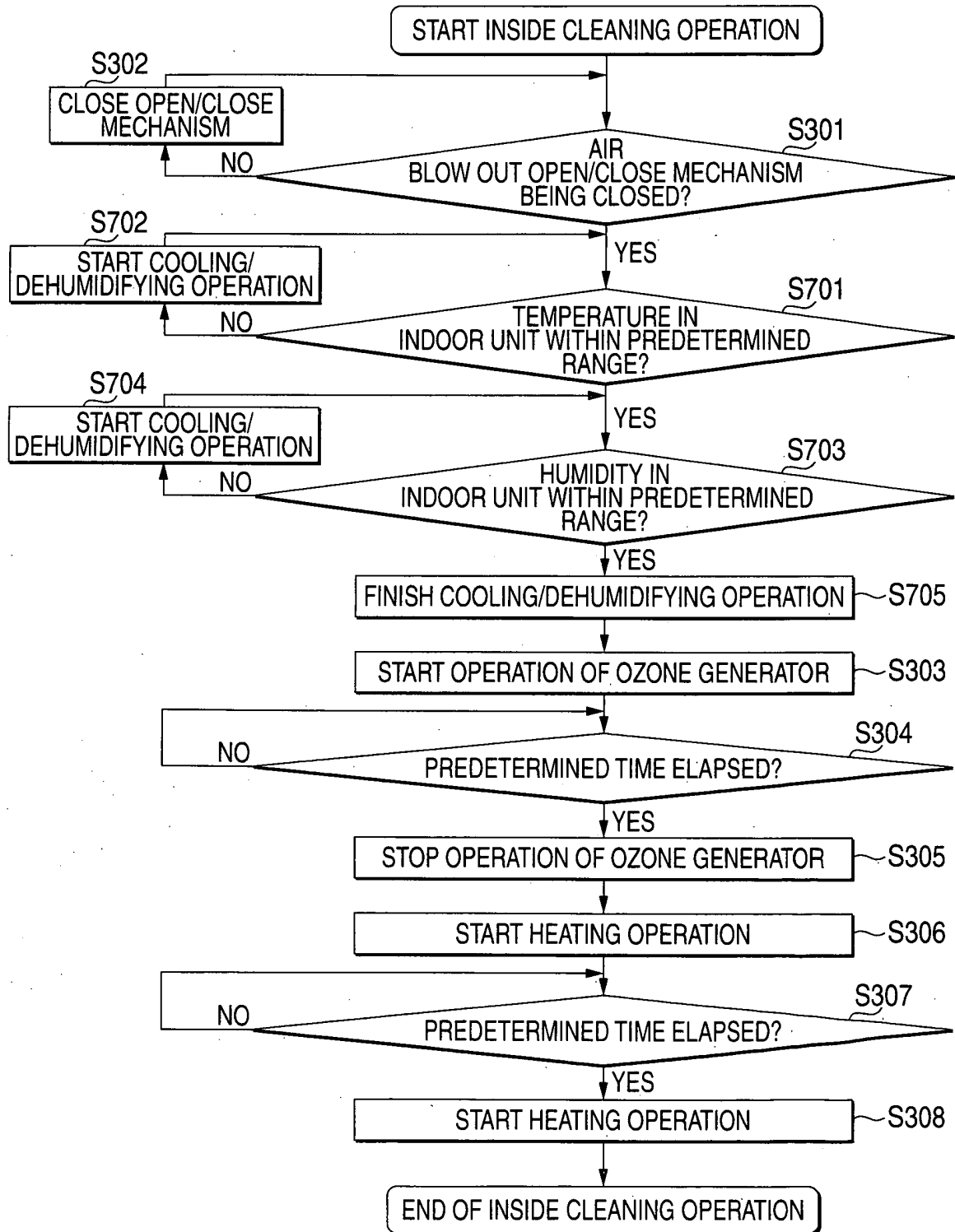


FIG. 8

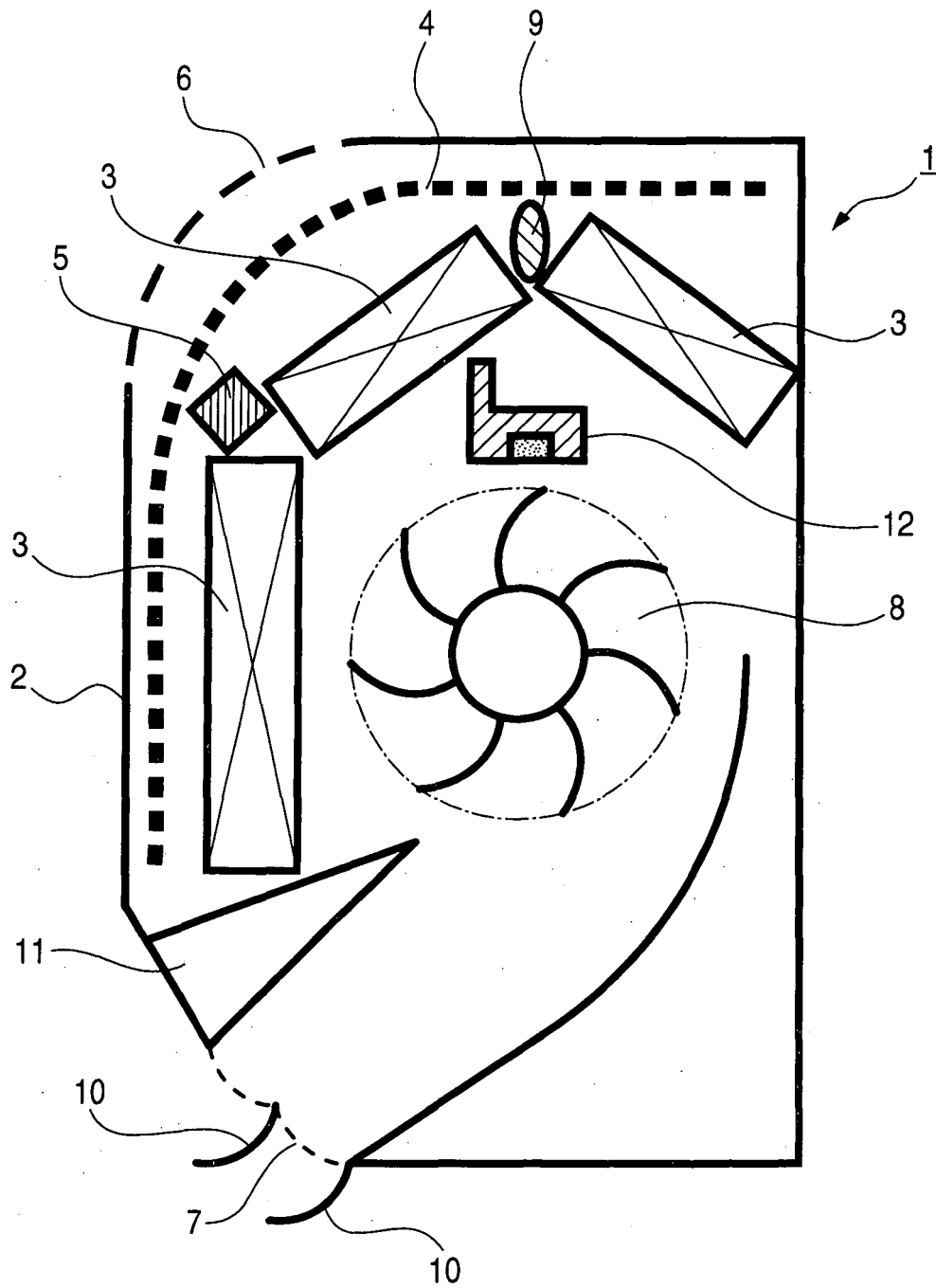


FIG. 9

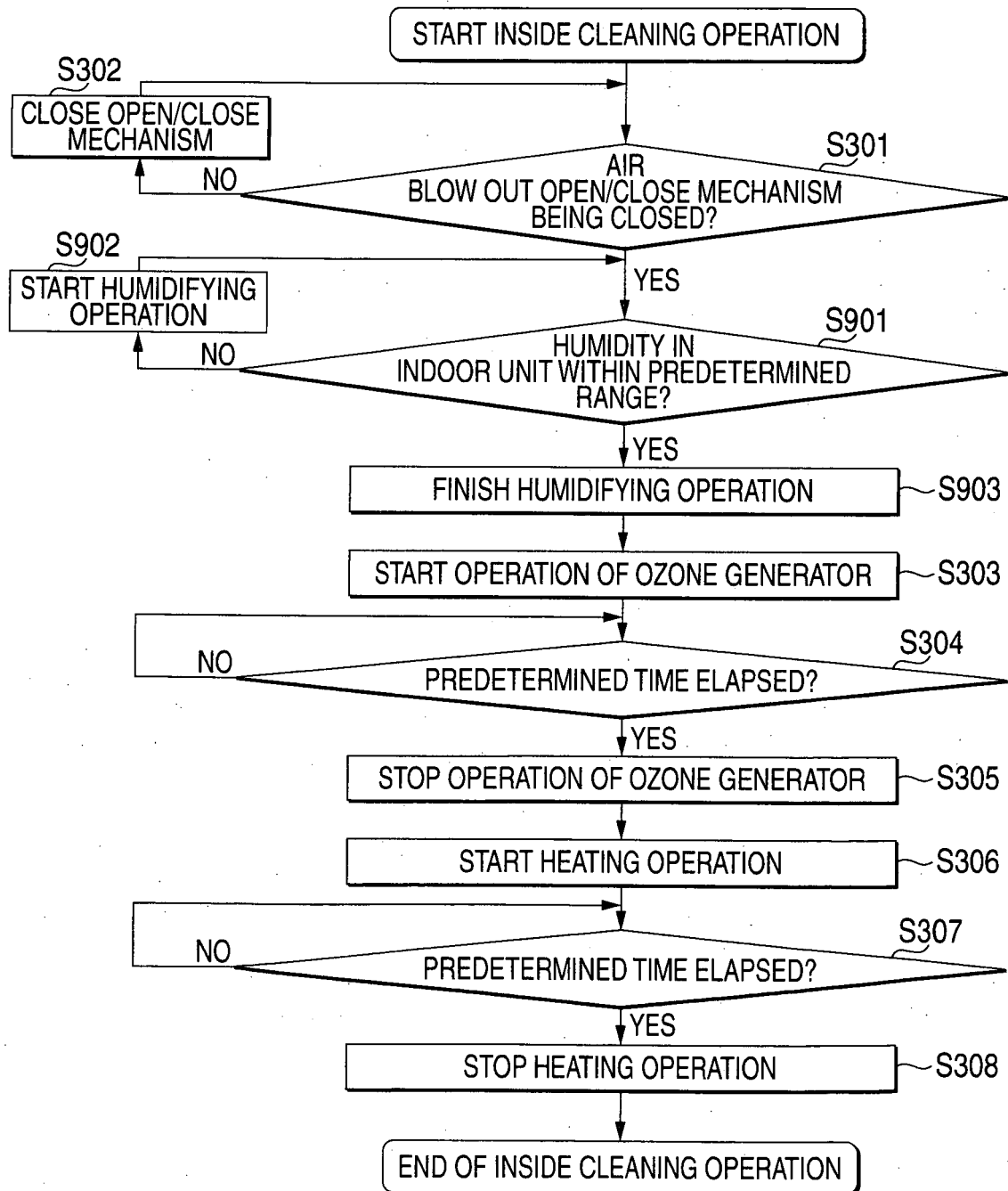


