Laundry treatment method and apparatus

Provided is a laundry treatment method and apparatus. First, a cleaning liquid with a detergent dissolved is sprayed. Waiting lasts for a certain time such that the sprayed cleaning liquid is absorbed into laundry. Steam generated by applying heat to flowing water is sprayed to laundry.

FIG. 13
Description

[0001] The present invention relates to a laundry treatment method and an apparatus.

[0002] Generally, examples of laundry treatment machines include washing machines, drying machines, and drying & washing machines.

[0003] A washing machine is an apparatus that performs washing, rinsing, and spinning cycles to remove contaminants from laundry such as clothing and bedding using water, detergent, and mechanical action. The washing machines are classified into a top-loading type in which a drum holding laundry rotates about a vertical axis, and a front-loading type in which the drum rotates about a horizontal axis.

[0004] A drying machine, which is an apparatus that dries a drying subject with hot air, dries the drying subject loaded into the drum with hot air or cool air.

[0005] The washing & drying machine, which is an apparatus having a drying function as well as a washing function, receives laundry such as clothing in the rotating drum and performs a washing or drying cycle according to a mode selected by a user.

[0006] These laundry treatment machines may include a steam supply unit for supplying steam into the drum. A typical steam supply unit holds water in a certain container, heats water in the container to generate steam, and then transfers the generated steam to a spray nozzle through a hose. However, during the transfer through the hose, the steam can be condensed. Accordingly, laundry that is already dried may be again wetted by water sprayed together with the steam through the steam nozzle. Also, a typical spray apparatus has a limitation in securing a desired performance because the sprayed steam cannot reach clothing due to a low steam spray pressure.

[0007] Meanwhile, the steam supply unit in the typical laundry treatment machine is used to sterilize laundry or unwrinkle laundry, but is inappropriate to remove contaminants from laundry. Accordingly, hand-washing is additionally needed to remove local stains on laundry, or a washing machine needs to be operated, which is very inconvenient and makes excessive time, water, and power inefficiently consumed.

[0008] The present invention provides a laundry treatment method that removes contaminants from laundry with steam.

[0009] The present invention also provides a laundry treatment method that can easily remove local spots from laundry.

[0010] The present invention also provides a laundry treatment method that can reduce the laundry treatment time and the power consumption.

[0011] The present invention also provides a laundry treatment method that can secure sufficient performance regardless of the type of contaminant.

[0012] The present invention also provides a laundry treatment method that can secure sufficient performance for both of water-soluble and fatty contaminants.

[0013] The present invention also provides a laundry treatment apparatus.

[0014] According to an aspect of the present invention, there is provided a laundry treatment method using a steam spraying apparatus comprising: spraying a cleaning liquid with a pre-mixed detergent onto laundry contained in a space for holding laundry; waiting for a certain time interval such that the sprayed cleaning liquid is absorbed into laundry; and spraying steam to laundry, the steam being generated by applying heat to flowing water to the detergent-absorbed laundry, wherein the spraying of the cleaning liquid and the spraying of the steam are performed using the same nozzle.

[0015] The spraying of the cleaning liquid may further include blowing air into a space holding laundry during the spraying of the cleaning liquid.

[0016] The spraying of the cleaning liquid may include spraying steam at a spray angle of about 30 degrees to about 60 degrees.

[0017] The spraying of the steam may be performed such that the steam directly contacts laundry.

[0018] An amount of the steam contacting laundry may be about 40% or more of a total amount of the steam generated by heating.

[0019] In the spraying of the steam, an internal temperature of a space holding laundry may be maintained at a temperature of about 35 degrees Celsius to about 40 degrees Celsius.

[0020] The spraying of the steam may be performed together with heating for generating the steam.

[0021] In the spraying of the steam, a spray rate of the steam may range from about 70 cc per minute to about 120 cc per minute.

[0022] The certain time interval may range from about 1 minute to about 4 minutes, preferably depending on the density of the detergent used.

[0023] The spraying of the steam may include blowing hot air into the space holding laundry.

[0024] The laundry treatment method may further include drying laundry after the spraying of the steam.

[0025] The drying of laundry may include blowing hot air into the space holding laundry.

[0026] The drying of laundry may include blowing hot air for about 5 minutes to about 10 minutes.

[0027] The spraying of the steam and the drying of laundry may be repeatedly performed.

[0028] The laundry treatment method may further include reducing a temperature by waiting for a certain time such that the laundry is cooled after the drying of laundry.

[0029] The reducing of the temperature may include blowing cool air into the space holding laundry.

[0030] In the reducing of the temperature, a time during which cool air is blown into the space may be within about 1 minute.

[0031] The spraying of the cleaning liquid may include receiving a detergent from a detergent receiving unit storing the detergent to perform the spraying.
The spraying of the cleaning liquid and the spraying of the steam may be performed using the same nozzle, and in the spraying of the steam, a detergent supply from the detergent receiving unit to the nozzle may be stopped.

