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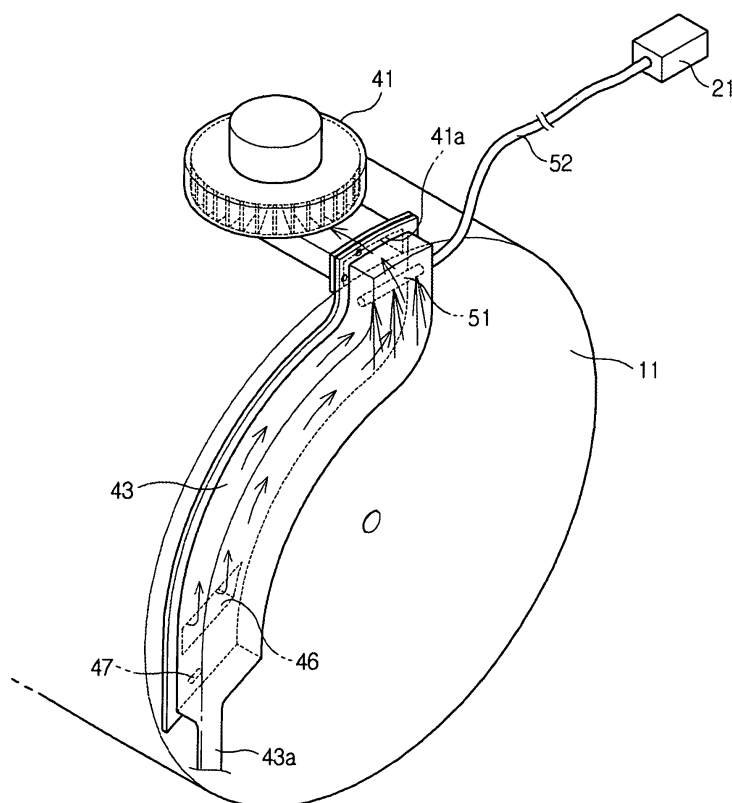
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**Suwon-si, Gyeonggi-Do (KR)**(54) **Washing machine and suds removal method thereof**

(57) A washing machine having a drying device (40) and a suds removal method thereof. The suds removal method is able to effectively remove suds, which are excessively generated during a washing cycle to thereby be introduced into the drying device (40). The suds removal method comprises determining whether a drying cycle is selected, and removing the suds by supplying water into the drying device (40) when the drying cycle is selected.

FIG. 3



**Description****BACKGROUND OF THE INVENTION**

## 1. Field of the Invention

**[0001]** The present invention relates to a washing machine having a drying device, and, more particularly, to a washing machine and suds removal method thereof capable of removing suds, which are excessively generated during a washing cycle, to thereby be introduced into a drying device.

## 2. Description of the Related Art

**[0002]** In general, a drying device is designed to supply hot air, heated by a heater, into a drum when the drum is rotated at a low speed, thereby drying wet laundry contained in the drum. As the drying device is combined with a washing machine, the washing machine is able to also be used as a clothes dryer. This type of washing machine has been recently launched in the form of a drum-type washing machine, and serves to independently perform a drying cycle only or to perform a drying cycle after completing washing, rinsing, and dewatering cycles in this sequence.

**[0003]** Korean Registered Patent Publication No. 10-435241 discloses an example of the washing machine having the drying device. In this washing machine, when a drying cycle is performed after completion of washing, rinsing, and dewatering cycles, a heater is operated to heat the interior space of a duct of the washing machine. Also, a drying fan (i.e. blower) is operated to generate and inject compressed air into the duct.

**[0004]** The injected compressed air is converted into hot air while passing through the interior space of the duct. Therefore, when the hot air is supplied to a drum of the washing machine, wet laundry contained in the drum can be dried.

**[0005]** In using the conventional washing machine mentioned above, when a detergent beyond a standard amount is used or a detergent tends to generate a large amount of suds, an excess of suds is generated during the washing cycle to thereby be pushed upward into the duct.

**[0006]** However, since the conventional washing machine is not capable of removing the suds introduced into the duct, the suds are inevitably left inside the duct. This is problematic since the residual suds inside the duct may be introduced into the drum when the hot air is circulated during the drying cycle, resulting in contamination of the washed laundry.

**SUMMARY OF THE INVENTION**

**[0007]** Accordingly, it is an aspect of the present invention to provide a washing machine and suds removal method thereof capable of removing suds, which are excessively generated during a washing cycle to thereby be introduced into a drying device.

**[0008]** It is another aspect of the present invention to provide a washing machine and suds removal method thereof, which can effectively remove suds or foreign substances present in a drying device by performing a suds removal cycle after a washing cycle or before a drying cycle, thereby improving cleanliness of the washing machine.

**[0009]** Additional aspects and/or advantages of the invention 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 invention.

**[0010]** The foregoing and/or other aspects may be achieved by providing a washing machine having a drying device, the washing machine including a signal input unit to select a drying cycle or washing cycle, water supply means to supply water into the drying device, and a controller to control the supply of water in order to remove suds present inside the drying device when the drying cycle or washing cycle is selected by the signal input unit.

**[0011]** The supply of water is controlled to supply the water into the drying device after the washing cycle, during a rinsing cycle, or before the drying cycle.

