(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 703 540 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
05.03.2014 Bulletin 2014/10

(21) Application number: **13181488.1**

(22) Date of filing: **23.08.2013**

(51) Int Cl.:
D06F 39/00 *(2006.01)* ***D06F 39/02*** *(2006.01)*
D06F 58/20 *(2006.01)* ***D06F 58/28*** *(2006.01)*
D06F 33/02 *(2006.01)* ***D06F 35/00*** *(2006.01)*

(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

(30) Priority: **28.08.2012 KR 20120094577**

(71) Applicant: **Samsung Electronics Co., Ltd**
Gyeonggi-do 443-742 (KR)

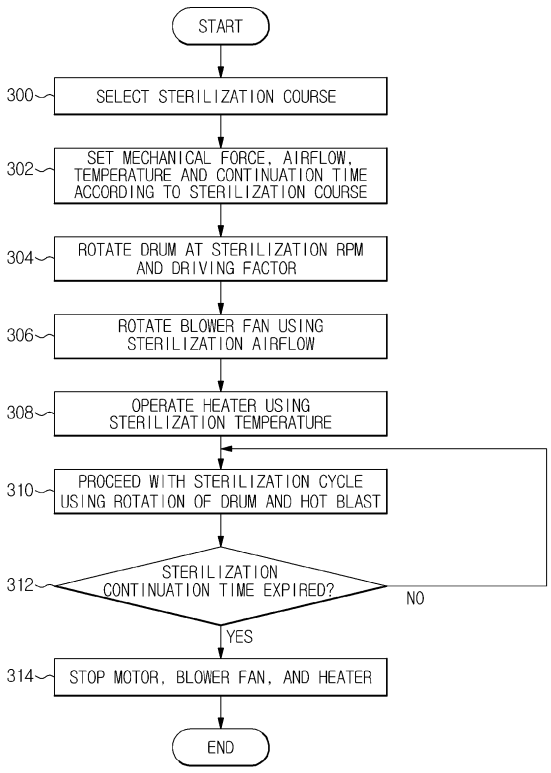
(72) Inventors:
- **Kim, Tai Eun**
  Gyeonggi-do (KR)
- **Yang, Byoung Yull**
  Gyeonggi-do (KR)
- **Kim, Hyun Sook**
  Gyeonggi-do (KR)
- **Kang, Myung Sun**
  Gyeonggi-do (KR)

(74) Representative: **Walaski, Jan Filip et al**
Venner Shipley LLP
200 Aldersgate
London
EC1A 4HD (GB)

(54) Drying apparatus and washing machine having the same and control method thereof

(57) A drying apparatus (60) provided with a total care function with respect to a substance such as bedding, a washing machine (1) having the same, and a control method thereof may include a sterilization course (operation 500), a deodorization course (operation 718), a pest elimination course, a dust elimination course (operation 1200), and a refreshing course (operation 1514), and may be capable of performing each total care function in an independent manner. By changing a rotation speed of the drum according to the type and the weight of the bedding, the damage of the substance at each of the total care courses is reduced while obtaining optimal effects. By providing a standard course having all the total care functions, the manipulation efficiency is enhanced for a user who is not familiar with the manipulation of the courses and also for a user who is not in favor of the individual manipulation of the courses.

FIG.7



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Description

[0001] The following description relates to a drying apparatus, a washing machine having the same, and a control method thereof, and more particularly, to a drying apparatus provided with a total care function with respect to bedding, a washing machine having the same, and a control method thereof.

[0002] In general, a drying apparatus is an apparatus configured to dry a substance by supplying high-temperature air (hot blast) heated by a hot blast heater to an inside of a drum while the drum having the clothing accommodated to be dried, (hereinafter called a substance) is rotated. Recently, a washing machine having a function of a drying apparatus as such, generally referred to as a drum washing machine, has been introduced, and is configured to independently proceed with a drying cycle, or to proceed with a drying cycle in connection with a washing cycle.

[0003] A drying cycle dries the substance by using a high-temperature hot blast, and thus is effective in sterilizing any bacteria that remains on the substance. However, in a case of ticks, or bedbugs, which mainly inhabit bedding such as bedclothes and pillows, the ticks not only inhabit the surface of the bedding, but also inhabit the cotton filling or the sponge filling inside the bedding, so the conventional drying cycle is less capable of effectively sterilizing the ticks that live inside the bedding.

[0004] Also, the drying cycle is not provided with a total care function with respect to the bedding to eliminate unpleasant odour particles or dust attached to a substance such as bedding, and to refresh the portion of the bedding which is compressed for storage purpose.

[0005] Therefore, it is an aspect of the present disclosure to provide a drying apparatus provided with a total care function in sterilizing, deodorizing, eliminating ticks, eliminating dust, and refreshing with respect to a substance such as bedding, a washing machine having the same, and a control method thereof.

[0006] Additional aspects of the disclosure will be set forth in part in the description which follows and, in part, will be obvious from the description, or may be learned by practice of the disclosure.

[0007] In accordance with an aspect of the present disclosure, a drying apparatus includes a drum, a motor, a heater, an input unit, and a control unit. The drum may be configured to accommodate a substance such as bedding. The motor may be configured to rotate the drum. The heater may be configured to supply a hot blast to an inside of the drum.

[0008] The input unit may be configured to select at least one of a plurality of care courses, also referred to as programs, for a sterilization, a deodorization, an elimination of ticks, an elimination of dust and refreshing with respect to the substance to perform total care functions such as a sterilizing function, a deodorizing function, a tick elimination function, a dust elimination function, and a refreshing function on the substance. The control unit may be configured to proceed with the total care course by controlling a by-course algorithm to operate the motor and the heater according to the selected care course.

[0009] The total care courses may include a sterilization course, a deodorization course, a tick elimination course, a dust elimination course, a refreshing course, and a standard course. The standard course may have all of a sterilizing function, a deodorizing function, a tick elimination function, a dust elimination function, and a refreshing function.

[0010] The input unit may include a first selection unit to select a bedding care mode to perform the total care function on the substance, and a second selection unit to select a detailed course such as the care courses for sterilization, deodorization, tick elimination, dust elimination, and refreshing of the bedding care mode. In addition, the input unit may include a third selection unit to select the type of the substance, and a fourth selection unit to select the weight or the amount of the substance.

[0011] The control unit may change the rotation speed of the drum according to the type of the substance, and change the rotation speed of the drum according to the weight or the amount of the substance.

[0012] The type of the substance may include bed clothes, pillows, and blankets. The weight of the substance may include high, mid and low. The amount of the substance may include great, middle and small.

[0013] The drying apparatus may further include a blower fan to control the amount of air being introduced to the inside of the drum. The control unit rotates the drum according to the operation motor, and supplies a hot blast to the inside of the drum according to the operation of the heater and the blower fan, thereby proceeding with the sterilization course to sterilize various bacteria inhabiting an inside of the substance.

[0014] In addition, the control unit may perform the sterilization course by changing at least one of a motor RPM, a driving factor, an airflow, a temperature, and a continuation time according to the weight of the substance.

[0015] The drying apparatus may further include an ion generator to generate ions at an inside of the drum, and an ultraviolet ray lamp to radiate ultraviolet rays at the drum. The control unit may perform a post-processing cycle to enhance the sterilization power of the substance by operating at least one of the ion generator and the ultraviolet lamp.

[0016] The drying apparatus may further include a blower fan to adjust the airflow of air being introduced to the inside of the drum, and a mist spray to supply moisture to the inside of the drum. The control unit rotates the drum according to the operation of the motor, supplies a hot blast to the inside of the drum according to the operation of the heater and the blower fan, and supplies the moisture to the substance according to the mist spray, thereby proceeding with the deodorization course.

[0017] In addition, the control unit may perform the deodorization course by changing at least one of a motor

RPM, a driving factor, an airflow, a temperature, and a continuation time according to the weight of the substance.

[0018] The drying apparatus may further include an ion generator to generate ions at the inside of the drum, and an ultraviolet ray lamp to radiate ultraviolet rays to the drum.

[0019] The control unit may perform a post-processing cycle to enhance the sterilization power of the substance by operating at least one of the ion generator and the ultraviolet lamp. The drying apparatus may further include a blower fan to adjust the airflow of the air being introduced to the inside the drum, and the control unit may rotate the drum according to the motor, and supplies a hot blast to the inside of the drum according to the operation of the heater and the blower fan, thereby proceeding with the tick elimination course to eliminate ticks inhabiting the inside of the substance.

[0020] The control unit may perform the tick elimination course by changing at least one of a motor RPM, a driving factor, an airflow, a temperature, and a continuation time according to the weight of the substance.

[0021] The drying apparatus may further include an ion generator to generate ions at the inside the drum, and an ultraviolet ray lamp to radiate ultraviolet rays to the drum. The control unit may perform a post-processing cycle in which at least one of the ion generator and the ultraviolet lamp is operated.

[0022] The drying apparatus may further include a blower fan to adjust the airflow of the air being introduced to the inside of the drum, and the control unit may rotate the drum according to the motor, and supplies a strong wind to the inside of the drum according to the operation of the blower fan, thereby proceeding with the dust elimination course to eliminate dust attached on the substance.

[0023] The control unit may perform the dust elimination course by changing at least one of a motor RPM, a driving factor, an airflow, a temperature, and a continuation time according to the weight of the substance.

[0024] The drying apparatus may further include a blower fan to adjust the airflow of the air being introduced to the inside of the drum, and the control unit may rotate the drum according to the motor, and supplies a hot blast to the inside of the drum according to the operation of the heater and the blower fan, thereby proceeding with the refreshing course to remove the moisture contained in the substance and to refresh the compressed state of the substance.

[0025] The control unit may perform the refreshing course by changing at least one of a motor RPM, a driving factor, an airflow, a temperature, and a continuation time according to a moisture content of the substance.

[0026] The moisture content may be directly input by a user or may be detected through a sensor.

[0027] The drying apparatus may further include a scent generator to generate scent at an inside of the drum, and the control unit may perform the post-processing cycle to operate the scent generator.

[0028] The drying apparatus may further include a blower fan to adjust the airflow of the air being introduced to the inside the drum, and the control unit may rotate the drum according to the motor, and supplies a hot blast to the inside of the drum according to the operation of the heater and the blower fan, thereby proceeding with the standard course to remove various bacteria, ticks, unpleasant odor particles, dust, and moisture of the substance.

[0029] The control unit may perform the standard course by changing at least one of a motor RPM, a driving factor, an airflow, a temperature, and a continuation time according to a moisture content of the substance.

[0030] The drying apparatus may further include an ion generator to generate ions at the inside of the drum, an ultraviolet ray lamp to radiate ultraviolet rays to the drum, and a scent generator to generate scent at an inside of the drum, and the control unit may perform the post-processing cycle in which at least one of the ion generator, the ultraviolet lamp, and the scent generator is operated.

[0031] In accordance with an aspect of the present disclosure, a washing machine includes a drum, a heater, an input unit, and a control unit. The drum may be configured to accommodate a substance such as bedding. The heater may be configured to supply a hot blast to the inside of the drum. The input unit may be configured to select at least one of a plurality of care courses for a sterilization, a deodorization, an elimination of ticks, an elimination of dust, and a refreshing with respect to the substance to perform a total care function, such as a sterilizing function, a deodorizing function, a tick elimination function, a dust elimination function, and a refreshing function on the substance. The control unit may be configured to proceed with the total care course independently from a drying cycle according to the selected course.

[0032] The washing machine may further include a motor to rotate the drum, and a blower fan to adjust an airflow of air being introduced to the inside of the drum. The control unit may proceed with a by-course algorithm for each of the total care courses by controlling the motor, the blower fan, and the heater.

[0033] The control unit may further determine the weight or the amount of the substance, and change the by-course algorithm according to the weight or the amount of the substance.

[0034] The washing machine may further include an ion generator to generate ions at an inside of the drum, an ultraviolet ray lamp to radiate ultraviolet rays at the drum, and a scent generator to generate scent to the inside of the drum. The control unit may perform a post-processing cycle by operating at least one of the ion generator, the ultraviolet lamp, and the scent generator.

[0035] In accordance with an aspect of the present disclosure, a method of controlling a drying apparatus having a drum to accommodate a substance such as bed-

ding, a motor to rotate the drum, and a heater to supply a hot blast to an inside of the drum includes selecting a bedding care mode to perform total care functions such as a sterilizing function, a deodorizing function, a tick elimination function, a dust elimination function, and a refreshing function with respect to the substance; selecting a detailed total care course of the bedding care mode; selecting a by-course algorithm for each of the total care courses to control the motor and the heater according to the total care course; determining the weight or amount of the substance; and changing the selected by-course algorithm according to the weight or amount of the substance.

[0036] The selecting of the detailed total care course may include selecting one of a plurality of care courses for a sterilization, a deodorization, an elimination of ticks, an elimination of dust, and a refreshing.

[0037] The method may further include selecting a type of the substance, and the by-course algorithm may include changing the rotation speed of the drum according to the type of the substance. The method may further include a blower fan to adjust the airflow of air being introduced to the drum, and the sterilization course may include tumbling the substance by rotating the drum according to the operation of the motor; and maintaining an internal temperature of the drum at or above a predetermined temperature by supplying a hot blast to the inside of the drum according to the operation of the heater and the blower fan.

[0038] The sterilization course may include proceeding with a sterilization cycle by changing at least one of a motor RPM, a driving factor, an airflow, a temperature, and a continuation time according to the weight of the substance.

[0039] The method may further include an ion generator to generate ions at an inside of the drum, and an ultraviolet ray lamp to radiate ultraviolet rays at the drum. The sterilization course may include performing a post-processing cycle to enhance the sterilization power of the substance by operating at least one of the ion generator and the ultraviolet lamp.

[0040] The method may further include a blower fan to adjust the airflow of air being introduced to the inside of the drum, and a mist spray to supply moisture to the inside of the drum. The deodorization course may include tumbling the substance by rotating the drum according to the operation of the motor; supplying a hot blast to the inside of the drum according to the heater and the blower fan; and supplying a moisture to the substance according to the operation of the mist spray.

[0041] The deodorization course may include proceeding with a deodorization cycle by changing at least one of a motor RPM, a driving factor, an airflow, a temperature, and a continuation time according to the weight of the substance.

[0042] The method may further include an ion generator to generate ions at the inside of the drum, and an ultraviolet ray lamp to radiate ultraviolet rays to the drum. The deodorization course may include performing a post-processing cycle to enhance the sterilization power of the substance by operating at least one of the ion generator and the ultraviolet lamp.

[0043] The method may further include a blower fan to adjust the airflow of the air being introduced to the inside of the drum, and the tick elimination course may include tumbling the substance by rotating the drum according to the operation of the motor; and eliminating ticks by supplying a hot blast to the inside of the drum according to the operation of the heater and the blower fan.

[0044] The tick elimination course may include performing a tick elimination cycle by changing at least one of a motor RPM, a driving factor, an airflow, a temperature, and a continuation time according to the weight of the substance.

[0045] The method may further include an ion generator to generate ions at the inside of the drum, and an ultraviolet ray lamp to radiate ultraviolet rays to the drum. The tick generation course may include performing a post-processing cycle in which at least one of the ion generator and the ultraviolet lamp is operated.

[0046] The method may further include a blower fan to adjust the airflow of the air being introduced to the inside of the drum, and the dust elimination course may include tumbling the substance by rotating the drum according to the motor, and eliminating dust attached to the substance by supplying a strong wind to the inside of the drum according to the operation of the blower fan.

[0047] The dust elimination course may include performing a dust elimination cycle by changing at least one of a motor RPM, a driving factor, an airflow, a temperature, and a continuation time according to the weight of the substance.

[0048] The method may further include a blower fan to adjust the airflow of the air being introduced to the inside of the drum, and the refreshing course may include tumbling a substance by rotating the drum according to the motor; and removing moisture contained in the substance and refreshing the compressed state of the substance by supplying a hot blast to the inside of the drum according to the operation of the heater and the blower fan.

[0049] The refreshing course may include performing a refreshing cycle by changing at least one of a motor RPM, a driving factor, an airflow, a temperature, and a continuation time according to a moisture content of the substance.

[0050] The method may further include a scent generator to generate scent at an inside of the drum, and the refreshing course may perform the post-processing cycle to operate the scent generator.

[0051] The method may further include a blower fan to adjust the airflow of the air being introduced to the inside of the drum, and the standard course may include tumbling the substance by rotating the drum according to the motor, and removing various bacteria, ticks, unpleasant odor particles, dust, and moisture of the substance by

supplying a hot blast to the inside of the drum according to the operation of the heater and the blower fan.

[0052] The standard course may include changing at least one of a motor RPM, a driving factor, an airflow, a temperature, and a continuation time according to a moisture content of the substance.

[0053] The method may further include an ion generator to generate ions at the inside of the drum, a ultraviolet ray lamp to radiate ultraviolet rays to the drum, and a scent generator to generate scent at an inside of the drum, and the standard course may include performing the post-processing cycle in which at least one of the ion generator, the ultraviolet lamp, and the scent generator is operated.

[0054] These and/or other aspects of the disclosure will become apparent and more readily appreciated from the following description of the embodiments, taken in conjunction with the accompanying drawings of which:

FIG. 1 is a perspective view of an exterior of a washing machine having a drying apparatus in accordance with an embodiment of the present disclosure.

FIG. 2 is a cross-sectional view of a structure of the washing machine shown in FIG. 1.

FIG. 3 is a perspective view illustrating a portion of the structure of FIG. 2.

FIG. 4 is a drawing showing a control panel of a washing machine in accordance with an embodiment of the present disclosure.

FIG. 5 is a control block diagram of a washing machine in accordance with an embodiment of the present disclosure.

FIG. 6 is a flow chart of an operation of an algorithm for the selection of a total care of bedding at a washing machine having a drying apparatus in accordance with an embodiment of the present disclosure.

FIG. 7 is a flow chart of an operation of a control algorithm of a sterilization course for the sterilization of bedding at a washing machine having a drying apparatus in accordance with an embodiment of the present disclosure.

FIG. 8 is a flow chart of an operation of a control algorithm of a sterilization course for the sterilization bedding at a washing machine having a drying apparatus in accordance with an embodiment of the present disclosure.

FIG. 9 is a flow chart of an operation of a control algorithm of a sterilization course for the sterilization of bedding at a washing machine having a drying apparatus in accordance with an embodiment of the present disclosure.

FIG. 10 is a flow chart of an operation of a control algorithm of a deodorization course for the deodorization of bedding at a washing machine having a drying apparatus in accordance with an embodiment of the present disclosure.

FIG. 11 is a flow chart of an operation of a control algorithm of a deodorization course for the deodorization of bedding at a washing machine having a drying apparatus in accordance with an embodiment of the present disclosure.

FIG. 12 is a flow chart of an operation of a control algorithm of a deodorization course for the deodorization of bedding at a washing machine having a drying apparatus in accordance with an embodiment of the present disclosure.

FIG. 13 is a flow chart of an operation of a control algorithm of a tick elimination course for the elimination of ticks on bedding at a washing machine having a drying apparatus in accordance with an embodiment of the present disclosure.

FIG. 14 is a flow chart of an operation of a control algorithm of a tick elimination course for the elimination of ticks on bedding at a washing machine having a drying apparatus in accordance with an embodiment of the present disclosure.

FIG. 15 is a flow chart of an operation of a control algorithm of a tick elimination course for the elimination of ticks on bedding at a washing machine having a drying apparatus in accordance with an embodiment of the present disclosure.

FIG. 16 is a flow chart of an operation of a control algorithm of a dust elimination course for the elimination of dust on bedding at a washing machine having a drying apparatus in accordance with an embodiment of the present disclosure.

FIG. 17 is a flow chart of an operation of a control algorithm of a dust elimination course for the elimination of dust on bedding at a washing machine having a drying apparatus in accordance with an embodiment of the present disclosure.

FIG. 18 is a flow chart of an operation of a control algorithm of a dust elimination course for the elimination of dust on bedding at a washing machine having a drying apparatus in accordance with an embodiment of the present disclosure.

FIG. 19 is a flow chart of an operation of a control algorithm of a refreshing course for the refreshing of bedding at a washing machine having a drying apparatus in accordance with an embodiment of the present disclosure.

FIG. 20 is a flow chart of an operation of a control algorithm of a refreshing course for the refreshing of bedding at a washing machine having a drying apparatus in accordance with an embodiment of the present disclosure.

FIG. 21 is a flow chart of an operation of a control algorithm of a refreshing course for the refreshing of bedding at a washing machine having a drying apparatus in accordance with an embodiment of the present disclosure.

FIG. 22 is a flow chart of an operation of a control algorithm of a standard course for a total care of bedding at a washing machine having a drying apparatus in accordance with an embodiment of the present disclosure.

FIG. 23 is a drawing showing a variable profile of a driving factor of a standard course.

FIG. 24 is a flow chart of an operation of a control algorithm of a standard course for a total care of bedding at a washing machine having a drying apparatus in accordance with an embodiment of the present disclosure.

FIG. 25 is a flow chart of an operation of a control algorithm of a standard course for a total care of bedding at a washing machine having a drying apparatus in accordance with an embodiment of the present disclosure.

FIG. 26 is a perspective view of a drying apparatus in accordance with an embodiment of the present disclosure.

FIG. 27 is a side-sectional view of the drying apparatus illustrated on FIG. 26.

[0055] In FIGS. 1 to 3, a washing machine 1 in accordance with an embodiment of the present disclosure includes a body 10 forming an exterior appearance while having a box shape, a tub 11 installed inside the body 10 and provided therein to hold water, that is, washing water or rinsing water, while having a drum shape, and a drum 12 rotatably installed inside the tub 11 and provided with a plurality of holes 13.

[0056] At an outer side of a rear surface of the tub 11, a motor 15 is provided as a driving apparatus to rotate a rotation shaft 15a connected to the drum 12 to perform a washing cycle, a rinsing cycle, a spin-drying cycle, and a drying cycle. In general, the motor 15 may be an universal motor composed of field coils and an armature, or a brushless direct motor (BLDC) composed of a permanent magnet and an electromagnet, and any motor which may be applied to the drum 12, which is provided in mid-to-small size, may be considered as the motor 15. In addition, at a front surface of the body 10, a door 19 is installed thereto, so that laundry may be inserted into an inside of the drum 12 through the door 19 or be withdrawn from an inside of the drum 12 through the door 19.

[0057] At an upper portion of the tub 11, a detergent insertion apparatus 20 configured to supply a detergent, that is, a synthetic detergent or a natural soap detergent, and a water supply apparatus 30 configured to supply water, that is, washing water or rinsing water, are installed thereto. The detergent insertion apparatus 20 has an inside partitioned into a plurality of spaces, and is installed at a front surface side of the body 10, so that a user may easily insert a detergent and a rinsing aid into each of the plurality of spaces.

[0058] In addition, the water supply apparatus 30 includes a water supply pipe 31 connecting an outside water supply pipe to the detergent insertion apparatus 20 to supply washing water or rinsing water to an inside of the tub 11, a water supply valve 32 installed at the middle of the water supply pipe 31 to control the supply of water, and a connecting pipe 35 connecting the detergent insertion apparatus 20 to the tub 11. The structure as the above enables the water being supplied to an inside of the tub 11 to pass through the detergent insertion apparatus 20, so that the detergent inside the detergent insertion apparatus 20 may be supplied to the tub 11 together with water.

[0059] In addition, at an upper portion of a front surface of the body 10, a control panel 40, which is provided with various buttons and displays to control the washing machine 1, is provided thereto, and at one side of the control panel 40, a detergent insertion port 21 is provided to insert a detergent into the washing machine 1 while being connected to the detergent insertion apparatus 20.

[0060] In addition, the washing machine 1 in accordance with an embodiment of the present disclosure is provided with a drain apparatus 50, which is configured to drain the water inside the tub 11, installed thereto. The drain apparatus 50, to drain the water of the tub 11 to the outside, includes a first drain pipe 51 connected to a lower portion of the tub 11, a drain pump 52 installed at the first drain pipe 51, and a second drain pipe 53 connected to an exit side of the drain pump 52.

[0061] In addition, the washing machine 1 in accordance with an embodiment of the present disclosure is provided with a drying apparatus 60, which is configured to dry the laundry inside the drum 12, installed thereto. The drying apparatus 60 includes a condensation duct 62 to condense moisture in the air that is introduced from the drum 12, a drying duct 64 to dry the air that is introduced from the condensation duct 62 by applying heat to the air, and a fan, for example a blower fan 66, disposed between the condensation duct 62 and the drying duct 64 and configured to form an air flow so that the air that is introduced to the condensation duct 62 may be introduced to an inside of the drum 12 by passing through the drying duct 64. At the drying duct 64, a heater 68 is placed to heat the air inside the drying duct 64, and at the condensation duct 62, a water supply nozzle 63 is provided to supply condensation water, that is, cold water, to an inside of the condensation duct 62 so that moisture of high-temperature and high-humidity air, which is generated as a result of drying the laundry is condensed and thus eliminated in the course of air passing through the condensation duct 62. The water supply nozzle 63 is connected to a condensation water supply pipe 69 that supplies condensation water, and the condensation water supply pipe 69 is connected to the water supply valve 32.

[0062] Thus, by having the condensation water, which is supplied through the water supply valve 32, sprayed from the water supply nozzle 63 by passing through the condensation water supply pipe 69 and flowing along an inner surface of the condensation duct 62, the contact between the high-temperature and high-humidity air ascending from a lower portion and the condensation water is increased, thereby enhancing a condensation effect.

[0063] In addition, the washing machine 1 in accordance with an embodiment of the present disclosure, to reduce the vibration that is generated in the process of operating the washing machine 1, is provided therein with

a damper 70 to movably support the tub 11 from a lower portion of the tub 11.

[0064] In addition, the washing machine 1 in accordance with an embodiment of the present disclosure is provided with a temperature sensor 91 provided at an upper portion of a front surface of the drying duct 64 to detect the temperature of the air introduced to the drum 12, that is, the temperature of an entry of the drum 12, and is provided with a humidity sensor 92 installed at a lower end of a front surface of the drum 12 to detect the amount of moisture in the substance by making contact with the substance that rotates along with the rotation of the drum 12 to measure the sensing value of the electrical signal that varies depending on the moisture in the substance. As for the humidity sensor 92, a touch sensor having a shape of a plate bar, or a capacitance sensor may be used to directly measure and detect the resistance at the time of when the substance is in contact with the drum 12.

[0065] Meanwhile, the washing machine 1 in accordance with an embodiment of the present disclosure, other than the temperature sensor 91 and the humidity sensor 92, includes various sensors for the total care of bedding, and with respect to the various sensors, the detailed descriptions will be provided later by referring to FIG. 5.

[0066] In FIG. 4, at the control panel 40, an input unit 100 provided with various buttons to receive a manipulation command from a user to control the operation of the washing machine 1, and a display unit 140 to display the operation status of the washing machine 1 and the manipulation status of a user.

[0067] The input unit 100 is configured to input the command to execute a washing cycle, a rinsing cycle, a spin-drying cycle, and a drying cycle of the washing machine 1 by the manipulation of a user, and may be composed with keys, buttons, switches, touch pads, and jog dials, for example. The input unit 100 may include all apparatuses that generate predetermined input data through the manipulations such as a pushing, a contact, a pressure, and a rotating, for example.

[0068] In addition, the input unit 100 is provided with a first selection unit 101 to select a bedding care mode to perform total care functions such as sterilization, deodorization, elimination of ticks, elimination of dust, and refreshing with respect to bedding such as bed clothes, pillows, bed sheets, and blankets, separately from a conventional washing cycle or a drying cycle, a second selection unit 102 to select a detailed total care course of the bedding care mode, such as a standard course, a sterilization course, a deodorization course, a tick elimination course, a dust elimination course, and a refreshing course, a third selection unit 103 to select the type of bedding of the total care course, such as bed clothes, pillows, bed sheets, and blankets, and a fourth selection unit 104 to select the amount of the bedding of the total care course, such as great, medium, and small, or high, mid, and low, that corresponds to the weight or the volume of the bedding. However, the disclosure is not limited to the functions provided above, such that different, additional, or fewer functions may be provided as required.

[0069] The display unit 140 includes a light-emitting body such as a light-emitting diode (LED), a liquid crystal display (LCD), or an organic electroluminescent (EL), for example, and is provided adjacent to the first selection unit 101, the second selection unit 102, the third selection unit 103, and the forth selection unit 104, and displays information regarding the operation status of the washing machine 1 and the manipulation status of a user through various forms such as 7-segments or the flashing of the LED.

[0070] The display unit 140 includes a plurality of LEDs provided adjacent to the first selection unit 101 to display the selections of a wash mode, a dry mode, and a bedding care mode, a plurality of LEDs provided at an upper portion of the second selection unit 102 to display the selections of a standard course, a sterilization course, a deodorization course, a tick elimination course, a dust elimination course, and a refreshing course, a plurality of LEDs provided at an upper portion of the third selection unit 103 to display the selections on the types of the bedding, such as bed clothes, pillows, bed sheets, and blankets, and a plurality of LEDs provided at an upper portion of the fourth selection unit 104 to display the selections of the amount of the bedding the weight or the volume, such as great, medium, and small, or high, mid, and low.

[0071] In addition to the above, in a case when the display unit 140 is an LCD, when the bedding care mode for the total care of bedding is selected, primarily, a user interface (UI) of the sterilization course, the tick elimination course, the dust elimination course, and the refreshing course is activated, and one of the activated display is selected. Secondarily, a UI to select the type of the bedding, such as bed clothes, pillows, bed sheets, and blankets, is activated, and after the type of the bedding is selected, thirdly, a UI to select the amount of the bedding, that is, the weight or the volume, of the bedding is activated, so that a user may select the total care functions in stages.

[0072] The operation in selecting the total care functions of bedding by using the input unit 100 and the display unit 140 is described as follows.

[0073] A user selects the bedding care mode, which is independently provided separately from a conventional washing cycle or a conventional drying cycle, by manipulating the first selection unit 101. The bedding care mode is selected, as the first selection unit 101 is rotated for manipulation, the selection display LEDs of the wash mode, the dry mode, and the bedding care mode that are provided at a nearby of the first selection unit 101 are selectively flashed according to the rotating manipulation of the first selection unit 101, and thus, a user, by checking the selection display LEDs, selects the desired bedding care mode.

[0074] After selecting the bedding care mode by manipulating the first selection unit 101, a user selects a desired course from a plurality of total care courses which

includes the standard course, the sterilization course, the deodorization course, the tick elimination course, the dust elimination course, and the refreshing course by manipulating the second selection unit 102. The total care course is selected, as the second selection unit 102 is pressed, the selection display LEDs of the standard course, the sterilization course, the deodorization course, the tick elimination course, the dust elimination course, and the refreshing course provided at an upper portion of the second selection unit 102 are selectively flashed according to the pressed manipulation of the second selection unit 102, and thus, a user selects the desired total care course while checking the selection display LEDs.