In the spraying of the cleaning liquid and the spraying of the steam, water may be supplied to the same nozzle via the detergent receiving unit holding the detergent, and in the spraying of the cleaning liquid, a total amount of the detergent held in the detergent receiving unit may be supplied to the nozzle.

According to a further aspect, the invention provides a laundry treatment apparatus, comprising: a drum for receiving clothing, being rotatably disposed in a casing; a steam spraying apparatus for generating and spraying steam into the drum; and a water supply pipe for supplying water into the steam spraying apparatus, wherein the steam spraying apparatus includes a nozzle configured for spraying cleaning liquid with pre-mixed detergent and steam therethrough.

The foregoing and other objects, features, aspects and advantages of the present invention will become more apparent from the following detailed description of the present invention when taken in conjunction with the accompanying drawings. Exemplary embodiments of the present invention will now be described in detail with reference to the accompanying drawings. The invention may, however, be embodied in many different forms and should not be construed as being limited to the embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art. In the drawings, the shapes and dimensions may be exaggerated for clarity, and the same reference numerals will be used throughout to designate the same or like components.

Hereinafter, a drying machine among laundry treatment machines will be exemplified, but embodiments are not limited thereto. For example, a laundry treatment method according to an embodiment of the present invention can be applied to other laundry treatment machines such as washing machines with a steam spraying function or washing & drying machines within the scope of the present invention.

FIGS. 1A and 1B are perspective views illustrating a clothing stand; FIG. 13 is a view illustrating a procedure of a laundry treatment method according to an embodiment of the present invention and a control relationship among components of each part of a laundry treatment machine during the procedure; and FIG. 14 is a graph illustrating a comparison between an internal temperature T1 of a drum and a temperature at an inlet of a nozzle while spraying is being performed from a spray apparatus.

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FIG. 1 is a perspective view illustrating a drying machine according to an embodiment of the present invention;
FIG. 2 is a cross-sectional view taken along line A-A of FIG. 1;
FIG. 3 is an exploded perspective view illustrating a drying machine according to an embodiment of the present invention;
FIG. 4 is a perspective view illustrating the inside of a drying machine including a spray apparatus;
FIG. 5A is a perspective view of a spray apparatus;
FIG. 5B is a view illustrating a flow passage forming part of a spray apparatus;
FIG. 5C is a cross-sectional view taken along line B-B of FIG. 5B;
FIG. 6 is a view illustrating a coupling structure of a spray apparatus;
FIG. 7 is a graph illustrating a spray pressure according to a spray diameter of a nozzle;
FIG. 8 is a view illustrating an installation structure of a spray apparatus according to another embodiment of the present invention;
FIG. 9 is a view illustrating a spray apparatus according to still another embodiment of the present invention;
FIG. 10 is a cross-sectional view illustrating a portion A of FIG. 9;
FIG. 11 is a view illustrating a nozzle according to an embodiment of the present invention;
FIGS. 12A and 12B are perspective views illustrating a clothing stand; FIG. 13 is a view illustrating a procedure of a laundry treatment method according to an embodiment of the present invention and a control relationship among components of each part of a laundry treatment machine during the procedure; and FIG. 14 is a graph illustrating a comparison between an internal temperature T1 of a drum and a temperature at an inlet of a nozzle while spraying is being performed from a spray apparatus.

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may cover the upper portion of the cabinet 30. The base 38 may be mounted under the cabinet 30. A door 28 may be pivotally coupled to the cabinet 30 to open or close the clothing loading hole.

[0042] The control panel 40 may include an input unit such as buttons or dials, a display unit such as LCD and LED, and a controller 41. The input unit may receive various kinds of control commands related to the operation of the drying machine from a user. The display unit may visually display the operation state of the drying machine. Also, the controller 41 may be disposed on the rear surface of the control panel 40 to control the overall operation of the drying machine.

[0043] In an embodiment, the cabinet 30 may include a water receiving unit 72 that supplies water to a spray apparatus 100. For this, a drawer 71 may be withdrawably supported by the cabinet 30, and a water receiving unit 72 may be held in the drawer 71.

[0044] A front support 10 and a rear support 8 may be disposed at the front portion and the rear portion in the casing. The front portion and the rear portion of the drum 4 may be supported by the front support 10 and the rear support 8, respectively.

[0045] The central portion of the front support 10 may have an opening 50 communicating with the clothing loading hole. Also, a ring-shaped front supporting protrusion 54 may be formed on the rear surface of the front support 10 to support the front end of the drum 4. Also, a front guide roller 56 may be rotatably disposed at a lower portion of the front support 10. The inner circumferential surface of the front end of the drum 4 may be supported by the front supporting protrusion 54, and the outer circumferential surface thereof may be supported by the front guide roller 56.