**[0012]** The drying device includes a duct connected to a water tub to circulate heated air into the water tub, and the water supply means includes a water supply valve to supply the water into the duct.

**[0013]** Another aspect of the present invention is achieved by providing a suds removal method of a washing machine to remove suds present inside a drying device, the method including determining whether a drying cycle is selected, and removing the suds by supplying water into the drying device when the drying cycle is selected.

**[0014]** The removing of the suds may be performed before the drying cycle.

**[0015]** Another aspect of the present invention is achieved by providing a suds removal method of a washing machine having a drying device, the method including determining whether a washing cycle is completed, removing suds present inside the drying device by supplying water into the drying device when the washing cycle is completed.

**[0016]** It is an aspect of the present invention, that the removing of the suds is an independent cycle to remove the suds or foreign substances present inside the drying device.

**[0017]** It is another aspect of the present invention that the removing of the suds is performed simultaneously with a rinsing cycle.

**[0018]** It is yet another aspect of the present invention that the removing of the suds is performed by supplying the water into the drying device for a predetermined time, or by supplying the water into the drying device for a predetermined time for a predetermined number of cycles.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0019]** These and/or other aspects and advantages of the invention 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 illustrating a washing machine having a drying device according to an embodiment of the present invention;

FIG. 2 is a sectional view of the washing machine having the drying device of FIG. 1;

FIG. 3 is a partial perspective view illustrating a condensation duct of the drying device according to an embodiment of the present invention;

FIG. 4 is a sectional view illustrating the condensation duct of the drying device of FIG. 3;

FIG. 5 is a control block diagram illustrating a suds removal system of the washing machine according to an embodiment of the present invention;

FIG. 6 is a flow chart illustrating an operational sequence of a suds removal method of the washing machine according to a first embodiment of the present invention; and

FIG. 7 is a flow chart illustrating an operational sequence of a suds removal method of the washing machine according to a second embodiment of the present invention.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

**[0020]** Reference will now be made in detail to the embodiments of the present invention, examples of which are illustrated in the accompanying drawings, wherein like reference numerals refer to like elements throughout. The embodiments are described below to explain the present invention by referring to the figures.

**[0021]** FIG. 1 is a perspective view illustrating a washing machine having a drying device according to an embodiment of the present invention. FIG. 2 is a sectional view of the washing machine having the drying device of FIG. 1.

**[0022]** As shown in FIGS. 1 and 2, the washing machine having a drying device of the present invention comprises a drum-shaped water tub 11 mounted in a body 10 to contain wash water therein, and a rotating drum 12 rotatably mounted in the water tub 11 and having a plurality of dewatering holes.

**[0023]** A motor 13 is mounted underneath the water tub 11 to rotate the rotating drum 12 forward or in reverse to perform washing, rinsing and dewatering cycles. Openings 14 are provided at respective front ends of the water tub 11 and the rotating drum 12 to put laundry into the rotating tub 12 or to take the laundry out of the rotating tub 12 at a front side of the body 10. A door 15 is mounted at the front side of the body 10 to open and close the openings 14.

**[0024]** A detergent supply device 24 to supply a detergent and fabric softener into the water tub 11, and a water supply device 20 to supply water into the detergent supply device 24 are provided above the water tub 11.

**[0025]** The water supply device 20 comprises water supply pipes 23 to supply water into the water tub 11, and water supply valves 21 and 22 mounted to the respective water supply pipes 23 to control the supply of water via the water supply pipes 23.

**[0026]** Among the water supply valves 21 and 22, the water supply valve 21 is an electrically operated three-way valve. The water supply valve 21 is connected to a cool water supply hose(not shown) to supply water in three directions for preliminary washing, main washing and drying cycles. The water supply pipes 23 are connected with the detergent supply device 24 to supply water from an external water source (not shown) into the detergent supply device 24.

**[0027]** A connection pipe 25 is mounted between the detergent supply device 24 and the water tub 11 to supply the water, having passed through the detergent supply device 24, into the water tub 11. Supplying the water into the water tub 11 by way of the detergent supply device 24 allows the fabric softener liquid, contained in the detergent supply device 24, to be supplied into the water tub 11 in a mixed state with the water.

**[0028]** The detergent supply device 24 is internally sectionalized into a plurality of chambers. Also, the detergent supply device 24 is mounted at the front side of the body 10 to facilitate input of the detergent or fragrant fabric softener into the respective chambers.

**[0029]** The washing machine further comprises a drainage device 30 to drain the water contained in the water tub 11. The drainage device 30 comprises a drainage pipe 31 connected with a bottom of the water tub 11 to guide the water from the water tub 11 to the outside of the body 10, and a drainage pump 32 mounted to the drainage pipe 31.

**[0030]** The washing machine further comprises a drying device 40 to dry laundry. The drying device 40 comprises a

drying fan 41 mounted at an upper side of the water tub 11, a drying duct 42 connected between a discharge port 41 b of the drying fan 41 and an air inlet hole 45 formed at a top of the opening 14 of the water tub 11, and a condensation duct 43 mounted at a rear surface of the water tub 11 to be connected between an air outlet hole 46 formed at a lower end of the rear surface of the water tub 11 and a suction port 41a of the drying fan 41.

**[0031]** The drying device 40 further comprises a drying heater 44 mounted in the drying duct 42 to supply hot air into the water tub 11, and a condenser mounted in the condensation duct 43, to condense and remove moisture contained in water vapor that is produced during the drying of laundry and rises along the condensation duct 43.

