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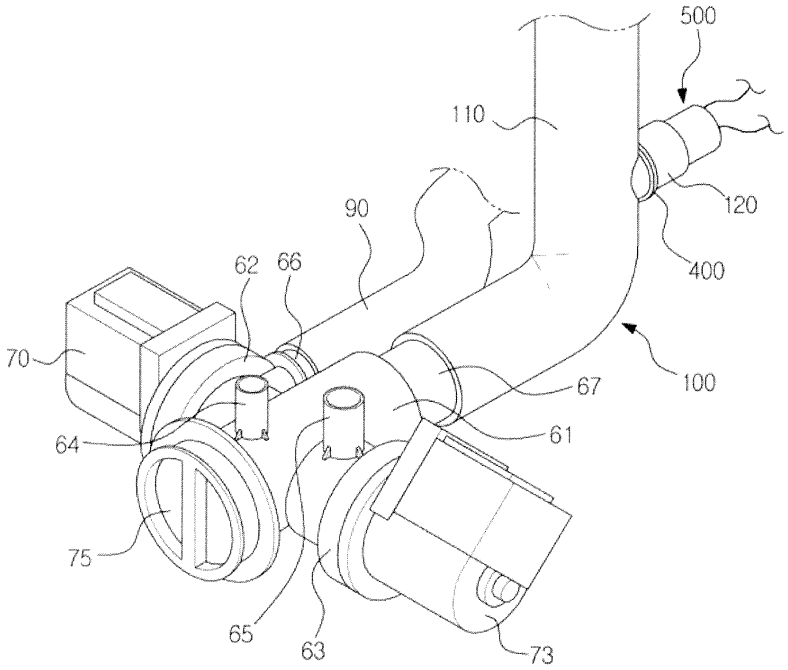
(54) Drum washing machine

(57) A drum washing machine provided with a wash water sensor mounted at a drain hose to easily measure the amount of the detergent contained in the wash water therein, the drum washing machine a cabinet, a tub disposed at an inside the cabinet to accommodate water, a drain pump disposed at a lower portion of the tub to pump the wash water at an inside the tub, a first drain hose configured to connect the tub to the drain pump, such that the wash water at an inside the tub is introduced to the drain pump, a second drain hose configured to connect the drain pump to an outside the cabinet, and a wash water sensor configured to sense the amount of the detergent contained in the wash water drained from the tub, and mounted at the first drain hose.

FIG. 3



EP 2 615 201 A1

Description

BACKGROUND

1. Field

[0001] Embodiments of the present disclosure relate to a drum washing machine having a wash water sensor capable of measuring the amount of the detergent contained in the wash water therein.

2. Description of the Related Art

[0002] A drum washing machine is an apparatus configured to wash clothes by using electricity, and in general, the drum washing machine includes a tub to store wash water, a drum rotatively installed at an inside the tub, and a motor to drive the drum.

[0003] In a state when a laundry and wash water are input to an inside the drum, when the drum is rotated by the motor, the laundry makes contact with the drum and the wash water, and thereby the stain on the laundry is removed.

[0004] A washing machine is provided with a turbidity sensor and an electrode sensor to measure the amount of the detergent contained by wash water, and includes a function to control the time that takes at least one of a washing process, a rinsing process, and a draining process.

SUMMARY

[0005] Therefore, it is an aspect of the present disclosure to provide a drum washing machine provided with a wash water sensor mounted at a drain hose to easily measure the amount of the detergent contained in the wash water therein.

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

[0007] In accordance with one aspect of the present disclosure, a drum washing machine include a cabinet, a tub, a drain pump, a first drain hose, a second drain hose, and a wash water sensor. The tub may be disposed at an inside the cabinet to accommodate wash water. The drain pump may be disposed at a lower portion of the tub to pump the wash water at an inside the tub. The first drain hose may be configured to connect the tub to the drain pump, such that the wash water at an inside the tub is introduced to the drain pump. The second drain hose may be configured to connect the drain pump to an outside the cabinet. The wash water sensor may be configured to sense the amount of the detergent contained in the wash water drained from the tub, and mounted at the first drain hose.

[0008] The first drain hose comprises a settling hole in which the wash water sensor is settled.

[0009] The first drain hose may include a split part branching from the first drain hose.

[0010] The first drain hose may further include a settling hole formed at one end portion of the split part, and configured such that the wash water sensor is settled in the settling hole.

[0011] The drum washing machine may further include a fixation apparatus. The fixation apparatus may be configured to surround an outer circumferential surface of the split part, in which the wash water sensor is settled, such that the wash water sensor and the split part are closely attached and fixed to each other.

[0012] The fixation apparatus may include a clamp.

[0013] The fixation apparatus may include a cable tie.

[0014] The wash water sensor may include a body, and a sensing part protrudedly formed from the body to measure the amount of the detergent contained in the wash water.

[0015] The wash water sensor may further include a position determining protrusion protrudedly formed from a side surface of the body in an outward radial direction.

[0016] The first drain hose may further include a position determining groove formed on an inner side of the split part in a carved manner, such that the position determining groove corresponds to the position determining protrusion.

[0017] The first drain hose and the split part may be integrally formed with each other.

[0018] The wash water sensor may be insertedly mounted on the split part, such that the sensing part is disposed at an inside the first drain hose.

[0019] The wash water sensor may include a turbidity sensor.

[0020] The wash water sensor may include an electrode sensor.

[0021] In accordance with another aspect of the present disclosure, a drum washing machine includes a cabinet, a tub, a drain hose, and a wash water sensor. The tub may be disposed at an inside the cabinet to accommodate wash water. The drain hose may be connected to the tub to guide the wash water at an inside the tub to an outside the cabinet. The wash water sensor may be configured to sense the amount of the detergent contained in the wash water. The drain hose may include a main line and a split line. The main line may be configured to guide the wash water. The split line may branch from the main line. The wash water sensor may be insertedly mounted on the split line.

[0022] The drum washing machine may further include a fixation apparatus. The fixation apparatus may be installed to surround a circumference of the split line, such that the split line and the wash water sensor are closely attached to each other, and thus one end portion of the split line is sealed.

[0023] The wash water sensor may include a body, and a sensing part protrudedly formed from the body to measure the amount of the detergent of the wash water.

[0024] The wash water sensor may further include a

position determining protrusion protrudedly formed from a side surface of the body. The split line may further include a position determining groove formed as one end portion of the split line is slit at a position corresponding to the position determining protrusion.

[0025] The wash water sensor may be mounted at the split line, such that the sensing part is disposed at an inside the main line.

[0026] The split line may be separately formed from the main line, and may be coupled to the main line.

[0027] The split line may be integrally formed with the main line.