FIG. 10

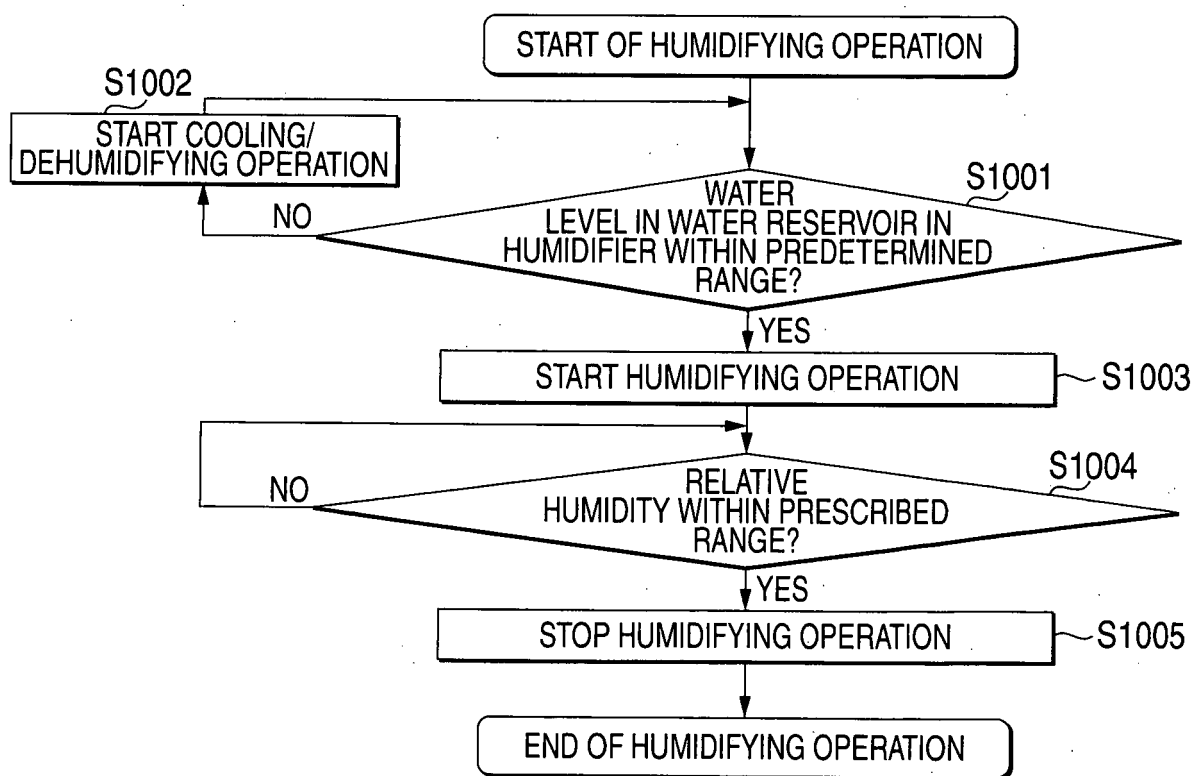


FIG. 11

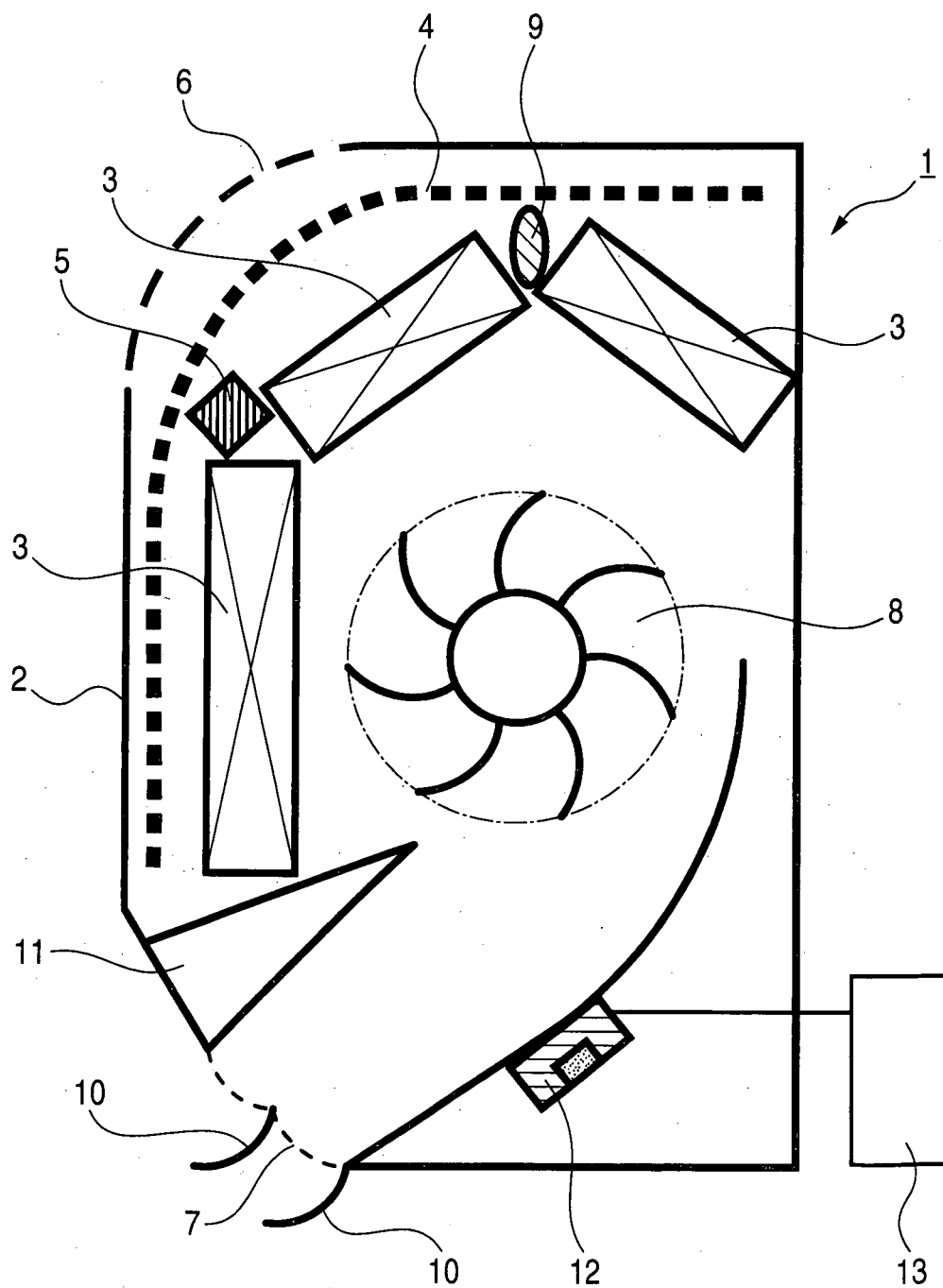


FIG. 13