**[0032]** FIG. 3 is a partial perspective view illustrating the condensation duct of the drying device according to an embodiment of the present invention. FIG. 4 is a sectional view illustrating the condensation duct of the drying device of FIG. 3.

**[0033]** As shown in FIGS. 3 and 4, the condensation duct 43 defines a channel extended between the air outlet hole 46 formed at the lower end of the rear surface of the water tub 11 and the suction port 41 a of the drying fan 41 mounted at the upper side of the water tub 11. The condensation duct 43 is curved by a predetermined curvature, and is opened at a surface thereof to be closely coupled with the rear surface of the water tub 11 and the suction port 41 a of the drying fan 41.

**[0034]** The condenser, mounted in the condensation duct 43, comprises an injection nozzle 51 inserted into an upper portion of the condensation duct 43 to inject condensing water, i.e. cool water, into the condensation duct 43, and a condensing water supply pipe 52 connected between the injection nozzle 51 and the water supply valve 21. The condensing water is injected from the injection nozzle 51 mounted in the upper portion of the condensation duct 43 to flow down along an inner surface of the condensation duct 43. Contact efficiency increases between the rising water vapor and the cool condensing water, resulting in improved dehumidification.

**[0035]** The condensation duct 43 comprises a discharge branch 43a at a lower end thereof, to discharge the condensed water. An end of the discharge branch 43a is connected with the drainage pipe 31. In the present invention, a water temperature sensor 47 is mounted between the air outlet hole 46 and the discharge branch 43a. Since the water supply valve 21 is operated so that an amount of water to be gathered in a lower region of the condensation duct 43 is greater than an amount of water to be discharged from the condensation duct 43 via the discharge branch 43a by a predetermined rate, the water temperature sensor 47 is immersed in the water gathered in the condensation duct 43 and is adapted to sense a temperature of the water, thereby providing the sensed water temperature information to a controller 130 (shown in FIG. 5). In this way, the controller 130 is able to determine an ending point of the drying cycle based on the temperature of the condensed water.

**[0036]** FIG. 5 is a control block diagram of a suds removal system provided in the washing machine according to an embodiment of the present invention. As shown in FIG. 5, the suds removal system comprises a signal input unit 100, a water level sensor 110, a temperature sensor 120, a controller 130, and a drive unit 140.

**[0037]** The signal input unit 100 serves to input various operational information to the controller 130. Here, the operational information comprises a desired wash course, such as an independent washing cycle, independent drying cycle, or a combined washing and drying cycle, a temperature of wash water, a revolutions per minute for dewatering, addition of a rinsing operation, etc. The water level sensor 110 serves to sense the level of wash water supplied in the water tub 11. The temperature sensor 120 comprises the water temperature sensor 47 to sense a temperature of the water gathered in the lower region of the condensation duct 43 and other sensor to sense a temperature of wash water inside the water tub 11.

**[0038]** The controller 130 is a micro-computer to control an operation of the water supply valve 21 to supply the condensing water into the condensation duct 43 after a washing cycle or before a drying cycle to thereby remove suds introduced into the condensation duct 43. The controller 130 comprises a timer (not shown) to calculate a supply time and the number of supply times of the condensing water into the condensation duct 43 opened by the water supply valve 21, and a read-only memory (ROM) table to store various data, such as the supply time and the number of supply times of water depending on a selected wash course, a capacity of the washing machine, and a size of the rotating drum 12.

**[0039]** The drive unit 140 is adapted to drive the motor 13, water supply valves 21 and 22, drainage pump 32, drying fan 41, and drying heater 44 according to drive control signals of the controller 130.

**[0040]** Now, an operational sequence and effects of a suds removal method of the washing machine having the drying device configured as stated above will be described.

**[0041]** FIG. 6 is a flow chart illustrating an operational sequence of a suds removal method of the washing machine according to a first embodiment of the present invention. In the present invention, a suds removal cycle may be performed as an independent cycle after completion of a washing cycle or may be performed simultaneously with a rinsing cycle. Therefore, the suds removal cycle may be set to a default value to be automatically performed after completion of a washing cycle, or may be set to be selectively performed only when a user pushes a separate option key.

**[0042]** First, in a state wherein laundry is put into the rotating drum 12 and a detergent is filled in the detergent supply device 24, operational information, such as a desired wash course (for example, a combined washing and drying cycle), a temperature of wash water, a revolutions per minute for dewatering, and addition of a rinsing operation, is selected.

In operation 100, the selected operational information is inputted to the controller 130 via the signal input unit 100

**[0043]** Based on the inputted operational information in operation 100, the process moves to operation 110 where the controller 130 switches "on" the water supply valves 21 and 22 to supply water into the detergent supply device 24 via the water supply pipes 23. As the water is supplied into the detergent supply device 24, the detergent contained in the detergent supply device 24 dissolves in the supplied water, thereby being supplied into the water tub 11 via the connection pipe 25.

**[0044]** After a predetermined amount of the water is supplied into the water tub 11 via the connection pipe 25, the controller 130 switches "off" the water supply valves 21 and 22 to stop the supply of the water into the water supply pipes 23. After completion of the water supply operation, the rotating drum 12 is rotated by operation of the motor 13 according to a control of the controller 130, thereby performing a washing cycle of the selected wash course.