[0028] By mounting a wash water sensor at a drain hose that generally accommodates wash water, such that the wash water sensor makes contact with the wash water at all times, and through such, the amount of the detergent contained in the wash water is accurately sensed by the wash water sensor.

BRIEF DESCRIPTION OF THE DRAWINGS

[0029] These and/or other aspects of the disclosure will become apparent and more readily appreciated from the following description of embodiments, taken in conjunction with the accompanying drawings of which:

FIG. 1 is a cross-sectional view illustrating a structure of a drum washing machine in accordance with an embodiment of the present disclosure.

FIG. 2 is a perspective view illustrating only a structure of an inside a cabinet of the drum washing machine in FIG. 1.

FIG. 3 is an expanded view illustrating a drain pump and a drain hose in FIG. 2.

FIG. 4 is a view illustrating a drain hose and a turbidity sensor in accordance with an embodiment of the present disclosure.

FIGS. 5 to 6 are views each illustrating a fixation apparatus configured for the coupling of the drain hose and the turbidity sensor of FIG. 4 in accordance with another embodiment of the present disclosure.

FIG. 7 is a view illustrating a drain hose and a turbidity sensor in accordance with another embodiment of the present disclosure.

FIG. 8 is a view illustrating a drain hose, a turbidity sensor, and a drain pump in accordance with another embodiment of the present disclosure.

DETAILED DESCRIPTION

[0030] Reference will now be made in detail to embodiments of the present disclosure, examples of which are illustrated in the accompanying drawings, wherein like reference numerals refer to like elements throughout.

[0031] FIG. 1 is a cross-sectional view illustrating a structure of a drum washing machine in accordance with an embodiment of the present disclosure, and FIG. 2 is a perspective view illustrating only a structure of an inside a cabinet of the drum washing machine in FIG. 1.

[0032] As illustrated in FIGS. 1 to 2, a drum washing machine 1 includes a cabinet 10 forming an exterior, a tub 20 disposed at an inside the cabinet 10, a drum 30 rotatively formed at an inside the tub 20, and a motor 41 to drive the drum 30.

[0033] An input unit 11 is formed at a front of the cabinet 10 to input a laundry to an inside the drum 30. The input unit 11 is open/closed by a door 12 installed at a front surface unit of the cabinet 10.

[0034] The tub 20 is supported by at least one damper 25. The damper 25 connects a lower surface of an inner side of the cabinet 10 and an outer surface of the tub 20.

[0035] At least one water supply pipe 50 is installed at an upper portion of the tub 20 to supply wash water to the tub 20. One side of the water supply pipe 50 is connected to an outside water supply source (not shown), and other end of the water supply pipe 50 is connected to a detergent supply apparatus 52. At least one water supply valve 56 is provided between the outside water supply source and the detergent supplying apparatus 30 to control water supply is provided,

[0036] The detergent supply apparatus 52 is connected to the tub 20 through a connecting pipe 54. The water supplied through the water supply pipe 50 passes through the detergent supply apparatus 52, and is supplied to an inside the tub 20 along with detergent.

[0037] The drum 30 includes a cylindrical unit 31, a front surface panel 32 disposed at a front of the cylindrical unit 31, and a rear surface panel 33 disposed at a rear of the cylindrical unit 31. An opening hole 32a is formed at the front surface panel 32 for the entry/exit of the laundry, and a driving shaft 42 is connected to the rear surface panel 33 to deliver the driving force of the motor 41.

[0038] A plurality of penetrating holes 34 is provided at a circumference of the drum 30, and an inside space of the drum 30 and an inside space of the tub 20 are communicated with each other.

[0039] A plurality of lifters 35 is installed at an inner circumferential surface of the drum 30, such that the laundry ascends and descends as the drum 30 rotates.

[0040] The driving shaft 42 is disposed in between the drum 30 and the motor 41. One end of the driving shaft 42 is connected to the rear surface panel 33 of the drum 30, and other end of the driving shaft 42 is extended to an outer side of the rear wall of the rub 20. As the motor 41 rotates the driving shaft 42, the drum 30 connected to the driving shaft 42 is rotated while having the driving shaft 42 as a center.

[0041] A bearing housing 43 is installed at the rear wall of the tub 20 to rotatively support the driving shaft 42. The bearing housing 43 may be provided with aluminum

alloy, and may be inserted into the rear wall of the tub 20 when the tub 20 is injection-molded. A plurality of bearings 44 is installed in between the bearing housing 43 and the driving shaft 42, such that the driving shaft 43 may be smoothly rotated.

[0042] In the washing cycle, the motor 41 rotates the drum 30 in a normal direction and in an opposite direction at low speed, and accordingly, the laundry at an inside the drum 30 repeats the ascending and descending motion, and thus, the stain on the laundry is removed.

[0043] In the spin dry cycle, as the motor 41 rotates the drum 30 in a single direction at high speed, by the centrifugal force applied to the laundry, water is separated from the laundry.

[0044] A drain pump 60 is installed at a lower portion of an inner side of the cabinet 10 to pump the wash water stored in the tub 20.

[0045] The drain pump 60 is connected to other components through a plurality of hoses. A first drain hose 100 and a bubble hose 95 connect the tub 20 to the drain pump 60, and a second drain hose 90 connects the drain pump 60 to an outside the cabinet 10.

[0046] Other drawings hereinafter are illustrated while the bubble hose 95 is omitted.

[0047] FIG. 3 is a drawing illustrating an expanded view of the drain pump and the drain hose in FIG. 2.

[0048] As illustrated in FIG. 3, the drain pump 60 includes a pump case having a wash water inlet compartment 61, a drain pump compartment 62 and a bubble generating compartment 63, a pump filter 75 inserted into the wash water inlet compartment 61, a pumping motor 70 providing a driving force to pump the wash water introduced to an inside the pump case, and a bubble generating motor 73 to generate bubbles in the wash water. The drain pump compartment 62 and the bubble generating compartment 63 are disposed to face each other while having the wash water inlet compartment 61 thereinbetween.

[0049] The bubble generating motor 73 is mounted at the bubble generating compartment 63. A bubble discharging port 65, while upwardly extended, is formed at an upper portion of the bubble generating compartment 63 to circulate the wash water to an inside the tub 20 (FIG. 1). The bubble discharging port 65 is connected to the bubble hose 95 (FIG. 1).

[0050] As a bubble impeller (not shown) connected to the bubble generating motor 73 is rotated, the wash water at an inside the wash water inlet compartment 61 is drawn in an axis direction. By using the pressure difference by the drop of the pressure as a result of the flow of the wash water at the bubble generating compartment 63, air and the wash water are mixed to generate bubbles. The bubbles, by the bubble impeller (not shown), pass through the bubble discharging port 65 and the bubble hose 95 (FIG. 1), and are introduced to an inside the tub 20 (FIG. 1).