[0046] A ring-shaped rear supporting protrusion 60 may be formed on the front surface of the rear support 8 to support the rear end of the drum 4, and a rear guide roller 64 may be rotatably disposed at a lower portion of the front surface thereof. The inner circumferential surface of the rear end of the drum 4 may be supported by the rear supporting protrusion 60, and the outer circumferential surface thereof may be supported by the rear guide roller 64.

[0047] A drying heater 42 may be disposed under the drum 4. A drying duct 14 communicating between the rear support 8 and the drying heater 42 may be disposed such that air heated by the drying heater 42 can be supplied into the drum 4. A lint duct 16 may be disposed on the front support 10 such that air passing the drum 4 can flow therein.

[0048] The drying duct 14 may have a plurality of passage holes 144 such that air can be discharged into the drum 4. Due to a blowing force according to the operation of the blower 22, air may flow along the lint duct 16, the blower 22, and a discharge duct 20. Particularly, during the air flowing, air heated by the drying heater 42 may flow along the drying duct 14, and then may be discharged into the drum 4 through the passage hole 144.

[0049] Also, air introduced into the lint duct 16 may be purified by a filter 18. The discharge duct 20 may be disposed at the rear surface of the casing such that air inside the line duct 16 can be guided to the outside of the casing.

[0050] The blower 22 may be disposed between the discharge duct 20 and the lint duct 16. Also, a motor 24 may be provided to generate a driving force of the blower 22 and the drum 4, and a power transmission belt 26 may be provided to rotate the drum through the driving force of the motor 24.

[0051] FIG. 4 is a perspective view illustrating the inside of a drying machine including a spray apparatus 100. FIG. 5A is a perspective view of a spray apparatus. FIG. 5B is a view illustrating a flow passage forming part of a spray apparatus. FIG. 5C is a cross-sectional view taken along line B-B of FIG. 5B.

[0052] Referring to FIGS. 4 and 5, the spray apparatus 100 may spray water into the drum 4. The spray apparatus 100 may include a flow passage forming part 160, a spray generator 170, and a steam generating heater 130. The flow passage forming part 160 may have a flow passage forming unit 160 and a nozzle 170. The nozzle 170 may spray water introduced through the inlet 140 to an outlet 121. The nozzle 170 may spray steam generated by the steam generating heater 130. The nozzle 170 may spray steam at a certain pressure. The pressure of the injected steam is preferably within a range of 0.2 to 0.4 bars above atmospheric pressure.

[0053] Although it will be described in this embodiment that the water receiving unit 72 is separately provided, the flow passage forming unit 160 may be directly supplied with water from an external water resource such as a faucet. In this case, a water supply hose connected to the external water resource may be connected to the inlet 140, and a valve may be further provided between the inlet 140 and the water supply hose to control water supply. A filter may be further provided to filter foreign substances from supplied water.

[0054] In this embodiment, the inlet 140 may be connected to the water receiving unit 72 through a water supply pipe 74, and a pump 73 may be provided to forcibly transfer water from the water receiving unit 72 to the flow passage forming unit 160.

[0055] The flow passage forming unit 160 may be integrally coupled to the nozzle 170. Here, the meaning of the integral coupling may include a case where the flow passage forming unit 160 and the nozzle 170 are formed into one member by injection molding as well as a case where the flow passage forming unit 160 and the nozzle are separately formed and then form one unit or module. In either case, the location of the nozzle 170 may be determined by the fixed location of the flow passage forming unit 160.

[0056] A typical structure in which water is held and heated in a certain container to generate steam and the steam is transferred to the nozzle through the hose has
a limitation in that the steam can be condensed and the condensate water can be sprayed through the nozzle, wetting the drying subject again. However, according to an embodiment of the present invention, water may be heated while flowing through the flow passage unit 160, and steam may be sprayed through the nozzle 170 formed integrally with the flow passage forming unit 160. Accordingly, it can be fundamentally prevented that steam is condensed while steam generated in the flow passage forming unit 160 is flowing to the nozzle 170.

The water receiving unit 72 may be disposed in the drawer 71. A user may withdraw the drawer 71, and may supply water through a loading hole 72a. Particularly, in case of a drying machine miniaturized in consideration of mobility, it is advantageous to receive water through the water receiving unit 72 rather than receive water from an external water source.

The flow passage forming unit 160 may include a flow passage main body 110 and a cover 120. The flow passage main body 110 may include a flow passage for guiding water from the inlet 140 to the outlet 121, and may have an upper portion opened. The cover may cover the opened upper portion of the flow passage main body 110. According to an embodiment, the flow passage main body 110 and the cover 120 may be integrally formed. The flow passage main body 110 may have the inlet 140 connected to the water supply pipe 74. Water may be introduced into the flow passage main body 110 through the inlet 140.