[0075] After selecting the total care course by manipulating the second selection unit 102, the type and the capacity of the bedding are selected by manipulating the third selection unit 103 and the fourth selection unit 104.

[0076] First, the type of bedding is selected, as the third selection unit 103 is pressed, the selection display LEDs of the bed clothes for the pillows, the bed sheets, and the blankets provided at an upper portion of the third selection unit 103 are selectively flashed according to the pressed manipulation of the third selection unit 102, and thus, a user, by checking the selection display LEDs, selects the type of the bedding.

[0077] Next, the amount of the bedding, that is, the weight or the volume, of bedding is selected, as the fourth selection unit 104 is pressed, the selection display LEDs for the high, the med, and the low, or the great, the medium, and the small, provided at an upper portion of the fourth selection unit 104 are selectively flashed according to the pressed manipulation of the fourth selection unit 104, and thus, a user, by checking the selection display LEDs, selects the amount of the bedding.

[0078] As the above, in order to perform the total care functions of bedding, by selecting the bedding care mode through the first selection unit 101 to enter a mode to perform the total care functions of bedding, and then, through the second selection unit 102, the third selection unit 103, and the fourth selection unit 104, the desired total care course and the type and the amount of the bedding of each total care course are sequentially selected by a user.

[0079] However, in order to perform the total care function for the bedding, the standard course is provided such that a basic bedding care function is performed without having to select the first selection unit 101, the second selection unit 102, the third selection unit 103, and the fourth selection unit 104, and thus, when the bedding care mode is selected as a user manipulates the first selection unit 101, the standard course of the bedding, which is configured as a default value, is set to be automatically selected without having to additionally manipulate the second selection unit 102, the third selection unit 103, and the fourth selection unit 104.

[0080] The standard course of the bedding care mode is a course having all of the total care functions of the sterilization, the deodorization, the elimination of ticks, the elimination of dust, and the refreshing, and provides the convenience to a user who is not familiar with the manipulation of the courses and also to a user who is not in favor of the individual manipulation of the courses.

[0081] Other than the above, the display unit 140 may select the total care course of the bedding care mode as well as the type and the amount of the bedding of the total care course by hierarchical selection by using a LCD.

[0082] FIG. 5 is a control block diagram of a washing machine in accordance with an embodiment of the present disclosure, and will mainly describe the bedding care mode separately provided from the conventional washing cycle or the conventional drying cycle to perform the total care function of the bedding. In FIG. 5, the washing machine 1 further includes a sensor unit 90, the input unit 100, a control unit 110, a memory 120, a driving unit 130, and the display unit 140.

[0083] The sensor unit 90 includes various sensors installed at the washing machine 1, such as the temperature sensor 91 provided at an upper portion of a front surface of the drying duct 64 to detect the temperature of the air introduced to the drum 12, that is, the temperature of the entry of the drum 12, and the humidity sensor 92 installed at a lower end of a front surface of the drum 12 to detect the moisture in the substance.

[0084] Meanwhile, the moisture in the substance is detected by directly using the humidity sensor 92, by measuring and detecting the temperature increase by using a sensor at a rear surface of the washing machine 1, or by directly measuring the resistance at the time of when the substance is in contact with the drum 12 by use of a capacitance sensor attached to the drum 12.

[0085] In addition, the sensor unit 90 further includes a weight sensor 93 to detect the weight of the substance, a current sensor 94 to detect the volume of the substance, and a smell sensor 95 to detect the smell of the substance.

[0086] The weight sensor 93 detects the weight of the substance by using a load cell, a piezoelectric sensor, or a proximity sensor that are generally known in the art. The weight of the substance is detected by using the time for the motor 15 to reach a predetermined speed or a predetermined number of revolutions as the motor 15 is accelerated, or by using the second law of motion (torque = inertia x acceleration) after the inertia of the drum 12 is directly or indirectly measured by providing a torque to the motor 15 for a predetermined period of time.

[0087] The current sensor 94 detects the change of the current of the blower fan 66 at a predetermined rotation speed, or detects the volume of the substance by using an RPM (Revolution per minute) that changes when a predetermined voltage is supplied to the blower fan 66. In addition to the above, an airflow sensor may be used to detect the volume of the substance.

[0088] The smell sensor 95 is a sensor configured to detect the unpleasant odor particle that is separated from

the substance which is input into the drum 12 for deodorization, and may use an electronic nose sensor. The electronic nose sensor is a type of a gas sensor that is provided with a function to detect and quantify the gas particle, which is an element of the odor that is generated in various environments, and depending on the type of the gas that causes smell, a different response signal is output, thereby able to distinguish the type of smell.

[0089] In addition to the above, the odor sensor 95 may use an odor sensor to detect the smell and the humidity of the substance from a methyl hexenoic element that is smeared on the substance such as bedding.

[0090] The input unit 100 is provided to input commands therethrough to perform a washing cycle, a rinsing cycle, a spin-drying cycle, a drying cycle, and a bedding care, and includes the first selection unit 101 to select the bedding care mode, the second selection unit 102 to select a detailed course of the total care courses of the bedding care mode (for example, a standard course, a sterilization course, a deodorization course, a tick elimination course, a dust elimination course, and a refreshing course), the third selection unit 103 to select the type of bedding of the total care courses (for example, as bed clothes, pillows, bed sheets, and blankets) and the fourth selection unit 104 to select the amount of the bedding of the total care courses (for example, great, medium, and small, or high, mid, and low) that corresponds to the weight or the volume of the bedding.

[0091] The control unit 110 is a micro computer configured to control the overall operation of the washing machine 1, such as a washing and a rinsing, a spin-drying, a drying, and a bedding care, according to the operation information input from the input unit 100, and is configured to reduce the damage of the subject by changing the rotation speed of the drum 12 at the selected bedding care mode according to the type and the weight, that is, the amount or the volume, of the bedding, and also is configured to control the algorithm of the total care course to obtain the optimal effect of the total care.

[0092] In addition, the control unit 110 controls the algorithm of the total care course to perform a care function suitable for the corresponding bedding by using various sensor information input through the sensor unit 90. In addition, the control unit 110 controls the algorithm of the total care course by changing the rotation speed of the drum 12 according to the type of the substance and also changing the rotation speed of the drum 12 according to the amount, that is, the weight or the volume, of the substance.

[0093] The memory 120 may store setting information, such as control data to control the operation of the washing machine 1, reference data used during the control of the operation of the washing machine 1, operation data generated while the washing machine 1 performs a predetermined operation, and setting data input by the input unit 100 so that the washing machine 1 may perform a predetermined operation, usage information, such as the number of times by which the washing machine 1 performs a particular operation, and the model information of the washing machine 1, and failure information that includes the cause of malfunction or the position of malfunction in a case when the washing machine 1 malfunctions.

[0094] The driving unit 130, according to the driving control signal of the control unit 110, drives the motor 15, the water supply valve 32, the drain pump 52, the blower fan 66, the heater 68, a mist spray 72, an ion generator 74, an ultraviolet ray lamp 76, and a scent generator 78 that are related to the operation of the washing machine 1.

[0095] The motor 15 is a driving apparatus to rotate the rotation shaft 15a, which is connected to the drum 12, to perform the bedding care mode, and is configured to change the mechanical force, that is, the rotation speed of the drum, according to the total care course or the volume, the type, or the weight of the bedding.

[0096] The blower fan 66 is an apparatus configured to introduce high-temperature air (hot blast), to an inside of the drum 12 to perform the bedding care mode, and is configured to change the amount of wind according to the total care course.

[0097] The heater 68 is an apparatus configured to introduce high-temperature air (hot blast) to an inside of the drum 12 to perform the bedding care mode, and is configured to change the inside temperature of the drum 12 according to the total care course.

[0098] The mist spray 72 is an apparatus configured to spray water in the form of mist (fog), to an inside of the drum 12 to perform the bedding care mode, and is configured to change the moisture that is sprayed to an inside of the drum 12 according to the total care course.

[0099] In addition, the mist spray 72 is provided with a water supply pipe (not shown) installed thereto to supply water to a spray nozzle, and the spray nozzle is penetratively installed at an upper surface of the tub 11 such that a fine discharge port of the spray nozzle is installed in a way to face the drum 12 to supply the moisture in the form of mist. The mist spray 72 may be installed at any position from which the mist may be sprayed to an inside of the drum 12.

[0100] The ion generator 74 is configured to generate ozone and ions, such as anion, inside the drum 12 to increase the sterilizing power of bedding, and the ion generator 74 may be installed at any position from which ozone may be supplied to an inside the drum 12. The ultraviolet ray lamp 76 is configured to radiate an ultraviolet ray having sterilizing action on the bedding which is input in the drum 12, and the ultraviolet ray lamp 76 is composed of a UV-LED module, while the ultraviolet ray lamp 76 may be installed at any proper position at which the substance, such as the bedding that is input into the drum 12, may be sterilized with an ultraviolet ray.

[0101] The scent generator 78 is configured to generate scent such as an air freshener inside the drum 12 to improve the refreshing rate of bedding, and may be installed at any position from which the substance, such

as the bedding that is input in the drum 12, may be supplied with an air freshener.

[0102] The display unit 140 is provided at a control panel 40, and is configured to display the status of the operation of the washing machine 1 according to the display control signal of the control unit 110 while displaying the status of the manipulation of a user by recognizing the information that is input through a user interface.

[0103] Hereinafter, the function and effect of a draying apparatus in accordance with an embodiment of the present disclosure, a washing machine having the same, and a control method thereof will be described.

[0104] In FIG. 6, a user inputs the substance, in particular, the bedding, which is a subject of a care, into an inside of the drum 12, and a user selects the bedding care mode that is independently provided separately from a conventional washing cycle or drying cycle by rotatably manipulating the first selection unit 101 provided on the control panel 40 (operation 200).

[0105] The method of selecting the bedding care mode by rotatably manipulating the first selection unit 101 is as follows.

[0106] For example, in a case when the first selection unit 101 is composed of a jog dial, when the jog dial is rotatably manipulated, the selection display LEDs of the washing, the drying, and the bedding care modes provided adjacent to the first selection unit 101 are selectively flashed according to the rotative manipulation, or rotation, of the first selection unit 101. Thus, a user, while checking the selectively flashed LED, rotatably manipulates the first selection unit 101 to select the bedding care mode. If a user selects the bedding care mode by rotatably manipulating the first selection unit 101, the control unit 110 determines whether the bedding care mode is selected (operation 202).

[0107] When it is determined that the bedding care mode is selected as a result of the determination from the operation 202, the control unit 110 determines that a user has selected the bedding care mode, and flashes the bedding care LED (operation 204).

[0108] Thus, a user, through the flashing of the bedding care LED displayed on the display unit 140, may be able to confirm that the bedding care mode is selected.

[0109] After the above, a user, by pressedly manipulating, or pressing, the second selection unit 102 in a state that the bedding care mode is selected, selects a desired course from a plurality of total care courses (the standard course, the sterilization course, the deodorization course, the tick elimination course, the dust elimination course, and the refreshing course) (operation 206).

[0110] As for the method of selecting the total care course, as the second selection unit 102 is pressedly manipulated, the selection display LEDs, including the standard course, the sterilization course, the deodorization course, the tick elimination course, the dust elimination course, and the refreshing course, provided at an upper portion of the second selection unit 102 are selectively flashed according to the pressed manipulation of the second selection unit 102. Thus, a user, while checking the selectively flashed LED, rotatively manipulates the second selection unit 102 to select the bedding care mode to be performed (operation 208).

[0111] When a user selects a desired course from a plurality of total care courses by pressedly manipulating the second selection unit 102, the control unit 110 flashes the course LED that a user selects from the standard course, the sterilization course, the deodorization course, the tick elimination course, the dust elimination course, and the refreshing course (operation 210).

[0112] Thus, a user, through the flashing of the course selection LED displayed on the display unit 140, may be able to confirm which one from the plurality of total care courses is selected.

[0113] While in the state of the total care course is selected, a user, by pressedly manipulating the third selection unit 103, selects the type of the bedding (operation 212). As for the method of selecting the type of the bedding, as the third selection unit 103 is pressedly manipulated, the selection display LEDs, which are for bedclothes, pillows, bed sheets, and blankets, provided at an upper portion of the third selection unit 103 are selectively flashed according to the manipulation of the third selection unit 103 in a pressed manner. Thus, a user, by pressedly manipulating the third selection unit 103, selects the desired type of the bedding.

[0114] Thus, a user, while checking the selectively flashing the LEDs, pressedly manipulates the third selection unit 103 to select the type of the bedding (operation 214). When a user selects a desired course from the plurality of types of bedding by pressedly manipulating the third selection unit 103, the control unit 110 flashes the bedding selection LED that a user selects from the types of the bedding, which are for bedclothes, pillows, bed sheets, and blankets (operation 216).

[0115] Thus, a user, through the flashing of the bedding selection LED displayed on the display unit 140, may be able to confirm which one from the plurality of types of bedding is selected.

[0116] Next, while in the state of the total care course is selected, a user, by pressedly manipulating the fourth selection unit 104, selects the amount of the bedding (operation 218).

[0117] As for the method of selecting the capacity of the bedding, as the fourth selection unit 104 is pressedly manipulated, the selection display LEDs, which are for great, medium, and small, or high, med, and low, provided at an upper portion of the fourth selection unit 104 are selectively flashed according to the manipulation of the fourth selection unit 104 in a pressed manner. Thus, a user, by pressedly manipulating the fourth selection unit 104, selects the amount of the bedding.

[0118] Thus, a user, while checking the selectively flashing the LEDs, pressedly manipulates the fourth selection unit 104 to select the amount (the weight or the volume) of the bedding (operation 220). When a user selects the desired amount from the plurality of amounts

of bedding by pressedly manipulating the fourth selection unit 104, the control unit 110 flashes a LED corresponding to an amount selected by a user from the amounts of the bedding, which are for great, medium, and small, or high, medium and low (operation 222). Thus, a user, through the flashing of the bedding selection LED displayed on the display unit 140, may be able to confirm which one from the plurality of amounts of bedding is selected.

[0119] When the course selection of the bedding care mode as well as the selection of the type and the amount of the bedding are completed by using the first selection unit 101, the second selection unit 102, the third selection unit 103, and the fourth selection unit 104 (operation 224), a user presses a "Start" button provided on the control panel. The "Start" button may be formed with a press button provided inside the jog dial of the first selection unit 101.

[0120] Thus, when the selection of the bedding care mode is completed, the control unit 110 performs the selected total care course by controlling each apparatus of the washing machine 1 to perform the selected total care course (operation 226).

[0121] As a result of the determination from the operation 224, if the selection of the bedding care mode is not completed, the control unit 110 additionally inputs the weight, the volume, or the moisture content of the substance, so that the total care course may be performed (operation 228). The moisture content from the above indicates whether the bedding is completely dried or contains a small amount of moisture. The weight, the volume, or the moisture content of the substance may be directly input by a user, or may be sensed by using a sensor unit in a case when an input is not made by a user.

[0122] On FIG. 7, a user inputs the substance, in particular, the bedding, which is to be sterilized, into the drum 12, and by rotatably manipulating the first selection unit 101 provided on the control panel 40, a user selects the bedding care mode, and then by pressedly manipulating the second selection unit 102, a user selects the sterilization course (operation 300). The information of the sterilization course that a user selects is input into the control unit 110 through the input unit 100.

[0123] Thus, the control unit 110, when the sterilization course is selected and the operation command is input, sets the mechanical force (the sterilization RPM and the driving factor), the air flow, the temperature, and the continuation time according to the sterilization course (operation 302). The mechanical force set at this time is provided in a way to rotate the drum 12 at a proper RPM (the sterilization RPM), and a proper driving factor to sterilize various bacteria inside the bedding, and the air flow set at this time is provided in a way to rotate the blower fan 66 with a proper air flow (the sterilization air flow), to sterilize various bacteria inside the bedding. In addition, the temperature and the continuation time configured are provided in a way to drive the heater 68 so that the temperature of the entire bedding or a portion of the bedding may be maintained at above a predetermined level of temperature by using hot blast. The most important factor in the sterilization course is the "temperature," and is set at or above approximately 60°C, which provides a condition capable of sterilizing an inside the substance (the bedding), and the maximum temperature is set within a range in which the substance is not being damaged.

[0124] Thus, the control unit 110 operates the motor 15, the blower fan 66, and the heater 68 through the driving unit 130 to proceed with a basic cycle of the sterilization course. To describe the above more in detail, the control unit 110 tumbles the bedding inside the drum 12 by rotating the drum 12 at the set mechanical force (the sterilization RPM and the driving factor), according to the operation of the motor 15 (operation 304). As for the sterilization RPM and the driving factor (the ON-OFF time of the motor), the drying RPM at approximately 50 RPM and the driving factor at approximately 20 seconds with the motor ON and approximately 2 seconds with the motor OFF are the same as in a conventional drying cycle and are pre-stored in the control unit 110.

[0125] The control unit 110 rotates the blower fan 66 using the set sterilization air flow, and the air is started to circulate inside the drum 12 (operation 306). The sterilization air flow is capable of delivering heat energy deep inside the bedding, and is pre-stored in the control unit 110.

[0126] Next, the control unit 110 generates high-temperature air (hot blast), by operating the heater 68 to heat the air being circulated inside the drum 12 (operation 308). At this time, the control unit 110, through the temperature sensor 91, detects the temperature of the air being introduced into the drum 12, that is, the temperature of the entry unit of the drum 12, and sets the sterilization temperature at approximately 80°C and the sterilization continuation time at approximately 40 minutes or more, so that the temperature inside the bedding may be at the temperature at which the sterilization may be possible, that is, at approximately 60°C or more, and the sterilization temperature and the sterilization continuation time are pre-stored in the control unit 110.

[0127] As the above, the hot blast generated by the operation of the heater 68 is introduced inside the drum 12 through a drying duct, and the hot blast introduced inside the drum 12 delivers the heat energy deep into the inside of the bedding that repeats the ascending and the descending operations inside the drum 12 according to the rotation of the drum 12, to proceed with the sterilization cycle to sterilize various bacteria in the bedding (operation 310).

[0128] Then, the control unit 110 counts the proceeding time of the sterilization cycle to determine whether the set sterilization continuation time, which is approximately 40 minutes or more, that is, the time needed for the entire bedding or a portion of the bedding to be continued and maintained at above a predetermined level of temperature by using hot blast, is expired (operation 312), and if the sterilization continuation time is not ex-

pired, the control unit 110 returns to the operation 310 and proceeds with the sterilization cycle by using the rotation of the drum 12 and the hot blast until the sterilization continuation time expires.

[0129] As a result of the determination from the operation 312, if the sterilization continuation time is expired, the control unit 110, through the driving unit 130, stops the motor 15, the blower fan 66, and the heater 68, and completes the basic cycle of the sterilization course (operation 314).

[0130] In FIG. 8, a user inputs the substance (in particular, the bedding), which is to be sterilized, into the drum 12, and by manipulating the first selection unit 101 and the second selection unit 102 provided on the control panel 40, a user selects the sterilization course (operation 400).

[0131] Thus, when the sterilization course is selected and the operation command is input, the control unit 110 determines the weight (or the volume), of the substance that is input into the drum 12 to proceed with the sterilization course (operation 402). At this time, as for the method of determining the amount (the weight or the volume), of the substance, the weight or the volume of the substance may be detected as a user may pressedly manipulate the fourth selection unit 104 to directly input the amount (the weight or the volume) of the substance, or by using the weight sensor or the current sensor of the sensor unit. In addition to the above, as for the method of determining the weight of the substance may include a method of detecting the weight of the substance by using the time for the motor 15 to reach a predetermined speed or a predetermined number of revolutions by use of an instantaneous acceleration of the motor 15 as illustrated in the Japanese unexamined patent publication No. 2002-336593, or a method in which the amount of inertia of the drum 12 is directly and indirectly measured in a state that a torque is applied to the motor 15 for a predetermined period of time and then the weight is detected by using the second law of motion (torque = inertia x acceleration) as illustrated in Japanese unexamined patent publication No. Hei 07-90077.

[0132] When the weight (the volume) of the substance is determined, the control unit 110 sets the mechanical force (the sterilization RPM and the driving factor), the airflow, the temperature, and the continuation time according to the weight (the volume) of the determined substance (operation 404). The mechanical force set at this time is provided in a way to rotate the drum 12 at a proper RPM (the sterilization RPM), and a proper driving factor according to the weight (the volume) of the substance, and the airflow set at this time is provided in a way to rotate the blower fan 66 with a proper airflow (the sterilization airflow), according to the weight (the volume) of the substance. In addition, the temperature and the continuation time are provided in a way to drive the heater 68 so that the temperature of the entire bedding or a portion of the bedding may be maintained at above a predetermined level of temperature and for a predetermined period of time or above according to the weight or the volume of the substance.

[0133] Thereafter, the control unit 110 operates the motor 15, the blower fan 66, and the heater 68 through the driving unit 130 to proceed with the sterilization cycle varying with the weight (volume) of the substance.

[0134] In more detail, the control unit 110 tumbles the bedding inside the drum 12 by rotating the drum 12 at the sterilization RPM and the driving factor, which are set, according to the operation of the motor 15 (operation 406). As for the sterilization RPM and the driving factor, the RPM at approximately 50 RPM or less and the driving factor at approximately 20 seconds with the motor ON and approximately 2 seconds with the motor OFF are the same as in a conventional drying cycle and are pre-stored in the control unit 110.

[0135] Then, the control unit 110 rotates the blower fan 66 using the sterilization airflow that is set, and the air inside the drum 12 is started to circulate (operation 408). The set sterilization airflow is an airflow capable of delivering heat energy deep inside the bedding, and a sterilization air flow corresponds to the weight (the volume) of the substance is invoked for use from an airflow table that is stored in the control unit 110.

[0136] Next, the control unit 110 generates high-temperature air (hot blast), by applying heat on the air being circulated inside the drum 12 by operating the heater 68 (operation 410). At this time, the control unit 110, through the temperature sensor 91, detects the temperature of the air being introduced into the drum 12, and sets the sterilization temperature and the sterilization continuation time, so that the temperature inside the bedding may be at the temperature at which the sterilization may be possible, that is, at approximately 60°C or above, and the sterilization temperature and the sterilization continuation time corresponding to the weight (the volume) of the substance are invoked for use from the airflow table that is stored in the control unit 110.

[0137] Above, the hot blast generated by the operation of the heater 68 is introduced inside the drum 12 through a drying duct, and the hot blast introduced inside the drum 12 delivers heat energy deep into the inside of the bedding that tumbles while repeating the ascending and the descending operations inside the drum 12 according to the rotation of the drum 12, to proceed with the sterilization cycle, which is changed according to the weight (the volume) of the substance (operation 412).

[0138] Then, the control unit 110 counts the proceeding time of the sterilization cycle to determine whether the set sterilization continuation time is expired (operation 414), and if the sterilization continuation time is not expired, the control unit 110 returns to the operation 412 and proceeds with the changed sterilization cycle until the sterilization continuation time expires, by using the rotation of the drum 12 and the hot blast.

[0139] As a result of the determination from the operation 414, if the sterilization continuation time is expired, the control unit 110, through the driving unit 130, stops

the motor 15, the blower fan 66, and the heater 68, and completes the cycle of the sterilization course (operation 416).

[0140] In FIG. 9, a user inputs the substance (in particular, the bedding), which is to be sterilized, into the drum 12, and by manipulating the first selection unit 101 and the second selection unit 102 provided on the control panel 40, a user selects the sterilization course (operation 500).

[0141] Thus, when the sterilization course is selected and the operation command is input, the control unit 110 determines the weight (the volume), of the substance that is input into the drum 12 to proceed with the sterilization course (operation 502).

[0142] If the weight (the volume) of the substance is determined, the control unit 110 sets the mechanical force (the sterilization RPM and the driving factor), the airflow, the temperature, and the continuation time according to the weight (the volume) of the determined substance (operation 504).

[0143] Then, the control unit 110 operates the motor 15, the blower fan 68, and the heater 68 through the driving unit 130 to proceed with the cycle of the sterilization course, which is changed according to the weight or the volume of the substance.

[0144] To describe the above more in detail, the control unit 110 rotates the drum 12 at the set RPM and with the driving factor, according to the operation of the motor 15, thereby tumbling the bedding inside the drum 12 (operation 506).

[0145] The control unit 110 rotates the blower fan 66 using the set sterilization wind, and thus the air is started to circulate inside the drum 12 (operation 508).

[0146] Next, the control unit 110 generates high-temperature air (hot blast), by applying heat on the air being circulated inside the drum 12 by operating the heater 68 (operation 510).

[0147] As above, the hot blast generated by the operation of the heater 68 is introduced inside the drum 12 through a drying duct, and the hot blast introduced inside the drum 12 delivers heat energy deep into the inside of the bedding that tumbles while repeating the ascending and the descending operations inside the drum 12 according to the rotation of the drum 12, to proceed with the sterilization cycle, which is changed according to the weight (the volume) of the substance (operation 512).

[0148] Then, the control unit 110 counts the proceeding time of the sterilization cycle to determine whether the set sterilization continuation time is expired (operation 514), and if the sterilization continuation time is not expired, the control unit 110 returns to the operation 512 and proceeds with the changed sterilization cycle until the sterilization continuation time expires, by using the rotation of the drum 12 and the hot blast.

[0149] As a result of the determination from the operation 514, if the sterilization continuation time is expired, the control unit 110, through the driving unit 130, drives the ion generator 74 and the ultraviolet ray lamp 76 to additionally proceed with a post-processing cycle that may increase the sterilization power of the bedding (operation 516).

[0150] Meanwhile, in the embodiment of the present disclosure, the description of the post-processing cycle, which is being proceeded after the completion of the sterilization cycle, is used as an example, but the present disclosure is not limited hereto, and may be composed in a way that the post-processing cycle is proceeded while the sterilization cycle is being proceeded. In the case as such, by proceeding with the post-processing cycle, the most important factors in the sterilization course, which are the sterilization temperature and the sterilization continuation time, may be variably changed. That is, in a case when the post-processing cycle is proceeded while provided with the lower sterilization temperature and the reduced sterilization continuation time, the same sterilization effect may be anticipated compared to when the sterilization cycle is proceeded without proceeding with the post-processing cycle.

[0151] In FIG. 10, a user inputs the substance, in particular, the bedding, which is to be deodorized, into the drum 12, and by rotatably manipulating the first selection unit 101 provided on the control panel 40, a user selects the bedding care mode, and then by pressedly manipulating the second selection unit 102, a user selects the deodorization course (operation 600). The information of the deodorization course that a user selects is input in the control unit 110 through the input unit 100.

[0152] Thus, the control unit 110, when the deodorization course is selected and the operation command is input, sets the humidity, the mechanical force (the deodorization RPM and the driving factor), the airflow, the temperature, and the continuation time according to the deodorization course (operation 602). The humidity set at this time is provided in a way that a proper amount of mist is sprayed into the drum 12, so that the unpleasant odor particle attached to the bedding may be separated as the mist is coupled to the unpleasant odor particle to soak the unpleasant odor particle, and the mechanical force set at this time, that is, the deodorization RPM and the driving factor, is provided in a way that the drum 12 is rotated at a proper RPM or the deodorization RPM to eliminate the unpleasant odor particle attached to bedding, the air flow set at this time is provided in a way to rotate the blower fan 66 with the proper wind (the deodorization airflow), to eliminate the unpleasant odor particle attached to the bedding. In addition, the temperature and the continuation time set at this time are provided in a way to drive the heater 68 so that the unpleasant odor particle in the bedding may be separated by using the humidity and the hot blast. The most important factor in the deodorization course is the "humidification," and is applied with an algorithm that may maximize the performance of the humidification at the substance or the bedding. The method of the humidification includes a mist spray using a nozzle, a humidification using ultrasonic waves, and a humidification having the hot blast to pass

through the area where water is present, and in the embodiment of the present disclosure, the mist spray using a nozzle will be described as an example.

[0153] Thus, the control unit 110 operates the mist spray 72, the motor 15, the blower fan 66, and the heater 68 through the driving unit 130 to proceed with the basic cycle of the deodorization course.

[0154] To describe the above more in detail, the control unit 110 sprays the water having the form of mist (fog), at the set humidity, into the drum 12 by operating the mist spray 72 (operation 604). The humidity, which is sprayed into the drum 12, uses the amount of the spray that may separate the unpleasant odor particle attached to the bedding, as the humidity is coupled to the unpleasant odor particle and soaks the unpleasant odor particle from the bedding, and is pre-stored in the control unit 110. The humidity that is sprayed into an inside the drum 12 may be controlled by controlling the spray time. The control unit 110 rotates the drum 12 at the set mechanical force (the deodorization RPM and the driving factor), according to the operation of the motor 15, and tumbles the bedding inside the drum 12 (operation 606). The deodorization RPM and the driving factor (the ON-OFF time) of the motor, use the drying RPM at approximately 50 RPM or less and the driving factor at approximately 20 seconds with the motor ON and approximately 2 seconds with the motor OFF, respectively, and are pre-stored in the control unit 110.

[0155] The control unit 110 rotates the blower fan 66 using the set deodorization airflow, and the air is started to circulate inside the drum 12 (operation 608). The deodorization airflow is capable of separating the unpleasant odor particle attached to the bedding, and is pre-stored in the control unit 110.

[0156] Next, the control unit 110 generates high-temperature air (hot blast), by applying heat to the air being circulated inside the drum 12 by operating the heater 68 (operation 610). At this time, the control unit 110, through the temperature sensor 91, detects the temperature of the air being introduced into the drum 12, that is, the temperature of the entry unit of the drum 12, and sets the deodorization temperature, that is lower than the deodorization temperature, and the deodorization continuation time at approximately 20 minutes or more, so that the temperature introduced to the drum 12, that is, the temperature at which the water coupled to the unpleasant odor particle is changed into a form of vapor, and the deodorization temperature and the deodorization continuation time are pre-stored in the control unit 110.

[0157] As above, the hot blast generated by the operation of the heater 68 is introduced inside the drum 12 through a drying duct, and the deodorization cycle is proceeded as the hot blast introduced to an inside the drum 12 is supplied to the bedding that is humidified by the mist spray to separate the unpleasant odor particle attached at the bedding (operation 612).