[0051] The pump filter 75 is mounted at a front of the wash water inlet compartment 61, and removes foreign substances contained in the wash water that is introduced from the tub 20. A wash water inlet port 67 is formed at a rear of the wash water inlet compartment 61, such that the first drain hose 100, which is configured to allow the wash water to be introduced from the tub 20, is connected to the wash water inlet port 67. An air discharging port 64 is formed at an upper portion of the wash water inlet compartment 61 to discharge the air inside the wash water inlet compartment 61.

[0052] A wash water discharging port 66 is formed at a rear of the drain pump compartment 62, such that the second drain hose 90, which is configured to guide the wash water to an outside the drum washing machine 1 (FIG. 1), is connected to the wash water discharging hole 66. The pumping motor 70 is mounted at the drain pump compartment 62. As a pumping impeller (now shown) connected to the pumping motor 70 is rotated, the wash water at an inside the wash water inlet compartment 61 is drawn in an axis direction and is discharged in a radius direction. By the force as such, the wash water is discharged to an outside the drum washing machine 1 (FIG. 1) along the second drain hose 90. That is, the second drain hose 90 may be referred to as a guiding hose to guide the wash water, which is pumped by the drain pump 60, to an outside the washing machine 1.

[0053] FIG. 4 is a drawing illustrating a drain hose and a turbidity sensor in accordance with an embodiment of the present disclosure.

[0054] As illustrated in FIGS. 3 to 4, a main line 110 of the first drain hose 100 forms a main stem of the wash water that flows from the tub 20 (FIG. 1) to the drain pump 60. A split line 120 is formed while branching from the main line 110. The split line 120 is protrudedly formed from the circumference of a side surface of the main line 110. A settling hole 130, in which a wash water sensor 500 is settled, is formed at one end portion of the split line 120.

[0055] The split line 120 may be integrally formed with the main line 110, for example, through an injection molding. However, depending on an embodiment, the split line 120 may be coupled to and/or mounted at the main line 110 after the split line 120 and the main line 110 are separately formed. In addition, the split line 120, which is separately formed, or integrally formed with the main line 110 through a predetermined process may be included in the aspect of the present disclosure.

[0056] In an embodiment, the washing water sensor 500 may be a turbidity sensor that determines the amount of the detergent contained in wash water by comparing the amount of the light radiating from a light-emitting unit 520 with light received from a light-receiving unit 530. However, other types of sensors may be included in the aspect of the present disclosure to measure the amount of the detergent contained in wash water.

[0057] The wash water sensor 500 includes a body 510, the light-receiving unit 530 protrudedly formed from the body 510, and the light emitting unit 520 protrudedly formed from the body 510. The wash water sensor 500

is mounted at the settling hole 130 such that the light-receiving unit 530 and the light emitting unit 520 are inserted into an inside the main line 110.

[0058] As the wash water sensor 500 is mounted at the settling hole 130, the circumference of a side surface of the split line 120 is fastened by using a fixation member 400. The fixation member 400 may include, as a non-limiting example, a spring hose clamp (FIG. 4), a ring type hose clamp (FIG. 5), or a cable tie (FIG. 6). However, the fixation member 400 may be any type of a fastening member that closely attach and seal the wash water sensor 500 and the inner side surface of the split line such that the wash water present at the inside the split line 120 is not leaked.

[0059] The fixation member 400 applies a pressure while having the split line 120 as a center of pressure applied, such that the inner side surface of the spit line 120 is closely attached to the wash water sensor 500. As the wash water sensor 500 and the inner side surface of the split line 120 are closely attached and thus sealed, the wash water that is present at an inside the split line 120 is not leaked.

[0060] In the drum washing machine 1 (FIG. 1), the first drain hose 100 disposed in between the tub 20 (FIG. 1) and the drain pump 60 is filled with wash water in the washing process and the rinsing process, all the time when the wash water sensor 500 determines the amount of the detergent contained in the wash water. Thus, as the wash water sensor 500 is mounted at the first drain hose 100, the light-receiving unit 530 and the light-emitting unit 520 of the wash water sensor 500 are maintained in the state of making contact with wash water at all times. Thus, the wash water sensor 500 may be able to measure the amount of the detergent contained in the wash water. Even when wash water flows, since the wash water sensor 500 makes contact with the wash water at all times, the noise, which is generated as the light-receiving unit 530 and the light-emitting unit 520 of the wash water sensor 500 are spaced apart from the wash water, may be eliminated.

[0061] In addition, by mounting the wash water sensor 500 at the first drain hose 100 formed of flexible material and by fastening the wash water sensor 500 with the fixation member 400, the wash water being leaked from the surroundings of the mounting area of the wash water sensor 500 may be prevented.

[0062] In the washing process, the wash water sensor 500 senses the amount of the detergent contained in the wash water, and by determining the amount of the detergent contained in the wash water at a control unit (not shown), the washing time may be extended or reduced. When the amount of the detergent in the wash water is determined to be less than the predetermined amount of the detergent for the laundry, the control unit (not shown) may require more detergent to be input. When the amount of the detergent in the wash water is determined to be more than the predetermined amount of the detergent for the laundry, the control unit may control the water supply valve to supply more water.

[0063] In the rinsing process, the wash water sensor 500 continuously measures the amount of the detergent contained in the wash water, so that the rinsing process may continue until the wash water sensor 500 measures that the detergent contained in the wash water is less amount than the predetermined amount. Even when the predetermined time is not passed, the rinsing process may be stopped when the amount of the detergent contained in the wash water is below the predetermined amount. By extending the washing and the rinsing time as the above, the washing and the rinsing may be performed more completely. Furthermore, by reducing the washing and the rinsing time according to circumstances, the washing time is decreased, and thus, the power consumption may be reduced at the time of a washing.

[0064] In accordance with an embodiment illustrated on the drawing, a spring hose clamp 410 is illustrated as the fixation member 400. The spring hose clamp 410, by using the elasticity thereof, closely attaches and fastens the first drain hose 100 to the wash water sensor 500.

[0065] FIGS. 5 to 6 are drawings illustrating another embodiment of the fixation apparatus configured for the coupling of the drain hose and the turbidity sensor in FIG. 4.

[0066] As illustrated in FIG. 5, as another embodiment of the fixation member 400, a ring-type hose clamp 420 is illustrated.