The steam generating heater 130 may heat water introduced into the flow passage main body 110. Water may be heated to generate steam according to the heating action of the steam generating heater 130. The steam generating heater may be exposed to the flow passage of which water flows, but in this embodiment, will be exemplified as being buried in a bottom 113 of the flow passage main body 110. Since the steam generating heater 130 is not directly exposed to water, there is an advantage in that a separate insulating structure for the insulation of the steam generating heater 130 is unnecessary. The flow passage main body 110 may be formed of a thermal conductive material such as aluminum such that heat transfer from the steam generating heater 130 can be easily performed.

The steam generating heater 130 may include two terminals 131 and 132 for power supply. The terminals 131 and 132 may outwardly protrude from the flow passage main body 110 to be electrically connected to a power supply.

The flow passage main body 110 may form a certain space such that water can be moved to the inside. A plurality of flow passage forming ribs 151 and 152 may be protrusively formed on the bottom of the flow passage main body 110. The flow passage forming ribs 151 and 152 may form a path along which water moves, and may extend from side portions 118 and 119 of the flow passage main body 110.

The plurality of flow passage forming ribs may include a first flow passage forming rib 151 extending from the right side portion 118 of the flow passage main body 110 and a second flow passage forming rib 152 extending from the left side portion 119 of the flow passage main body 110. The first flow passage forming rib 151 and the second flow passage forming rib 152 may be alternately arranged between the inlet 140 and the nozzle 170.

The end portion of the first flow passage forming rib 151 may be spaced from the left side portion 119 by a certain gap, and the second flow passage forming rib 152 may also be spaced from the right side portion 118 by a certain gap. Water supplied through the inlet 140 may be guided along the plurality of flow passage forming ribs 151 and 152. The traveling direction of water may be alternately switched while flowing to the nozzle 170.

The cover 120 may cover the flow passage main body 110, and may be formed integrally with the flow passage main body 110 or may be coupled to the flow passage main body 110 by a coupling member. In this case, airtightness may be maintained between the cover 120 and the flow passage main body 110 such that steam generated in the flow passage main body 110 is not leaked.

The cover 120 may include a plate body 112 covering the flow passage main body 110 and a guide tube 123 extending from the outlet 121 formed in the plate body 112 and guiding steam generated in the flow passage main body 110 to the nozzle 170. The nozzle 170 may be coupled to the end portion of the guide tube 123.

The flow passage main body 110 may include a plurality of coupling parts 116 and 117. The coupling parts 116 and 117 may have a coupling hole to which a coupling member is coupled to fix the flow passage main body 110. The opening direction of each coupling hole may be differently configured in consideration of various installation structures. In this embodiment, the opening directions of the coupling hole formed in the first coupling part 116 and the coupling hole formed in the second coupling part 117 may be different from each other.

A plurality of heat transferring protrusions 155 may protrude from the bottom 113 between the first flow passage forming rib 151 and the second flow passage forming rib 152. The plurality of heat transferring protrusions 155 may be disposed spaced from each other. Upon heating of the steam generating heater 130, the bottom 113 of the flow passage main body 110 may be heated, and the flow passage forming ribs 151 and 152 and the heat transferring protrusions 155 may be together heated. This structure has an effect that can secure a wide heating area by heat transferred from the steam generating heater 130 and thus allow water moving between the flow passage forming ribs 151 and 152 to be quickly phase-shifted into steam. When the flow passage main body 110, particularly, bottom 113 may be formed of a thermal conductive material, the heating effect by the flow passage forming ribs 151 and 152 and the heat
transferring protrusions 155 may be improved.

[0068] The structure in which the traveling direction of water is alternately switched between the flow passage forming ribs 151 and 152 may apply sufficient heat to water flowing along the flow passage. Furthermore, in consideration of the heat effect by the heat transferring protrusion 155, water may be sufficiently heated before reaching the nozzle 170. Particularly, when comparing with a case where steam is generated by heating water held in a certain place, the embodiment has an effect of significantly reducing time necessary in steam spraying because heat is applied to flowing water and thus the phase change is almost instantaneously achieved.

[0069] Also, since water is heated while flowing along the flow passage formed in the flow passage forming unit 160, the pressure may increase as water travels downstream along the traveling direction of the water flow, allowing steam to be sprayed at a high pressure through the nozzle 170. Particularly, in addition to the increasing pressure by the steam at the outlet 121, since the pressure of the water flow is added according to the flow of the water to the outlet 121, the spray pressure of the nozzle 170 may be further strengthened.

[0070] During the spraying through the nozzle 170, the temperature at the outlet 121 or the inlet of the nozzle 170 may be maintained at about 70 degrees Celsius (hereinafter, unit of temperature is Celsius), preferably, 70 degrees or less, and the internal temperature of the drum 4 may be maintained at a temperature range from about 30 degrees to about 40 degrees. When the temperature of steam contacting clothing is too high, clothing may be directly damaged, and secondary contamination may occur due to a deformation of spots on clothing. However, in this embodiment, since steam is sprayed at a certain pressure or more through the nozzle 170 and the temperature of steam contacting clothing is about 70 degrees or less, the damage of clothing can be prevented.