**[0045]** When the detergent is excessively used beyond a standard amount, or the detergent tends to generate a large amount of suds, an excess of suds is generated during the washing cycle. The generated suds pass through the air outlet hole 46 (shown in FIG. 2) formed at the lower end of the rear surface of the water tub 11, thereby being pushed upward into the condensation duct 43 mounted at the rear surface of the water tub 11.

**[0046]** The suds, introduced into the condensation duct 43, may be further pushed upward into the drying duct 42 connected to the condensation duct 43 to thereby be circulated therein under an influence of a pneumatic pressure of circulating air during a drying cycle. Therefore, to prevent the circulation of the suds, the present invention is intended to remove the suds introduced into the condensation duct 43 after the washing cycle or before the drying cycle.

**[0047]** FIG. 6 exemplifies a method of automatically performing the suds removal cycle after the washing cycle. However, the order in which to complete the suds removal cycle is not limited thereto, and may vary, as necessary.

**[0048]** After completion of the washing cycle in operation 110, the process moves to operation 120 where the controller 130 switches "on" the water supply valve 21 connected with the condensation duct 43 to open the condensation duct 43 in order to remove the suds introduced into the condensation duct 43.

**[0049]** That is, as the water supply valve 21 opens the condensation duct 43, the condensing water (i.e. cool water) is supplied via the condensing water supply pipe 52 to be injected into the condensation duct 43 from the injection nozzle 51, thereby rinsing and removing the suds introduced in the condensation duct 43.

**[0050]** From operation 120, the process moves to operation 130, where the controller 130 calculates the supply time of the condensing water into the condensation duct 43 (i.e. the opening time of the water supply valve 21) and determines whether the calculated time exceeds a predetermined suds removal time T1, which is a sufficient time to remove the suds introduced in the condensation duct 43.

**[0051]** When the calculated time exceeds the predetermined suds removal time T1 in operation 130, the process moves to operation 140 where the water supply valve 21 connected to the condensation duct 43 is closed to stop the supply of the condensing water into the condensation duct 43. Then, the remaining rinsing, dewatering, and drying cycles are partially or completely performed based on the selected operational information, completing the selected wash course.

**[0052]** However, when the calculated time does not exceed the predetermined suds removal time T1 in operation 130, the process returns to operation 120 where water is continuously supplied into the condensation duct 43 until the calculated time exceeds the predetermined suds removal time T1 in operation 130.

**[0053]** Next, a method of independently performing a suds removal cycle before a drying cycle regardless of a washing cycle will be explained with reference to FIG 7.

**[0054]** FIG. 7 is a flow chart illustrating an operational sequence of a suds removal method of the washing machine according to a second embodiment of the present invention. In the present invention, the suds removal cycle may be set to a default value to be automatically performed simultaneously with a drying cycle regardless of a washing cycle. The present invention is not limited thereto, and is applicable in other various manners.

**[0055]** First, in operation 200, when a desired wash course, for example, an independent drying cycle, is selected in a state wherein laundry is put into the rotating drum 12, the process moves to operation 210 where the controller 130 determines whether a drying cycle is selected. When the drying cycle is selected in operation 210, the process moves to operation 220 where the controller 130 switches "on" the water supply valve 21 to open the condensation duct 43 in order to remove foreign substances, including suds, present in the condensation duct 43 or to keep the condensation duct 43, as an air circulation path, in a clean state.

**[0056]** As the water supply valve 21 opens the condensation duct 43, the condensing water (i.e. cool water) is supplied via the condensing water supply pipe 52 to be injected into the condensation duct 43 from the injection nozzle 51, thereby removing the foreign substances inside the condensation duct 43 and keeping the condensation duct 43 in a clean state.

**[0057]** From operation 220, the process moves to operation 230 where the controller 130 calculates the supply time of the condensing water into the condensation duct 43 (i.e. the opening time of the water supply valve 21) and determines whether the calculated time exceeds a predetermined foreign substance removal time T2, which is a sufficient time to remove the foreign substances inside the condensation duct 43.

**[0058]** The predetermined foreign substance removal time T2 may be equal to or different from the suds removal time T1 (shown in FIG. 6). However, the present invention is not limited thereto, and may vary based on a design of the

washing machine taking into consideration a capacity of a washing machine or a selected wash course.

**[0059]** When the calculated time exceeds the predetermined foreign substance removal time (T2) in operation 230, the water supply valve 21 connected to the condensation duct 43 is closed to stop the supply of the water into the condensation duct 43. Then the process moves to operation 240 where the drying cycle is performed, completing the wash course .

**[0060]** Meanwhile, the present invention determines a suds or foreign substance removal time point based on the supply time of the condensing water into the condensation duct 43, but is not limited thereto. The present invention is able to determine the suds or foreign substance removal time point by supplying the condensing water for a predetermined time a predetermined number of times (approximately two or three times).

**[0061]** Also, the embodiment of the present invention exemplifies a drum-type washing machine having a drying function, but is not limited thereto, and is applicable to any type of washing machines having a drying function or refresh function. Here, the refresh function is to remove bad smell and dust of clothing.