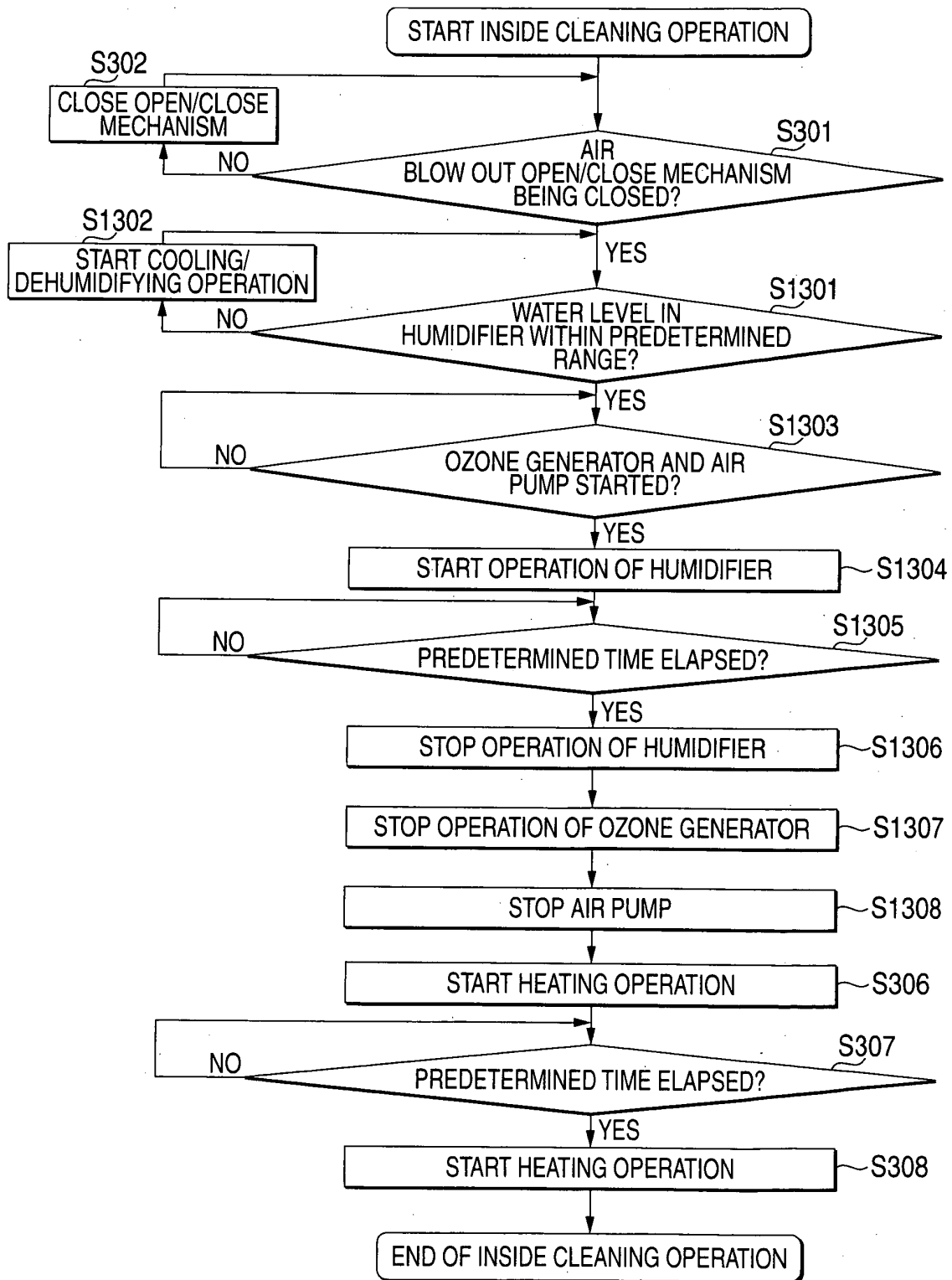


FIG. 14

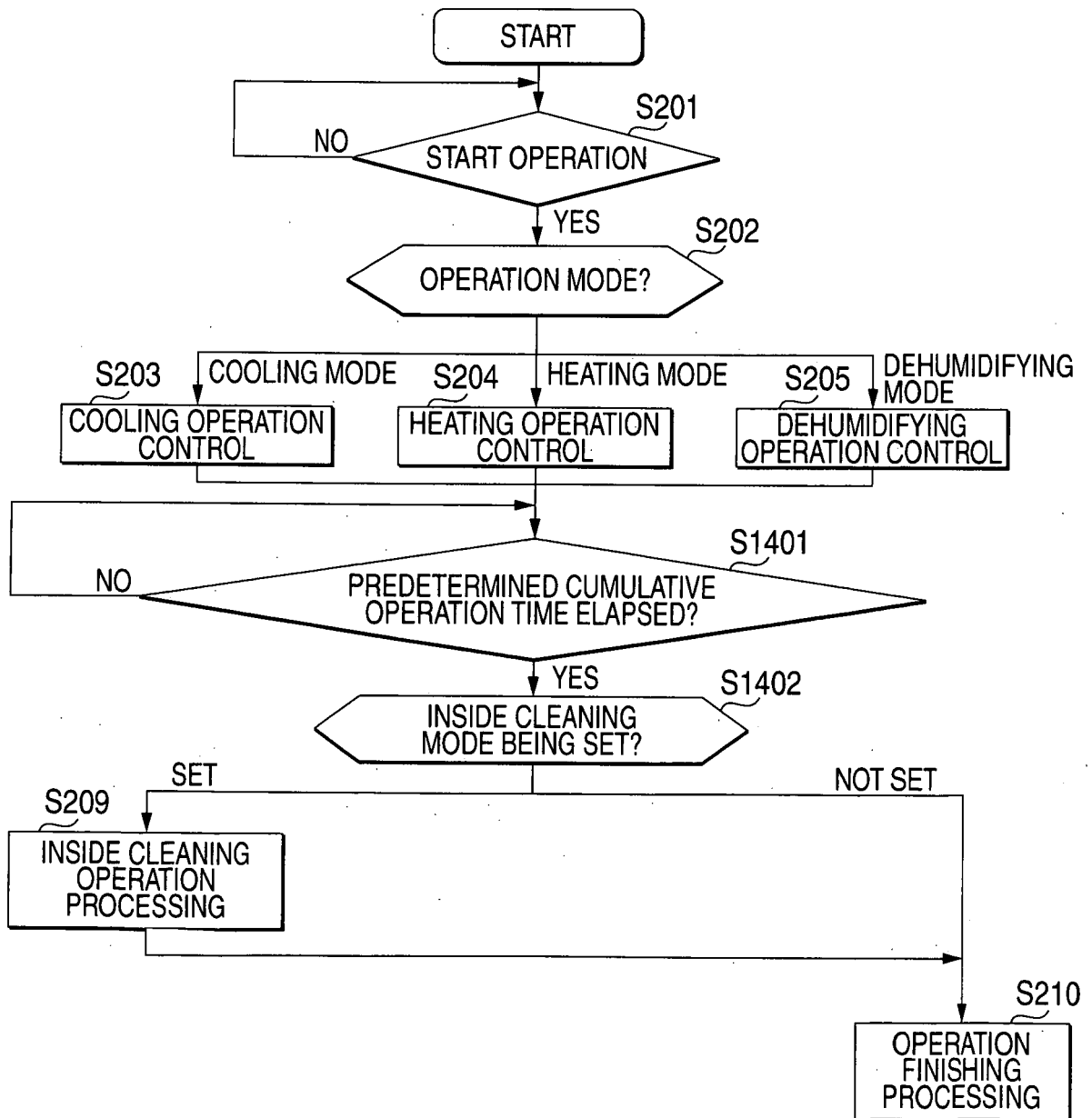


FIG. 15

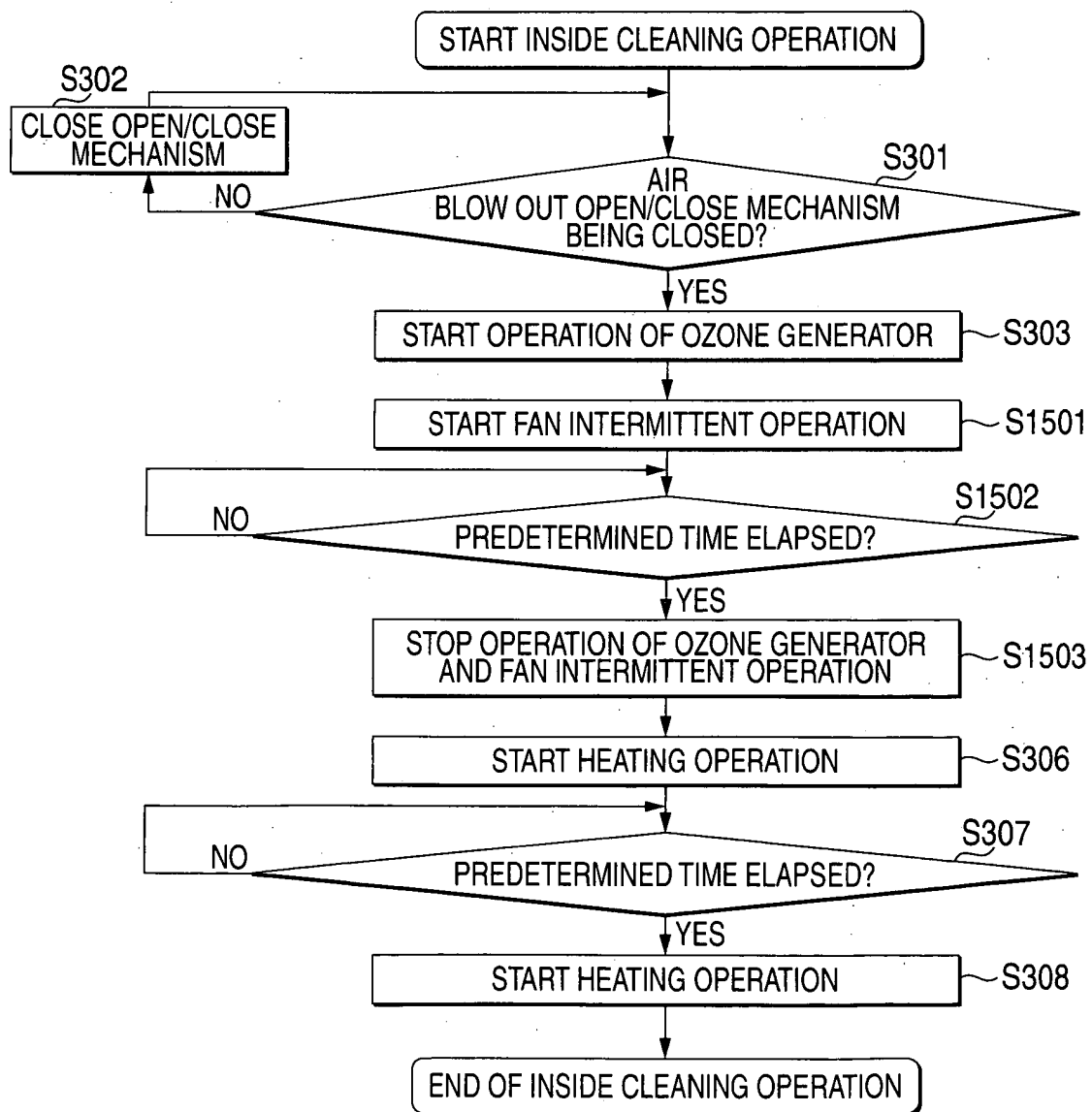


FIG. 16