[0071] The spray pressure of the nozzle may be closely related with the diameter of the spray hole. Referring to Fig. 7, under the same conditions except the diameter of the spray hole of the nozzle 170, when the diameter of the spray hole is greater than about 1.5 mm, water sprayed from the nozzle 170 may not hit clothing with a sufficient strength. On the other hand, when the diameter of the spray hole is smaller than about 1 mm, the amount of spray may be insufficient to treat clothing. Also, as the diameter of the spray hole decreases, the possibility of the clogging of the spray hole may increase due to scale. Accordingly, in consideration of various factors, the diameter of the spray hole of the nozzle 170 may range from about 1.5 mm to about 2 mm. In this case, the nozzle 170 may spray water of about 70 cc to about 120 cc per minute.

[0072] Also, since water keeps absorbing heat while flowing along a narrow flow passage defined as a gap between the flow passage forming ribs 151 and 152, when the water flow is divided into upstream and downstream according to the traveling direction from the inlet 140 to the nozzle 170, downstream water may be prone to phase change due to much heat-absorbing time, and upstream water may also rapidly generate steam at a portion contacting the bottom 113, where a high temperature and pressure state is generated due to a water pressure according to the flowing of the water in addition to the steam, and a high pressure may act from upstream to downstream. Accordingly, steam finally sprayed through the nozzle may be maintained at a very high pressure, and can reach clothing in the drum 4.

[0073] That is, since the spray apparatus 100 can generate and spray steam in a short time, time spent on the steam spray cycle can be reduced, and the power consumption can also be reduced. Also, steam can be sprayed at a high pressure.

[0074] FIG. 6 is a view illustrating a coupling structure of a spray apparatus. Referring to FIG. 6, the rear supporter 8 may have a passage hole (not shown) such that steam sprayed from the nozzle 170 can be sprayed into the drum 4. The nozzle 170 may be inserted into the passage hole.

[0075] When considering the structure for fixing the steam generating unit 100, the flow passage main body 110 may directly coupled to the rear supporter 8, and may be fixedly coupled to the cabinet 30 or the back panel 34 in this case, the flow passage main body 110 is directly coupled to the cabinet 30 or the back panel 34, and the flow passage forming unit 160 may be disposed such that the inlet 140 is higher than the nozzle 170. After the pump 73 stops operating, residual water in the flow passage forming unit 160 may be naturally discharged through the nozzle 170. Accordingly, generation of scale and contamination due to residual water in the flow passage forming unit 160 can be prevented. According to an embodiment, the drying machine may perform an operation for cleaning of the flow passage forming unit 160. This cleaning operation may be performed during a cycle provided for the drying function, or may be performed by a separately additional function according to the selection of the user. When this cleaning operation is performed, water may be supplied into the flow passage forming unit 160 to discharge foreign substances such as deposits out of the nozzle 170. The location of the inlet 140 and the nozzle 170 may be determined such that all water supplied through the inlet 140 can be discharged through the nozzle 170 to always
Meanwhile, the amount of steam sprayed from the nozzle 170 and contacting clothing in the drum 4 may be about 40% or more of the total amount of steam generated by heating of the steam generating heater 130. For this, the operation temperature of the steam generating heater 130, the area of the spray hole of the nozzle 170, and the operation pressure of the pump 73 need to be appropriately determined, and particularly, the spray angle of the nozzle 170 may be determined such that steam can be sprayed at an angle of about 30 degrees to about 60 degrees with respect to the horizontal plane.

Steam sprayed through the nozzle 170 needs to contact clothing. Steam sprayed from the nozzle 170 may reach the lowermost portion of the drum 4 such that steam can be applied to clothing regardless of the amount of clothing loaded in the drum 4.

FIG. 9 is a view illustrating a spray apparatus according to still another embodiment of the present invention. FIG. 10 is a cross-sectional view illustrating a portion A of FIG. 9.

Referring to FIGS. 9 and 10, a spray apparatus 100 and 600 in a typical drying machine may include a flow passage forming unit 660 and a nozzle 670 like the above-described embodiments. Also, although indicated as different reference numerals, a flow passage main body, a cover 620, a steam generating heater 630, a left side portion 619, and a right side portion 618 will follow the description of the previous embodiments. Accordingly, the description of this embodiment will be focused on differences from the previous embodiments.

In this embodiment, the flow passage forming unit 660 may include a plurality of flow passage forming ribs 611 and 612 protruding from the bottom 613, and may be divided into both spaces based on one of the flow passage forming ribs 611 and 612. Also, the flow passage forming unit 660 may have a gap for movement of water at an upper side of the flow passage forming rib 612 such that water can overflow the flow passage forming rib 612 while traveling from one of the both spaces pertaining to upstream side to the other space pertaining to downstream side. In order to provide the gap for the movement of water, a gap forming section 625 may be formed in the cover 620. In the gap forming section 625, the cover 620 may include a gap for movement of water at an upper side of the flow passage forming rib 612.