**[0062]** As is apparent from the above description, the present invention provides a washing machine and suds removal method thereof capable of removing suds, which are excessively generated during a washing cycle to thereby be introduced into a drying device. This is effective to eliminate a risk of contamination of laundry. By performing a suds removal cycle after the washing cycle or before a drying cycle, it is possible to effectively remove suds, including foreign substances, present inside the drying device, resulting in improved cleanness of the washing machine.

**[0063]** Although 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 and spirit of the invention, the scope of which is defined in the claims and their equivalents.

## Claims

1. A washing machine having a drying device, comprising:

a signal input unit to select a drying cycle or washing cycle;  
water supply means to supply water into the drying device; and  
a controller to control the supply of water in order to remove suds present inside the drying device if the drying cycle or washing cycle is selected by the signal input unit.

2. The machine according to claim 1, wherein the supply of water is controlled to supply the water into the drying device after the washing cycle.

3. The machine according to claim 1, wherein the supply of water is controlled to supply the water into the drying device during a rinsing cycle.

4. The machine according to claim 1, wherein the supply of water is controlled to supply the water into the drying device before the drying cycle.

5. The machine according to claim 1, wherein the drying device comprises a duct connected to a water tub to circulate heated air into the water tub.

6. The machine according to claim 5, wherein the water supply means comprises a water supply valve to supply the water into the duct.

7. A suds removal method of a washing machine having a drying device to remove suds present inside the drying device, comprising:

determining whether a drying cycle is selected; and  
removing the suds by supplying water into the drying device when the drying cycle is selected.

8. The method according to claim 7, wherein the removing of the suds is performed before the drying cycle is performed.

9. The method according to claim 7, wherein the removing of the suds is an independent cycle to remove suds or foreign substances present inside the drying device.

10. The method according to claim 7, wherein the removing of the suds is performed by supplying the water into the

drying device for a predetermined time.

5 11. The method according to claim 7, wherein the removing of the suds is performed by supplying the water into the drying device for a predetermined time for a predetermined number of cycles.

12. A suds removal method of a washing machine having a drying device comprising:

10 determining whether a washing cycle is completed;  
removing suds present inside the drying device by supplying water into the drying device when the washing cycle is completed.

13. The method according to claim 12, wherein the removing of the suds is an independent cycle to remove the suds or foreign substances present inside the drying device.

15 14. The method according to claim 12, wherein the removing of the suds is performed simultaneously with a rinsing cycle of the washing machine.

20 15. The method according to claim 12, wherein the removing of the suds is performed by supplying the water into the drying device for a predetermined time.

16. The method according to claim 12, wherein the removing of the suds is performed by supplying the water into the drying device for a predetermined time for a predetermined number of cycles.

25 17. A washing machine having a water tub and a drum, the washing machine comprising:

30 a drying device to dry laundry placed in the drum, and comprising a condensation duct mounted at a rear surface of the water tub, wherein excess suds are removed from the drum via the condensation duct; and  
a controller to control an operation of a supply of condensing water into the condensation duct after a washing cycle or before a drying cycle of the washing machine to thereby remove the suds introduced into the condensation duct.

35 18. The washing machine of claim 17, further comprising an injection nozzle inserted into an upper portion of the condensation duct to inject condensing water into the condensation duct to flow down an inner surface of the condensation duct.