[0067] The ring-type hose clamp 420, by using the elasticity thereof, is configured to fasten the first drain hose 100 and the wash water sensor 500. Two handles are provided at the ring-type hose clamp 420 for a mounting purpose, and a user may fasten the ring-type hose clamp 420 to the first drain hose 100 by a simple motion of clutching the two handles of the ring-type hose clamp 420.

[0068] As illustrated in FIG. 6, as another embodiment of the fixation member 400, a cable tie 430 is illustrated. The cable tie 430 provided with an extension unit 431 and a fixation unit 432 may be fastened by inserting the extension unit 431 having a gear shape on one side thereof into the fixation unit 432.

[0069] By placing the extension unit on a portion to be desired fastened and inserting the extension unit into the fixation unit, the first drain hose 100 may be simply fastened. The hose clamp illustrated on the earlier drawing may be mounted in a manner to insert the hose clamp from one end portion of the wash water sensor 500. However, since the cable tie 430 is open, the mounting may be easily performed as the cable tie 430 may be directly placed on a portion desired to be mounted.

[0070] As an example of the fixation member 400 in the FIGS. 4 to 6, the hose clamp and the cable tie are illustrated, but other than the above, any type of a fastening member that may closely attach and fasten the first drain hose 100 and the wash water sensor 500 may be included as the fixation member 400.

[0071] FIG. 7 is a drawing illustrating a first drain hose

and a turbidity sensor in accordance with another embodiment of the present disclosure.

[0072] As illustrated in FIG. 7, a drain hose 200 includes a main line 210, and a split line 220 branching from the main line 210. A settling hole 230, in which a wash water sensor 600 may settle, is formed at one end portion of the split line 220.

[0073] The wash water sensor 600 includes a body 610, and a light-receiving unit 630 and a light-emitting unit 620 that are protrudedly formed from the body 610. The light-receiving unit 630 and a light-emitting unit 620 may be mounted at the settling hole 230 such that the light-receiving unit 630 and the light-emitting unit 620 are inserted into an inside the main line 210. A position determining groove 240 is formed at an inner side surface of the split line 220. For example, a portion of the inner side surface is carved to form the position determining groove 240. In an embodiment, two units of the position determining groove 240 are formed to face each other, as shown in FIG. 7. However, the number of units of the position determining groove 240 is not limited thereto. Any number of the position determining groove 240 may be included in the aspect of the present disclosure.

[0074] A position determining protrusion 640 is protrudedly formed on a side surface of the body of the wash water sensor 600 at a position corresponding to the position determining groove 240. In an embodiment, two units of the position determining protrusions 640 are formed as shown in FIG. 7 as an example, but, any number of the position determining protrusions 640 may be included in the aspect of the present disclosure, as long as the number of the position determining grooves 240 and the number of the position determining protrusions 640 are same.

[0075] The position determining groove 240 and the position determining protrusion 640, when the wash water sensor 600 is mounted at the split line 220, enables the wash water sensor 600 to be mounted at the settling hole 230 at a desired position.

[0076] For example, if the length d1 which is the length from the main line 210 to the one end portion of the position determining groove 240 is shorter than the length d2 which is the length from one end portion of the light-receiving unit 630 and/or the light-emitting unit 620 of the wash water sensor 600 to the one end portion of the position determining protrusion 640, the light-receiving unit 630 and the light-emitting unit 620 may be disposed at an inside the main line 210. That is, the wash water flows only to the main line 210, and is not introduced to the split line 220, and the split line 220 merely provides a place at which the wash water sensor 600 is mounted. As the wash water sensor 600 is mounted as such, even when the flow of the wash water is not changed, the amount of the detergent contained in the wash water may be precisely measured.

[0077] In FIG. 7, the illustration is provided while the fixation apparatus 400 (FIG. 3) configured to fasten the circumference of the side surface of the split line 220 is omitted.

[0078] FIG. 8 is a drawing illustrating a drain hose, a turbidity sensor, and a drain pump in accordance with another embodiment of the present disclosure.

[0079] As illustrated in FIG. 8, the drain pump 60 includes the pump case including the wash water inlet compartment 61, the drain pump compartment 62 and the bubble generating compartment 63, the pump filter 75 inserted into the wash water inlet compartment 61, the pumping motor 70 providing a driving force to pump the wash water introduced to an inside the pump case, and the bubble generating motor 73 to generate bubbles in the wash water. The drain pump compartment 62 and the bubble generating compartment 63 are disposed to face each other while having the wash water inlet compartment 61 thereinbetween.

[0080] The wash water inlet port 67 is formed at a rear of the wash water inlet compartment 61, such that a first drain hose 300, which is configured such that the wash water is introduced from the tub 20, is connected to the wash water inlet port 67.

[0081] The first drain hose 300 includes a main line 310, and a split line 320 branching from the main line 310. A settling hole 330, in which a wash water sensor 700 is settled, is formed at one end portion of the split line 320.

[0082] With reference to the main line 310, a wrinkle part 350, which moves by the vibration caused by the operation of the drum washing machine 1 (FIG. 1) to prevent the damage of the first drain hose 300, is formed at one end portion side of the main line 310 to which the wash water inlet port 67 is connected.

[0083] In an embodiment, the wash water sensor 700 may be the electrode sensor configured to determine the amount of the detergent contained in the wash water by measuring the amount of the current flowing through a plurality of electrodes 720 and 730. However, other than the above, other types of sensors may be included in the aspect of the present disclosure.

[0084] The wash water sensor 700 includes a body 710, and the plurality of electrodes 720 and 730 protrudedly formed from the body 710. The washing water sensor 700 is mounted at the settling hole 330 such that the plurality of electrode sensors 720 and 730 is inserted into an inside the main line 310.

[0085] One end portion of the split line 320 is slit to form a position determining groove. In an embodiment, two units of the position determining groove 340 are formed to face each other as shown in FIG. 8. However, the number of units of the position determining groove 340 is not limited thereto. Any number of the position determining groove 240 may be included in the aspect of the present disclosure.

[0086] A position determining protrusion 740 is protrudedly formed on a side surface of the body of the wash water sensor 700 at a position corresponding to the position determining groove 340. In an embodiment, two units of the position determining protrusions 740 are

formed in FIG. 8 as an example, but, any number of the position determining protrusions 740 may be included in the aspect of the present disclosure, as long as the number of the position determining grooves 340 and the number of the position determining protrusions 740 are same.

[0087] In FIG. 8, the illustration is provided while the fixation apparatus 400 (FIG. 3) configured to fasten the circumference of the side surface of the split line 320 is omitted.

[0088] In accordance with an embodiment illustrated on the drawing, the illustration is provided that a main line and a split line are only present, but as long as a fixation apparatus is mounted in such that wash water is not leaked, having a settling hole directly formed at the main line without forming a split line may be included in the aspect of the present disclosure.