An impactor 690 may be provided in the flow passage forming unit 660, and may extend from the flow passage forming rib 612. The impactor 690 may protrude in plurality toward the space pertaining to the upstream side among the both spaces based on the flow of water.

The impactor 690 may be formed at a location corresponding to the gap forming section 625. Water flowing in the flow passage forming unit may be hit by the impactor 690 at the space pertaining to the upstream side of the both spaces divided by the flow passage forming rib 612, and then may travel to the space pertaining to the downstream side through the gap forming section 625. When this process is continuously repeated, scale may be mainly generated among the impactors 691, 692 and 693. Accordingly, the spray hole of the nozzle 670 can be prevented from clogging.

The impactor 690 may be formed at a plurality of locations, particularly, at sections where the flow direction is switched. The flow passage forming rib may be partially cut such that the water flow can travel even though the gap forming section 625 is not formed at a section where the impactor 690 is not installed among the sections where the flow direction is switched.

Although not shown, the spray apparatus 600 may be configured such that the inlet 640 is disposed over the nozzle 670. Similarly to the embodiment described with reference to FIG. 8, this structure is advantageous to discharging of residual water in the flow passage forming unit 660.

FIG. 11 is a view illustrating a nozzle according to an embodiment of the present invention. Referring to FIG. 11, a spray apparatus according to an embodiment may include a nozzle varying in the area of the spray hole according to the water pressure. Thus, although the spray hole is narrowed due to scale generated by the continuous use of the spray apparatus, a spray amount of a certain level or more can be secured. This nozzle can be implemented in various types. It will be noted that a nozzle 270 exemplified herein can be applied to any one of the spray apparatus described in the previous embodiments.

The nozzle 270 may be formed of a deformable material. The nozzle 270, particularly, the spray hole may be deformed according to the spray pressure. Although scale is generated around the spray hole, since the area of the spray hole varies, a spray amount of a certain level or more can be secured, and foreign substances in the flow passage forming units 160 and 660 can also be discharged to the outside.

The spray hole of the nozzle 270 may be formed to be cut along the edge thereof multiple times. As the cut portions spread out according to the spray pressure, the diameter of the spray hole of the nozzle 270 may increase.

FIGS. 12A and 12B are perspective views illustrating a clothing stand. Referring to FIGS. 12A and 12B, a clothing stand 300 may allow clothing to be placed therein when clothing is washed through the spray apparatus 100 and 600. Here, the meaning of washing is a process of removing contaminants by applying steam clothing through the spray apparatus 100 and 600 unlike a washing cycle or operation performed by a typical washing machine. Since steam is used, the amount of water required for washing is smaller than that required for typical washing. Accordingly, washing is more efficient, and local contaminants such as spots on clothing can be conveniently removed. Particularly, it is possible to install the spray apparatus 100 and 600 in a typical drying machine to provide a washing function.
The clothing stand 300 may include a base 310 and a support plate 340. The support plate 340 may be pivotably disposed in the base 310, and may adjust the contaminated part of clothing so as to face the spray direction of the nozzle 170. A user may place clothing on the clothing stand such that the contaminated part is located on the support plate 340, and then may adjust the angle of the support plate 340 so as to face the nozzle 170 such that steam sprayed through the nozzle 170 accurately reaches the contaminated part. The maximum pivotable angle of the support plate 340 may be set corresponding to the spray direction of the nozzle 170. The clothing stand 300 may be detachably disposed in the drum 4 such that a user can arbitrarily attach or detach the clothing stand 300 only when necessary. The laundry stand 300 may be detachably disposed in the drum 4 such that a user can arbitrarily attach or detach the clothing stand such that the contaminated part is located on the support plate 340 only when necessary. The laundry stand 300 may stop operating.

FIG. 13 is a view illustrating a procedure of a laundry treatment method according to an embodiment of the present invention and a control relationship among components of each part of a laundry treatment machine during the procedure. FIG. 14 is a graph illustrating a comparison between an internal temperature T1 of a drum and a temperature T2 at an inlet of a nozzle while spraying is being performed from a spray apparatus. Hereinafter, a laundry treatment method according to an embodiment of the present invention will be described with reference to FIGS. 13 and 14.

The laundry treatment method may include a cleaning liquid treatment process S10 in which a solution comprising a detergent is sprayed to laundry, a cleaning liquid infiltration process S20 of waiting for a certain time such that the sprayed solution can be absorbed into laundry, and a steam spraying process S30 in which steam generated by applying heat to flowing water is sprayed to laundry.

The cleaning liquid treatment process S10 may be performed by the spray apparatus 100 and 600 as described in the previous embodiments. In this case, the pump 73 may operate, but the steam generating heater 130 may stop operating.