[0158] Then, the control unit 110 counts the proceeding time of the deodorization cycle to determine whether the set deodorization continuation time, that is, approximately 20 minutes or more, and also the time to separate the unpleasant odor particle attached to the bedding by using humidification, is expired (operation 614), and if the deodorization continuation time is not expired, the control unit 110 returns to the operation 612 and proceeds with the deodorization cycle by using the humidification and the hot blast until the deodorization continuation time expires.

[0159] As a result of the determination from the operation 614, if the deodorization continuation time is expired, the control unit 110, through the driving unit 130, stops the mist spray 72, the motor 15, the blower fan 66, and the heater 68, and completes the cycle of the deodorization course (operation 616).

[0160] In FIG. 11, a user inputs the substance, in particular, the bedding, which is to be deodorized, inside the drum 12, and by manipulating the first selection unit 101 and the second selection unit 102 provided on the control panel 40, a user selects the deodorization course (operation 700).

[0161] Thus, when the deodorization course is selected and the operation command is input, the control unit 110 determines the weight (the volume) of the substance that is input into the drum 12 to proceed with the deodorization course (operation 702).

[0162] If the weight (the volume) of the substance is determined, the control unit 110 sets the humidity, the mechanical force (the deodorization RPM and the driving factor), the airflow, the temperature, and the continuation time according to the weight (the volume) of the determined substance (operation 704). At this time, the mechanical force set at this time is provided in a way to rotate the drum 12 at the proper RPM, that is, the deodorization RPM, and with the proper driving factor according to the weight (the volume) of the substance, and the airflow configured at this time is provided in a way to rotate the blower fan 66 with the proper airflow (the deodorization airflow) according to the weight (the volume) of the substance. In addition, the temperature and the continuation time set are provided in a way to drive the heater 68 so that the unpleasant odor particle attached at the bedding may be separated according to the weight (the volume) of the substance.

[0163] Then, the control unit 110 operates the mist spray 72, the motor 15, the blower fan 66, and the heater 68 through the driving unit 130 to proceed with the cycle of the deodorization course, which is changed according to the weight (the volume) of the substance.

[0164] To describe the above more in detail, the control unit 110 sprays the water having the form of mist or fog, which is provided with the set humidity, into an inside the drum 12 by operating the mist spray 72 (operation 706). The set humidity is the amount of the spray capable of soaking the unpleasant odor particle attached at the bedding by being coupled to the unpleasant odor particle, and the spray time is configured so that the moisture which corresponds to approximately 2% to approximate-

ly 5% of the weight or the weight (the load) of the substance may be supplied. For example, under the condition of the load of approximately 1kg, the mist or the humidification is configured to be approximately 20g to approximately 50g to be supplied to the substance, and in a case when a water supply valve having the capacity of approximately 0.1 liter/min is used, the humidification time may be set for approximately 12 seconds to approximately 55 seconds. However, because the mist and the humidified moisture are not all making contact with the substance, the actual supply time is set to be longer than the calculated setting time.

[0165] That is, with respect to the set humidity, a table showing the mist or the humidification at each load provided for the mist spray or the humidification during the deodorization course is stored in the control unit 110, and the mist or the humidification, which corresponds to the weight (the volume) of the substance, is invoked for use from the table showing the mist or the humidification at each load stored in the control unit 110. In addition, with respect to the set humidity, a table showing supply time at each load provided for the mist spray or the humidification during the deodorization course is stored in the control unit 110, and the supply time, which corresponds to the weight (the volume) of the substance, is invoked from the table showing supply time at each load stored in the control unit 110 so that the humidity may be controlled by operating the mist spray 72 or the water supply valve during the supply time.

[0166] The control unit 110 rotates the drum 12 at the set deodorization RPM and driving factor, according to the operation of the motor 15, thereby tumbling the bedding inside the drum 12 (operation 708). The deodorization RPM at approximately less than 50 RPM, and the driving factor of approximately 20 seconds with the motor ON and approximately 2 seconds with the motor OFF, which are the same in a conventional drying cycle, may be used, or the motor RPM and the driving factor that are capable of delivering a proper mechanical force according to the weight (the volume) of the substance.

[0167] The control unit 110 rotates the blower fan 66 using the set deodorization airflow, and the air is started to circulate inside the drum 12 (operation 710). The set deodorization airflow is capable of separating the unpleasant odor particle attached at the bedding, and the deodorization airflow, which corresponds to the weight (the volume) of the substance, is invoked for use from the table showing the deodorization airflow that is stored in the control unit 110.

[0168] Next, the control unit 110 generates high-temperature air (hot blast), by applying heat on the air being circulated inside the drum 12 by operating the heater 68 (operation 712). At this time, the control unit 110, through the temperature sensor 91, detects the temperature of the air being introduced into the drum 12and sets the deodorization temperature, that is, the temperature at which the water coupled to the unpleasant odor particle attached to the bedding is changed into a form of vapor, and the deodorization continuation time, that is, the time during which the water coupled to the unpleasant odor particle attached to the bedding is changed into a form of vapor, and the deodorization temperature and the deodorization continuation time, which correspond to the weight (the volume) of the substance, are invoked for use from the table showing the temperature and the time stored in the control unit 110.

[0169] As the above, the hot blast generated by the operation of the heater 68 is introduced to an inside the drum 12 through a drying duct, and the deodorization cycle is proceeded as the hot blast introduced inside the drum 12 is supplied to the bedding, which is humidified by the mist spray, to separate the unpleasant odor particle attached at the bedding (operation 714).

[0170] Then, the control unit 110 counts the proceeding time of the deodorization cycle to determine whether the set deodorization continuation time is expired (operation 716), and if the deodorization continuation time is not expired, the control unit 110 returns to the operation 714 and proceeds with the changed deodorization cycle, until the deodorization continuation time expires, by using the humidification and the hot blast.

[0171] As a result of the determination from the operation 716, if the deodorization continuation time is expired, the control unit 110, through the driving unit 130, stops the mist spray 72, the motor 15, the blower fan 66, and the heater 68, and completes the cycle of the deodorization course (operation 718).

[0172] In FIG. 12, a user inputs the substance, in particular, the bedding, which is to be deodorized, into the drum 12, and by manipulating the first selection unit 101 and the second selection unit 102 provided on the control panel 40, a user selects the deodorization course (operation 800).

[0173] Thus, when the deodorization course is selected and the operation command is input, the control unit 110 determines the weight (the volume) of the substance that is input into the drum 12 to proceed with the deodorization course (operation 802).

[0174] If the weight (the volume) of the substance is determined, the control unit 110 sets the humidity, the mechanical force, that is, the deodorization RPM and the driving factor, the airflow, the temperature, and the continuation time according to the weight (the volume) of the determined substance (operation 804).

[0175] Then, the control unit 110 operates the mist spray 72, the motor 15, the blower fan 66, and the heater 68 through the driving unit 130 to proceed with the cycle of the deodorization course, which is changed according to the weight (the volume) of the substance.

[0176] To describe the above more in detail, the control unit 110 sprays the water having the form of mist or fog, which is provided with the set humidity, into an inside the drum 12 by operating the mist spray 72 (operation 806).

[0177] In addition, with respect to the supply time, the supply time, which corresponds to the weight (the volume) of the substance, may be invoked from the table

showing spray time stored in the control unit 110, so that the humidity may be controlled by operating the mist spray 72 during the supply time. The control unit 110 rotates the drum 12 at the configured deodorization RPM and with the driving factor, according to the operation of the motor 15, thereby tumbling the bedding inside the drum 12 (operation 808), and the control unit 110 rotates the blower fan 66 using the configured deodorization airflow, and the air is started to circulate inside the drum 12 (operation 810).

[0178] Next, the control unit 110 generates high-temperature air, that is, hot blast, by applying heat on the air being circulated inside the drum 12 by operating the heater 68 (operation 812).

[0179] As above, the hot blast generated by the operation of the heater 68 is introduced to an inside the drum 12 through a drying duct, and the deodorization cycle which is changed to be suitable for the substance is proceeded as the hot blast introduced to an inside the drum 12 is supplied to the bedding, which is humidified by the mist spray, to separate the unpleasant odor particle attached at the bedding (operation 814).

[0180] Then, the control unit 110 counts the proceeding time of the deodorization cycle to determine whether the configured deodorization continuation time is expired (operation 816), and if the deodorization continuation time is not expired, the control unit 110 returns to the operation 814 and proceeds with the changed deodorization cycle until the deodorization continuation time expires, by using the humidification and the hot blast.

[0181] As a result of the determination from the operation 816, if the deodorization continuation time is expired, the control unit 110, through the driving unit 130, drives the ion generator 74 and the ultraviolet ray lamp 76, and additionally proceeds with the after-processing cycle to increase the deodorization power (operation 818). Meanwhile, in the embodiment of the present disclosure, the description of the post-processing cycle, which is being proceeded after the completion of the deodorization cycle, is used as an example, but the present disclosure is not limited hereto, and may be composed in a way that the post-processing cycle is proceeded while the deodorization cycle is being proceeded. In the case as such, by proceeding with the post-processing cycle, the most important factor in the deodorization course, which is humidity, may be variably changed. That is, in a case when the post-processing cycle is proceeded while reducing humidity, the same deodorization effect may be anticipated compared to when the deodorization cycle is proceeded without proceeding with the post-processing cycle.

[0182] FIG. 13 is a flow chart of an operation of a control algorithm of a tick, or pest, elimination course for the elimination of pests, such as ticks, fleas, bedbugs, or mites, for example, on bedding at a washing machine having a drying apparatus in accordance with an embodiment of the present disclosure. In FIG. 13, a user inputs the substance, in particular, the bedding, which is to be deodorized, into the drum 12, and by rotatably manipulating the first selection unit 101 provided on the control panel 40, a user selects the bedding care mode, and then by pressedly manipulating the second selection unit 102, a user selects the tick elimination course (operation 900). The information of the tick elimination course that a user selects is input in the control unit 110 through the input unit 100.

[0183] Thus, the control unit 110, when the tick elimination course is selected and the operation command is input, sets the mechanical force, that is, the tick elimination RPM and the driving factor, the airflow, the temperature, and the continuation time according to the tick elimination course (operation 902). The mechanical force set at this time is provided in a way that the drum 12 is rotated at a proper PRM or the tick elimination RPM to eliminate the ticks that inhabit the bedding, and the airflow set at this time is provided in a way to rotate the blower fan 66 with the proper airflow, stronger than that of the sterilization course, which is to be referred to as tick elimination airflow, to eliminate ticks that inhabit the bedding. In addition, the temperature and the continuation time set are provided in a way to drive the heater 68 so that the temperature of the entire bedding or a portion of the bedding may be maintained at above a predetermined level of temperature by using hot blast for a predetermined period of the continuation time, that is, within 20 minutes, that corresponds to the condition in eliminating the ticks that inhabit the bedding. The most important factor in the tick elimination course is the temperature, and the temperature inside the substance, not only on a surface of the substance (the bedding) but also the inside the substance, is set at or above approximately 60°C, which provides the condition capable of eliminating the tick, and the temperature is set to be lower than the temperature of the sterilization course. Thus, the control unit 110 operates the motor 15, the blower fan 66, and the heater 68 through the driving unit 130 to proceed with the basic cycle of the tick elimination course.

[0184] To describe the above more in detail, the control unit 110 rotates the drum 12 at the set mechanical force, that is, the tick elimination RPM, and with the driving factor, according to the operation of the motor 15, thereby tumbling the bedding inside the drum 12 (operation 904). The tick elimination driving factor (the ON-OFF time) of the motor is configured in a way that the motor OFF time is longer, that is, by setting the motor ON time at approximately 2 seconds and the motor OFF time at approximately 60 seconds, so that the hot blast at high temperature is introduced deep inside the bedding with such a driving factor, not only at a surface of the bedding, and the tick elimination driving factor is pre-stored in the control unit 110

[0185] The control unit 110 rotates the blower fan 66 using the set tick elimination airflow, and the air is started to circulate inside the drum 12 (operation 906). The tick elimination airflow is provided with the stronger airflow than the sterilization airflow, so that the tick elimination

airflow may be able to deliver heat energy deep inside the bedding, and is pre-stored in the control unit 110.

[0186] Next, the control unit 110 generates high-temperature air, that is, hot blast, by applying heat on the air being circulated inside the drum 12 by operating the heater 68 (operation 908). At this time, the control unit 110, through the temperature sensor 91, detects the temperature of the air being introduced into the drum 12, that is, the temperature of the entry of the drum 12, and sets the tick elimination temperature (at approximately 80°C) and the tick elimination continuation time (at approximately 18 minutes or more), so that the temperature inside the bedding may be at the temperature at which the tick elimination may be possible, that is, at approximately 60°C or above, and the tick elimination temperature and the tick elimination continuation time are pre-stored in the control unit 110. The sterilization requires a long period of time, but the tick elimination is achieved by only maintaining the substance a temperature of approximately 60°C or above for approximately 18 minutes. Accordingly, within a relatively short period of time, a hygienic bedding is provided to the user.

[0187] As above, the hot blast generated by the operation of the heater 68 is introduced inside the drum 12 through a drying duct, and the hot blast introduced inside the drum 12 delivers heat energy deep into the inside of the bedding that tumbles while repeating the ascending and the descending operations inside the drum 12 according to the rotation of the drum 12, to proceed with the tick elimination cycle to eliminate the tick inhabiting the bedding, not only at a surface of the bedding (operation 910).

[0188] Then, the control unit 110 counts the proceeding time of the tick elimination cycle to determine whether the set tick elimination continuation time, which is approximately 18 minutes or more, that is, the time needed for the entire bedding or a portion of the bedding to be continued and maintained at above a predetermined level of temperature by using hot blast, is expired (operation 912), and if the tick elimination continuation time is not expired, the control unit 110 returns to the operation 910 and proceeds with the tick elimination cycle by using the rotation of the drum 12 and the hot blast until the tick elimination continuation time expires.

[0189] As a result of the determination from the operation 912, if the tick elimination continuation time is expired, the control unit 110, through the driving unit 130, stops the motor 15, the blower fan 66, and the heater 68, and completes the basic cycle of the tick elimination course (operation 914).

[0190] In FIG. 14, a user inputs the substance, in particular, the bedding, from which the tick elimination is to be occurred, into the drum 12, and by manipulating the first selection unit 101 and the second selection unit 102 provided on the control panel 40, a user selects the tick elimination course (operation 1000).

[0191] Thus, when the tick elimination course is selected and the operation command is input, the control unit 110 determines the weight (the volume) of the substance that is input into the drum 12 to proceed with the tick elimination course (operation 1002). When the weight (the volume) of the substance is determined, the control unit 110 sets the mechanical force, that is, the tick elimination RPM and the driving factor, the airflow, the temperature, and the continuation time according to the weight (the volume) of the determined substance (operation 1004). The mechanical force set at this time is provided in a way to rotate the drum 12 at the proper RPM, that is, the tick elimination of the substance, and with the proper driving factor according to the weight (the volume) of the substance, and the airflow set at this time is provided in a way to rotate the blower fan 66 with the proper airflow, that is, the tick elimination airflow, according to the weight (the volume) of the substance. In addition, the temperature and the continuation time set are provided in a way to drive the heater 68 so that the temperature of the entire bedding or a portion of the bedding may be maintained at above a predetermined level of temperature according to the weight (the volume) of the substance.

[0192] Then, the control unit 110 operates the motor 15, the blower fan 66, and the heater 68 through the driving unit 130 to proceed with the cycle of the tick elimination course, which is changed according to the weight (the volume) of the substance.

[0193] To describe the above more in detail, the control unit 110 rotates the drum 12 at the set mechanical force, that is, the tick elimination RPM, and with the driving factor, according to the operation of the motor 15, thereby tumbling the bedding inside the drum 12 (operation 1006). The set tick elimination RPM may use the same drying RPM of a conventional drying cycle, which is at approximately 50 RPM or less, or may use a motor RPM capable of delivering a proper mechanical force according to the weight (the volume) of the substance. In addition, the set driving factor is provided in a way that the motor OFF time is longer, that is, by setting the motor ON time at approximately 2 seconds and the motor OFF time at approximately 60 seconds, and may be changed according to the weight (the volume) of the substance.

[0194] The control unit 110 rotates the blower fan 66 using the set tick elimination airflow, and the air is started to circulate inside the drum 12 (operation 1008). The tick elimination airflow is provided with the stronger airflow than the sterilization airflow to deliver heat energy deep inside the bedding, and the tick elimination airflow, which corresponds to the weight (the volume) of the substance, is invoked for use from the table showing the tick elimination airflow that is stored in the control unit 110.

[0195] Next, the control unit 110 generates high-temperature air, that is, hot blast, by applying heat on the air being circulated inside the drum 12 by operating the heater 68 (operation 1010). At this time, the control unit 110, through the temperature sensor 91, detects the temperature of the air being introduced into the drum 12, and sets the tick elimination temperature and the tick elimi-

nation continuation time, so that the temperature inside the bedding may be at the temperature at which the tick elimination may be possible, that is, at approximately 60°C or above, and the tick elimination temperature and the tick elimination continuation time, which correspond to the weight (the volume) of the substance, are invoked for use from the table showing temperature and the time stored in the control unit 110.

[0196] As the above, the hot blast generated by the operation of the heater 68 is introduced to an inside the drum 12 through a drying duct, and the hot blast introduced to an inside the drum 12 delivers heat energy deep into the inside the bedding that tumbles while repeating the ascending and the descending operations inside the drum 12 according to the rotation of the drum 12, to proceed with the tick elimination cycle, which is changed according to the weight (the volume) of the substance (operation 1012).

[0197] Then, the control unit 110 counts the proceeding time of the tick elimination cycle to determine whether the set tick elimination continuation time is expired (operation 1014), and if the tick elimination continuation time is not expired, the control unit 110 returns to the operation 1012 and proceeds with the changed tick elimination cycle, by using the rotation of the drum 12 and the hot blast until the tick elimination continuation time expires.

[0198] As a result of the determination from the operation 1014, if the tick elimination continuation time is expired, the control unit 110, through the driving unit 130, stops the motor 15, the blower fan 66, and the heater 68, and completes the basic cycle of the changed tick elimination course (operation 1016).

[0199] In FIG. 15, a user inputs the substance, in particular, the bedding, from which the tick elimination is to be occurred, into the drum 12, and by manipulating the first selection unit 101 and the second selection unit 102 provided on the control panel 40, a user selects the tick elimination course (operation 1100).

[0200] Thus, when the tick elimination course is selected and the operation command is input, the control unit 110 determines the weight (the volume) of the substance that is input into the drum 12 to proceed with the tick elimination course (operation 1102).

[0201] When the weight (the volume) of the substance is determined, the control unit 110 sets the mechanical force, that is, the tick elimination RPM and the driving factor, the airflow, the temperature, and the continuation time according to the weight (the volume) of the determined substance (operation 1104).

[0202] Then, the control unit 110 operates the motor 15, the blower fan 66, and the heater 68 through the driving unit 130 to proceed with the cycle of the tick elimination course, which is changed according to the weight (the volume) of the substance.

[0203] To describe the above more in detail, the control unit 110 rotates the drum 12 at the set mechanical force, that is, the tick elimination RPM, and with the driving factor, according to the operation of the motor 15, thereby tumbling the bedding inside the drum 12 (operation 1106).

[0204] The control unit 110 rotates the blower fan 66 using the set tick elimination airflow, and the air is started to circulate inside the drum 12 (operation 1108).

[0205] Next, the control unit 110 generates high-temperature air, that is, hot blast, by applying heat on the air being circulated inside the drum 12 by operating the heater 68 (operation 1110).

[0206] As above, the hot blast generated by the operation of the heater 68 is introduced inside the drum 12 through a drying duct, and the hot blast introduced to the inside of the drum 12 delivers heat energy deep into the inside of the bedding that tumbles while repeats the ascending and the descending operations inside the drum 12 according to the rotation of the drum 12, to proceed with the tick elimination cycle, which is changed according to the weight (the volume) of the substance (operation 1112).

[0207] Then, the control unit 110 counts the proceeding time of the tick elimination cycle to determine whether the set tick elimination continuation time is expired (operation 1114), and if the tick elimination continuation time is not expired, the control unit 110 returns to the operation 1112 and proceeds with the changed tick elimination cycle by using the rotation of the drum 12 and the hot blast until the tick elimination continuation time expires.

[0208] As a result of the determination from the operation 1114, if the tick elimination continuation time is expired, the control unit 110, through the driving unit 130, drives the ion generator 74 and the ultraviolet ray lamp 76 to additionally proceed with an post-processing cycle that may increase the tick elimination power of the bedding (operation 1116).

[0209] Meanwhile, in the embodiment of the present disclosure, the description of the post-processing cycle, which is being proceeded after the completion of the tick elimination cycle, is used as an example, but the present disclosure is not limited hereto, and may be composed in a way that the post-processing cycle is proceeded while the tick elimination cycle is being proceeded. In the case as such, by proceeding with the post-processing cycle, the most important factors in the tick elimination course, which are the tick elimination temperature and the tick elimination continuation time, may be variably changed. That is, in a case when the post-processing cycle is proceeded while provided with the lower tick elimination temperature and the reduced tick elimination continuation time, the same tick elimination effect may be anticipated compared to as when the tick elimination cycle is proceeded without proceeding with the post-processing cycle.

[0210] In FIG. 16, a user inputs the substance, in particular, the bedding, from which dust is be eliminated, into the drum 12, and by rotatably manipulating the first selection unit 101 provided on the control panel 40, a user selects the bedding care mode, and then by pressedly manipulating the second selection unit 102, a user

selects the dust elimination course (operation 1200). The information of the dust elimination course that a user selects is input in the control unit 110 through the input unit 100.

[0211] Thus, the control unit 110, when the dust elimination course is selected and the operation command is input, sets the mechanical force, that is, the dust elimination RPM and the driving factor, the airflow, and the continuation time according to the dust elimination course (operation 1202). The mechanical force set at this time is provided in a way to rotate the drum 12 at the proper RPM, that is, the dust elimination RPM, and with the proper driving factor to eliminate the dust attached at the bedding, and the airflow set at this time is provided in a way to rotate the blower fan 66 with the stronger airflow, which is stronger than the airflows in the sterilization course, the deodorization course, and the tick elimination course, and hereinafter called as the dust elimination airflow, to eliminate the dust attached at the bedding. In addition, the continuation time set is provided in a way to drive the motor 15 and the blower fan 66 for a predetermined period of time at within 30 minutes during which the dust attached at the bedding may be eliminated by using the strong airflow. The most important factors in the dust elimination course are the "strong airflow and mechanical force," and is set in a way that the physical force being applied at the substance or the bedding is maximized so that the elimination of the dust attached at the substance or the bedding is made possible, and the maximum airflow and the mechanical force are set within the range in which the substance is not being damaged.

[0212] Thus, the control unit 110 operates the motor 15 and the blower fan 66 through the driving unit 130 to proceed with the basic cycle of the dust elimination course.

[0213] To describe the above more in detail, the control unit 110 rotates the drum 12 at the set mechanical force, that is, the dust elimination RPM, and with the driving factor, according to the operation of the motor 15, thereby tumbling the bedding inside the drum 12 (operation 1204). The dust elimination RPM uses the RPM that is equal to or greater than approximately 200 RPM, which is far higher than the drying RPM, which is at approximately 50 RPM or less, used at the sterilization course, the deodorization course, and the tick elimination course, and the driving factor (the ON-OFF time) of the motor uses the same driving factor as in a conventional drying cycle, which is at approximately 20 seconds with the motor ON and approximately 2 seconds with the motor OFF, or is set to have the longer motor ON time.

[0214] That is, the dust elimination RPM and the driving factor of the dust elimination course are set to be provided with the values, to separate the dust attached from the bedding by maximizing the physical force being applied to the substance or the bedding, and are pre-stored in the control unit 110.

[0215] Then, the control unit 110 rotates the blower fan 66 using the set dust elimination airflow, and the air inside the drum 12 is started to circulate (operation 1206). The dust elimination airflow, in order to separate and eliminate the dust attached at the bedding, uses a strong airflow having a strength increased by approximately 120% to approximately 150% when compared to airflow from the sterilization course, the deodorization course, and the tick elimination course, and is pre-stored in the control unit 110.

[0216] As the above, the strong airflow generated by the operation of the blower fan 66 is introduced to an inside the drum 12 through a drying duct, and the strong airflow introduced to an inside the drum 12 separates the dust attached at the bedding that tumbles while repeating the ascending and the descending operations inside the drum 12 according to the rotation of the drum 12, to proceed with the dust elimination cycle that eliminates the dust attached inside the bedding, not only on a surface of the bedding (operation 1208).

[0217] Then, the control unit 110 counts the proceeding time of the dust elimination cycle to determine whether the set dust elimination continuation time (the time to eliminate the dust attached at the bedding by using airflow, that is, within approximately 30 minutes), is expired (operation 1210), and if the dust elimination continuation time is not expired, the control unit 110 returns to the operation 1208 and proceeds with the dust elimination cycle by using the rotation of the drum 12 and the hot blast until the dust elimination continuation time expires.

[0218] As a result of the determination from the operation 1210, if the dust elimination continuation time is expired, the control unit 110, through the driving unit 130, stops the motor 15 and the blower fan 66, thereby completing the basic cycle of the dust elimination course (operation 1212).

[0219] In FIG. 17, a user inputs the substance, in particular, the bedding, from which dust is to be eliminated, into the drum 12, and by manipulating the first the first selection unit 101 and the second selection unit 102 provided on the control panel 40, a user selects the dust elimination course (operation 1300).

[0220] Thus, when the dust elimination course is selected and the operation command is input, the control unit 110 determines the weight (the volume) of the substance that is input into the drum 12 to proceed with the dust elimination course (operation 1302). When the weight (the volume) of the substance is determined, the control unit 110 sets the mechanical force, that is, the dust elimination RPM and the driving factor, the airflow, and the continuation time according to the weight (the volume) of the determined substance (operation 1304). The mechanical force set at this time is provided in a way to rotate the drum 12 at the proper RPM, that is, the dust elimination of the substance, and with the proper driving factor according to the weight (the volume) of the substance, and the airflow set at this time is provided in a way to rotate the blower fan 66 with the proper airflow, that is, the dust elimination airflow, according to the

weight (the volume) of the substance. In addition, the set continuation time is set to the time, during which the dust attached at the bedding is separated and eliminated, according to the weight (the volume) of the substance, so that the satisfaction of a user is increased.

[0221] Then, the control unit 110 operates the motor 15 and the blower fan 66 through the driving unit 130 to proceed with the cycle of the dust elimination course, which is changed according to the weight (the volume) of the substance.

[0222] To describe the above more in detail, the control unit 110 rotates the drum 12 at the set mechanical force, that is, the dust elimination RPM, and with the driving factor, according to the operation of the motor 15, thereby tumbling the bedding inside the drum 12 (operation 1306). The dust elimination RPM uses an RPM that is equal to or greater than approximately 200 RPM, which is far higher than the drying RPM, which is at approximately less than 50 RPM, used at the sterilization course, the deodorization course, and the tick elimination course, or uses an RPM capable of delivering the maximum mechanical force according to the weight (the volume) of the substance. In addition, the set dust elimination driving factor uses the same driving factor as in a conventional drying cycle, which is at approximately 20 seconds with the motor ON and approximately 2 seconds with the motor OFF, or is set to have the longer motor ON time, and may be changed according to the weight (the volume) of the substance.

[0223] Then, the control unit 110 rotates the blower fan 66 using the set dust elimination airflow, and the air inside the drum 12 is started to strongly circulate (operation 1308).

[0224] The dust elimination airflow, in order to separate and eliminate the dust attached at the bedding, is set to be stronger than the airflow from the sterilization course, the deodorization course, and the tick elimination course, and the dust elimination airflow, which corresponds to the weight (the volume) of the substance, is invoked for use from the airflow table stored in the control unit 110.

[0225] Other than the above, the control unit 110 invokes the dust elimination continuation time, which corresponds to the weight (the volume) of the substance, for use from the table showing the dust elimination time stored in the control unit 110.

[0226] As the above, the strong airflow generated by the operation of the heater 68 is introduced to an inside the drum 12 through a drying duct, and the strong airflow introduced to an inside the drum 12 separates the dust attached at the bedding that tumbles while repeating the ascending and the descending operations inside the drum 12 according to the rotation of the drum 12, to proceed with the dust elimination cycle, which is changed according to the weight (the volume) of the substance (operation 1310).

[0227] Then, the control unit 110 counts the proceeding time of the dust elimination cycle to determine whether the set dust elimination continuation time is expired (operation 1312), and if the dust elimination continuation time is not expired, the control unit 110 returns to the operation 1310 and proceeds with the dust elimination cycle by using the rotation of the drum 12 and the airflow until the dust elimination continuation time expires.

[0228] As a result of the determination from the operation 1312, if the dust elimination continuation time is expired, the control unit 110, through the driving unit 130, stops the motor 15 and the blower fan 66, thereby completing the cycle of the dust elimination course (operation 1314).

[0229] In FIG. 18, a user inputs the substance, in particular, the bedding, from which dust is to be eliminated, into the drum 12, and by manipulating the first the first selection unit 101 and the second selection unit 102 provided on the control panel 40, a user selects the dust elimination course (operation 1400).

[0230] Thus, when the dust elimination course is selected and the operation command is input, the control unit 110 determines the weight (the volume) of the substance that is input into the drum 12 to proceed with the dust elimination course (operation 1402).

[0231] When the weight (the volume) of the substance is determined, the control unit 110 sets the mechanical force, that is, the dust elimination RPM and the driving factor, the airflow, and the continuation time according to the weight (the volume) of the determined substance (operation 1404).

[0232] Then, the control unit 110 operates the motor 15 and the blower fan 66 through the driving unit 130 to proceed with the cycle of the dust elimination course, which is changed according to the weight (the volume) of the substance.

[0233] To describe the above more in detail, the control unit 110 rotates the drum 12 at the set dust elimination RPM, and with the driving factor, according to the operation of the motor 15, thereby tumbling the bedding inside the drum 12 (operation 1406). Then, the control unit 110 rotates the blower fan 66 using the set dust elimination airflow, and the air inside the drum 12 is started to strongly circulate (operation 1408).

[0234] As the above, the strong airflow generated by the operation of the blower fan 66 is introduced to an inside the drum 12 through a drying duct, and the strong airflow introduced to an inside the drum 12 separates the dust attached at the bedding that tumbles while repeating the ascending and the descending operations inside the drum 12 according to the rotation of the drum 12, thereby proceeding with the dust elimination cycle, which is changed according to the weight (the volume) of the substance (operation 1410).