FIG. 1

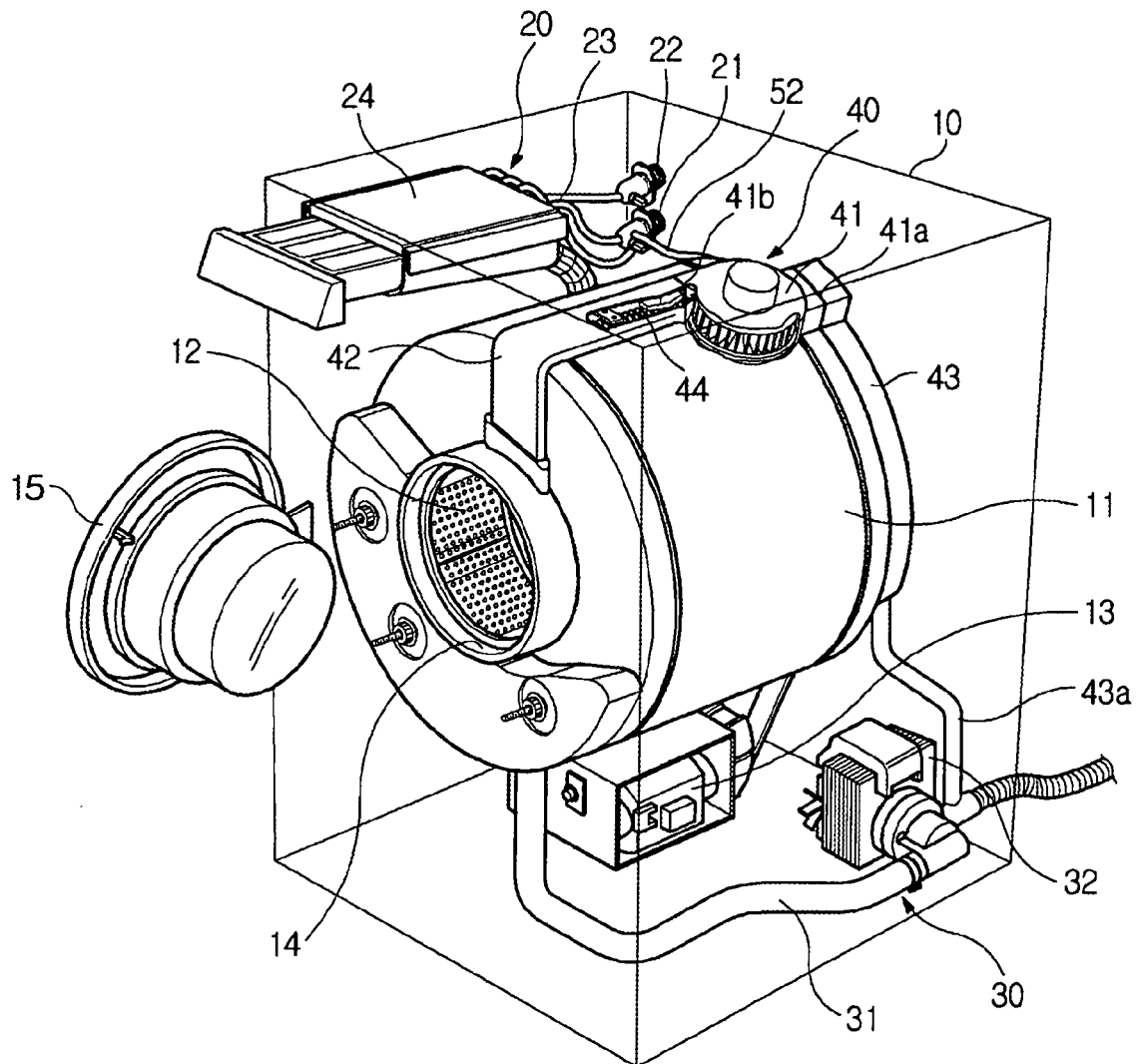


FIG. 2

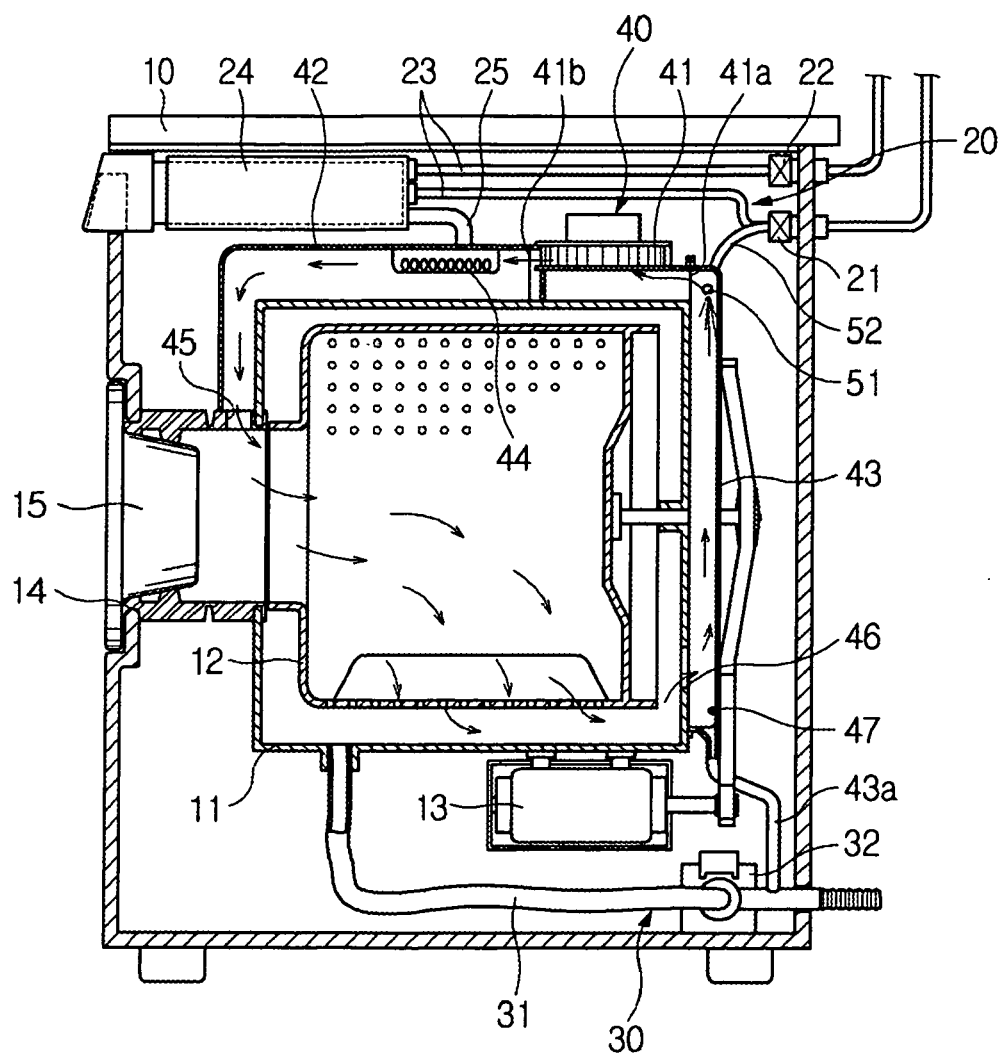