According to an embodiment, the water supply pipe 74 may be connected to the spray apparatus 100 and 600 via a detergent receiving unit containing detergent, or a detergent supply unit (not shown) for directly supplying a cleaning liquid to the spray apparatus 100 and 600. In the cleaning liquid treatment process S10, detergent contained in the detergent receiving unit may be supplied to the spray apparatus 100 and 600. In the cleaning liquid treatment process S10, the total amount of detergent held in the detergent receiving unit may be supplied and sprayed to the spray apparatus 100 and 600 together with water. Accordingly, in the subsequent steam spraying process S30, even though water passing the detergent receiving unit like the cleaning liquid treatment process S10 is supplied to the spray apparatus 100 and 600, water in which detergent is not dissolved may be supplied, and water sprayed through the nozzles 170 and 270 may also not contain detergent dissolved.

The cleaning liquid treatment process S10 may further include blowing air into a space (e.g., drum 4) where laundry is held during the spraying of steam. During the spraying of steam, the pump 73 may operate (ON), but the steam generating heater 130 may stop operating (OFF). The heater is turned off during steam injection in order to prevent an overheating. In addition, upon the blowing of air, the blower 22 may operate. Preferably, the cleaning liquid treatment process S10 may spend about 0.5 minutes to several minutes.

The spray angle of the nozzles 170 and 270 may range from about 30 degrees to about 60 degrees with respect to the horizontal plane such that laundry in the drum 4 can be evenly wetted by cleaning liquid sprayed through the spray apparatus 100 and 600.

In the cleaning liquid infiltration process S20, the cleaning liquid may infiltrate into laundry. Preferably, in the cleaning liquid infiltration process S20, cleaning liquid may not be further sprayed (pump 73 is turned off), the drying heater 42 and the blower 22 may stop operating so as to maintain the wet state of laundry. The cleaning liquid infiltration process S20 may spend about 1 minute to about 4 minutes.

In the steam spraying process S30, laundry treated by cleaning liquid may be washed and rinsed. Spraying of steam may be performed through the spray apparatus 100 and 600. Contaminants may be removed from laundry by a physical force of water sprayed from the spray apparatus 100 and 600 and a chemical action of detergent dissolved in water. During the cleaning liquid...
infiltration process S20, contaminants may be more easily removed because detergent is sufficiently absorbed into laundry. Spraying needs to be performed for a sufficient time, preferably, about 0.5 minutes to about several minutes such that cleaning liquid can be removed from laundry, but the embodiments are not limited thereto. The spray time can be set longer such that more amount can be sprayed than in the cleaning liquid treatment process S10.

[0104] In the steam spraying process S30, the drying heater 42 may operate to maintain or increase the internal temperature of the drum 4 in addition to the operation of the pump 73 and the steam generating heater 130 (but, when spraying is performed by its own water pressure of the water supply source that supplies water to the spray apparatus 100 and 600, the pump 73 can be omitted). Air heated by the drying heater 42 may be blown into the drum 4 by the blower 22. In the cleaning liquid infiltration process S20, the spray nozzle 170 may be always maintained at a temperature range from about 30 degrees to about 40 degrees during the cleaning liquid treatment process S10, and the steam spraying process S30. The steam spraying process S30 may serve to effectively remove water-soluble contaminants. Also, steam sprayed in the steam spraying process S30 directly contacts laundry, since steam is applied to laundry sufficiently wetted through the cleaning liquid treatment process S10 and the cleaning liquid infiltration process S20, the contamination sources stained on laundry may be prevented from being denaturalized or coagulated. Particularly, during the cleaning liquid treatment process S10 and the cleaning liquid infiltration process S20, fatty contaminants may be activated by a chemical action of detergent, thereby facilitating removal of contaminants. Also, steam sprayed in the steam spraying process S30 may serve to effectively remove water-soluble contaminants in consideration of the spray pressure and the temperature of steam, as well as the fatty contaminants.

[0110] Consequently, during the cleaning liquid treatment process S10, the cleaning liquid infiltration process S20, and the steam spraying process S30, the laundry treatment method according to the embodiment of the present invention can effectively remove water-soluble contaminants as well as fatty contaminants, as well as prevent denaturation and coagulation regardless of the types of contaminants.

[0111] During the steam spraying process S30, contaminants stained on laundry may be significantly removed. Also, since the amount of water absorbed into laundry is sufficient, the coagulation or denaturalization of protein or the denaturalization of clothing does not easily occur even though the internal temperature of the drum 4 rises due to the operation of the drying heater 42.

[0112] Water sprayed through the spray apparatus 100 and 600 in the steam spraying process S30 may be in a state where steam and cleaning liquid of a droplet state are mixed, which provides advantages in terms of increase of the spray pressure, increase of the spray distance, and securement of the amount of water for treating contamination of laundry.