[0235] Then, the control unit 110 counts the proceeding time of the dust elimination cycle to determine whether the set dust elimination continuation time is expired (operation 1412), and if the dust elimination continuation time is not expired, the control unit 110 returns to the operation 1410 and proceeds with the changed dust elimination cycle by using the rotation of the drum 12 and the

airflow until the dust elimination continuation time expires.

[0236] As a result of the determination from the operation 1412, if the dust elimination continuation time is expired, the control unit 110, through the driving unit 130, drives the ion generator 74 and the ultraviolet ray lamp 76 to additionally proceed with an post-processing cycle that may increase the dust elimination power of the bedding (operation 1414).

[0237] Meanwhile, in the embodiment of the present disclosure, the description of the post-processing cycle, which is being proceeded after the completion of the dust elimination cycle, is used as an example, but the present disclosure is not limited hereto, and may be composed in a way that the post-processing cycle is proceeded while the dust elimination cycle is being proceeded.

[0238] In addition, according to the washing machine 1 having a drying apparatus, a vertex may be detected by measuring a current when the motor 15 rotates. By using the detected vertex, a vertex falling algorithm according to weight (load) of the substance is applied to determining the rotation RPM and the driving factor of the drum 12.

[0239] In FIG. 19, a user inputs the substance, in particular, the bedding, to be refreshed, into the drum 12, and by rotatably manipulating the first selection unit 101 provided on the control panel 40, a user selects the bedding care mode, and then by pressedly manipulating the second selection unit 102, a user selects the refreshing course (operation 1500). The information of the refreshing course that a user selects is input in the control unit 110 through the input unit 100.

[0240] Thus, the control unit 110, when the refreshing course is selected and the operation command is input, sets the mechanical force, that is, the refreshing RPM and the driving factor, the airflow, the temperature, and the continuation time according to the refreshing course (operation 1502). The mechanical force set at this time is provided in a way to rotate the drum 12 at the proper RPM, that is, the refreshing RPM, and with the proper driving force, to refresh the compressed state of the cotton or the sponge inside the bedding, and the airflow set at this time is provided in a way to rotate the blower fan 66 with proper airflow, that is, the refreshing airflow, to refresh the compressed state of the cotton or the sponge inside the bedding. In addition, the temperature and the continuation time set are provided in a way to drive the heater 68 so that the temperature of the entire bedding or a portion of the bedding may be maintained at above a predetermined level of temperature by using hot blast. The most important factors in the refreshing course are the "temperature and mechanical force," and are set in a way to eliminate moisture generated during the storage process of the bedding and to refresh the compressed state, and the temperature and the mechanical force are set within the range in which the substance is not being damaged.

[0241] Thus, the control unit 110 operates the motor 15, the blower fan 66, and the heater 68 through the driving unit 130 to proceed with the basic cycle of the refreshing course. To describe the above more in detail, the control unit 110 rotates the drum 12 at the set mechanical force, that is, the refreshing RPM, and with the driving factor, according to the operation of the motor 15, thereby tumbling the bedding inside the drum 12 (operation 1504). The refreshing RPM and the driving factor, that is, the ON-OFF time of the motor, are set higher than the driving RPMs and the driving factors of the sterilization course and the tick elimination course, and are pre-stored in the control unit 110.

[0242] The control unit 110 rotates the blower fan 66 using the set refreshing airflow, and the air inside the drum 12 is started to circulate (operation 1506). The refreshing airflow uses the airflow capable of delivering heat energy deep into an inside of the bedding, and is pre-stored in the control unit 110.

[0243] Next, the control unit 110 drives the heater 68 to apply heat on the air that circulates inside the drum 12, thereby the high-temperature air, that is, the hot blast, is generated (operation 1508). At this time, the control unit 110 detects the temperature of the air, which is being introduced into the drum 12, that is, the temperature at the entry of the drum, through the temperature sensor 91, and sets the refreshing temperature, which is lower than the sterilization temperature and capable of eliminating the moisture generated during the storage process of the bedding, and the refreshing continuation time, which is within approximately 20 minutes, and the refreshing temperature and the refreshing continuation time are pre-stored in the control unit 110.

[0244] As the above, the hot blast generated by the operation of the heater 68 is introduced to an inside the drum 12 through a drying duct, and the hot blast introduced to an inside the drum 12 delivers heat energy deep into the bedding that tumbles while repeating the ascending and the descending operations inside the drum 12 according to the rotation of the drum 12, to proceed with the refreshing cycle, which is set to eliminate the moisture generated during the storage process of the bedding and refresh the compressed state of the bedding, thereby providing the soft, dry bedding (operation 1510).

[0245] Then, the control unit 110 counts the proceeding time of the refreshing cycle to determine whether the set refreshing time that is the time to eliminate the moisture of the bedding and refresh the compressed state of the bedding, for example, within approximately 20 minutes is expired (operation 1512), and if the refreshing continuation time is not expired, the control unit 110 returns to the operation 1510 and proceeds with the refreshing cycle by using the rotation of the drum 12 and the hot blast until the refreshing continuation time expires.

[0246] As a result of the determination from the operation 1512, if the refreshing continuation time is expired, the control unit 110, through the driving unit 130, stops the motor 15, the blower fan 66, and the heater 68, there-

by completing the basic cycle of the refreshing course (operation 1514).

[0247] In FIG. 20, a user inputs the substance, in particular, the bedding, to be refreshed, into an inside the drum 12, and by manipulating the first selection unit 101 and the second selection unit 102 that are provided on the control panel 40, a user selects the refreshing course (operation 1600).

[0248] Thus, the control unit 110, when the refreshing course is selected and the operation command is input, detects the moisture content of the substance being input into the drum 12 (operation 1602). With reference to the method of detecting the moisture of the substance, the moisture content may be detected by directly detecting the moisture content of the substance by use of the humidity sensor 92 installed at a lower end of a front surface of the drum 12, by measuring a temperature increase by use of a sensor provided at a rear surface of the washing machine 1, or by directly measuring a resistance at the time when the substance is in contact with the drum 12 using a capacitance sensor attached to the drum 12.

[0249] Other than the above, a user may determine the state of the moisture content of the substance and directly input the moisture content data in the control unit 110.

[0250] When the moisture content of the substance is detected, the control unit 110 sets the mechanical force, that is, the refreshing RPM and the driving factor, the airflow, the temperature, and the continuation time according to the detected moisture content of the substance (operation 1604). The mechanical force set at this time is provided in a way to rotate the drum 12 at the proper RPM, that is, the refreshing RPM, and with the proper driving force, and the airflow set at this time is provided in a way to rotate the blower fan 66 with proper airflow. In addition, the temperature and the continuation time set are provided in a way to drive the heater 68 so that the temperature of the entire bedding or a portion of the bedding may be maintained at above a predetermined level of temperature according to the moisture content of the substance.

[0251] Then, the control unit 110 operates the motor 15, the blower fan 66, and the heater 68 through the driving unit 130 to proceed with the cycle of the refreshing course, which is changed according to the moisture content of the substance.

[0252] To describe the above more in detail, the control unit 110 rotates the drum 12 at the set mechanical force, that is, the refreshing RPM, and with the driving factor, according to the operation of the motor 15, thereby tumbling the bedding inside the drum 12

[0253] (operation 1606). The refreshing RPM and the driving factor are set higher than the driving RPMs and the driving factors of the sterilization course and the tick elimination course.

[0254] The control unit 110 rotates the blower fan 66 using the set refreshing wind, and the air inside the drum 12 is started to circulate (operation 1608). With reference to the set refreshing airflow, which is the airflow capable of delivering heat energy deep into an inside the bedding, the refreshing airflow, which corresponds to the moisture content of the substance, is invoked for use from the table stored in the control unit 110.

[0255] Next, the control unit 110 drives the heater 68 to apply heat on the air that circulates inside the drum 12, and thereby the high-temperature air, that is, the hot blast, is generated (operation 1610). At this time, the control unit 110 detects the temperature of the air, which is being introduced into the drum 12 through the temperature sensor 91, and sets the refreshing temperature and the refreshing continuation time at which the moisture generated during the storage process of the bedding is able to be removed.

[0256] With reference to the refreshing temperature and the refreshing continuation time, the refreshing temperature and the refreshing continuation time, which correspond to the moisture content of the substance, are invoked for use from the temperature and time table stored in the control unit 110.

[0257] As the above, the hot blast generated by the operation of the heater 68 is introduced to an inside the drum 12 through a drying duct, and the hot blast introduced to an inside the drum 12 delivers heat energy deep into an inside the bedding that tumbles while repeating the ascending and the descending operations inside the drum 12 according to the rotation of the drum 12, to proceed with the refreshing cycle, which is changed according to the moisture content of the substance (operation 1612).

[0258] Then, the control unit 110 counts the proceeding time of the refreshing cycle to determine whether the set refreshing time is expired (operation 1614), and if the refreshing continuation time is not expired, the control unit 110 returns to the operation 1612 and proceeds with the refreshing cycle by using the rotation of the drum 12 and the hot blast until the refreshing continuation time expires.

[0259] As a result of the determination from the operation 1614, if the refreshing continuation time is expired, the control unit 110, through the driving unit 130, stops the motor 15, the blower fan 66, and the heater 68, thereby completing the cycle of the refreshing course (operation 1616).

[0260] In FIG. 21, a user inputs the substance, in particular, the bedding, to be refreshed, into the drum 12, and by manipulating the first selection unit 101 and the second selection unit 102 that are provided on the control panel 40, a user selects the refreshing course (operation 1700).

[0261] Thus, the control unit 110, when the refreshing course is selected and the operation command is input, detects the moisture content of the substance being input into the drum 12 to proceed with the refreshing course (operation 1702). When the moisture of the substance is detected, the control unit 110 sets the mechanical force, that is, the refreshing RPM and the driving factor, the

airflow, the temperature, and the continuation time according to the detected moisture content of the substance (operation 1704).

[0262] Then, the control unit 110 operates the motor 15, the blower fan 66, and the heater 68 through the driving unit 130 to proceed with the cycle of the refreshing course, which is changed according to the moisture content of the substance.

[0263] To describe the above more in detail, the control unit 110 rotates the drum 12 at the set mechanical force, that is, the refreshing RPM, and with the driving factor, according to the operation of the motor 15, thereby tumbling the bedding inside the drum 12 (operation 1706).

[0264] The control unit 110 rotates the blower fan 66 using the set refreshing airflow, and the air inside the drum 12 is started to circulate (operation 1708).

Next, the control unit 110 drives the heater 68 to apply heat on the air that circulates inside the drum 12, and thereby the high-temperature air, that is, the hot blast, is generated (operation 1710).

[0265] As the above, the hot blast generated by the operation of the heater 68 is introduced to an inside the drum 12 through a drying duct, and the hot blast introduced to an inside the drum 12 delivers heat energy deep into an inside the bedding that tumbles while repeating the ascending and the descending operations inside the drum 12 according to the rotation of the drum 12, to proceed with the refreshing cycle, which is changed according to the moisture content of the substance (operation 1712).

[0266] Then, the control unit 110 counts the proceeding time of the refreshing cycle to determine whether the set refreshing time is expired (operation 1714), and if the refreshing continuation time is not expired, the control unit 110 returns to the operation 1712 and proceeds with the refreshing cycle by using the rotation of the drum 12 and the hot blast until the refreshing continuation time expires.

[0267] As a result of the determination from the operation 1714, if the refreshing continuation time is expired, the control unit 110, through the driving unit 130, drives the scent generator 78, and additionally proceeds with the post-processing cycle that may increase the refreshing power of the bedding (operation 1716).

[0268] Meanwhile, in the embodiment of the present disclosure, the description of the post-processing cycle, which is being proceeded after the completion of the refreshing cycle, is used as an example, but the present disclosure is not limited hereto, and may be composed in a way that the post-processing cycle is proceeded while the refreshing cycle is being proceeded.

[0269] The above described bedding care mode is summarized as follows.

[0270] First, the bedding care mode has five total care courses, including the sterilization course, the deodorization course, the tick elimination course, the dust elimination course, and the refreshing course.

[0271] The most important factor in the sterilization course is the "temperature," and the sterilization course is set to be provided with the temperature condition capable of sterilizing an inside the subject while having a maximum temperature range in which the subject is not being damaged.

[0272] The most important factor in the deodorization course is the humidification, and the deodorization course is set to be provided with the humidification condition capable of separating the unpleasant odor particle attached to the substance, while having a moisture supply range of approximately 2% to approximately 5% of the deodorization load according to the weight (the load) of the substance.

[0273] The most important factor in the tick elimination course is the temperature, and the tick elimination course is set to be provided with the temperature condition capable of eliminating the tick inhibiting inside the substance while having a temperature range capable of providing the hygienic bedding because the tick elimination is possible at a shorter period of time than the sterilization course.

[0274] The most important factors in the dust elimination course are the strong airflow and the mechanical force, and the dust elimination course is set in a range that the physical force applied to the substance is maximized to eliminate the dust attached to the substance.

[0275] The most important factor in the refreshing course is the elimination of moisture, and the refreshing course is set in a range capable of removing the moisture generated during the storage process of the substance and capable of refreshing the compressed state of the substance to the original state.

[0276] In conclusion, the values of the factors set to perform the sterilization course, the deodorization course, the tick elimination course, the dust elimination course, and the refreshing course are arranged in order as follows:

First, the order of the courses from the largest mechanical force (having the highest rotational speed of the drum) to the smallest mechanical force is as follows: dust elimination course ≥ the deodorization course ≥ the refreshing course ≥ the tick elimination course ≥ the sterilization course.

Second, the order of the courses from the highest inner temperature of the drum 12 to the lowest inner temperature of the drum 12 is as follows: the sterilization course ≥ the tick elimination course ≥ the deodorization course ≥ the refreshing course ≥ the sterilization course.

Third, the order of the courses from the largest airflow to the smallest airflow is as follows: the dust elimination course ≥ the deodorization course ≥ the refreshing course ≥ the tick elimination course ≥ the sterilization course.

Fourth, the order of the courses from the highest moisture to the lowest moisture is as follows: the deodorization course ≥ the dust elimination course ≥ the refreshing course ≥ the tick elimination course ≥ the sterilization course.

[0277] Other than the above, the rotation speed of the drum 12 is changed according to the volume of the substance, and the order of the courses from the highest rotation speed of the drum 12 to the lowest rotation speed of the drum 12 is as follows: the large volume bedding ≥ the medium volume bedding ≥ the small volume bedding.

[0278] As the above, the bedding care mode includes a plurality of total care courses for the care of the bedding. However, in a case of some users who are not familiar with the manipulation of the courses or who are not in favor of the individual manipulation of the courses, a course having all of the total care functions, including sterilizing, deodorizing, eliminating ticks, eliminating dust, and refreshing, may be demanded.

[0279] Thus, in an embodiment of the present disclosure, by considering the above, a standard course is provided. The description with respect to the standard course will be provided by referring FIGS. 22 to 25.

[0280] In FIG. 22, a user inputs the substance, in particular, the bedding, to be subject to the total care, into the drum 12, and if a bedding care mode is selected by a rotating manipulation of the first selection unit 101 provided on the control panel 40, a standard course is selected as a default without pressedly manipulating the second selection unit 102 (operation 1800). Thus, in a case when a user does not additionally manipulate the second selection unit 102, the standard course, which is selected as default, is input in the control unit 110 through the input unit 100.

[0281] Thus, the control unit 110, when the standard course is selected and the operation command is input, sets the mechanical force, that is, the standard RPM and the driving factor, the airflow, the temperature, and the continuation time according to the standard course (operation 1802). The mechanical force set at this time is provided in a way to rotate the drum 12 at the proper RPM, that is, the standard RPM, and with the proper driving force, to eliminate the various bacteria, the tick, the unpleasant odor particle, the dust, and the moisture inside the bedding, and the airflow set at this time is provided in a way to rotate the blower fan 66 with proper airflow, that is, the standard airflow, to eliminate the various bacteria, the tick, the unpleasant odor particle, the dust, and the moisture inside the bedding. In addition, the temperature and the continuation time set are provided in a way to drive the heater 68 to eliminate the various bacteria, the tick, the unpleasant odor particle, the dust, and the moisture inside the bedding. The most important factors in the standard course are the "temperature and mechanical force," and are set in a way to eliminate the various bacteria, the tick, the unpleasant odor particle, the dust, and the moisture inside the bedding.

[0282] Thus, the control unit 110 operates the motor 15, the blower fan 66, and the heater 68 through the driving unit 130 to proceed with the basic cycle of the standard course.

[0283] To describe the above more in detail, the control unit 110 rotates the drum 12 at the set mechanical force, that is, the standard RPM, and with the driving factor, according to the operation of the motor 15, thereby tumbling the bedding inside the drum 12 (operation 1804). The standard RPM and the driving factor, that is, the ON-OFF time of the motor, use the same drying RPM of a conventional drying cycle, which is at approximately less than 50 RPM, and the driving factor at approximately 20 seconds with the motor ON and approximately 2 seconds with the motor OFF, respectively, and are pre-stored in the control unit 110.

[0284] At this time, in the standard course, the standard RPM and the driving factor are not fixed, but as illustrated on FIG. 23, the standard RPM and the driving factor are variably changed during the process of the standard course. In the standard course, the standard RPM and the driving factor are variably changed, as to further randomly tumble the bedding to satisfy the total care functions, which are set to eliminate the various bacteria, the tick, the unpleasant odor particle, the dust, and the moisture inside the bedding. In addition, the variable sections of the standard RPM se and the driving factor are configured to be freely inserted into the middle of proceeding with the cycle of the standard course.

[0285] The control unit 110 rotates the blower fan 66 using the set standard airflow, and the air inside the drum 12 is started to circulate (operation 1806). The standard airflow uses the airflow capable of delivering heat energy deep into an inside the bedding, and is pre-stored in the control unit 110.

[0286] Next, the control unit 110 drives the heater 68 to apply heat on the air that circulates inside the drum 12, and thereby the high-temperature air, that is, the hot blast, is generated (operation 1808). At this time, the control unit 110 detects the temperature of the air, which is being introduced into the drum 12, that is, the temperature at the entry of the drum, through the temperature sensor 91, and sets the standard temperature, which is lower than the tick elimination temperature, and the standard continuation time, which is within approximately 1 hour, to reach the temperature at which the various bacteria, the tick, the unpleasant odor particle, the dust, and the moisture inside the bedding are removed. The standard temperature and the standard continuation time are pre-stored in the control unit 110.

[0287] As the above, the hot blast generated by the operation of the heater 68 is introduced to an inside the drum 12 through a drying duct, and the hot blast introduced to an inside the drum 12 delivers heat energy deep into the bedding that tumbles while repeating the ascending and the descending operations inside the drum 12 according to the rotation of the drum 12, to proceeds with the standard cycle, which is set to eliminate the various

bacteria, the tick, the unpleasant odor particle, the dust, and the moisture inside the bedding (operation 1810).

[0288] Then, the control unit 110 counts the proceeding time of the standard cycle to determine whether the set standard time, that is, the time to eliminate the various bacteria, the tick, the unpleasant odor particle, the dust, and the moisture inside the bedding within 1 hour, is expired (operation 1812), and if the standard continuation time is not expired, the control unit 110 returns to the operation 1810 and proceeds with the standard cycle by using the rotation of the drum 12 and the hot blast until the standard continuation time expires.

[0289] As a result of the determination from the operation 1812, if the standard continuation time is expired, the control unit 110, through the driving unit 130, stops the motor 15, the blower fan 66, and the heater 68, thereby completing the basic cycle of the standard course (operation 1814).

[0290] In FIG. 24, a user inputs the substance that is subject to a total care in particular, the bedding, into the drum 12, and by manipulating the first selection unit 101 provided on the control panel 40, the standard course is selected (operation 1900).

[0291] Thus, the control unit 110, when the standard course is selected and the operation command is input, determines the weight (the volume) of the substance, which is input into the drum 12, to proceed with the standard course (operation 1902).

[0292] When the weight (the volume) of the substance is determined, the control unit 110 sets the mechanical force, that is, the standard RPM and the driving factor, the airflow, the temperature, and the continuation time according to the determined weight (the volume) of the substance (operation 1904). The mechanical force set at this time is provided in a way to rotate the drum 12 at the proper RPM, that is, the standard RPM, and with the proper driving force, and the airflow set at this time is provided in a way to rotate the blower fan 66 with proper airflow, that is, the standard airflow. In addition, the temperature and the continuation time set are provided in a way to drive the heater 68 so that the temperature of the entire bedding or a portion of the bedding may be maintained at above a predetermined level of temperature according to the weight (the volume) of the substance.

[0293] Then, the control unit 110 operates the motor 15, the blower fan 66, and the heater 68 through the driving unit 130 to proceed with the cycle of the standard course, which is changed according to the weight (the volume) of the substance.

[0294] To describe the above more in detail, the control unit 110 rotates the drum 12 at the set standard RPM and with the set driving factor, according to the operation of the motor 15, thereby tumbling the bedding inside the drum 12 (operation 1906). The set standard RPM and the set driving factor use the same drying RPM, which is at approximately less than 50 RPM, and the driving factor, which is at approximately 20 seconds with the motor ON and approximately 2 seconds with the motor OFF, that are the same as in a conventional drying cycle, or may use a motor RPM and a driving force that are capable of delivering a proper mechanical force according to the weight (the volume) of the substance.

[0295] At this time, in the standard course, the standard RPM and the driving factor are not fixed, but as illustrated on FIG. 23, the standard RPM and the driving factor are variably changed during the process of the standard course.

[0296] The control unit 110 rotates the blower fan 66 using the set standard airflow, and the air inside the drum 12 is started to circulate (operation 1908). The set standard airflow is the airflow capable of delivering heat energy deep into an inside bedding, and a standard airflow corresponding to the weight (the volume) of the substance is invoked for use from the airflow table that is stored in the control unit 110.

[0297] Next, the control unit 110 drives the heater 68 to apply heat on the air that circulates inside the drum 12, and thereby the high-temperature air, that is, the hot blast, is generated (operation 1910). At this time, the control unit 110 detects the temperature of the air, which is being introduced into the drum 12 through the temperature sensor 91, and sets the standard temperature, which is lower than the tick elimination temperature, and the standard continuation time, to reach to the temperature at which the various bacteria, the tick, the unpleasant odor particle, the dust, and the moisture inside the bedding are eliminated. The standard temperature and the standard continuation time corresponding to the weight (the volume) of the substance are invoked for use from the temperature and time table that is stored in the control unit 110.

[0298] As the above, the hot blast generated by the operation of the heater 68 is introduced to an inside the drum 12 through a drying duct, and the hot blast introduced to an inside the drum 12 delivers heat energy deep into an inside the bedding that tumbles while repeating the ascending and the descending operations inside the drum 12 according to the rotation of the drum 12, to proceed with the standard cycle, which is changed according to the weight (the volume) of the substance (operation 1912).

[0299] Then, the control unit 110 counts the proceeding time of the standard cycle to determine whether the set standard time is expired (operation 1914), and if the standard continuation time is not expired, the control unit 110 returns to the operation 1912 and proceeds with the changed standard cycle by using the rotation of the drum 12 and the hot blast until the standard continuation time expires.

[0300] As a result of the determination from the operation 1914, if the standard continuation time is expired, the control unit 110, through the driving unit 130, stops the motor 15, the blower fan 66, and the heater 68, thereby completing the cycle of the changed standard course (operation 1916).

[0301] In FIG. 25, a user inputs the substance that is

to be subject to a total care, in particular, the bedding into the drum 12, and by manipulating the first selection unit 101 provided on the control panel 40, the standard course is selected (operation 2000).

[0302] Thus, the control unit 110, when the standard course is selected and the operation command is input, determines the weight (the volume) of the substance, which is input into the drum 12, to proceed with the standard course (operation 2002).

[0303] When the weight (the volume) of the substance is determined, the control unit 110 sets the mechanical force, that is, the standard RPM and the driving factor, the airflow, the temperature, and the continuation time according to the determined weight of the substance (2004). The mechanical force set at this time is provided in a way to rotate the drum 12 at the proper RPM, that is, the standard RPM, and with the proper driving force, and the airflow set at this time is provided in a way to rotate the blower fan 66 with proper airflow, that is, the standard airflow. In addition, the temperature and the continuation time set are provided in a way to drive the heater 68 so that the temperature of the entire bedding or a portion of the bedding may be maintained at above a predetermined level of temperature according to the weight (the volume) of the substance.

[0304] Then, the control unit 110 operates the motor 15, the blower fan 66, and the heater 68 through the driving unit 130 to proceed with the cycle of the standard course, which is changed according to the weight (the volume) of the substance.

[0305] To describe the above more in detail, the control unit 110 rotates the drum 12 at the set standard RPM and with the set driving factor, according to the operation of the motor 15, thereby tumbling the bedding inside the drum 12 (operation 2006). The set standard RPM and the set driving factor use the drying RPM, which is at approximately less than 50 RPM, and the driving factor, which is at approximately 20 seconds with the motor ON and approximately 2 seconds with the motor OFF, that are the same as in a conventional drying cycle, or may use the motor RPM and the driving force that are capable of delivering a proper mechanical force according to the weight (the volume) of the substance. At this time, in the standard course, the standard RPM and the driving factor are not fixed, but as illustrated on FIG. 23, the standard RPM and the driving factor are variably changed during the process of the standard course.

[0306] The control unit 110 rotates the blower fan 66 using the set standard airflow, and the air inside the drum 12 is started to circulate (operation 2008). The set standard airflow is the airflow capable of delivering heat energy deep into an inside bedding, and the standard airflow corresponding to the weight (the volume) of the substance is invoked for use from the airflow table that is stored in the control unit 110.

[0307] Next, the control unit 110 drives the heater 68 to apply heat on the air that circulates inside the drum 12, and thereby the high-temperature air, that is, the hot blast, is generated (2010). At this time, the control unit 110 detects the temperature of the air, which is being introduced into the drum 12 through the temperature sensor 91, and sets the standard temperature, which is lower than the tick elimination temperature, and the standard continuation time, to reach to the temperature at which the various bacteria, the tick, the unpleasant odor particle, the dust, and the moisture inside the bedding are eliminated. The standard temperature and the standard continuation time corresponding to the weight (the volume) of the substance are invoked for use from the temperature and time table that is stored in the control unit 110.

[0308] As the above, the hot blast generated by the operation of the heater 68 is introduced to an inside the drum 12 through a drying duct, and the hot blast introduced to an inside the drum 12 delivers heat energy deep into an inside the bedding that tumbles while repeating the ascending and the descending operations inside the drum 12 according to the rotation of the drum 12, and proceeds with the standard cycle, which is changed according to the weight (the volume) of the substance (operation 2012).

[0309] Then, the control unit 110 counts the proceeding time of the standard cycle to determine whether the set standard time is expired (operation 2014), and if the standard continuation time is not expired, the control unit 110 returns to the operation 2012 and proceeds with the changed standard cycle, by using the rotation of the drum 12 and the hot blast until the standard continuation time expires.

[0310] As a result of the determination from the operation 2014, if the standard continuation time is expired, the control unit 110, through the driving unit 130, drives the ion generator 74 and the ultraviolet ray lamp 76 to additionally proceed with the post-processing cycle to increase the effect of the total care of the bedding (operation 2016). Meanwhile, in the embodiment of the present disclosure, the description of the post-processing cycle, which is being proceeded after the completion of the standard cycle, is used as an example, but the present disclosure is not limited hereto, and may be composed in a way that the post-processing cycle is proceeded while the standard cycle is being proceeded. In the case as such, by proceeding with the post-processing cycle, the most important factors in the standard course, which are the standard temperature and the mechanical force, may be variably changed. That is, in a case when the post-processing cycle is proceeded while reducing the standard temperature and the mechanical force, the same total care effect may be anticipated compared to as when the standard cycle is proceeded without proceeding with the post-processing cycle.

[0311] Meanwhile, in accordance with an embodiment of the present disclosure, the washing machine 1 having a drying apparatus to perform the total care functions of the bedding is described as an example. However, the present disclosure is not limited hereto, and any appli-

ance having a drying apparatus, such as a drying device, may be capable of achieving the same objectives and the effects of the present disclosure.

[0312] On FIGS. 26 and 27, a drying apparatus 3001 in accordance with an embodiment of the present disclosure includes a body 3010 having a hexagonal shape, a drum 3020 rotatably installed inside the drum 3010 and provided with a space in which the substance such as the bedding is being dried, a driving apparatus 3030 configured to rotate the drum 3020, and a hot blast duct 3070 configured to supply the hot blast into the drum 3020.

[0313] The body 3010 includes a cabinet 3011, a rear cover 3011a, a top cover 3012 covering an upper portion of the cabinet 3011, a front surface panel 3013 disposed at a front surface of the cabinet 3011, and a control panel 3014 provided with various buttons and displays to control the drying apparatus 3001 disposed thereto.

[0314] The drum 3020 is formed with a cylindrical shape having an opening at a front surface and a rear surface thereof, and is provided with a plurality of lifters 3021 pointedly protruded at an inner surface thereof so that the substance may be ascended and then descended. In addition, a front supporting panel 3022 and a rear supporting panel 3024 are fixedly installed at an inner side of the front surface portion of the body 3010 and at an inner side of the rear surface portion of body 3010, respectively, so that the front supporting panel 3022 and the rear supporting panel 3024 may be able to rotatably support the opening of the front surface and the opening of the rear surface of the drum 3020, respectively, while covering the opening of the front surface and the opening of the rear surface of the drum 3020, respectively.

[0315] An inlet port 3019a is formed at a front surface and at the front surface supporting panel 3022 to put in the substance or take out the substance from the drum 3020, and a door 3019 is installed at a front surface of the body 3010 to open/close the inlet port 3019a.

[0316] The driving apparatus 3030 includes a driving motor 3031 installed at a lower portion of an inner side of the cabinet 3010, and a pulley 3032 and a rotation belt 3033 to deliver the driving force of the driving motor 3031 to the drum 3020. The rotation belt 3033 is installed in a way to be wound around an outer surface of the drum 3020 and the pulley 3032, which is coupled to the shaft of the driving motor 3031.

[0317] The hot blast duct 3070 includes a heating unit 3080 to apply heat on the air introduced, and a hot blast supply unit 3040 connecting the heating unit 3080 to the drum 3020. The hot blast supply unit 3040 connects a drum air suction port 3024a formed at an upper portion of the rear surface supporting panel 3024 to the heating unit 3080, and is configured to guide the air, which is suctioned and heated, to the drum 3020.

[0318] The heating unit 3080 is installed at a lower portion of the drum 3020 to guide outside air to be introduced, and applies heat on the air introduced. The heating unit 3080 includes a heater 3081 to radiate heat inside, and a thermostat 3082 installed for the safety of the heater 3081.