FIG. 3

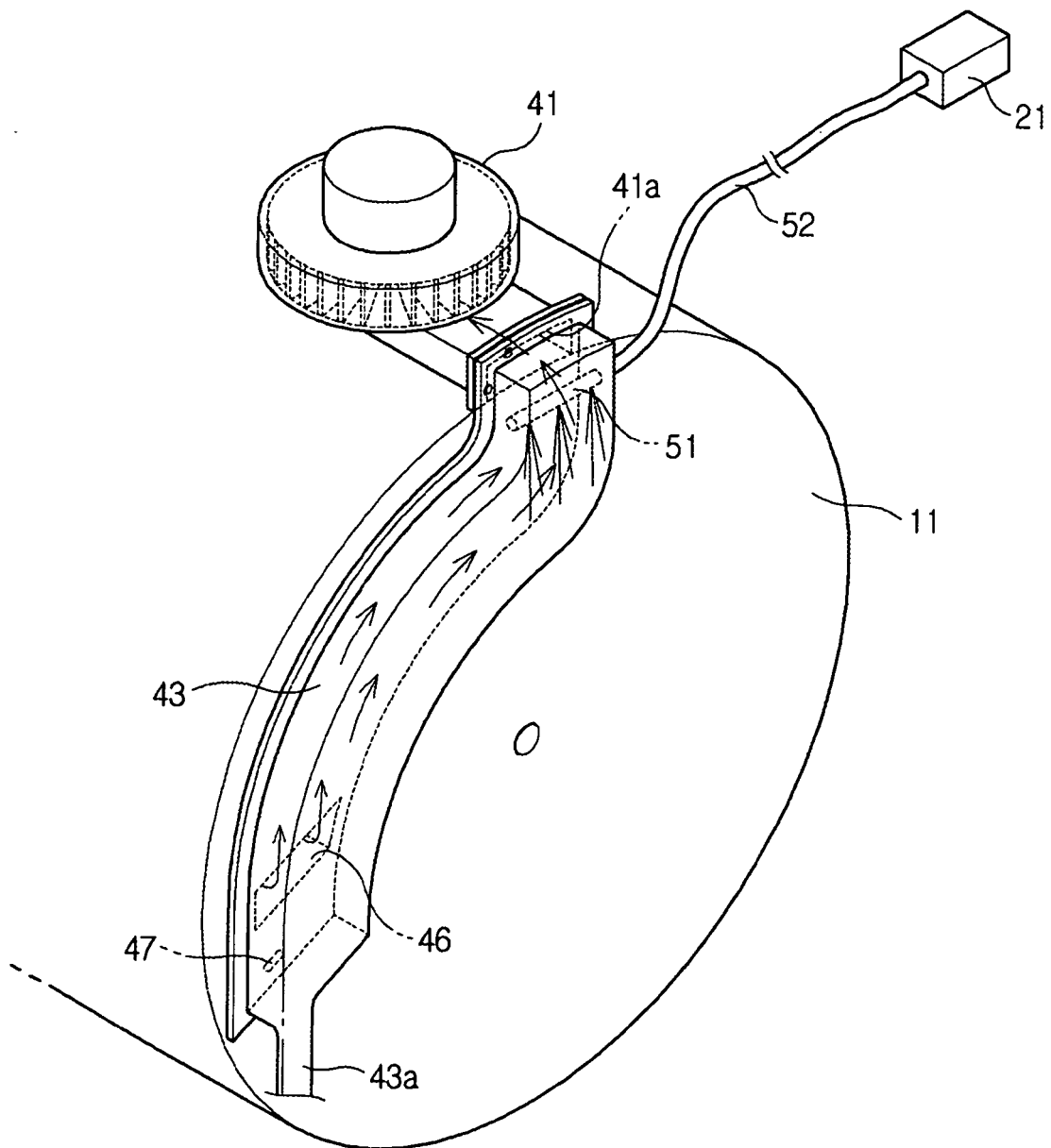


FIG. 4

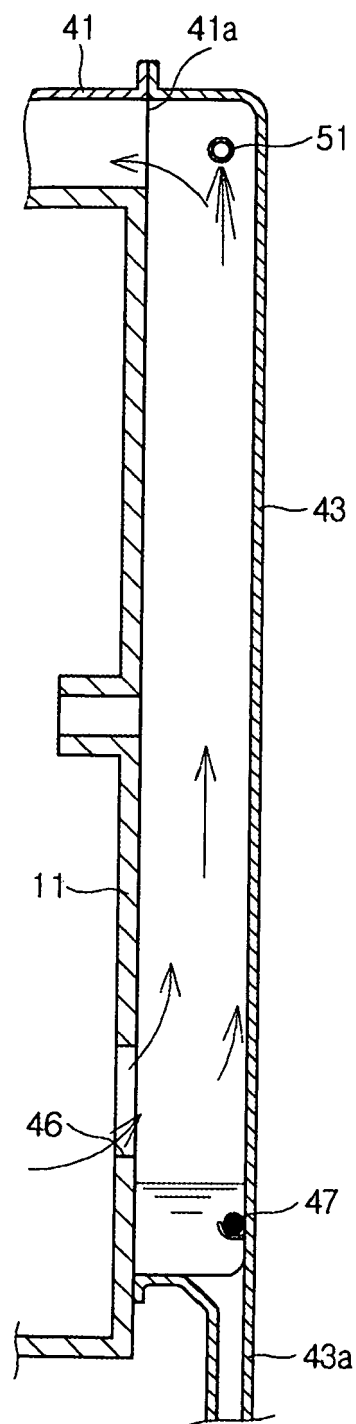