[0089] Although a few embodiments of the present disclosure 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 and spirit of the disclosure, the scope of which is defined in the claims and their equivalents.

Claims

1. A drum washing machine, comprising:

a cabinet;
a tub disposed at an inside the cabinet to accommodate water;
a drain pump disposed at a lower portion of the tub to pump the wash water at an inside the tub;
a first drain hose configured to connect the tub to the drain pump, such that the wash water at an inside the tub is introduced to the drain pump;
a second drain hose configured to connect the drain pump to an outside the cabinet; and
a wash water sensor configured to sense the amount of the detergent contained in the wash water drained from the tub, and mounted at the first drain hose.

2. The drum washing machine of claim 1, wherein:

the first drain hose comprises a settling hole in which the wash water sensor is settled.

3. The drum washing machine of claim 1, wherein:

the first drain hose comprises a split part branching from the first drain hose.

4. The drum washing machine of claim 3, wherein:

the first drain hose further comprises a settling hole formed at one end portion of the split part, and configured such that the wash water sensor is settled in the settling hole.

5. The drum washing machine of claim 4, further comprising:

a fixation apparatus configured to surround an outer circumferential surface of the split part, in which the wash water sensor is settled, such that the wash water sensor and the split part are closely attached and fixed to each other.

6. The drum washing machine of claim 5, wherein:

the fixation apparatus comprises a clamp.

7. The drum washing machine of claim 5, wherein:

the fixation apparatus comprises a cable tie.

8. The drum washing machine of claim 4, wherein:

the wash water sensor comprises a body, and a sensing part protrudedly formed from the body to measure the amount of the detergent contained in the wash water.

9. The drum washing machine of claim 8, wherein:

the wash water sensor further comprises a position determining protrusion protrudedly formed from a side surface of the body in an outward radial direction.

10. The drum washing machine of claim 9, wherein:

the first drain hose further comprises a position determining groove formed on an inner side of the split part in a carved manner, such that the position determining groove corresponds to the position determining protrusion.

11. The drum washing machine of claim 3, wherein:

the first drain hose and the split part are integrally formed with each other.

12. The drum washing machine of claim 8, wherein:

the wash water sensor is insertedly mounted on the split part, such that the sensing part is disposed at an inside the first drain hose.

13. The drum washing machine of claim 1, wherein:

the wash water sensor comprises a turbidity sensor.

14. The drum washing machine of claim 1, wherein:

the wash water sensor comprises an electrode sensor.