[0319] With respect to the heater 3081, a coil heater is mainly used, and the heater 3081 may be composed of more than one heater. At this time, the more than one heater may be provided with different power capacity or with same power capacity. For example, in a case when the overall power capacity (100%) is approximately 5.3kW, the heater 3082 may be composed of one heater using a large power capacity at approximately 70%, that is, approximately 3.7kW, and the other heater using a small power capacity at approximately 30%, that is, approximately 1.6kW. At this time, the capacity of the more than one heater is not precisely split into the ratio of 70%: 30%, but may be split into the various ratios based on the optimal split condition of the capacity.

[0320] The thermostat 3082 is a safety apparatus installed at a side surface or adjacent to the heater 3081, and configured to mechanically operate to be turned ON/OFF according to the temperature of the heater 3081. The thermostat 3082 is configured to maintain the ON status before the temperature of the heater 3081 reaches at a predetermined level of overheated temperature, and as the temperature of the heater 3081 is reached at the level of the overheated temperature, the thermostat 3082 is changed to the OFF status, so that the commercial power is not applied to the heater 3081.

[0321] In addition, an exhaust duct 3050 is connected to a lower portion of the front of the drum 3020 to guide the exhaustion of the air introduced to an inside the drum 3020. The exhaust duct 3050 includes a front exhaust duct 3051 configured to connect an exhaust port 3022b of a lower portion of the front supporting panel 3022 to an entry of a blower apparatus 3060 installed at a lower portion of the drum 3020, and a rear exhaust duct 3053 installed at a lower side of the cabinet 3011 so that the exit of the blower apparatus 3060 communicates with an outer side of a rear surface unit of the cabinet 3011. At the front exhaust duct 3051, a filter member 3055 is installed to filter the foreign substance such as dust or lint included in the hot blast that is exhausted from the drum 3020.

[0322] The draft apparatus 3060 having an entry connected to the exhaust duct 3051 includes a blower fan 3061 installed at a front of a lower portion of the drum 3020 to circulate air, and a blower case 3063 connected to the front exhaust duct 3051 and the rear exhaust duct 3053 while surrounding the blower fan 3061.

[0323] In addition, at a lower end of the front of the drum 3020, at which the exhaust unit 3022b is formed, a dryness sensor 3090 configured to determine the dryness of the substance by making contact with the substance that rotates according to the rotation of the drum 3020 to measure the sensing value of the electrical signal that varies according to the amount of the moisture contained in the substance. As for the dryness sensor 3090, a touch sensor in the form of a plate bar is used.

[0324] In addition, at an upper portion of the hot blast supply unity 3040 at an upper end side of the rear surface

of the drum 3020 at which the inlet port 3024a is formed, a temperature sensor 3095 is installed to detect the temperature of the air introduced into the drum 3020, that is, the temperature of the entry unit of the drum.

[0325] Meanwhile, the drying apparatus 3001 in accordance with an embodiment of the present disclosure further includes an outside exhaust duct configured to guide air to an outside to exhaust the air that passing through the drum 3020 to an outside of the drying apparatus 3001.

[0326] In addition, with respect to the drying apparatus 3001 in accordance with an embodiment of the present disclosure, an exhaust-type drying apparatus configured to exhaust the high-temperature, high-humidity air that passed through the drum 3020 to outside the drying apparatus 3001 is described as an example, but the present disclosure is not limited hereto, and a condensation-type drying apparatus set to circulate the air, after eliminating the moisture from the high-temperature, high-humidity air that passed through the drum 3020, again to an inside the drum 3020.

[0327] As is apparent from the above description, a total care function such as sterilizing, deodorizing, eliminating ticks, eliminating dust, and refreshing with respect to the substance can be performed, and total care courses, which include a sterilization course, a deodorization course, a tick elimination course, a dust elimination course, and a refreshing course, capable of performing each total care function in an independent manner can be provided, so that the total care function can be independently performed separately from a conventional washing cycle or a drying cycle.

[0328] In addition, by changing the rotation speed of the drum according to the type and the weight of the bedding, the damage of the substance at each of the total care courses may be reduced while obtaining optimal effects.

[0329] Other than the above, by providing a standard course having all the total care functions such as sterilizing, deodorizing, eliminating ticks, eliminating dust, and refreshing, the manipulation efficiency may be enhanced for a user who is not familiar with the manipulation of the courses and also for a user who is not in favor of the inconvenience of the manipulation of the courses.

[0330] Although a few embodiments of the present invention have been shown and described, it would be appreciated by those skilled in the art that changes may be made in these embodiments without departing from the principles of the invention, the scope of which is defined in the claims.

Claims

1. A washing machine, comprising:

a drum to accommodate a substance;
a motor to rotate the drum;
a fan to introduce air into the drum;
a heater to heat the air introduced into the drum;
an input unit provided with at least two of a plurality of care courses for a sterilization, a deodorization, an elimination of pests, an elimination of dust, and a refreshing function with respect to the substance, and configured to select at least one of the at least two care courses, and
a control unit to proceed with an algorithm of the selected care course by operating the motor, the fan and the heater when the care course is selected.

2. The washing machine of claim 1, wherein:

the plurality of care courses comprises a sterilization course, a deodorization course, a pest elimination course, a dust elimination course, a refreshing course and a standard course.

3. The washing machine of claim 2, wherein:

the standard course comprises performing all of a sterilizing function, a deodorizing function, a pest elimination function, a dust elimination function and a refreshing function with respect to the substance.

4. The washing machine of claim 2 or 3, wherein:

the plurality of care courses comprises a bedding care course independently provided from a drying cycle.

5. The washing machine of claim 4, wherein:

the input unit comprises a mode selection unit configured to select a mode to enter the bedding care course with respect to the substance, and
a course selection unit configured to select at least one of the care courses for sterilization, deodorization, pest elimination, dust elimination, and refreshing with respect to the substance.

6. A drying apparatus, comprising:

a drum to accommodate a substance;
a fan and a heater configured to supply a hot blast into the drum;
an input unit provided with at least two of a plurality of care courses for a sterilization, a deodorization, an elimination of pests, an elimination of dust, and a refreshing function with respect to the substance; and
a control unit to control the supplied hot blast by operating the fan and the heater when at least one of the plurality of care courses is selected

and to control a temperature of the hot blast according to the selected care course.

7. The drying apparatus of claim 6, wherein:

the control unit is configured to control an operation of the heater such that at least one of the plurality of care courses is controlled at a different temperature from other care courses.

8. The drying apparatus of claim 6 or 7, further comprising:

a motor to rotate the drum,
wherein the control unit is arranged to rotate the drum by operating the motor when the hot blast is supplied into the drum, and controls a rotation speed of the drum according to the selected care course.

9. The drying apparatus of claim 8, wherein:

the control unit is arranged to control the operation of the motor such that at least one of the plurality of care courses is controlled at a different rotation speed from other care courses.

10. A method of controlling a drying apparatus having a drum to accommodate a substance, and a fan and a heater to supply a hot blast into the drum, and proceeding with a drying cycle using the hot blast, the method comprising:

selecting at least one of a plurality of care courses for a sterilization, deodorization, an elimination of pests, an elimination of dust and a refreshing function with respect to the substance, independently from the drying cycle;
performing a care function on the substance by supplying the hot blast into the drum by operating the blower fan and the heater when the at least one of the plurality of care courses is selected; and
proceeding with an algorithm for each of the plurality of care courses by controlling a temperature of the hot blast according to the selected care course when supplying the hot blast into the drum.

11. The method of claim 10, further comprising:

determining a weight of the substance; and
changing the algorithm by controlling the temperature of the hot blast according to the weight of the substance.

12. The method of claim 11, wherein:

the weight of the substance is input by a user.

13. The method of claim 11, wherein:

the weight of the substance is detected using a sensor.

14. The method of claim 11, 12 or 13, further comprising:

proceeding with an algorithm for each of the plurality of care courses by selecting a supply time of the hot blast according to the selected care course.

15. The method of claim 14, further comprising:

changing the algorithm by controlling the supply time of the hot blast according to the weight of the substance.

FIG. 1

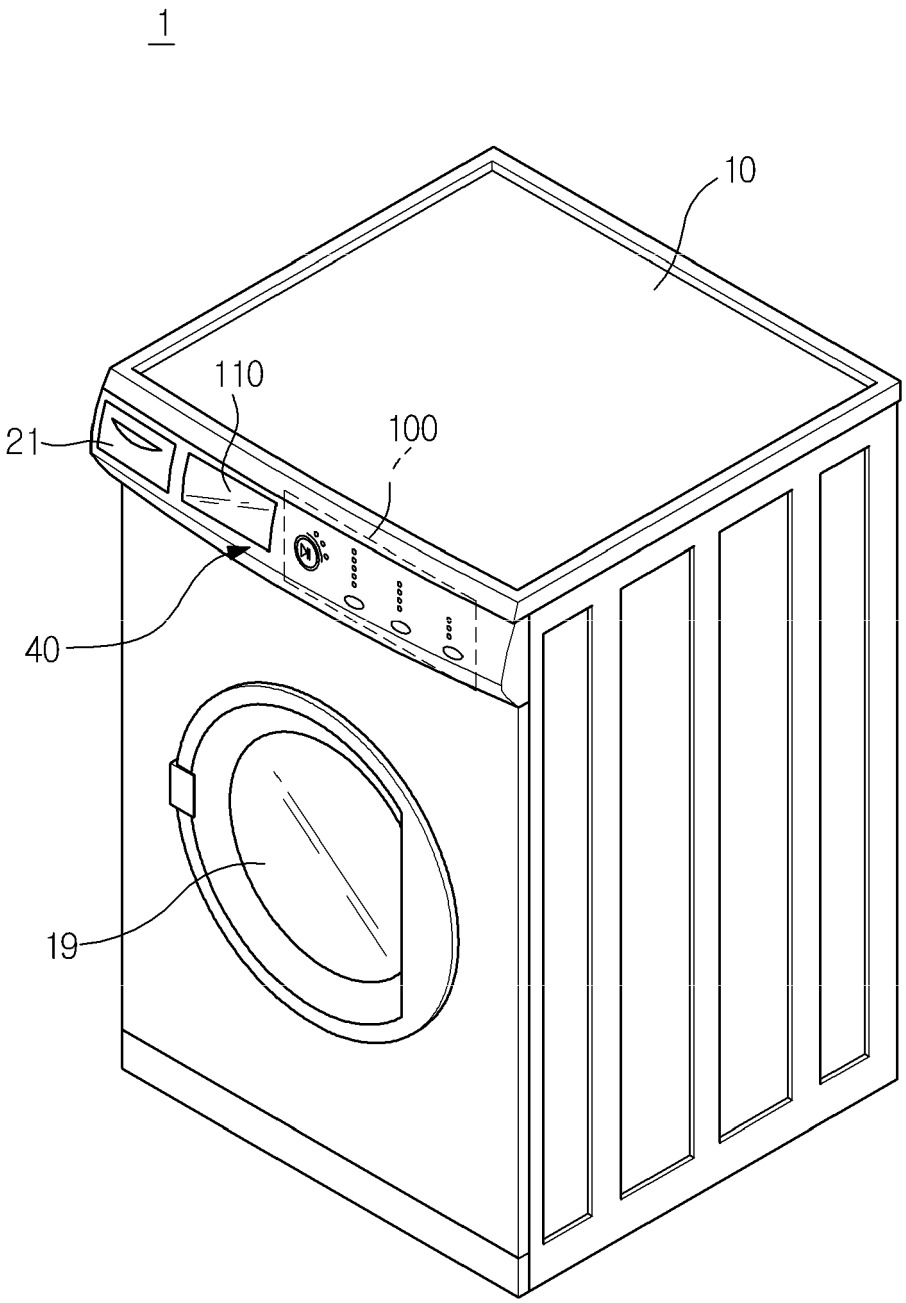


FIG.2

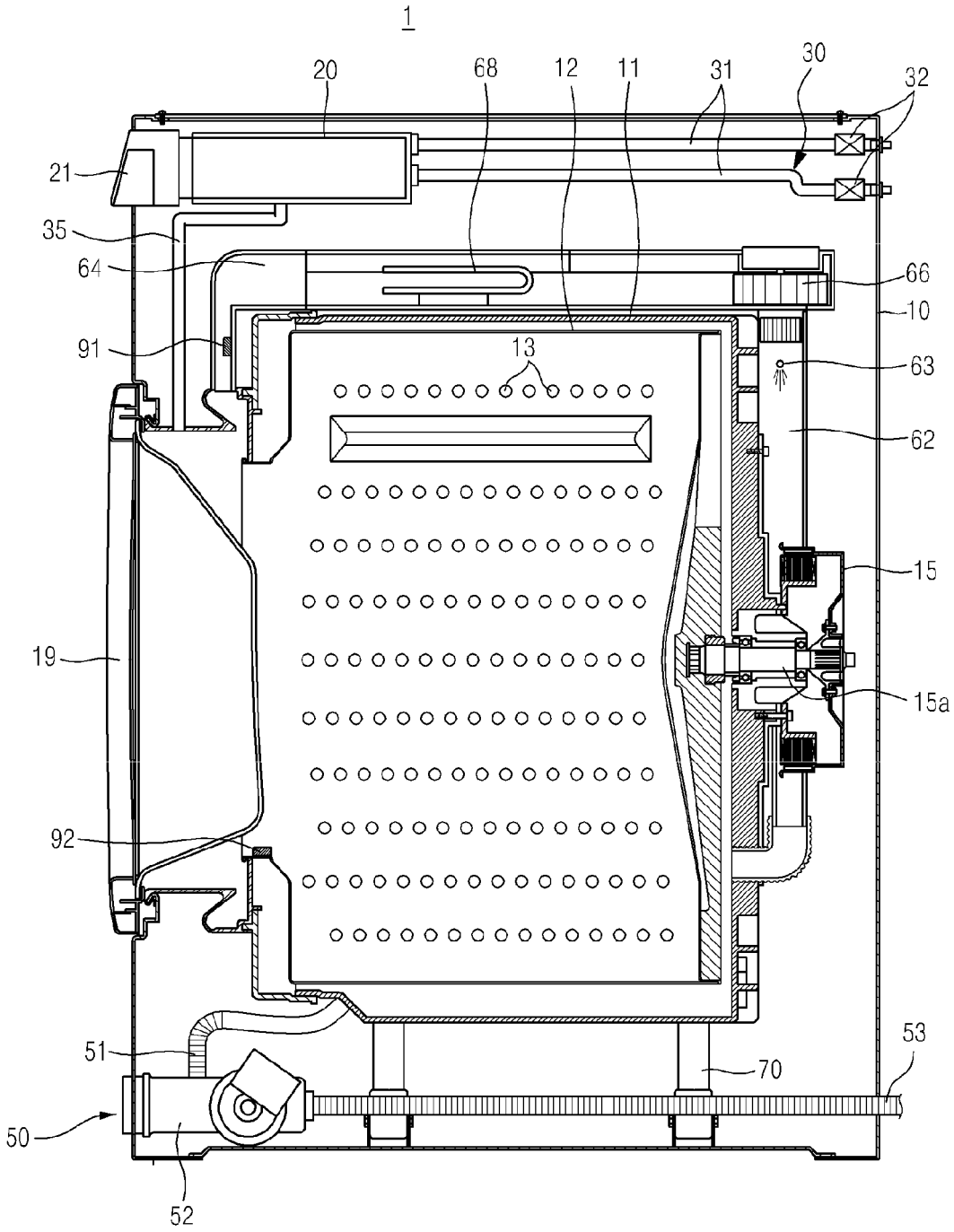

1
20
68
12
11
31
30
32
21
35
64
66
10
91
13
63
62
15
19
15a
92
51
53
70
50
52

FIG.3

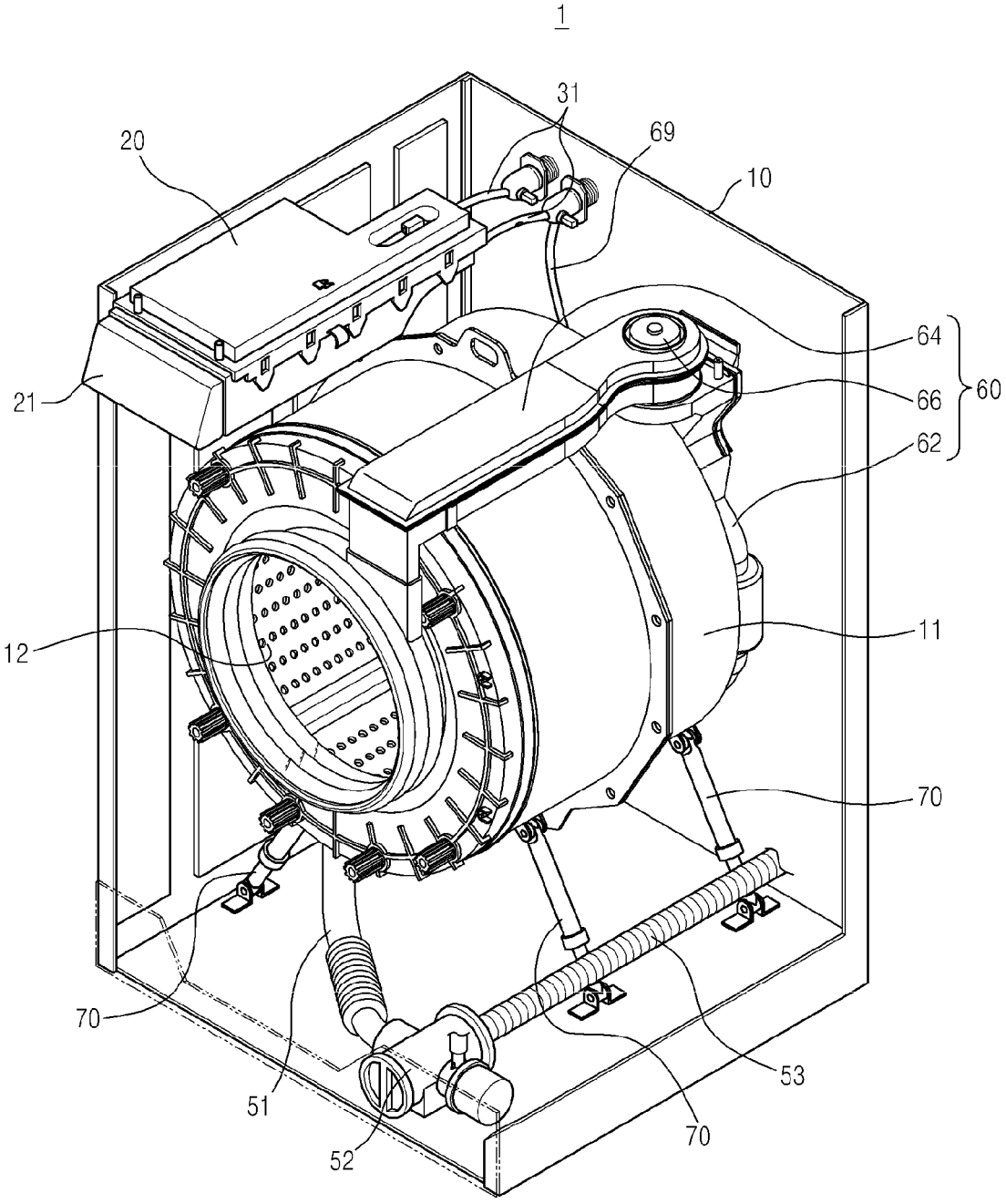


FIG.4

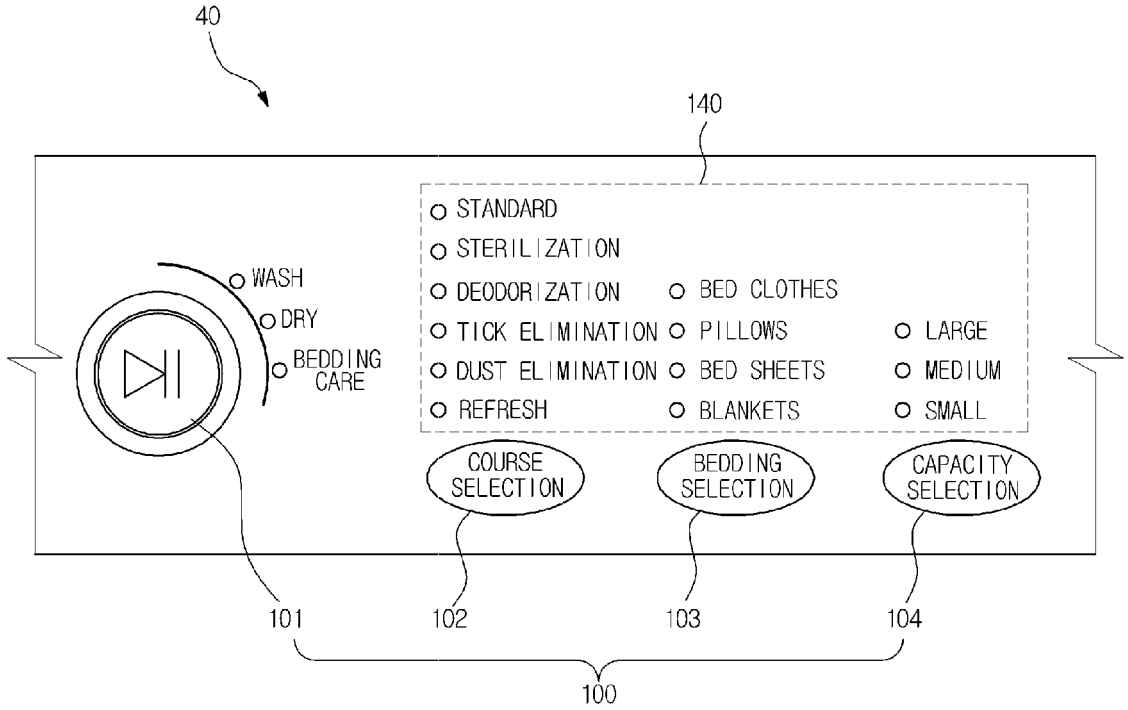

40
140
STANDARD
STERILIZATION
DEODORIZATION
BED CLOTHES
TICK ELIMINATION
PILLOWS
LARGE
DUST ELIMINATION
BED SHEETS
MEDIUM
REFRESH
BLANKETS
SMALL
WASH
DRY
BEDDING CARE
COURSE SELECTION
BEDDING SELECTION
CAPACITY SELECTION
101
102
103
104
100

FIG.5

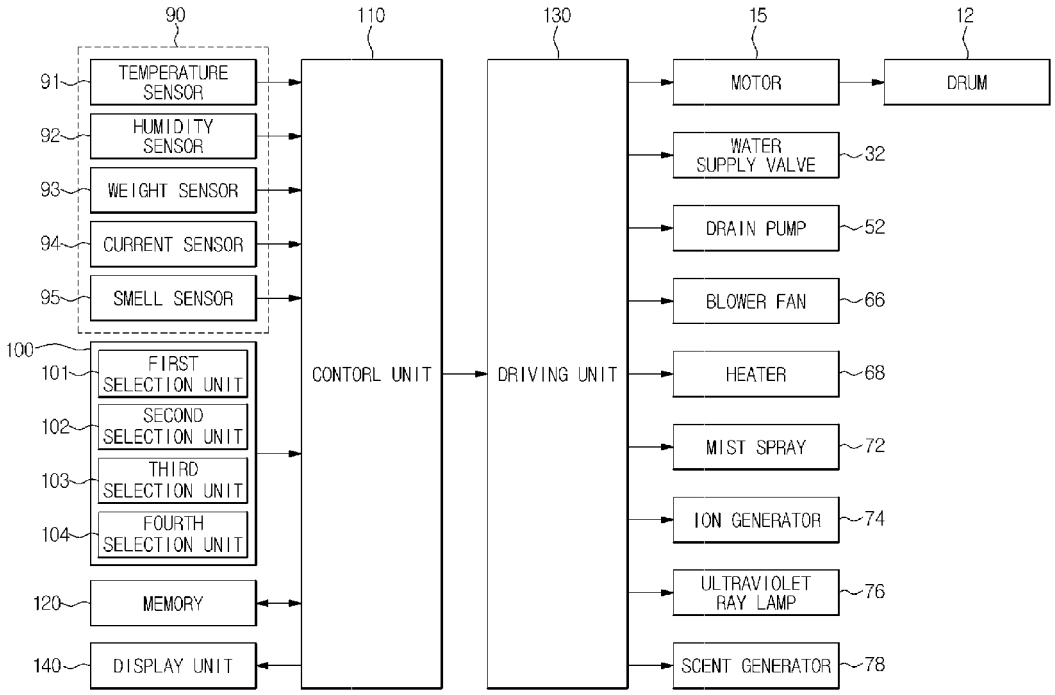

90
110
130
15
12
91
TEMPERATURE SENSOR
92
HUMIDITY SENSOR
93
WEIGHT SENSOR
94
CURRENT SENSOR
95
SMELL SENSOR
100
101
FIRST SELECTION UNIT
102
SECOND SELECTION UNIT
103
THIRD SELECTION UNIT
104
FOURTH SELECTION UNIT
120
MEMORY
140
DISPLAY UNIT
CONTORL UNIT
DRIVING UNIT
MOTOR
DRUM
WATER SUPPLY VALVE
32
DRAIN PUMP
52
BLOWER FAN
66
HEATER
68
MIST SPRAY
72
ION GENERATOR
74
ULTRAVIOLET RAY LAMP
76
SCENT GENERATOR
78

FIG.6

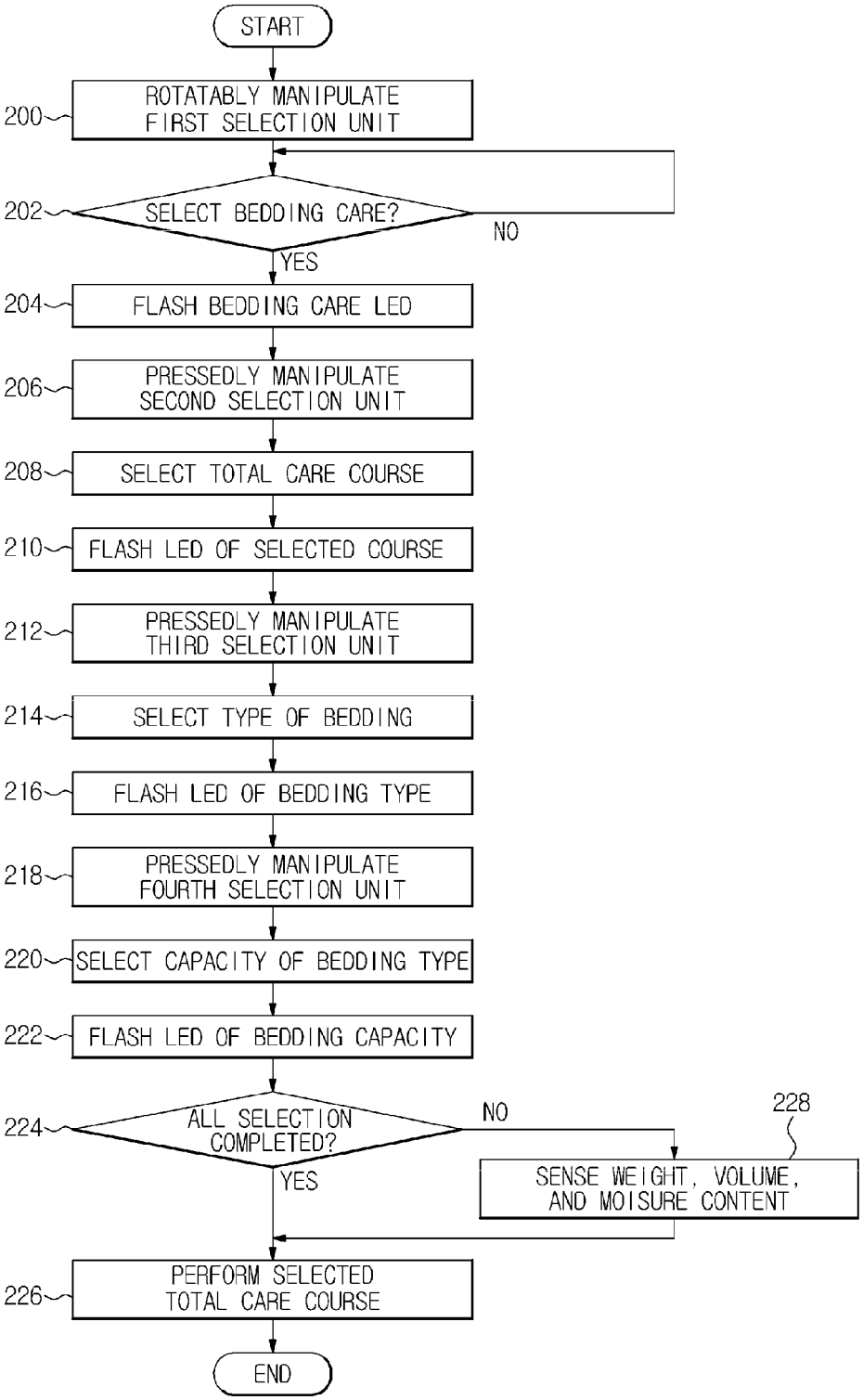

START
200
ROTATABLY MANIPULATE FIRST SELECTION UNIT
202
SELECT BEDDING CARE?
NO
YES
204
FLASH BEDDING CARE LED
206
PRESSEDLY MANIPULATE SECOND SELECTION UNIT
208
SELECT TOTAL CARE COURSE
210
FLASH LED OF SELECTED COURSE
212
PRESSEDLY MANIPULATE THIRD SELECTION UNIT
214
SELECT TYPE OF BEDDING
216
FLASH LED OF BEDDING TYPE
218
PRESSEDLY MANIPULATE FOURTH SELECTION UNIT
220
SELECT CAPACITY OF BEDDING TYPE
222
FLASH LED OF BEDDING CAPACITY
224
ALL SELECTION COMPLETED?
NO
228
SENSE WEIGHT, VOLUME, AND MOISURE CONTENT
YES
226
PERFORM SELECTED TOTAL CARE COURSE
END