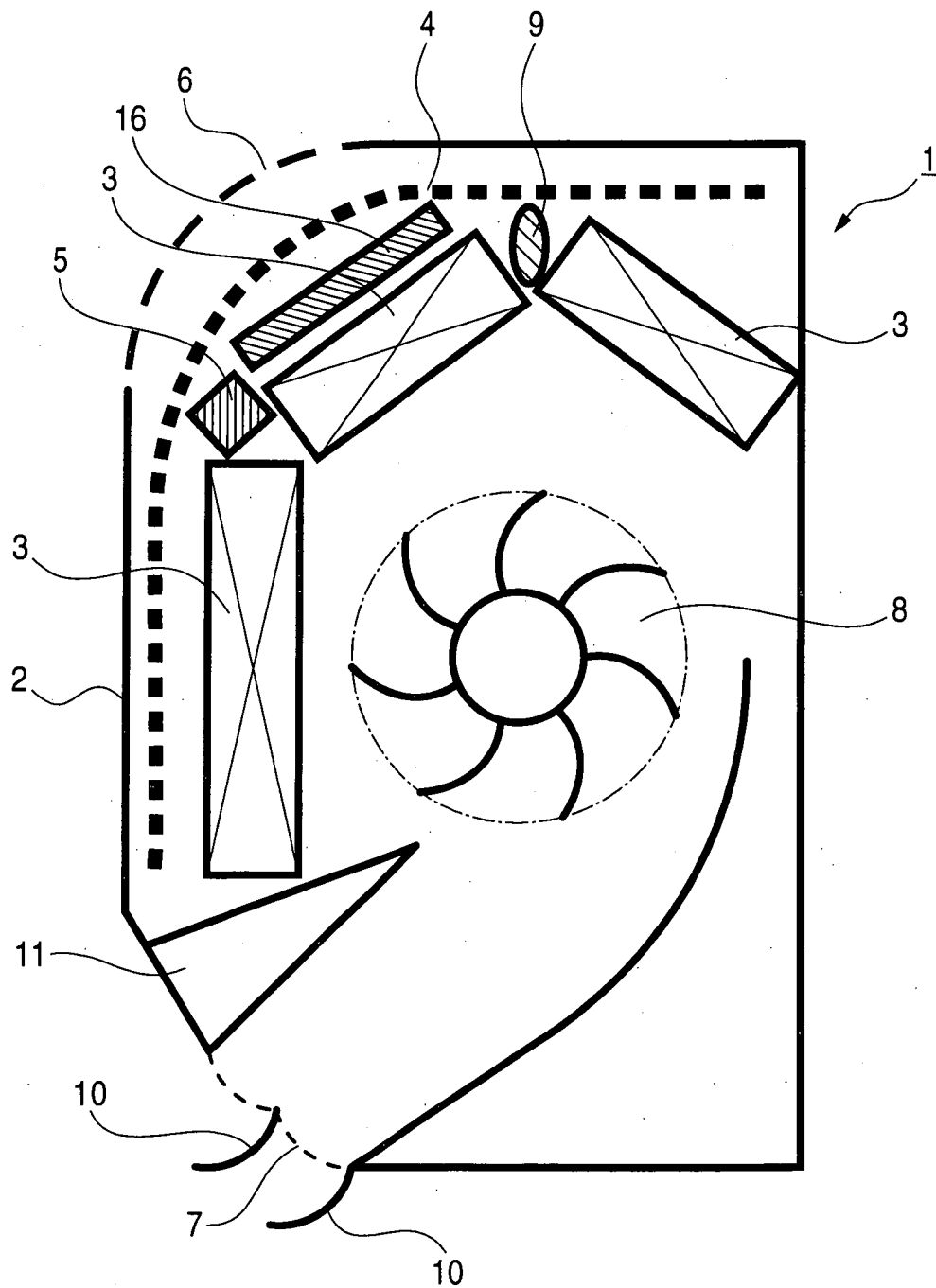


FIG. 17

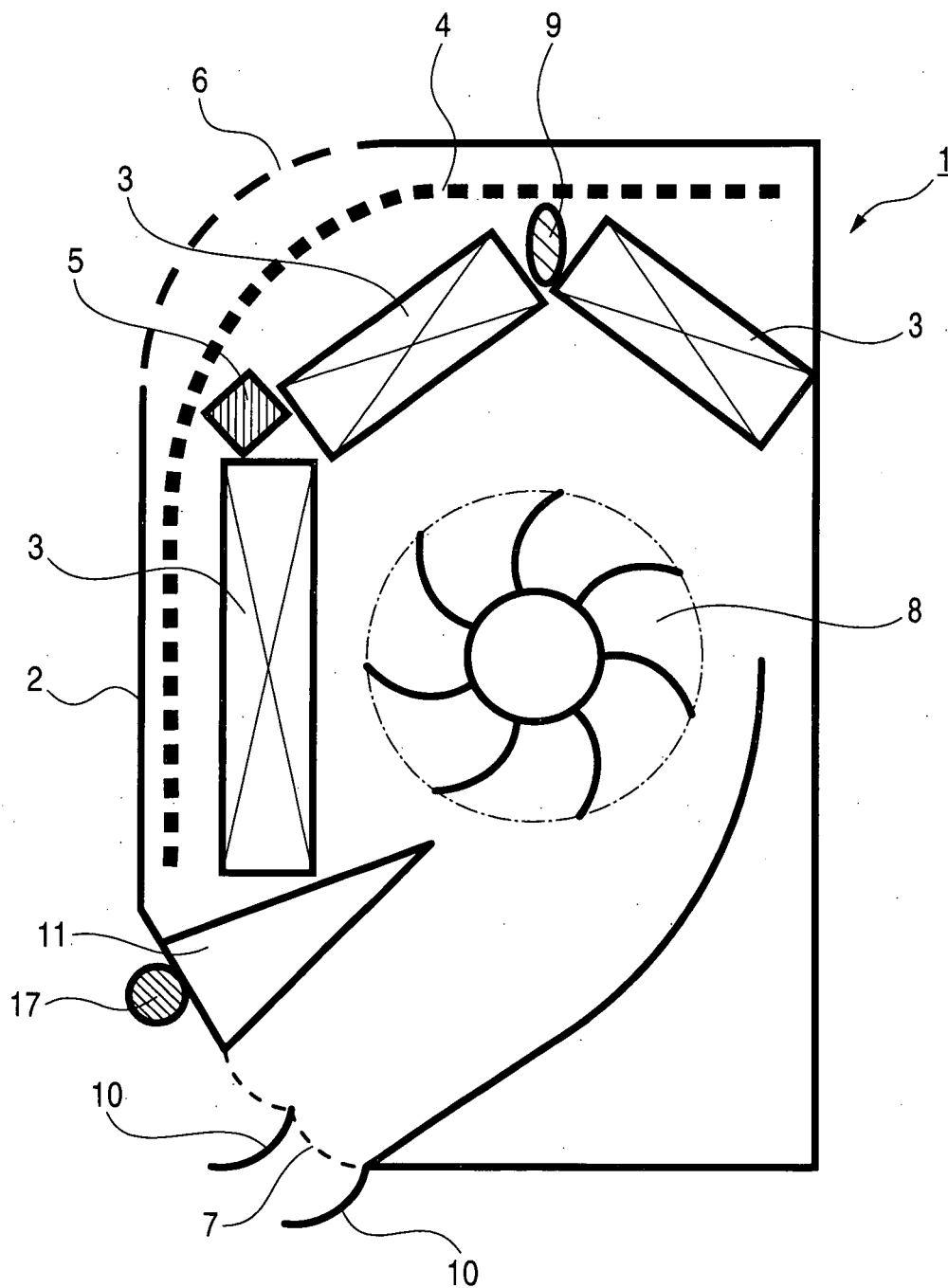
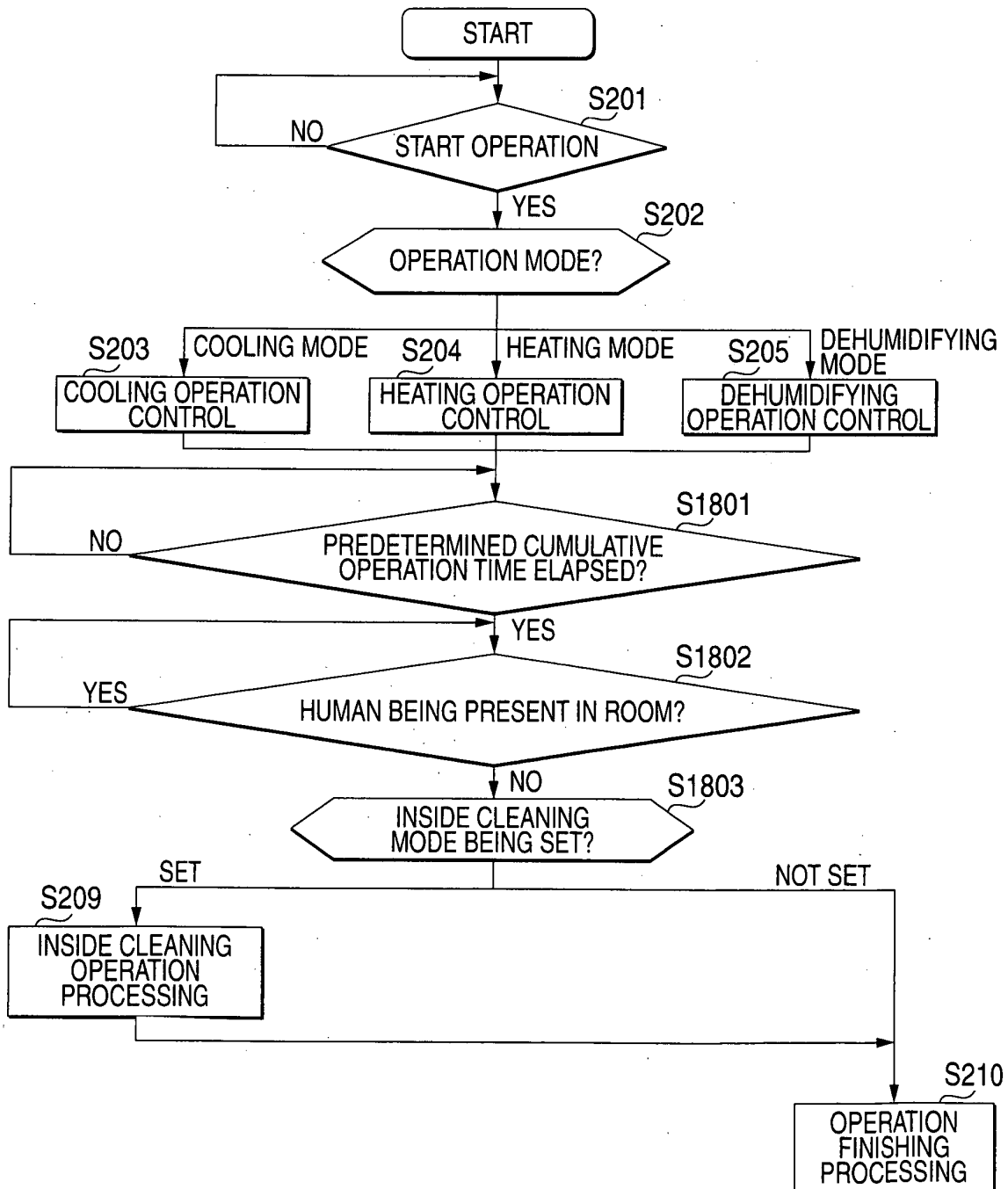


FIG. 18





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 07 02 1308

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			F24F
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 30 January 2008	Examiner Valenza, Davide
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 07 02 1308

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The members are as contained in the European Patent Office EDP file on
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30-01-2008

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