FIG. 1

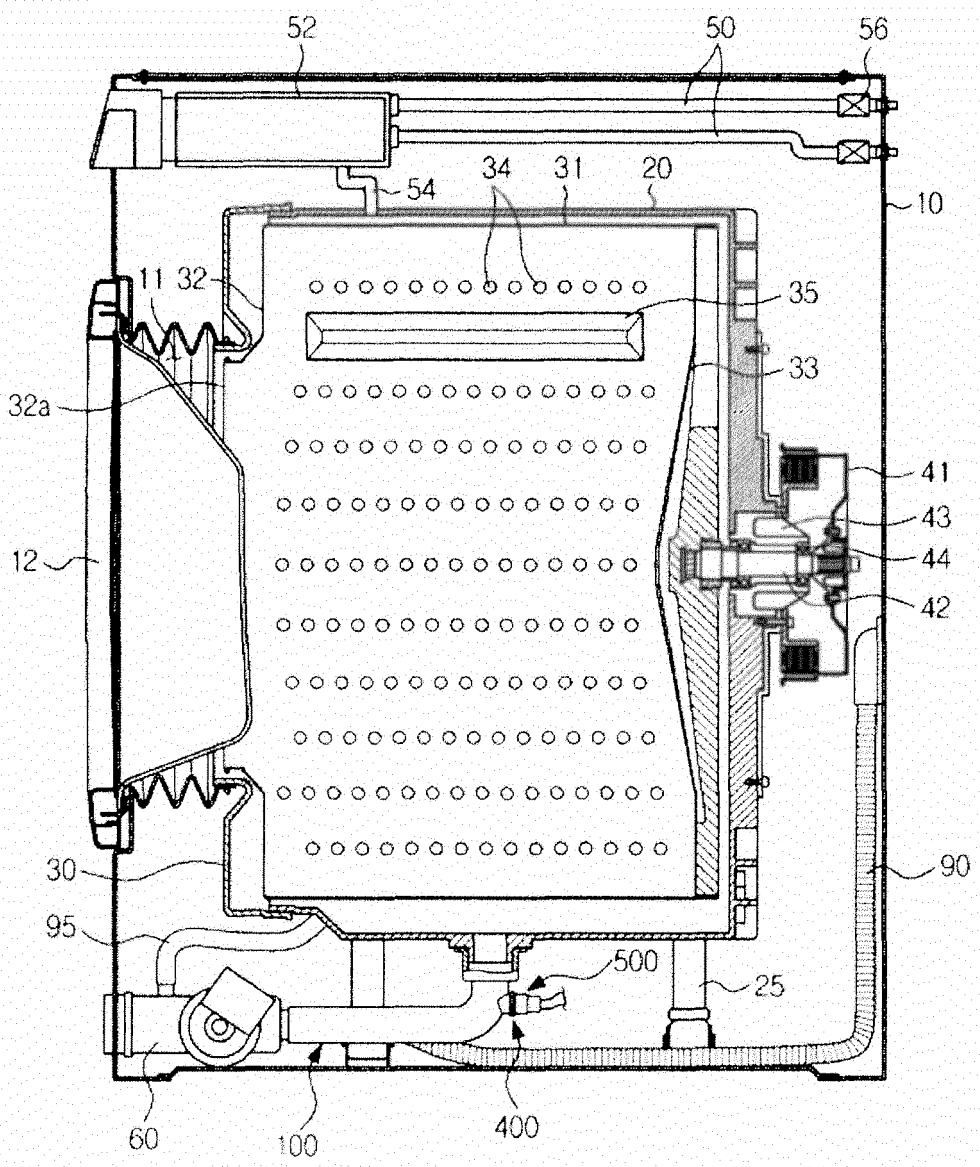

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FIG. 2

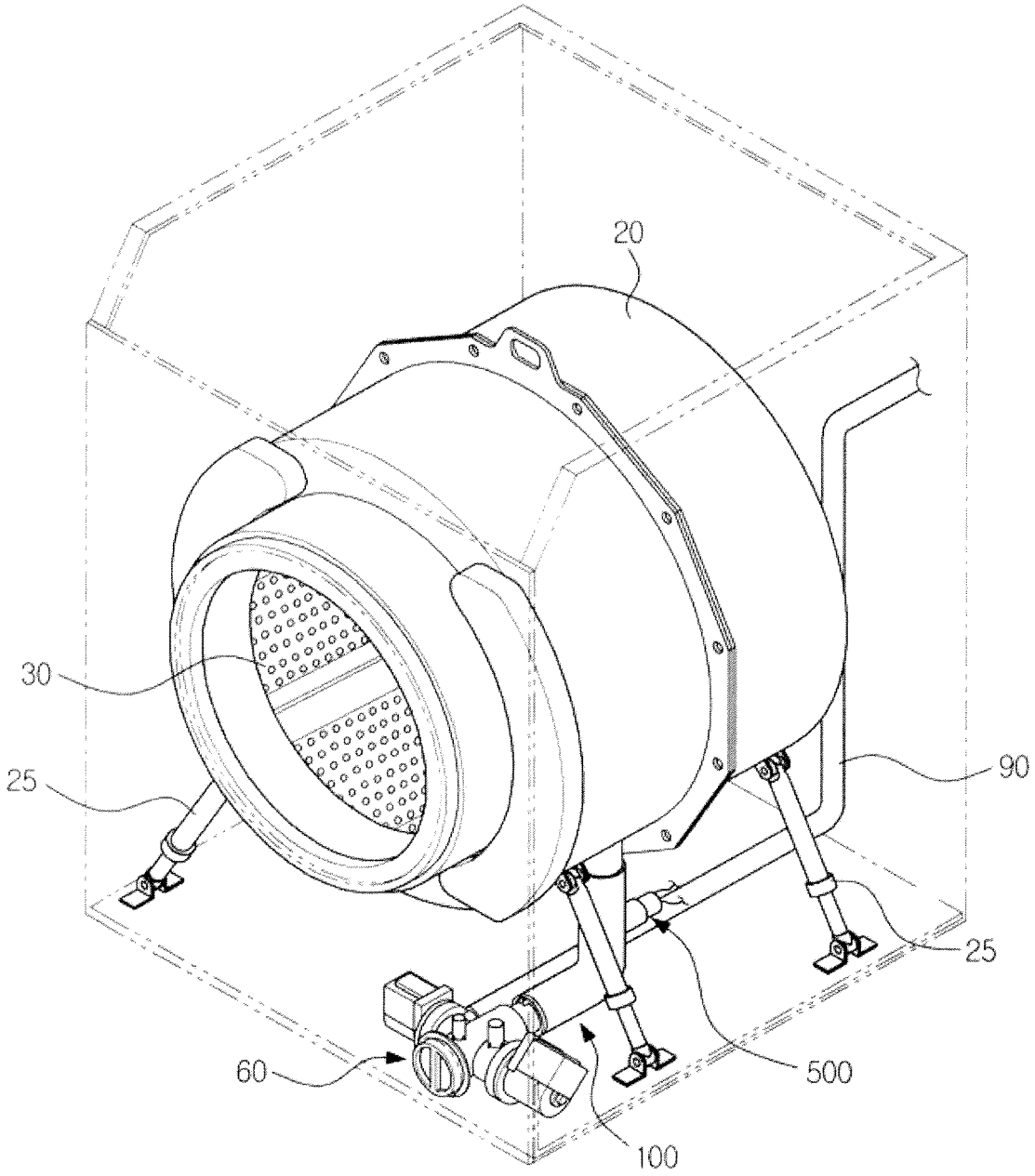


FIG. 3

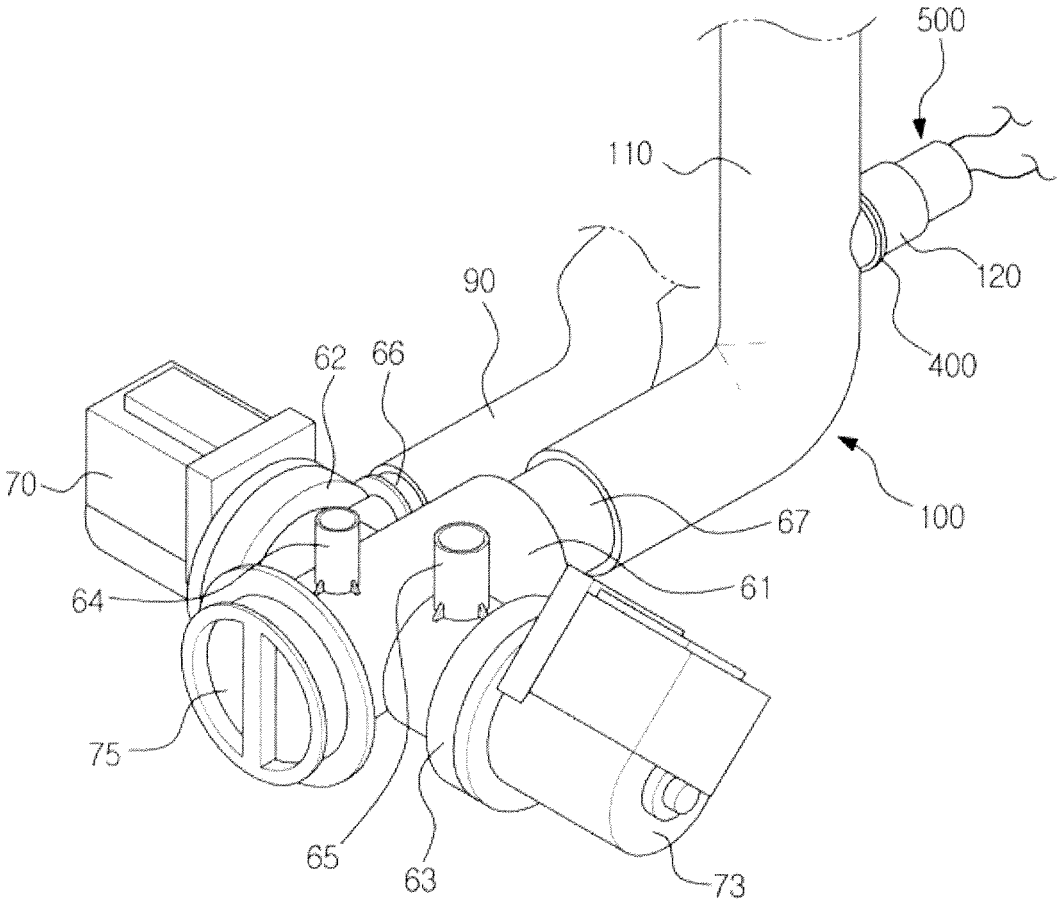


FIG. 4