FIG.7

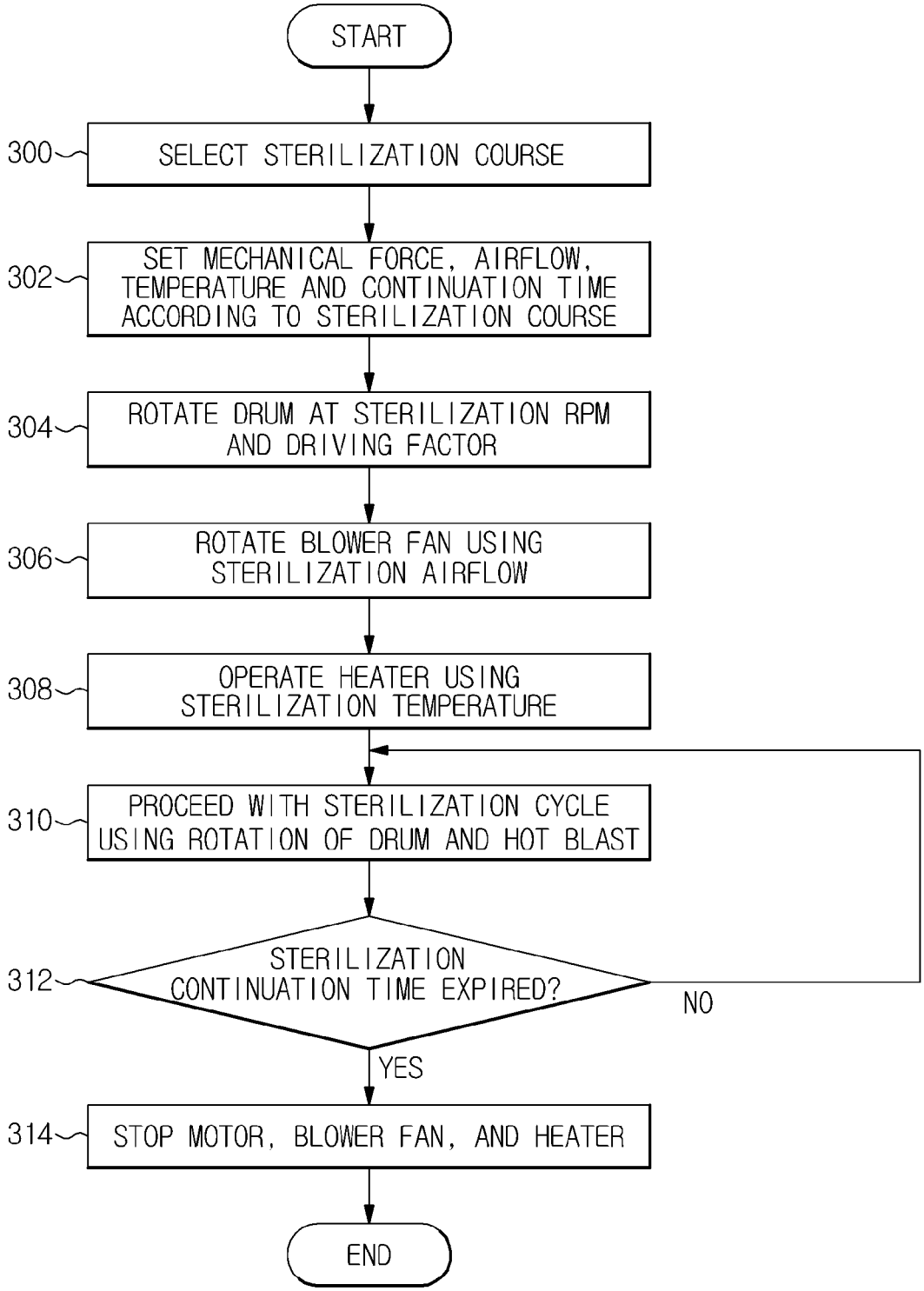

START
300
SELECT STERILIZATION COURSE
302
SET MECHANICAL FORCE, AIRFLOW, TEMPERATURE AND CONTINUATION TIME ACCORDING TO STERILIZATION COURSE
304
ROTATE DRUM AT STERILIZATION RPM AND DRIVING FACTOR
306
ROTATE BLOWER FAN USING STERILIZATION AIRFLOW
308
OPERATE HEATER USING STERILIZATION TEMPERATURE
310
PROCEED WITH STERILIZATION CYCLE USING ROTATION OF DRUM AND HOT BLAST
312
STERILIZATION CONTINUATION TIME EXPIRED?
NO
YES
314
STOP MOTOR, BLOWER FAN, AND HEATER
END

FIG.8

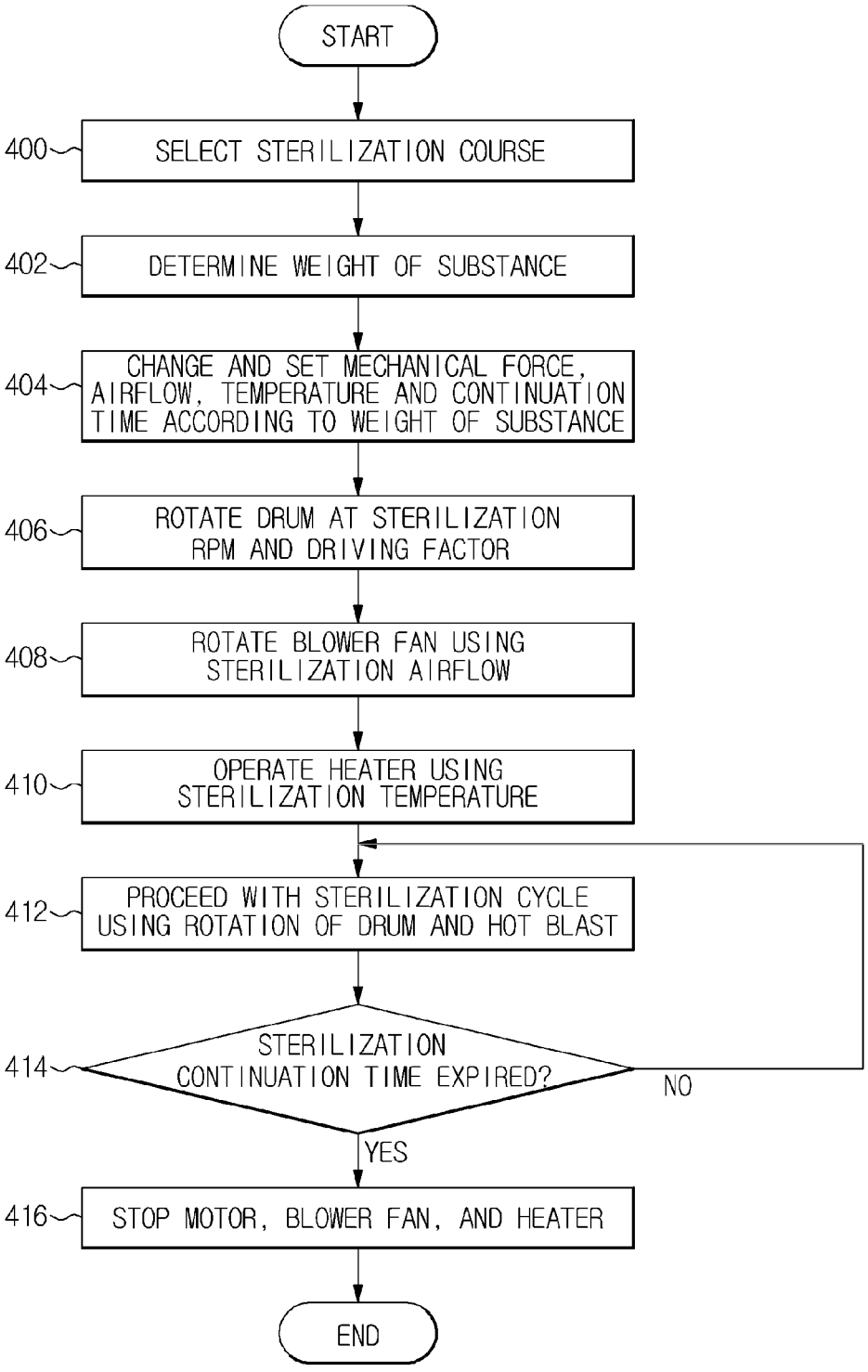

START
400
SELECT STERILIZATION COURSE
402
DETERMINE WEIGHT OF SUBSTANCE
404
CHANGE AND SET MECHANICAL FORCE, AIRFLOW, TEMPERATURE AND CONTINUATION TIME ACCORDING TO WEIGHT OF SUBSTANCE
406
ROTATE DRUM AT STERILIZATION RPM AND DRIVING FACTOR
408
ROTATE BLOWER FAN USING STERILIZATION AIRFLOW
410
OPERATE HEATER USING STERILIZATION TEMPERATURE
412
PROCEED WITH STERILIZATION CYCLE USING ROTATION OF DRUM AND HOT BLAST
414
STERILIZATION CONTINUATION TIME EXPIRED?
NO
YES
416
STOP MOTOR, BLOWER FAN, AND HEATER
END

FIG.9

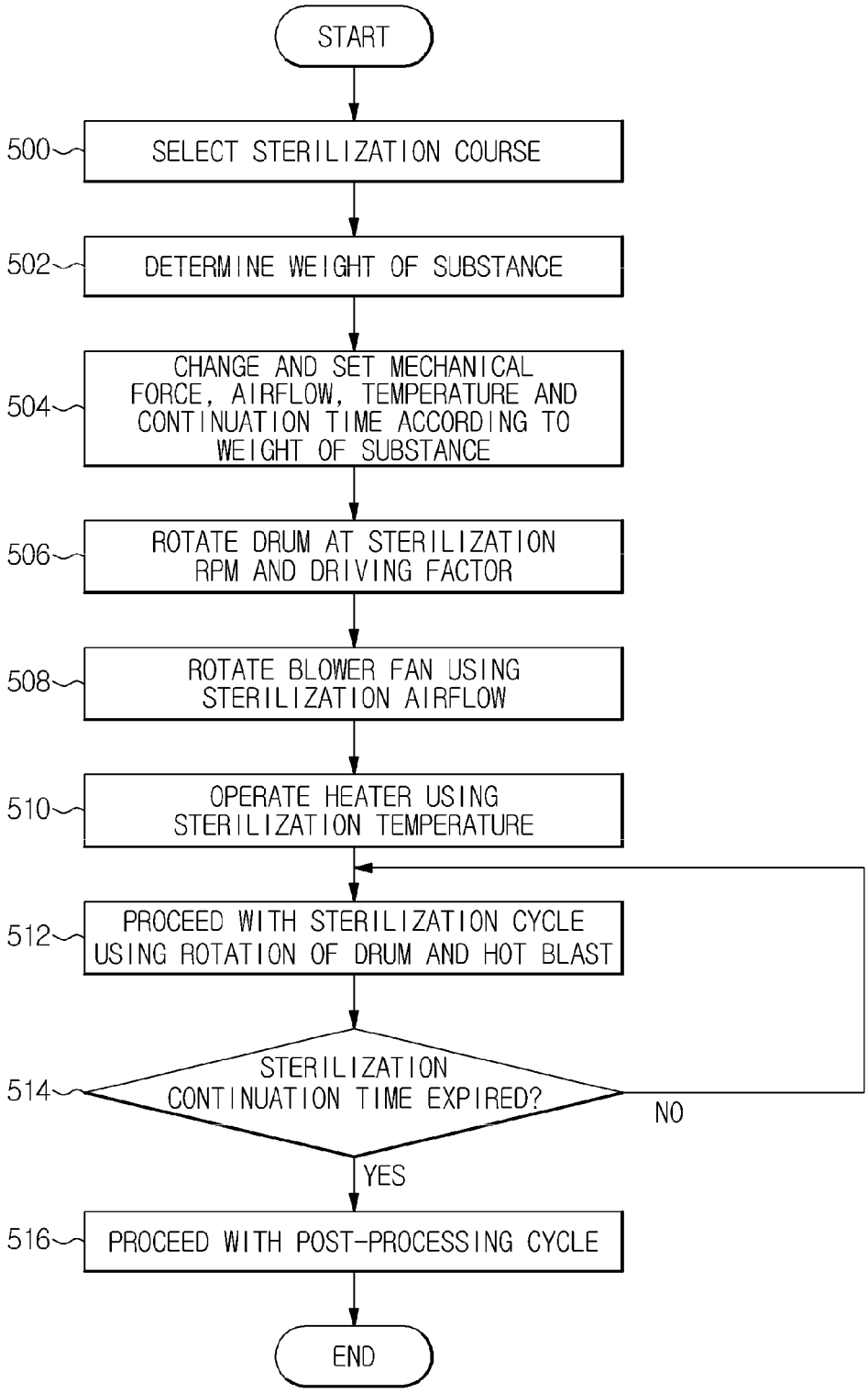

START
500
SELECT STERILIZATION COURSE
502
DETERMINE WEIGHT OF SUBSTANCE
504
CHANGE AND SET MECHANICAL FORCE, AIRFLOW, TEMPERATURE AND CONTINUATION TIME ACCORDING TO WEIGHT OF SUBSTANCE
506
ROTATE DRUM AT STERILIZATION RPM AND DRIVING FACTOR
508
ROTATE BLOWER FAN USING STERILIZATION AIRFLOW
510
OPERATE HEATER USING STERILIZATION TEMPERATURE
512
PROCEED WITH STERILIZATION CYCLE USING ROTATION OF DRUM AND HOT BLAST
514
STERILIZATION CONTINUATION TIME EXPIRED?
NO
YES
516
PROCEED WITH POST-PROCESSING CYCLE
END

FIG.10

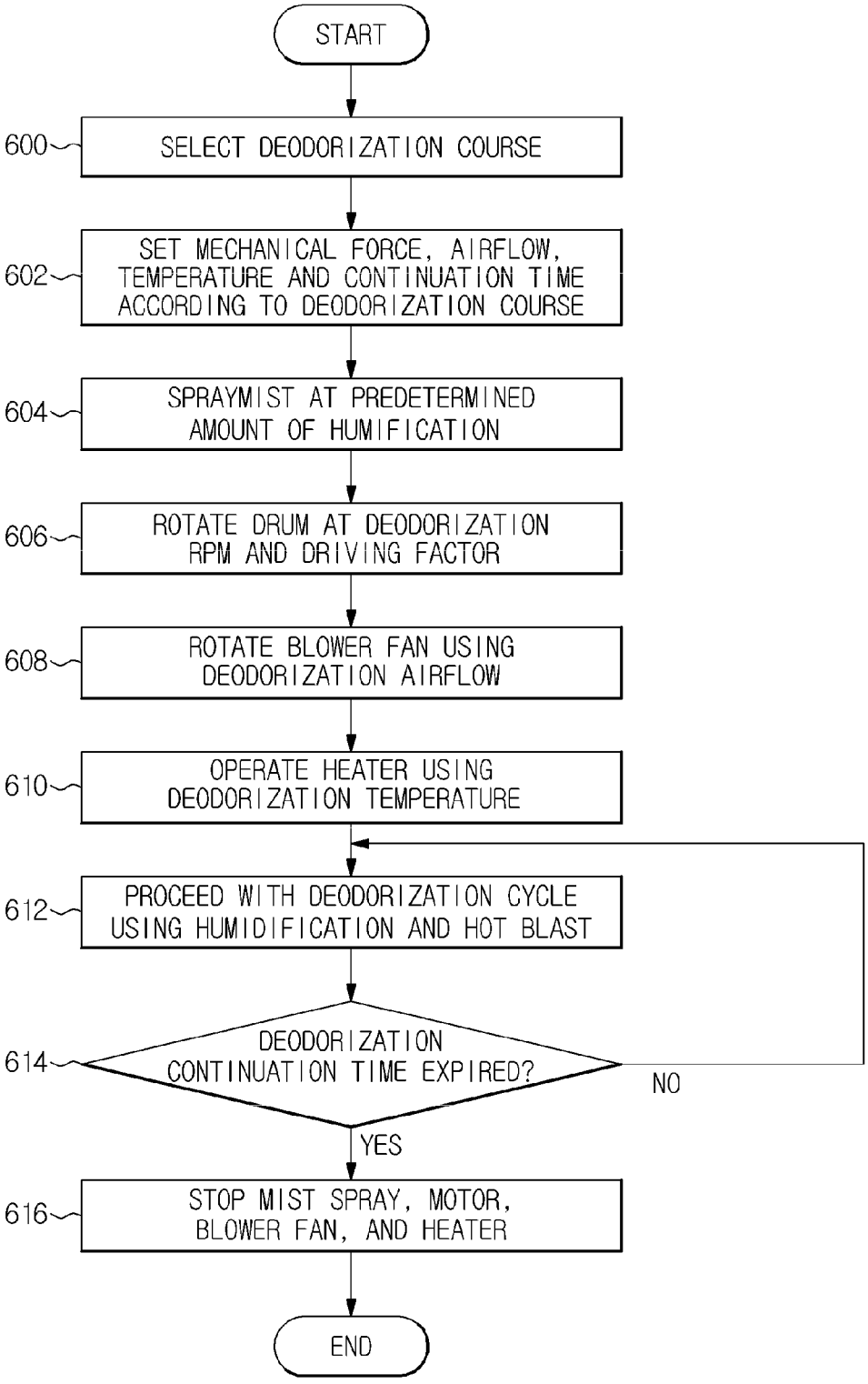

START
600
SELECT DEODORIZATION COURSE
602
SET MECHANICAL FORCE, AIRFLOW, TEMPERATURE AND CONTINUATION TIME ACCORDING TO DEODORIZATION COURSE
604
SPRAYMIST AT PREDETERMINED AMOUNT OF HUMIFICATION
606
ROTATE DRUM AT DEODORIZATION RPM AND DRIVING FACTOR
608
ROTATE BLOWER FAN USING DEODORIZATION AIRFLOW
610
OPERATE HEATER USING DEODORIZATION TEMPERATURE
612
PROCEED WITH DEODORIZATION CYCLE USING HUMIDIFICATION AND HOT BLAST
614
DEODORIZATION CONTINUATION TIME EXPIRED?
NO
YES
616
STOP MIST SPRAY, MOTOR, BLOWER FAN, AND HEATER
END

FIG.11

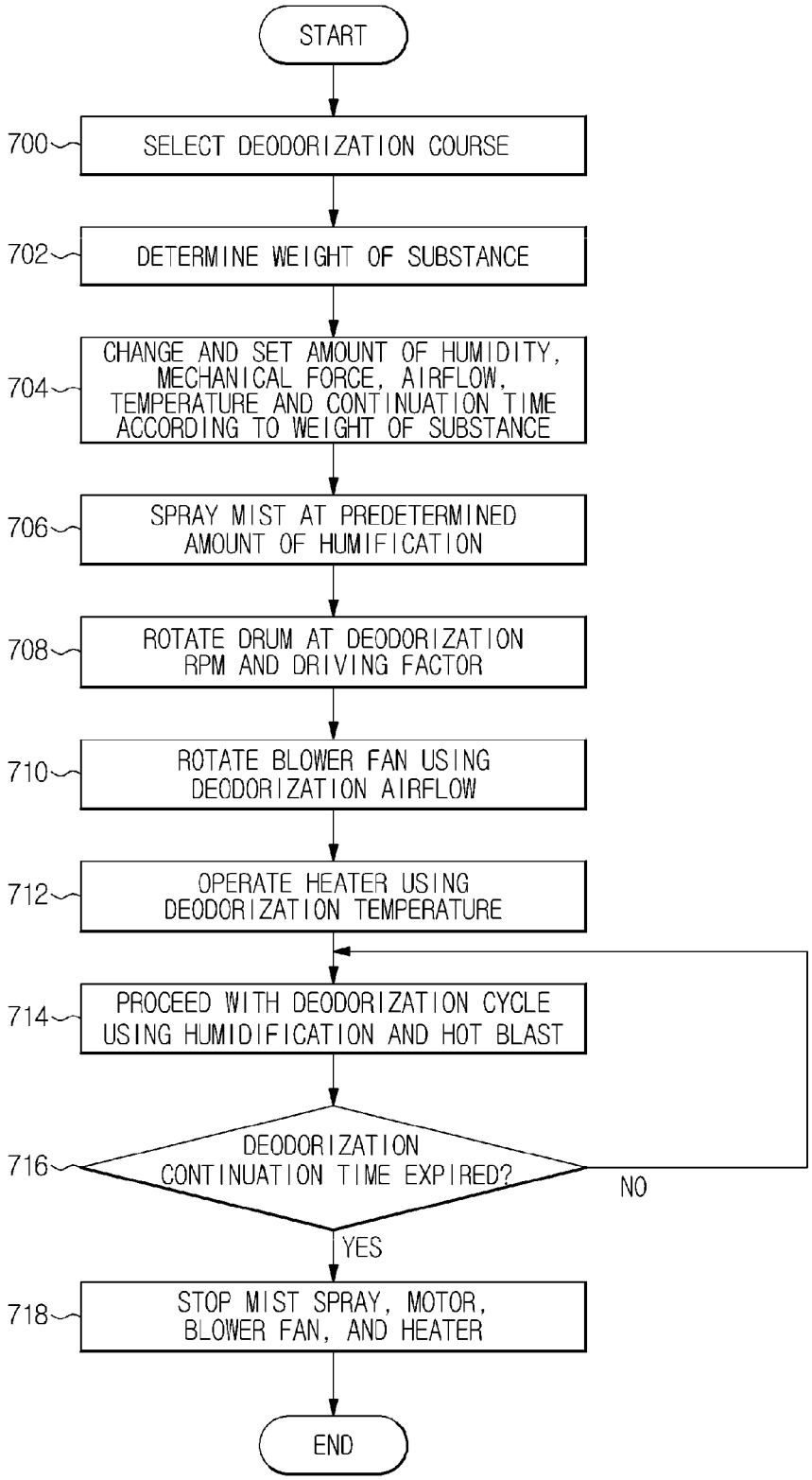

START
700
SELECT DEODORIZATION COURSE
702
DETERMINE WEIGHT OF SUBSTANCE
704
CHANGE AND SET AMOUNT OF HUMIDITY, MECHANICAL FORCE, AIRFLOW, TEMPERATURE AND CONTINUATION TIME ACCORDING TO WEIGHT OF SUBSTANCE
706
SPRAY MIST AT PREDETERMINED AMOUNT OF HUMIFICATION
708
ROTATE DRUM AT DEODORIZATION RPM AND DRIVING FACTOR
710
ROTATE BLOWER FAN USING DEODORIZATION AIRFLOW
712
OPERATE HEATER USING DEODORIZATION TEMPERATURE
714
PROCEED WITH DEODORIZATION CYCLE USING HUMIDIFICATION AND HOT BLAST
716
DEODORIZATION CONTINUATION TIME EXPIRED?
NO
YES
718
STOP MIST SPRAY, MOTOR, BLOWER FAN, AND HEATER
END

FIG.12

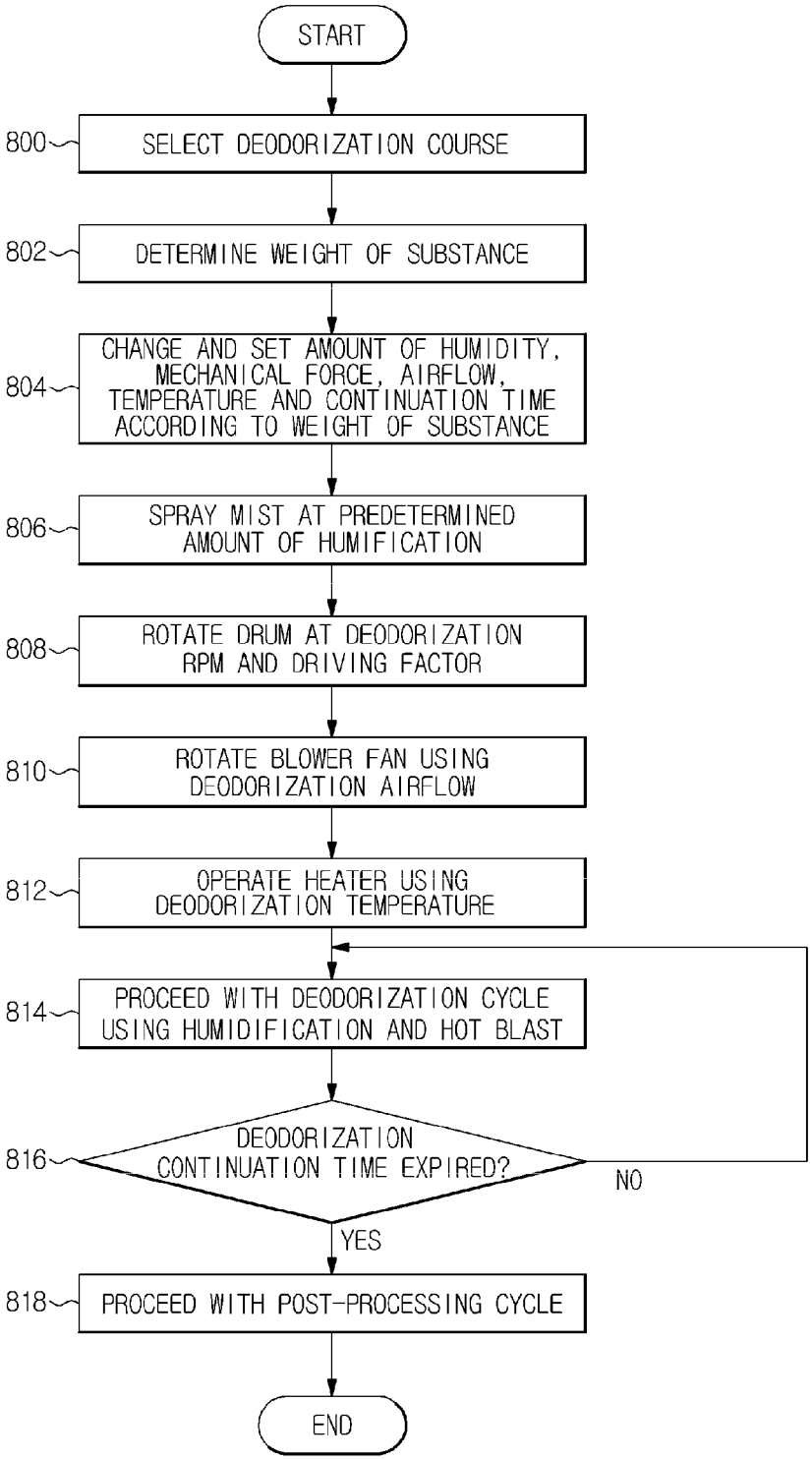

START
800
SELECT DEODORIZATION COURSE
802
DETERMINE WEIGHT OF SUBSTANCE
804
CHANGE AND SET AMOUNT OF HUMIDITY, MECHANICAL FORCE, AIRFLOW, TEMPERATURE AND CONTINUATION TIME ACCORDING TO WEIGHT OF SUBSTANCE
806
SPRAY MIST AT PREDETERMINED AMOUNT OF HUMIFICATION
808
ROTATE DRUM AT DEODORIZATION RPM AND DRIVING FACTOR
810
ROTATE BLOWER FAN USING DEODORIZATION AIRFLOW
812
OPERATE HEATER USING DEODORIZATION TEMPERATURE
814
PROCEED WITH DEODORIZATION CYCLE USING HUMIDIFICATION AND HOT BLAST
816
DEODORIZATION CONTINUATION TIME EXPIRED?
NO
YES
818
PROCEED WITH POST-PROCESSING CYCLE
END

FIG.13

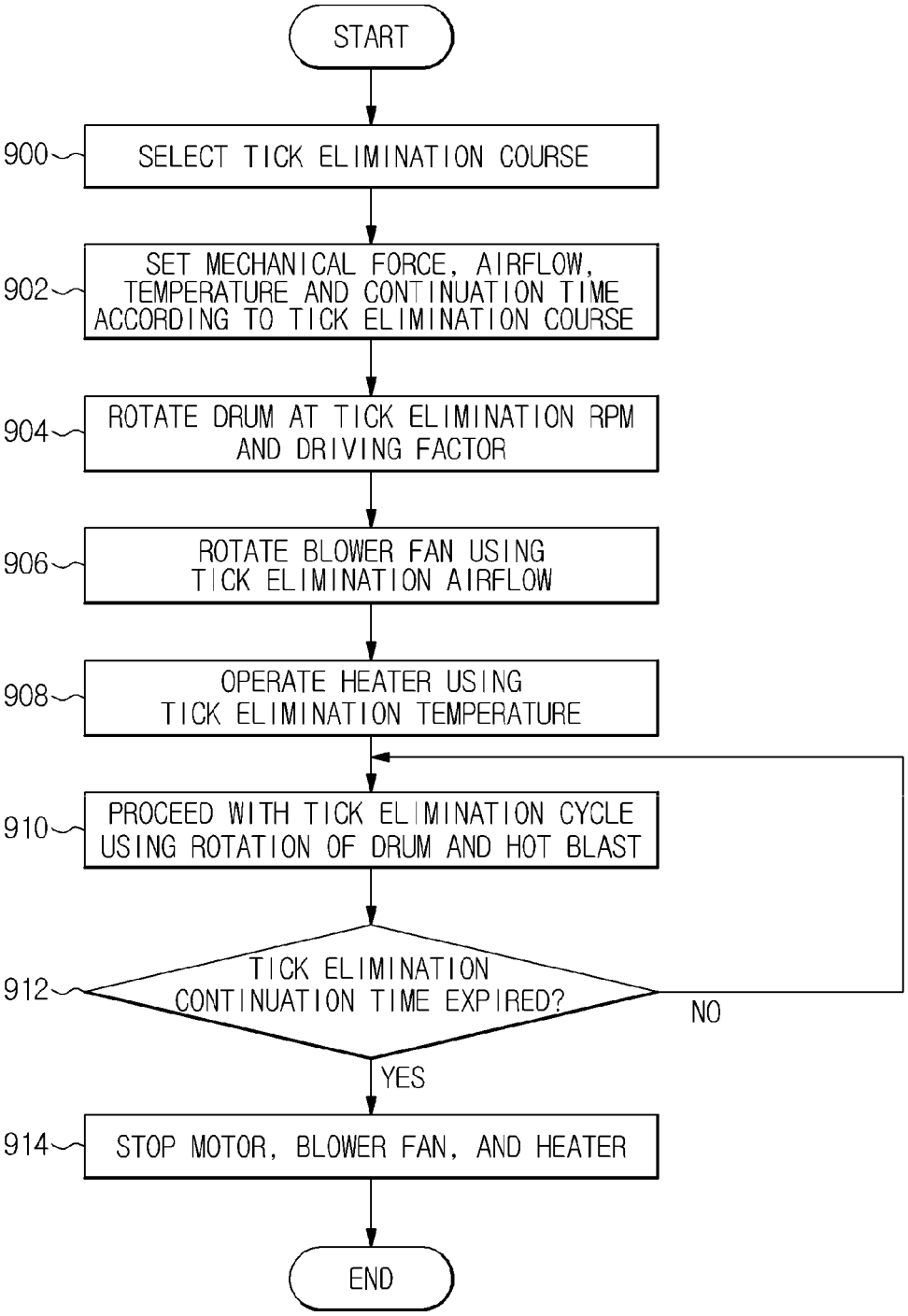

START
900
SELECT TICK ELIMINATION COURSE
902
SET MECHANICAL FORCE, AIRFLOW, TEMPERATURE AND CONTINUATION TIME ACCORDING TO TICK ELIMINATION COURSE
904
ROTATE DRUM AT TICK ELIMINATION RPM AND DRIVING FACTOR
906
ROTATE BLOWER FAN USING TICK ELIMINATION AIRFLOW
908
OPERATE HEATER USING TICK ELIMINATION TEMPERATURE
910
PROCEED WITH TICK ELIMINATION CYCLE USING ROTATION OF DRUM AND HOT BLAST
912
TICK ELIMINATION CONTINUATION TIME EXPIRED?
NO
YES
914
STOP MOTOR, BLOWER FAN, AND HEATER
END