[0115] A drying process S40 may include drying laundry washed or rinsed through the steam spraying process.
S30. Spraying through the spray apparatus 100 and 600 may be stopped, and cool air or hot air may be blown into the drum 4. The blower 22 may operate for the air blowing, and particularly, the drying heater 42 may operate for quick drying. Preferably, the drying process S40 may spend about 5 minutes to about 10 minutes.

A temperature reducing process S50 may include reducing the internal temperature of the drum 4 after the drying process S40. When a user opens the door 28 to unload laundry that is completely dried, hot air may be together discharged. In order to prevent the safety accident such as burn, the internal temperature of the drum 4 may be reduced. Spraying through the spray apparatus 100 and 600 may be in a stopped state, and the blower 22 may operate. In this case, the operation of the drying heater 42 may be stopped. Preferably, the temperature reducing process S50 may be finished within about 1 minute.

Meanwhile, the pump 73, the steam generating heater 130, the blower 22, and the drying heater 42 may not operate throughout the corresponding process, but may intermittently operate by the control of the controller 41. For example, the operation and the operation stop may be repeated at a certain time interval, or may be controlled according to a predetermined temperature or flow rate based on measured values of a sensing unit such as a temperature sensor (not shown) or a flow rate sensor (not shown).

The laundry treatment method according to the embodiment of the present invention can remove contaminants stained on laundry through steam spraying. Particularly, it is possible to simply remove spots locally stained on laundry. Also, this method has an effect of reducing time, power, and water necessary for treatment of laundry.

In addition, since the laundry treatment method uses hot steam to treat laundry, the coagulation and denaturalization of contaminants can be prevented regardless of the types of contaminants. Also, sufficient washing performance can be secured with respect to all of water-soluble and fatty contaminants.

Claims

1. A laundry treatment method using a steam spraying apparatus, comprising:

   spraying (S10) cleaning liquid with pre-mixed detergent onto laundry contained in a space for holding laundry; and

   waiting (S20) for a certain time interval such that the sprayed cleaning liquid is absorbed into said laundry; and

   spraying (S30) steam generated by applying heat to flowing water to the detergent-absorbed laundry, wherein the spraying of the cleaning liquid and the spraying of the steam are performed using the same nozzle (170).

2. The laundry treatment method of claim 1, wherein during the spraying of the cleaning liquid air is blown into the space holding laundry.

3. The laundry treatment method of claim 1 or 2, wherein in the spraying of the steam is performed such that the steam directly contacts laundry.

4. The laundry treatment method of claim 3, wherein in the spraying of the cleaning liquid comprises spraying steam at a spray angle of about 30 degrees to about 60 degrees.

5. The laundry treatment method of any of preceding claims, wherein in the spraying of the steam, the internal temperature of the space holding laundry is maintained at a temperature of about 35 degrees Celsius to about 40 degrees Celsius.

6. The laundry treatment method of any of preceding claims, wherein in the spraying of the steam, a spray rate of the steam ranges from about 70 cc per minute to about 120 cc per minute.

7. The laundry treatment method of any of preceding claims, wherein the certain time interval ranges from about 1 minute to about 4 minutes.

8. The laundry treatment method of any of preceding claims, wherein during the spraying of the steam hot air is separately blown into the space holding laundry.

9. The laundry treatment method of any of preceding claims, further comprising drying laundry (S40) after the spraying of the steam.

10. The laundry treatment method of claim 9, wherein the drying of laundry comprises blowing hot air, preferably, for about 5 minutes to about 10 minutes into the space holding laundry.

11. The laundry treatment method of any of preceding claims, wherein in the spraying of the steam, a detergent supply to the nozzle is stopped.

12. The laundry treatment method of any of claims 1 to 10, wherein in the spraying of the cleaning liquid and the spraying of the steam, water is supplied to the same nozzle via a detergent receiving unit holding the detergent, and in the spraying of the cleaning
liquid, the detergent is emptied from the detergent receiving unit.

13. A laundry treatment apparatus, comprising:

- a drum (4) for receiving clothing, being rotatably disposed in a casing;
- a steam spraying apparatus (100) for generating and spraying steam into the drum; and
- a water supply pipe (74) for supplying water into the steam spraying apparatus, wherein the steam spraying apparatus includes a nozzle (170) configured for spraying cleaning liquid with pre-mixed detergent and steam through.

14. The laundry treatment apparatus of claim 13, wherein the water supply pipe (74) is connected to the steam spraying apparatus (100) via a detergent receiving unit for storing detergent therein, so as to provide the cleaning liquid with pre-mixed detergent to the steam spraying apparatus.

15. The laundry treatment apparatus of claim 14, wherein the detergent receiving unit is configured to stop detergent supply when the steam spraying apparatus generates steam.
FIG. 1
FIG. 5B
FIG. 12B
FIG. 14

TEMPERATURE (°C)

T1

T2

TIME