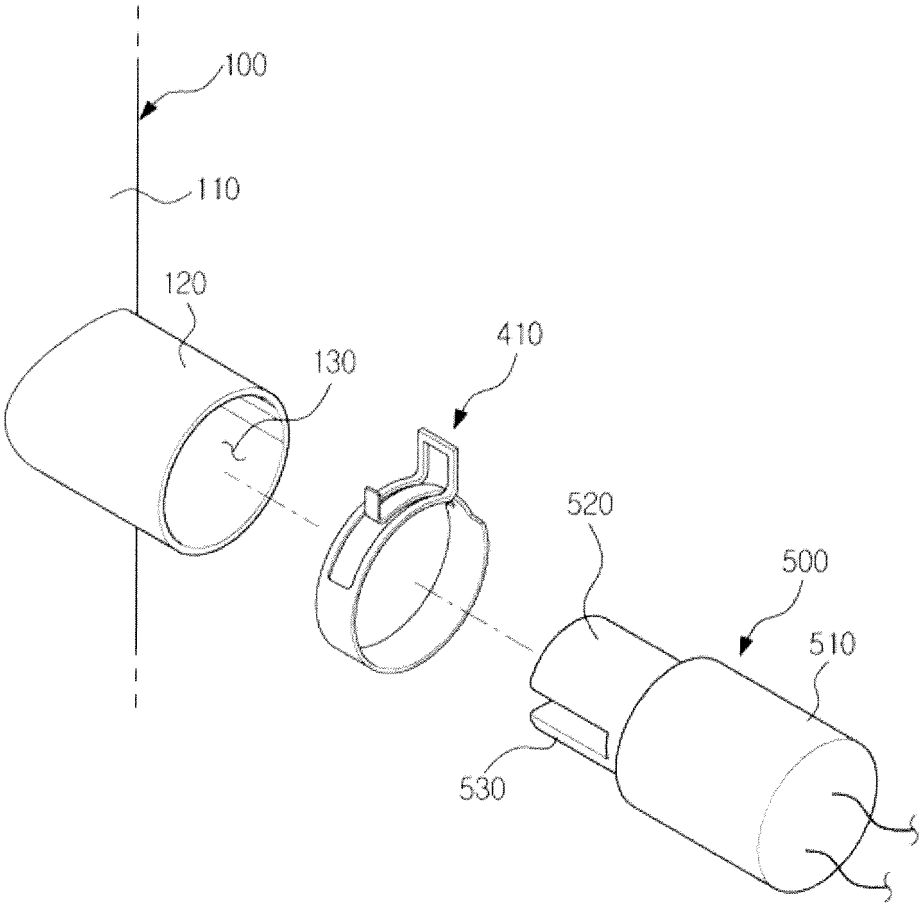


FIG. 5

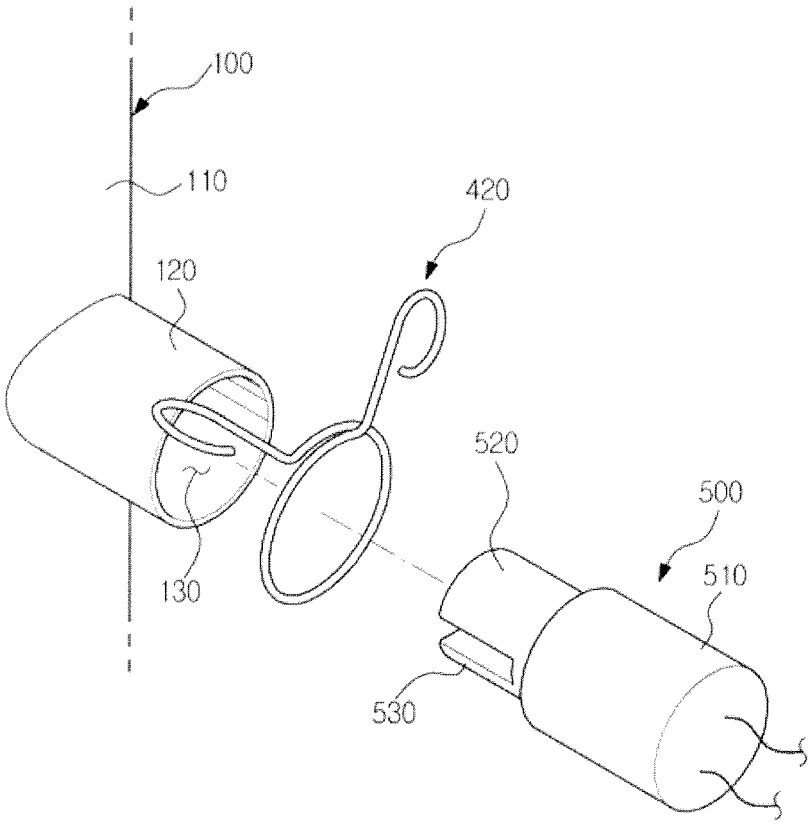


FIG. 6

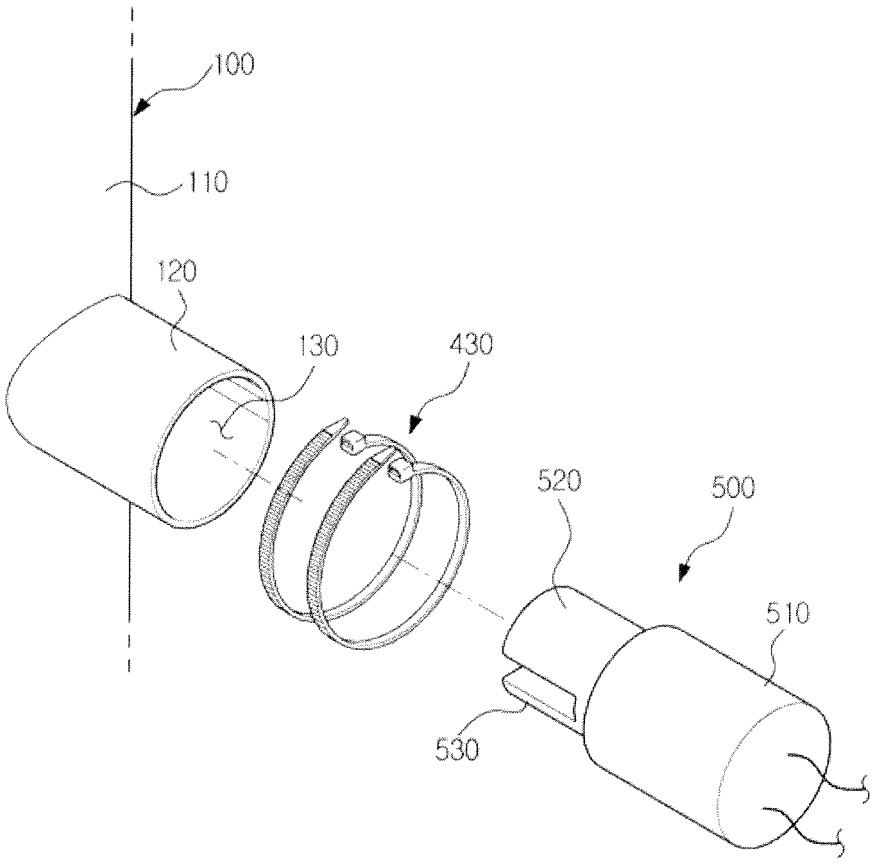


FIG. 7

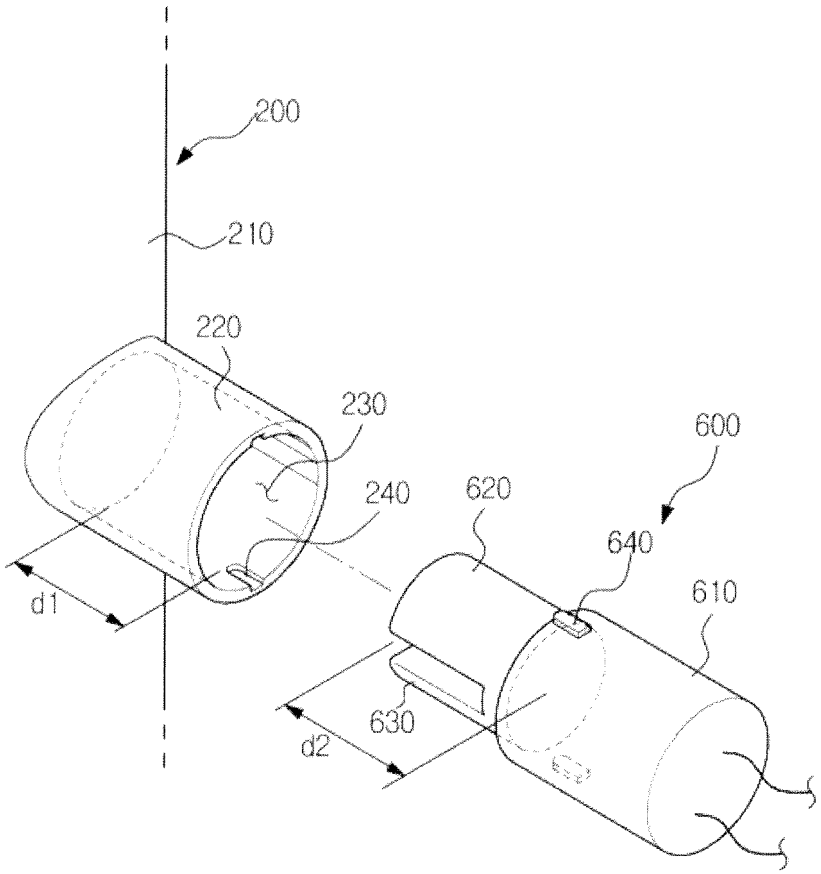
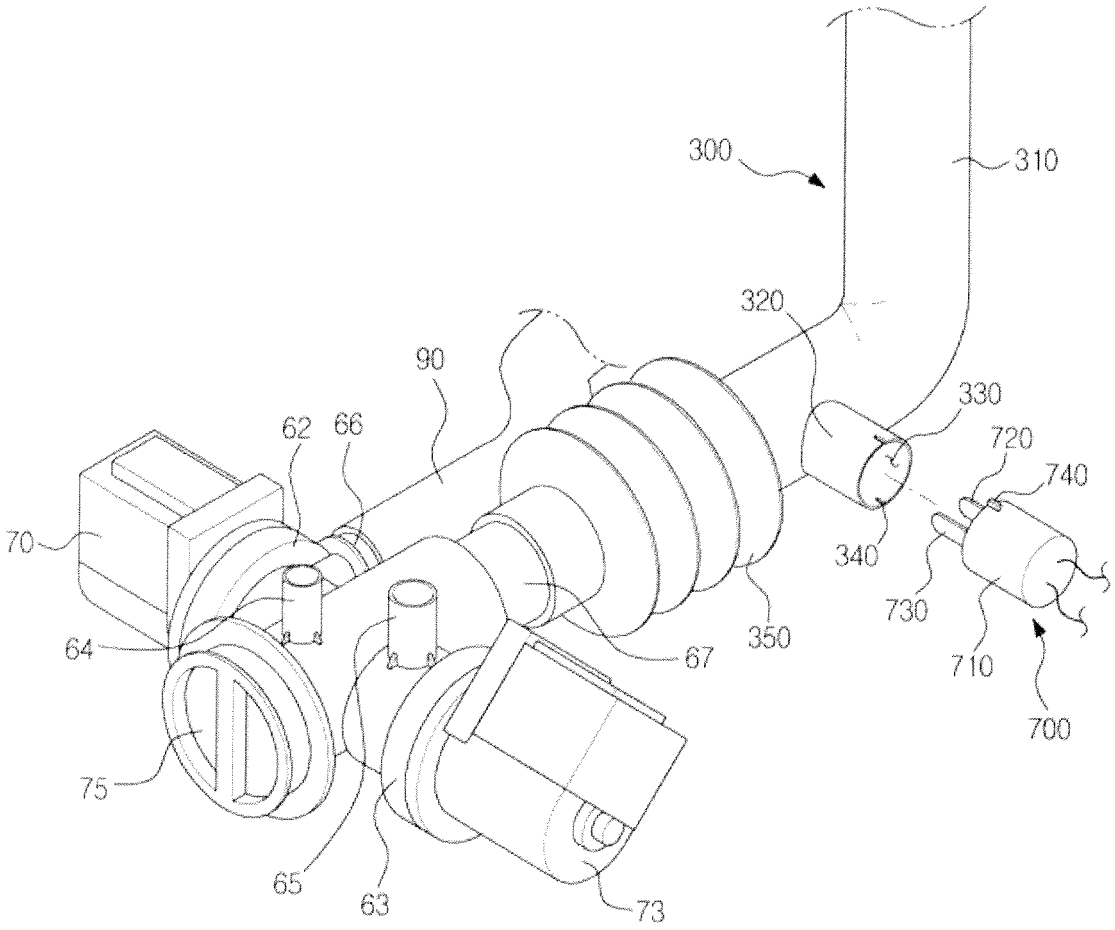


FIG. 8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Application Number
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	17 April 2013	Westermayer, Wilhelm

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