FIG.14

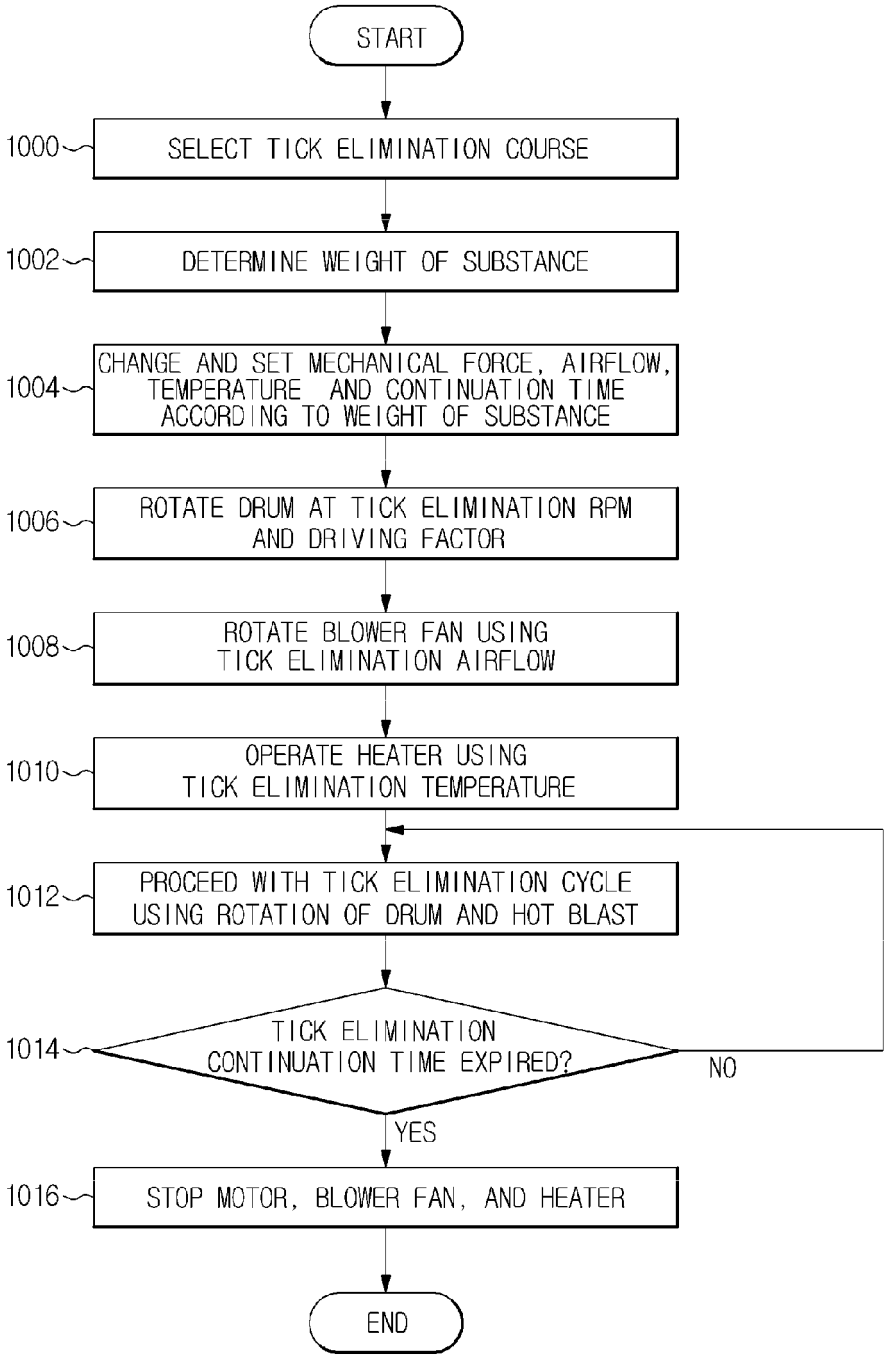

START
1000
SELECT TICK ELIMINATION COURSE
1002
DETERMINE WEIGHT OF SUBSTANCE
1004
CHANGE AND SET MECHANICAL FORCE, AIRFLOW, TEMPERATURE AND CONTINUATION TIME ACCORDING TO WEIGHT OF SUBSTANCE
1006
ROTATE DRUM AT TICK ELIMINATION RPM AND DRIVING FACTOR
1008
ROTATE BLOWER FAN USING TICK ELIMINATION AIRFLOW
1010
OPERATE HEATER USING TICK ELIMINATION TEMPERATURE
1012
PROCEED WITH TICK ELIMINATION CYCLE USING ROTATION OF DRUM AND HOT BLAST
1014
TICK ELIMINATION CONTINUATION TIME EXPIRED?
NO
YES
1016
STOP MOTOR, BLOWER FAN, AND HEATER
END

FIG.15

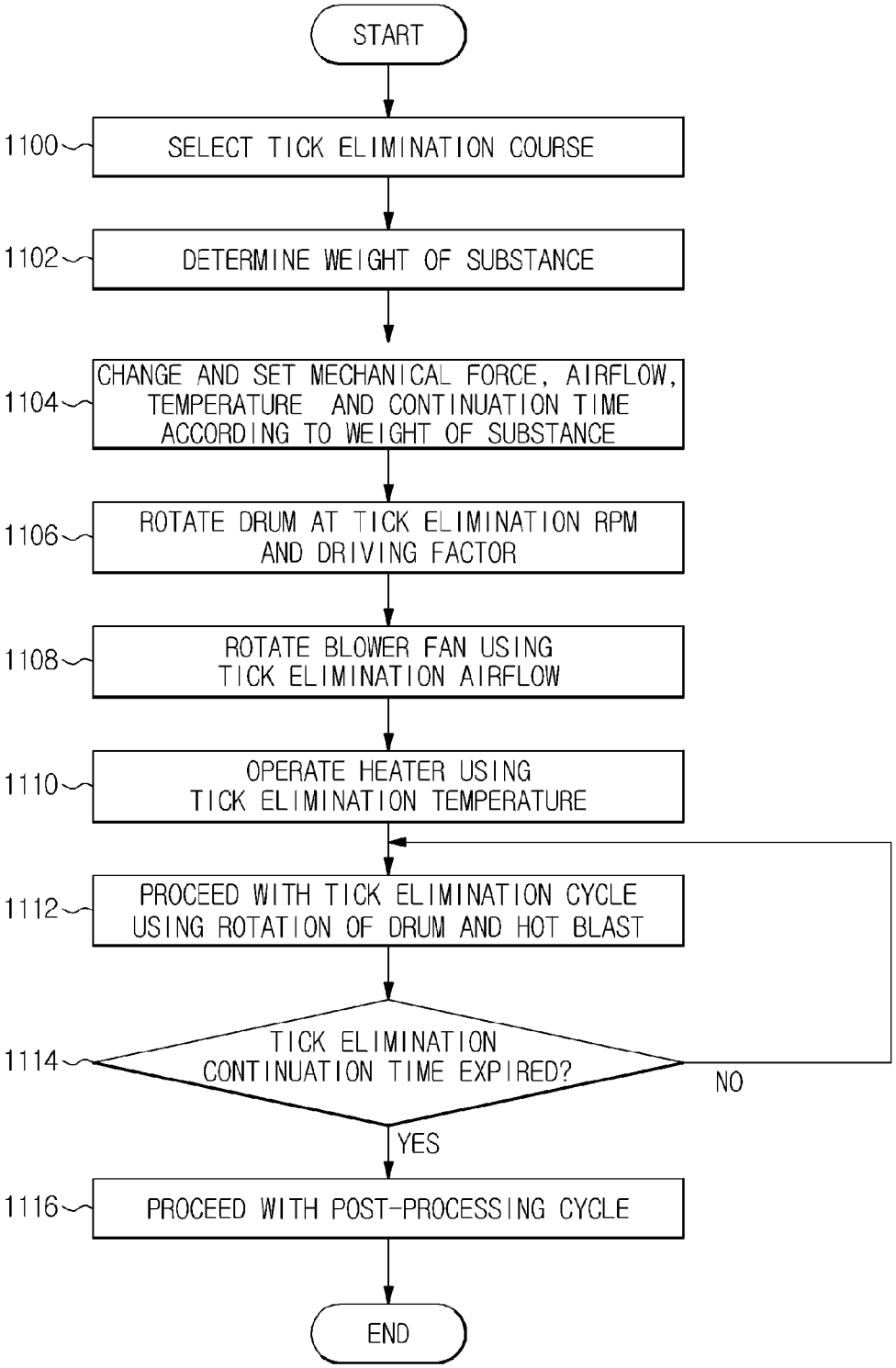

START
1100
SELECT TICK ELIMINATION COURSE
1102
DETERMINE WEIGHT OF SUBSTANCE
1104
CHANGE AND SET MECHANICAL FORCE, AIRFLOW, TEMPERATURE AND CONTINUATION TIME ACCORDING TO WEIGHT OF SUBSTANCE
1106
ROTATE DRUM AT TICK ELIMINATION RPM AND DRIVING FACTOR
1108
ROTATE BLOWER FAN USING TICK ELIMINATION AIRFLOW
1110
OPERATE HEATER USING TICK ELIMINATION TEMPERATURE
1112
PROCEED WITH TICK ELIMINATION CYCLE USING ROTATION OF DRUM AND HOT BLAST
1114
TICK ELIMINATION CONTINUATION TIME EXPIRED?
NO
YES
1116
PROCEED WITH POST-PROCESSING CYCLE
END

FIG.16

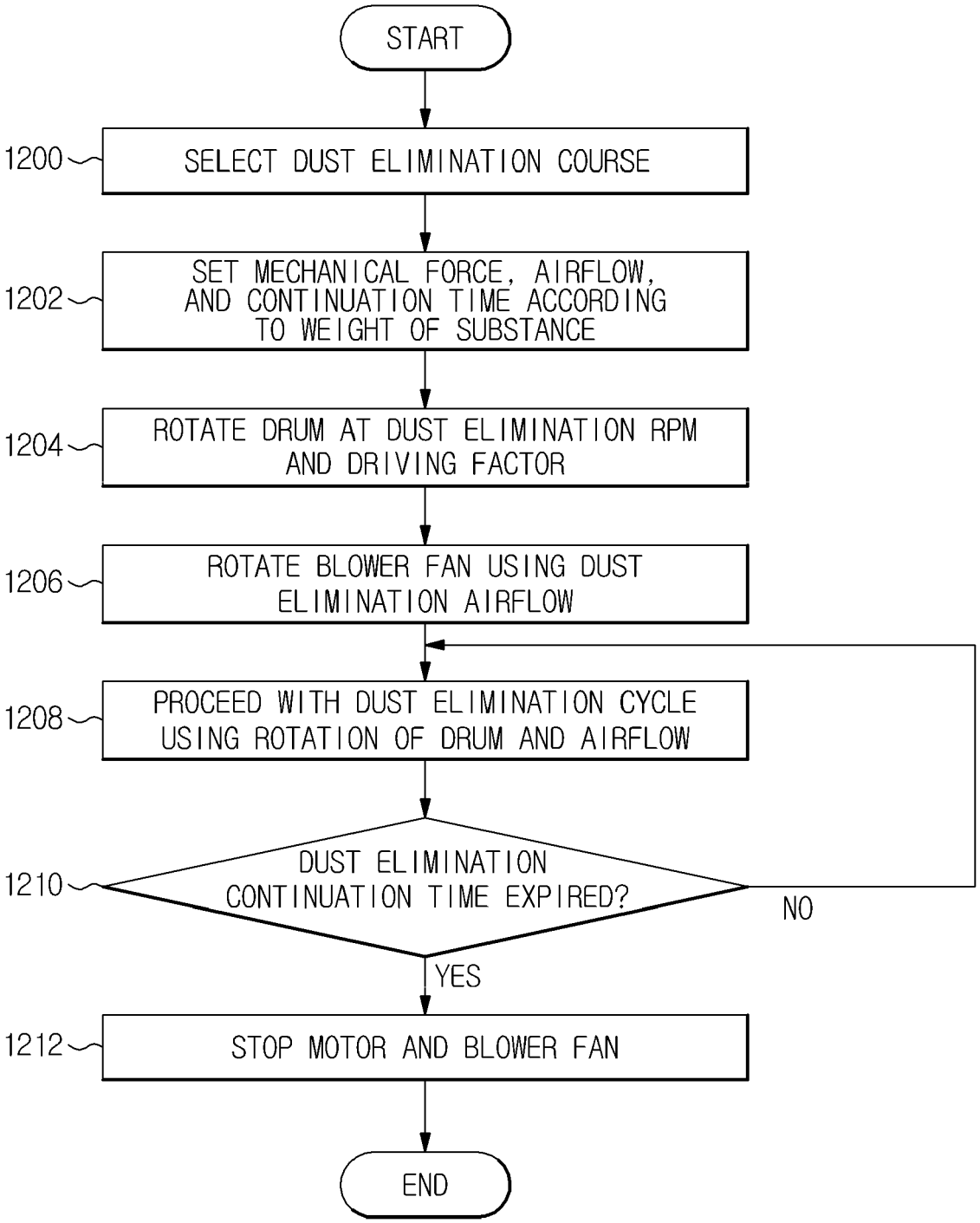

START
1200
SELECT DUST ELIMINATION COURSE
1202
SET MECHANICAL FORCE, AIRFLOW, AND CONTINUATION TIME ACCORDING TO WEIGHT OF SUBSTANCE
1204
ROTATE DRUM AT DUST ELIMINATION RPM AND DRIVING FACTOR
1206
ROTATE BLOWER FAN USING DUST ELIMINATION AIRFLOW
1208
PROCEED WITH DUST ELIMINATION CYCLE USING ROTATION OF DRUM AND AIRFLOW
1210
DUST ELIMINATION CONTINUATION TIME EXPIRED?
NO
YES
1212
STOP MOTOR AND BLOWER FAN
END

FIG.17

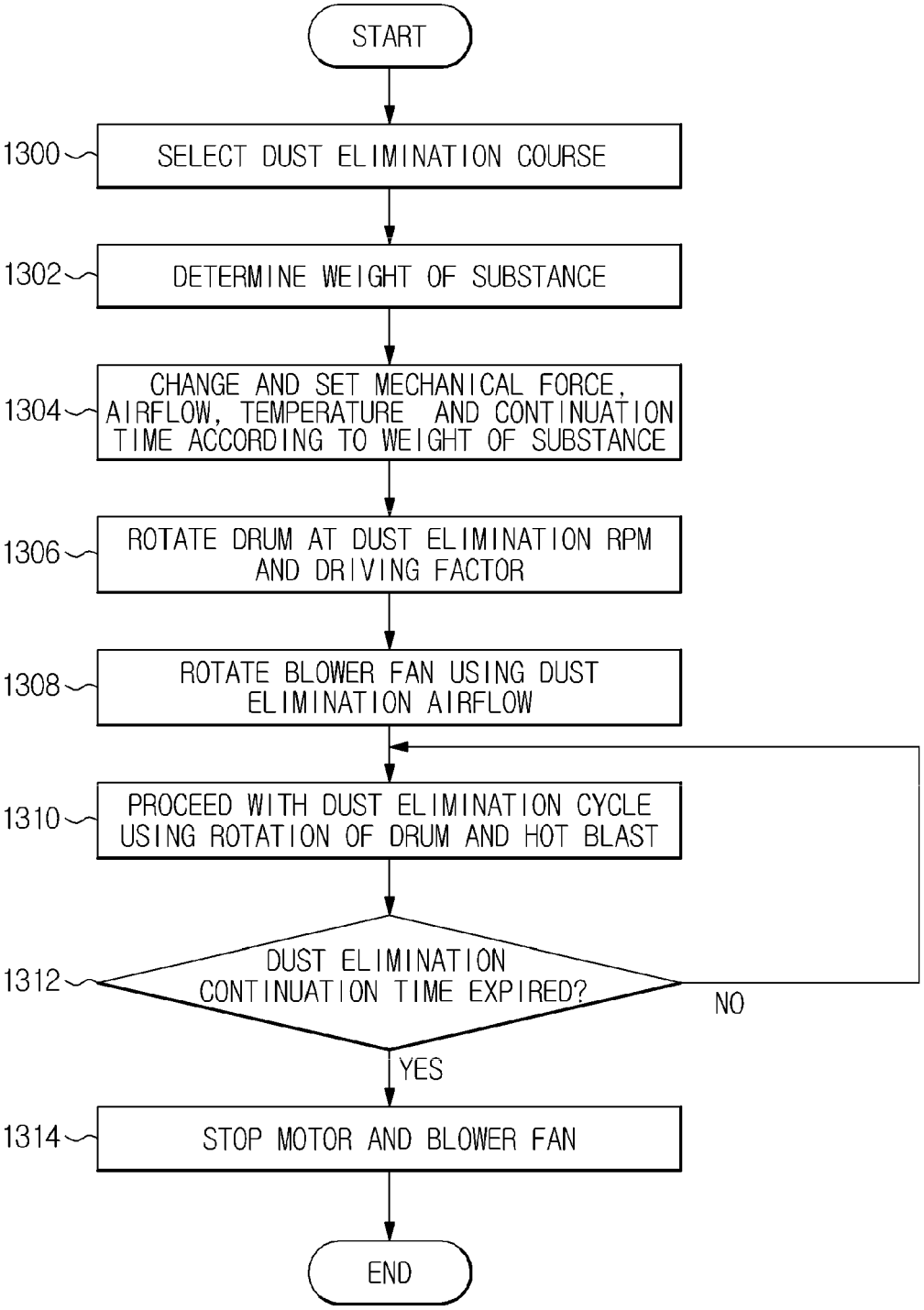

START
1300
SELECT DUST ELIMINATION COURSE
1302
DETERMINE WEIGHT OF SUBSTANCE
1304
CHANGE AND SET MECHANICAL FORCE, AIRFLOW, TEMPERATURE AND CONTINUATION TIME ACCORDING TO WEIGHT OF SUBSTANCE
1306
ROTATE DRUM AT DUST ELIMINATION RPM AND DRIVING FACTOR
1308
ROTATE BLOWER FAN USING DUST ELIMINATION AIRFLOW
1310
PROCEED WITH DUST ELIMINATION CYCLE USING ROTATION OF DRUM AND HOT BLAST
1312
DUST ELIMINATION CONTINUATION TIME EXPIRED?
NO
YES
1314
STOP MOTOR AND BLOWER FAN
END

FIG.18

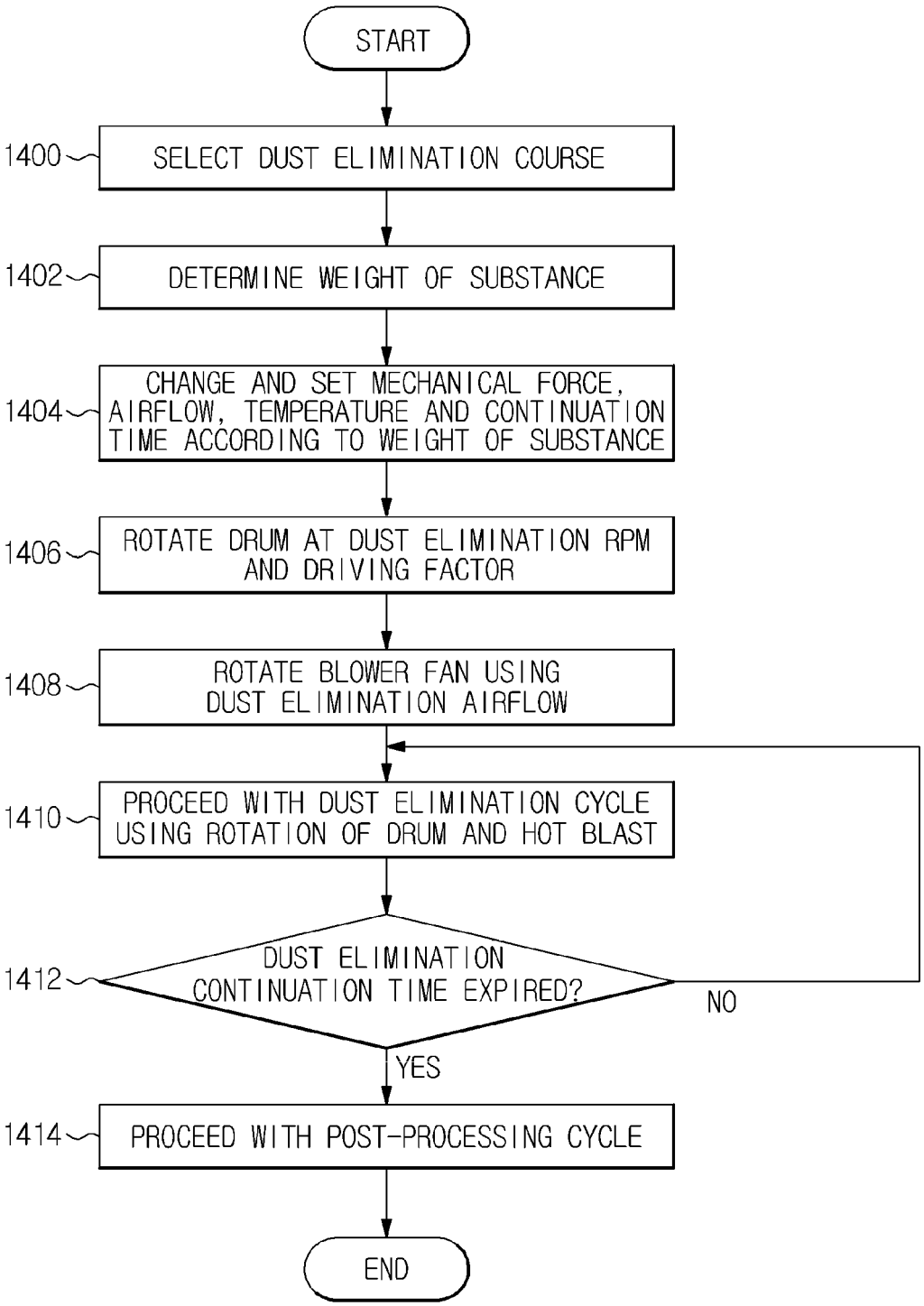

START
1400
SELECT DUST ELIMINATION COURSE
1402
DETERMINE WEIGHT OF SUBSTANCE
1404
CHANGE AND SET MECHANICAL FORCE, AIRFLOW, TEMPERATURE AND CONTINUATION TIME ACCORDING TO WEIGHT OF SUBSTANCE
1406
ROTATE DRUM AT DUST ELIMINATION RPM AND DRIVING FACTOR
1408
ROTATE BLOWER FAN USING DUST ELIMINATION AIRFLOW
1410
PROCEED WITH DUST ELIMINATION CYCLE USING ROTATION OF DRUM AND HOT BLAST
1412
DUST ELIMINATION CONTINUATION TIME EXPIRED?
NO
YES
1414
PROCEED WITH POST-PROCESSING CYCLE
END

FIG.19

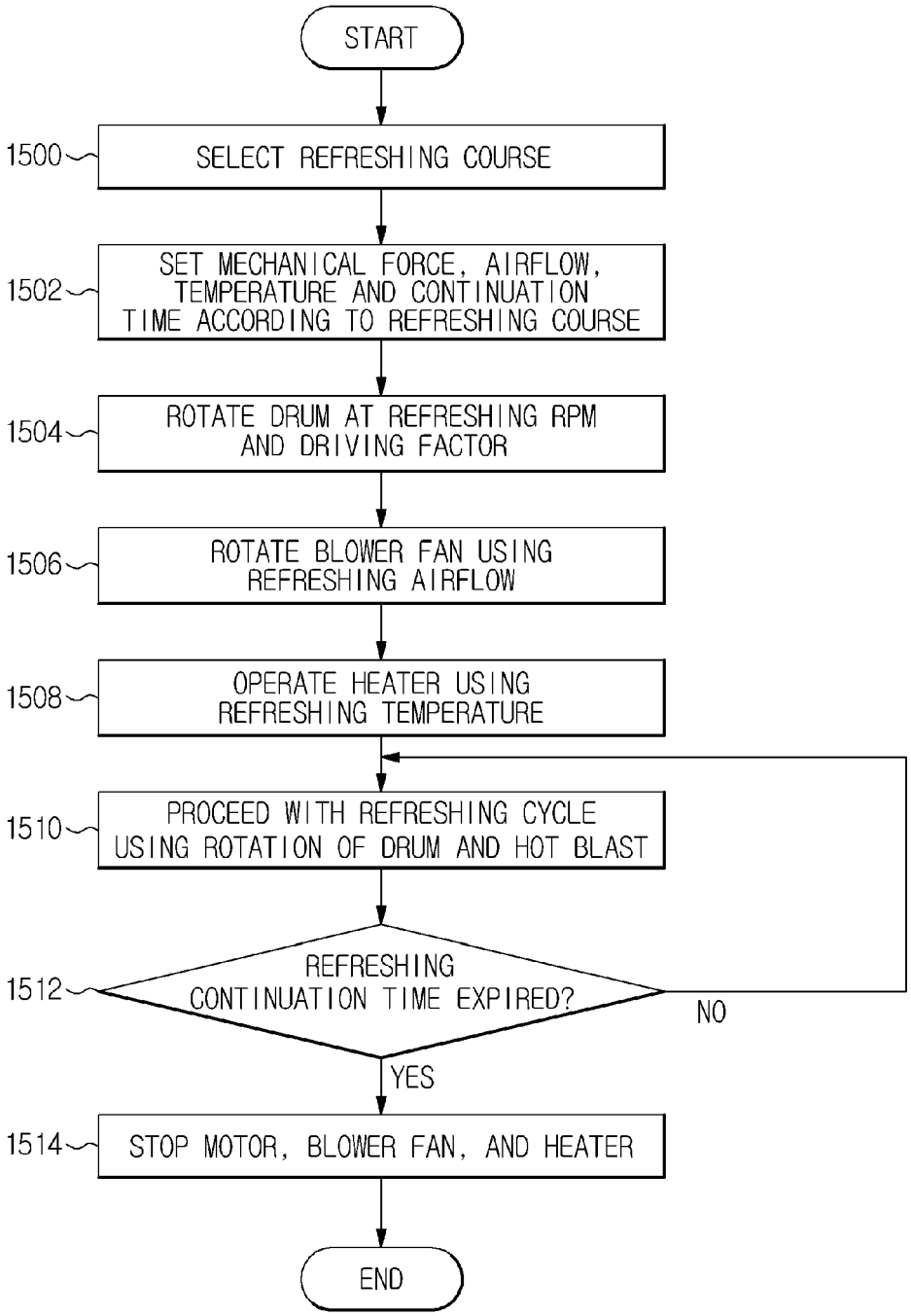

START
1500
SELECT REFRESHING COURSE
1502
SET MECHANICAL FORCE, AIRFLOW, TEMPERATURE AND CONTINUATION TIME ACCORDING TO REFRESHING COURSE
1504
ROTATE DRUM AT REFRESHING RPM AND DRIVING FACTOR
1506
ROTATE BLOWER FAN USING REFRESHING AIRFLOW
1508
OPERATE HEATER USING REFRESHING TEMPERATURE
1510
PROCEED WITH REFRESHING CYCLE USING ROTATION OF DRUM AND HOT BLAST
1512
REFRESHING CONTINUATION TIME EXPIRED?
NO
YES
1514
STOP MOTOR, BLOWER FAN, AND HEATER
END

FIG.20

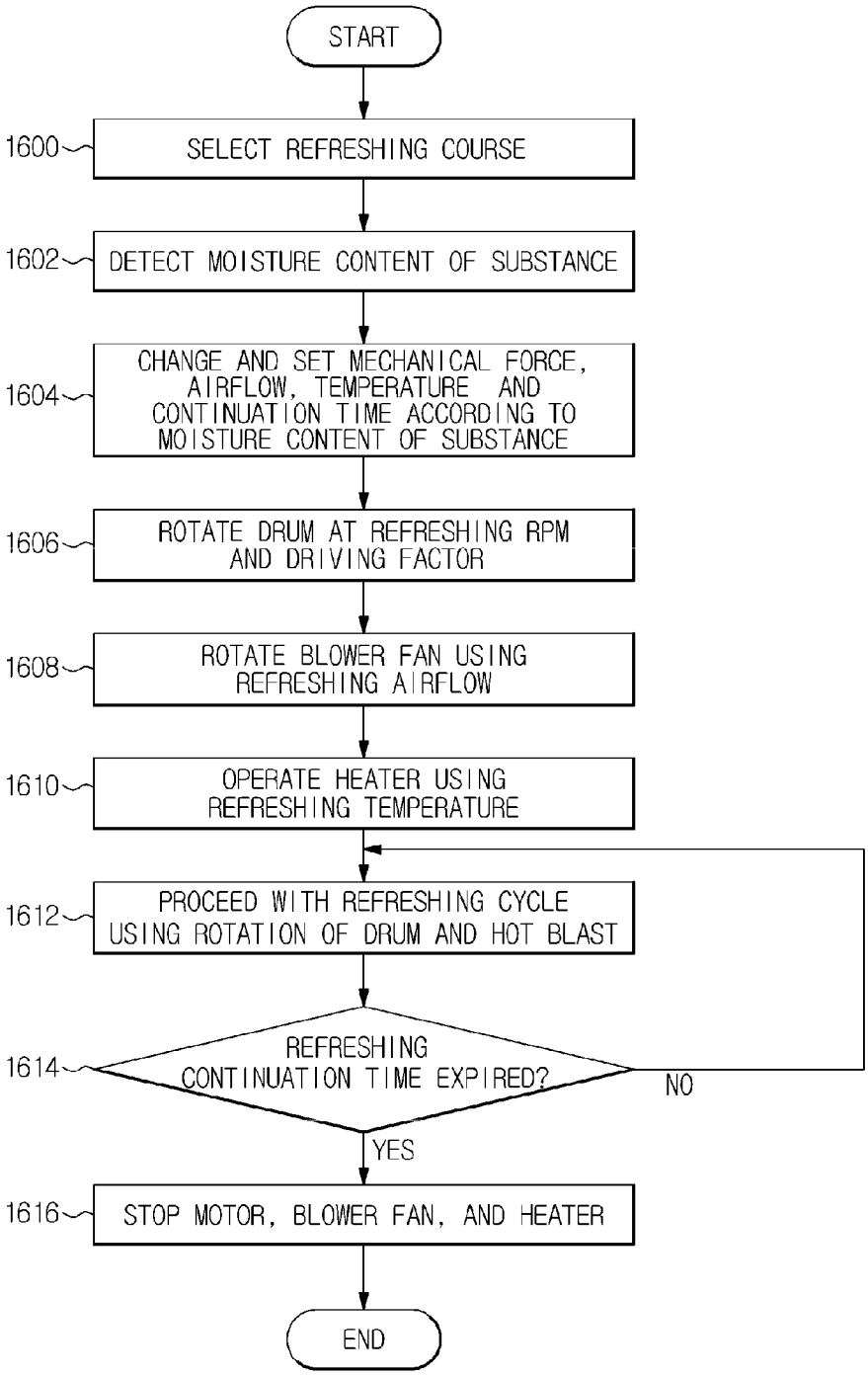

START
1600
SELECT REFRESHING COURSE
1602
DETECT MOISTURE CONTENT OF SUBSTANCE
1604
CHANGE AND SET MECHANICAL FORCE, AIRFLOW, TEMPERATURE AND CONTINUATION TIME ACCORDING TO MOISTURE CONTENT OF SUBSTANCE
1606
ROTATE DRUM AT REFRESHING RPM AND DRIVING FACTOR
1608
ROTATE BLOWER FAN USING REFRESHING AIRFLOW
1610
OPERATE HEATER USING REFRESHING TEMPERATURE
1612
PROCEED WITH REFRESHING CYCLE USING ROTATION OF DRUM AND HOT BLAST
1614
REFRESHING CONTINUATION TIME EXPIRED?
NO
YES
1616
STOP MOTOR, BLOWER FAN, AND HEATER
END

FIG.21

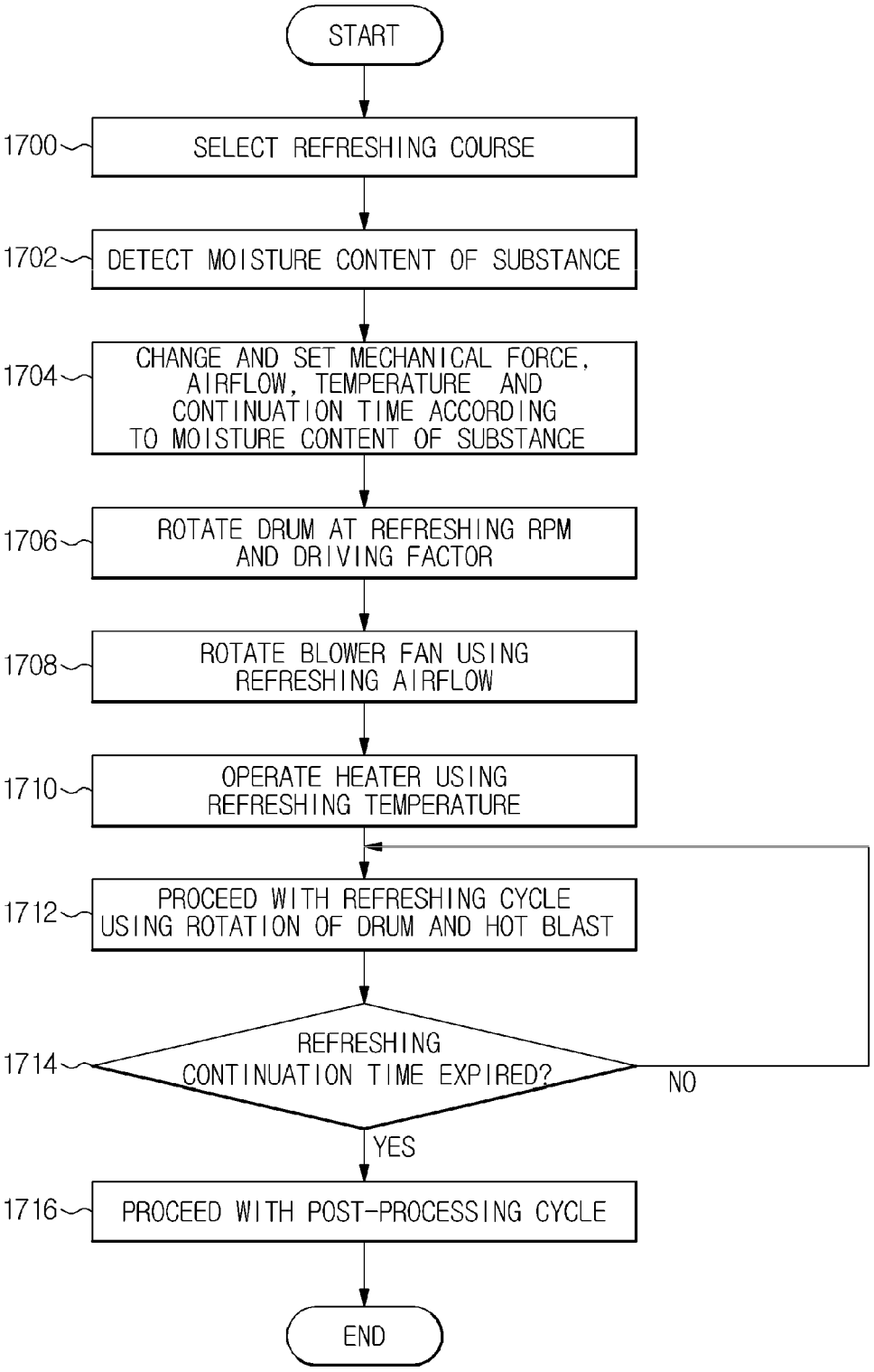

START
1700
SELECT REFRESHING COURSE
1702
DETECT MOISTURE CONTENT OF SUBSTANCE
1704
CHANGE AND SET MECHANICAL FORCE, AIRFLOW, TEMPERATURE AND CONTINUATION TIME ACCORDING TO MOISTURE CONTENT OF SUBSTANCE
1706
ROTATE DRUM AT REFRESHING RPM AND DRIVING FACTOR
1708
ROTATE BLOWER FAN USING REFRESHING AIRFLOW
1710
OPERATE HEATER USING REFRESHING TEMPERATURE
1712
PROCEED WITH REFRESHING CYCLE USING ROTATION OF DRUM AND HOT BLAST
1714
REFRESHING CONTINUATION TIME EXPIRED?
NO
YES
1716
PROCEED WITH POST-PROCESSING CYCLE
END

FIG.22

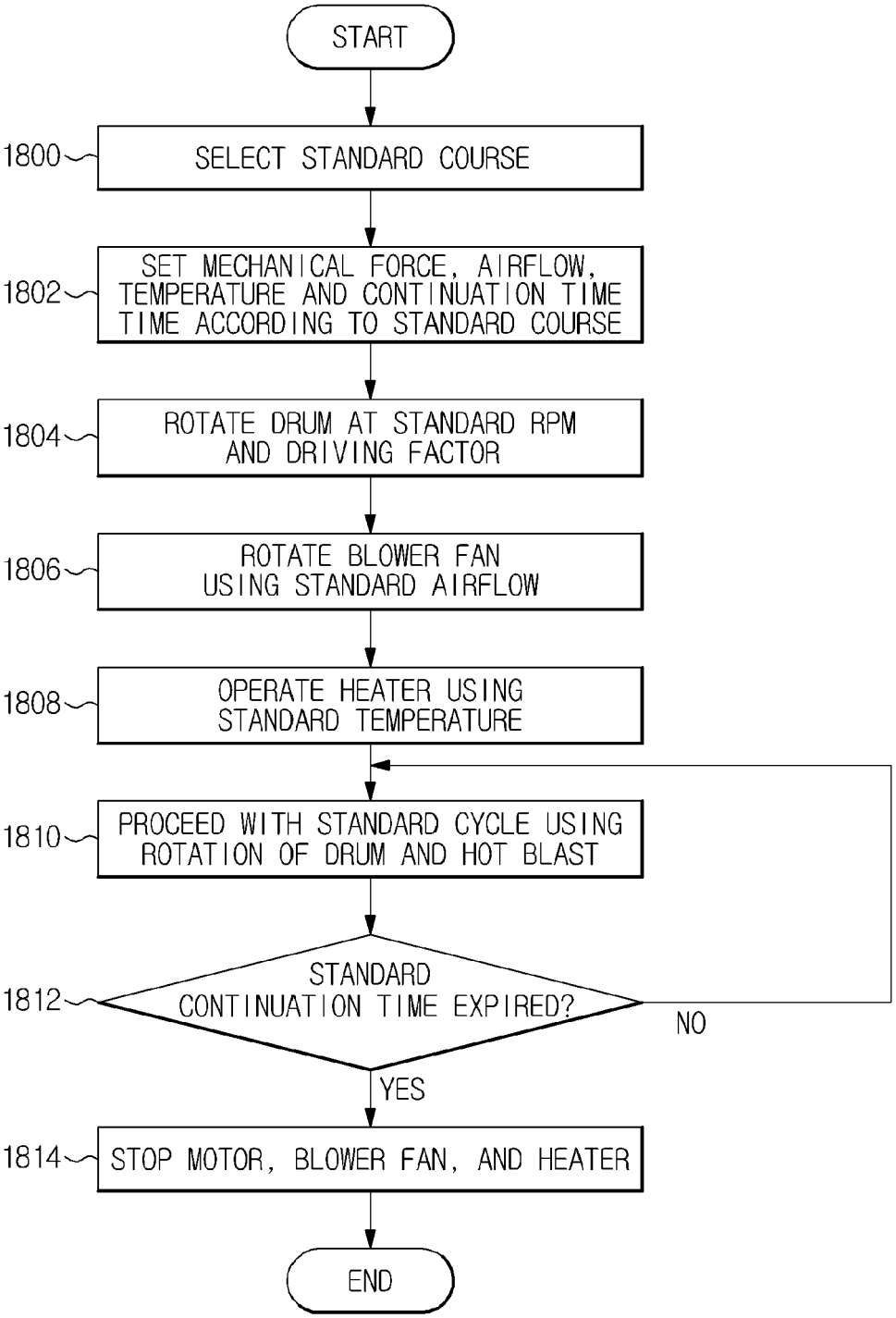

START
1800
SELECT STANDARD COURSE
1802
SET MECHANICAL FORCE, AIRFLOW, TEMPERATURE AND CONTINUATION TIME TIME ACCORDING TO STANDARD COURSE
1804
ROTATE DRUM AT STANDARD RPM AND DRIVING FACTOR
1806
ROTATE BLOWER FAN USING STANDARD AIRFLOW
1808
OPERATE HEATER USING STANDARD TEMPERATURE
1810
PROCEED WITH STANDARD CYCLE USING ROTATION OF DRUM AND HOT BLAST
1812
STANDARD CONTINUATION TIME EXPIRED?
NO
YES
1814
STOP MOTOR, BLOWER FAN, AND HEATER
END

FIG.23

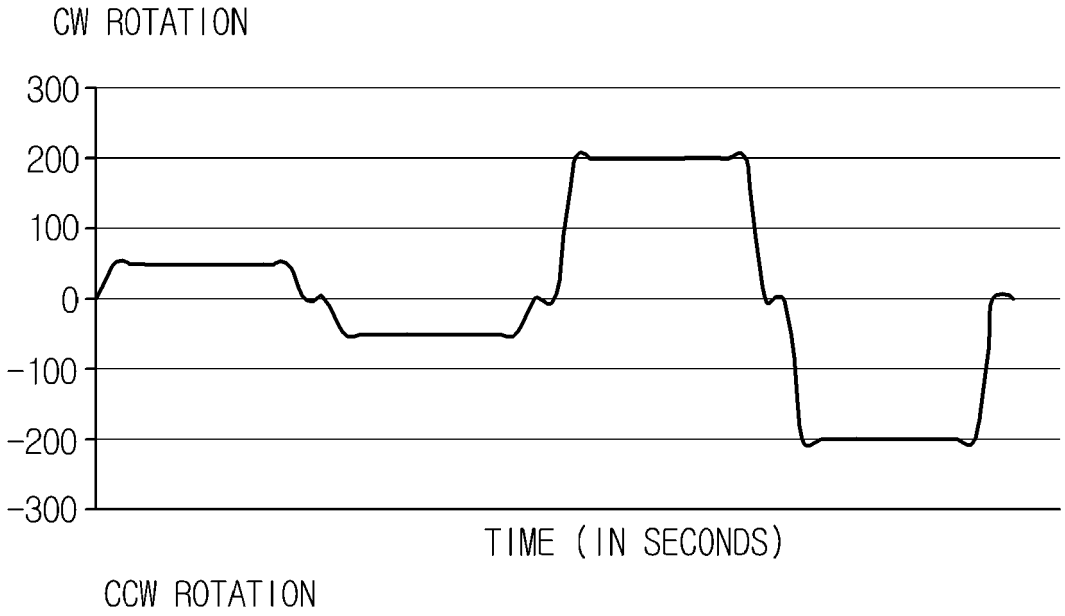

CW ROTATION
300
200
100
0
-100
-200
-300
TIME (IN SECONDS)
CCW ROTATION

FIG.24

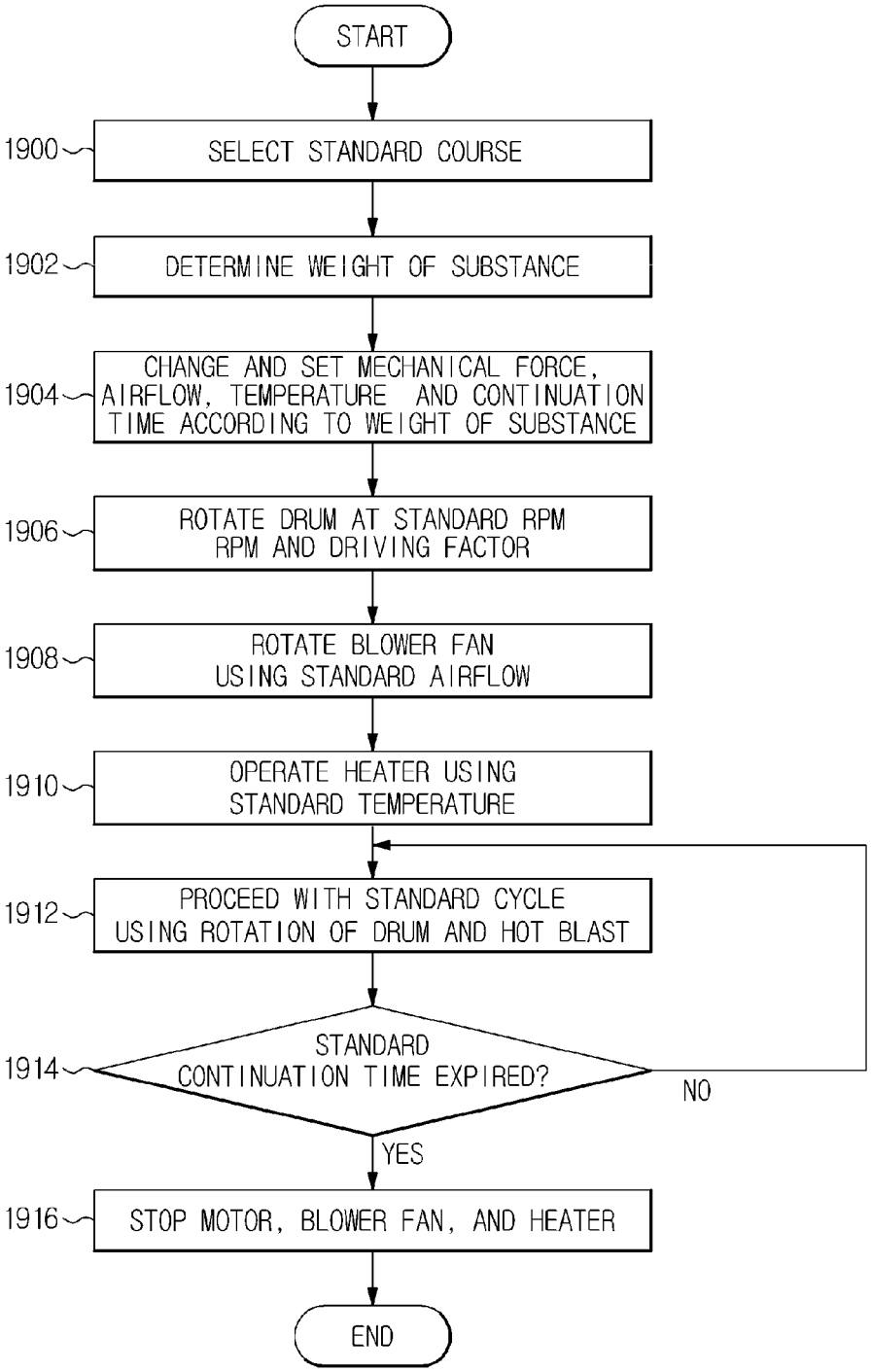

START
1900
SELECT STANDARD COURSE
1902
DETERMINE WEIGHT OF SUBSTANCE
1904
CHANGE AND SET MECHANICAL FORCE, AIRFLOW, TEMPERATURE AND CONTINUATION TIME ACCORDING TO WEIGHT OF SUBSTANCE
1906
ROTATE DRUM AT STANDARD RPM RPM AND DRIVING FACTOR
1908
ROTATE BLOWER FAN USING STANDARD AIRFLOW
1910
OPERATE HEATER USING STANDARD TEMPERATURE
1912
PROCEED WITH STANDARD CYCLE USING ROTATION OF DRUM AND HOT BLAST
1914
STANDARD CONTINUATION TIME EXPIRED?
NO
YES
1916
STOP MOTOR, BLOWER FAN, AND HEATER
END

FIG.25

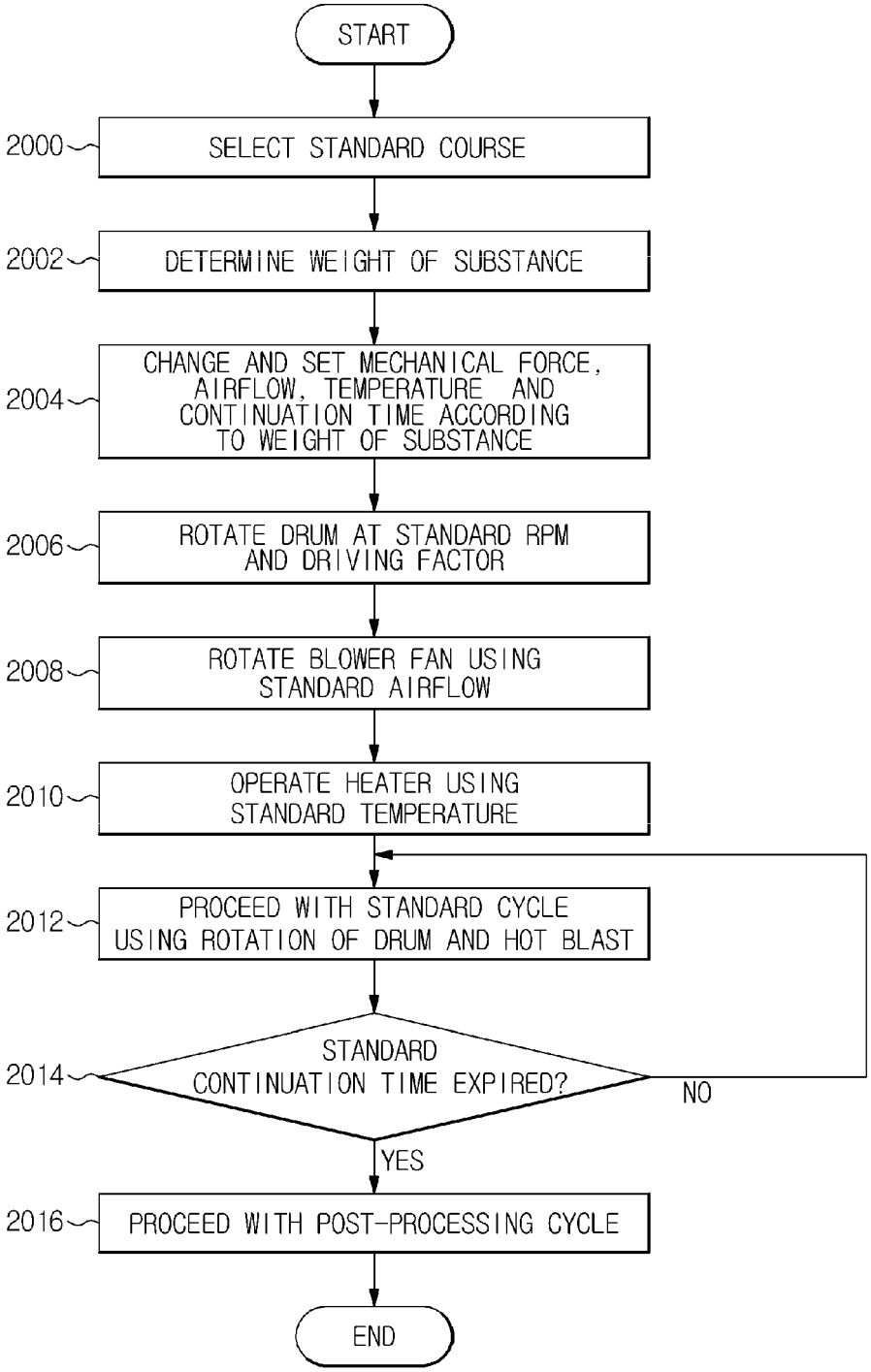

START
2000
SELECT STANDARD COURSE
2002
DETERMINE WEIGHT OF SUBSTANCE
2004
CHANGE AND SET MECHANICAL FORCE, AIRFLOW, TEMPERATURE AND CONTINUATION TIME ACCORDING TO WEIGHT OF SUBSTANCE
2006
ROTATE DRUM AT STANDARD RPM AND DRIVING FACTOR
2008
ROTATE BLOWER FAN USING STANDARD AIRFLOW
2010
OPERATE HEATER USING STANDARD TEMPERATURE
2012
PROCEED WITH STANDARD CYCLE USING ROTATION OF DRUM AND HOT BLAST
2014
STANDARD CONTINUATION TIME EXPIRED?
NO
YES
2016
PROCEED WITH POST-PROCESSING CYCLE
END

FIG.26

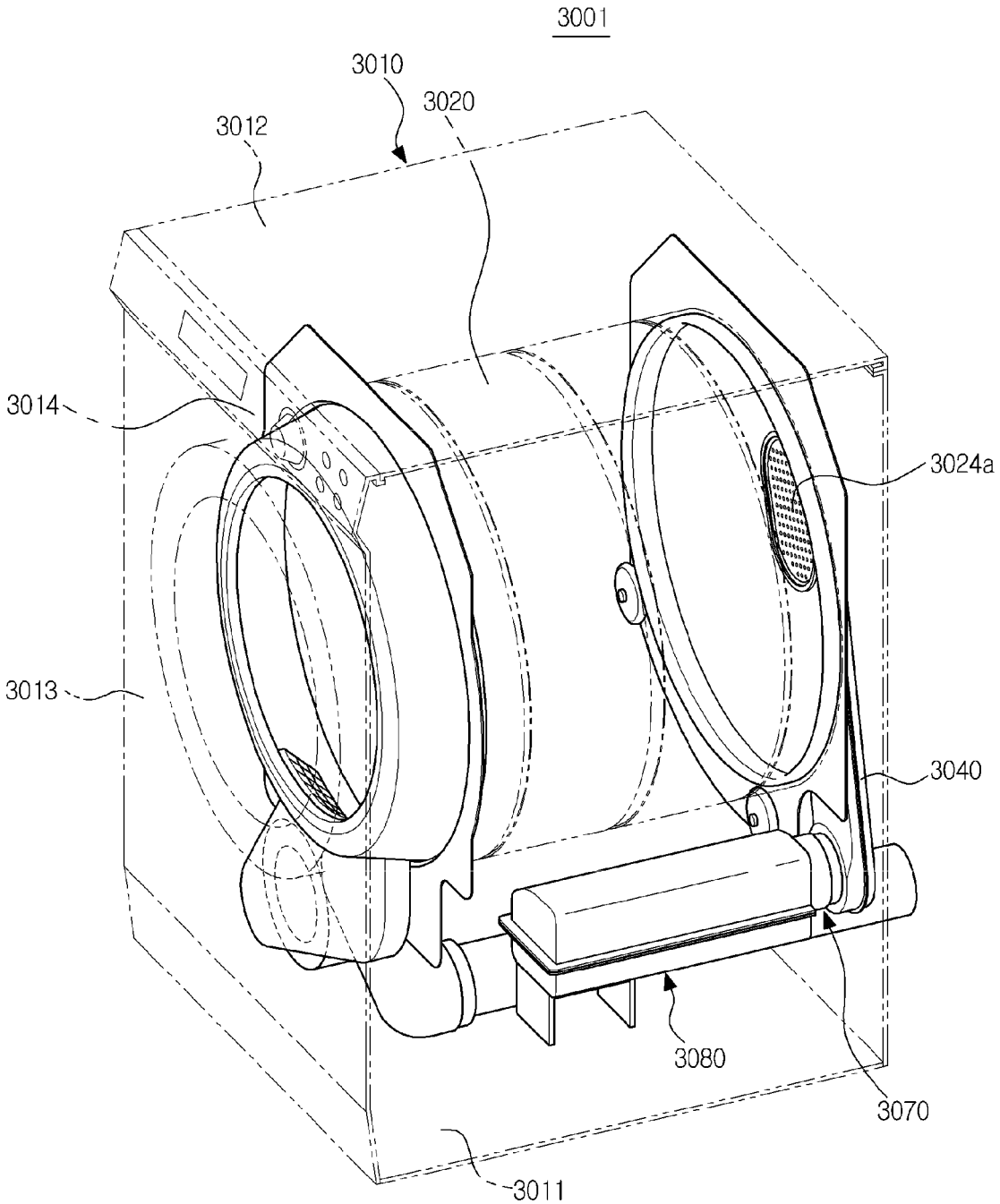
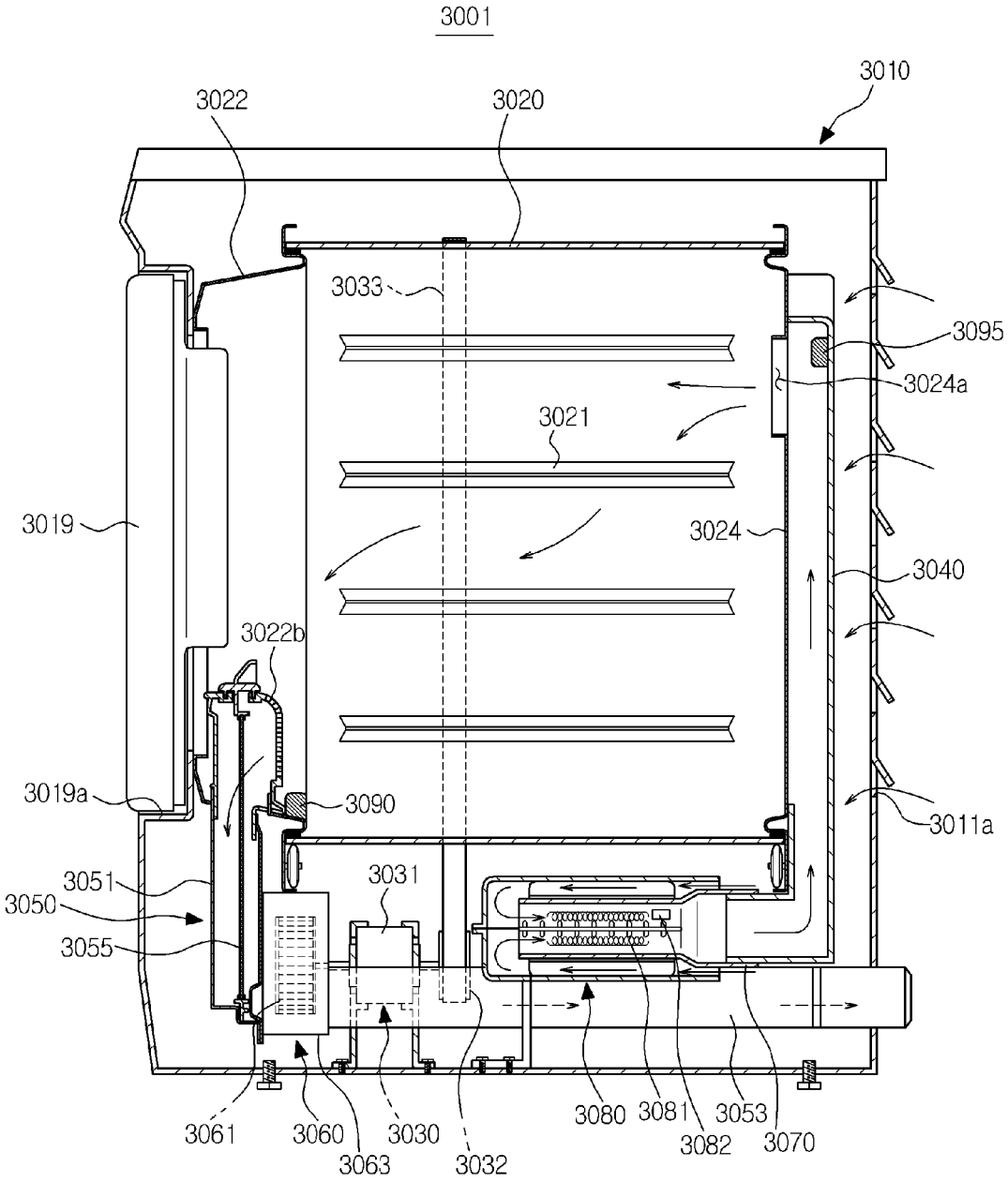


FIG.27


3001
3010
3022
3020
3033
3095
3024a
3021
3019
3024
3040
3022b
3019a
3090
3011a
3051
3031
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Patent documents cited in the description

- JP 2002336593 A **[0131]**
- JP HEI0790077 B **[0131]**