FIG. 5

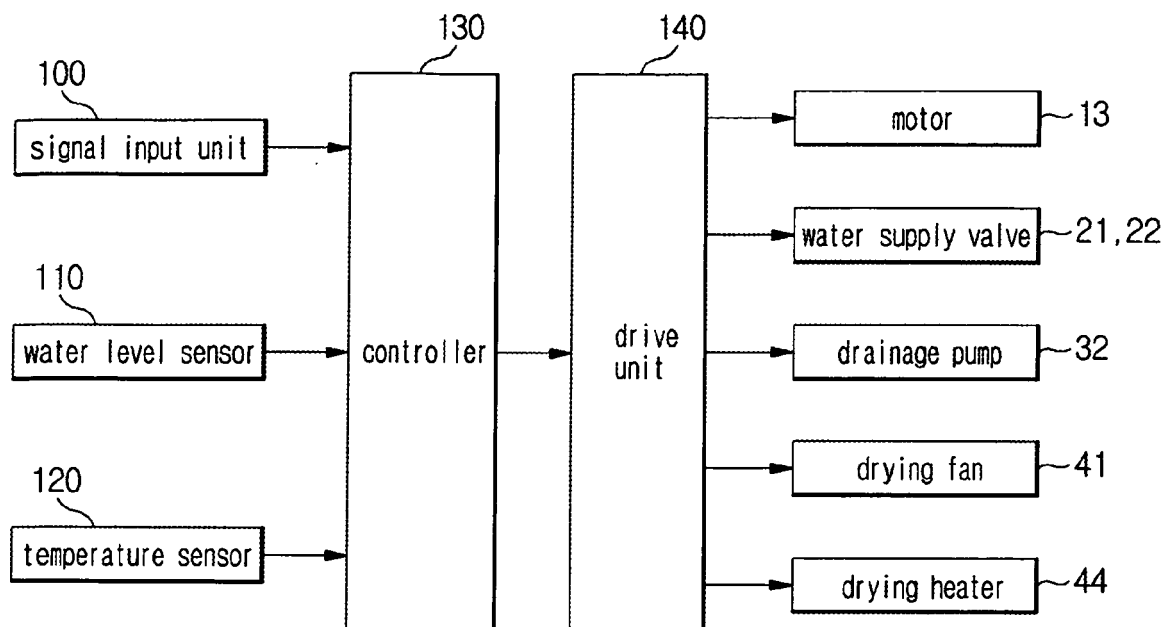


FIG. 6

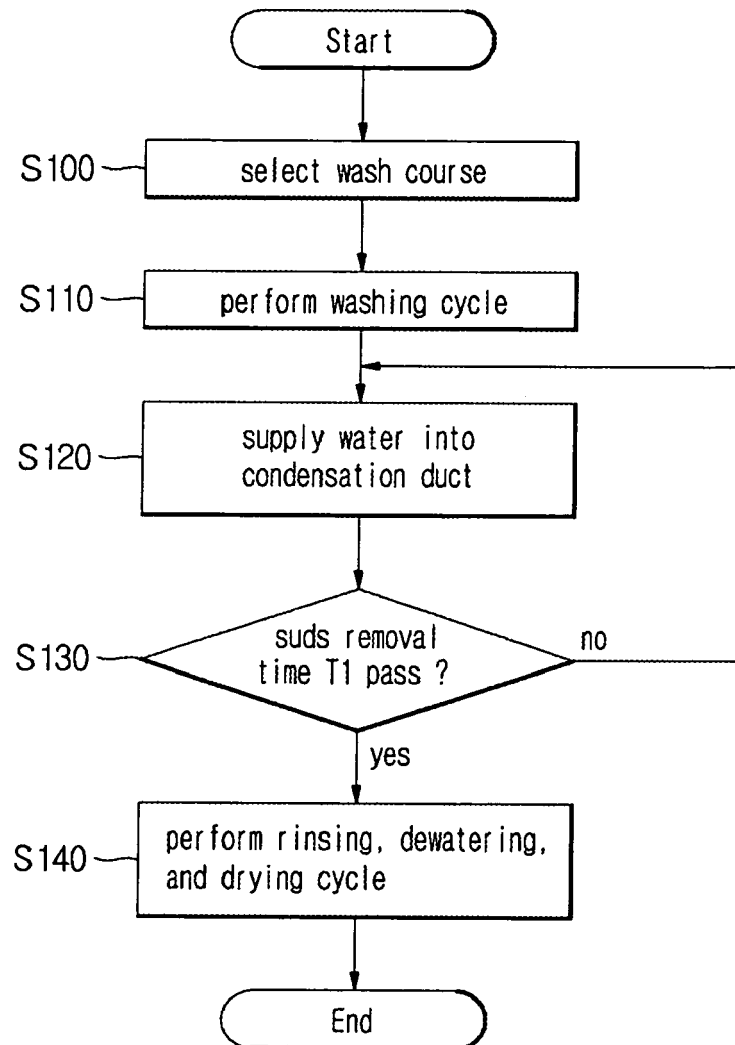
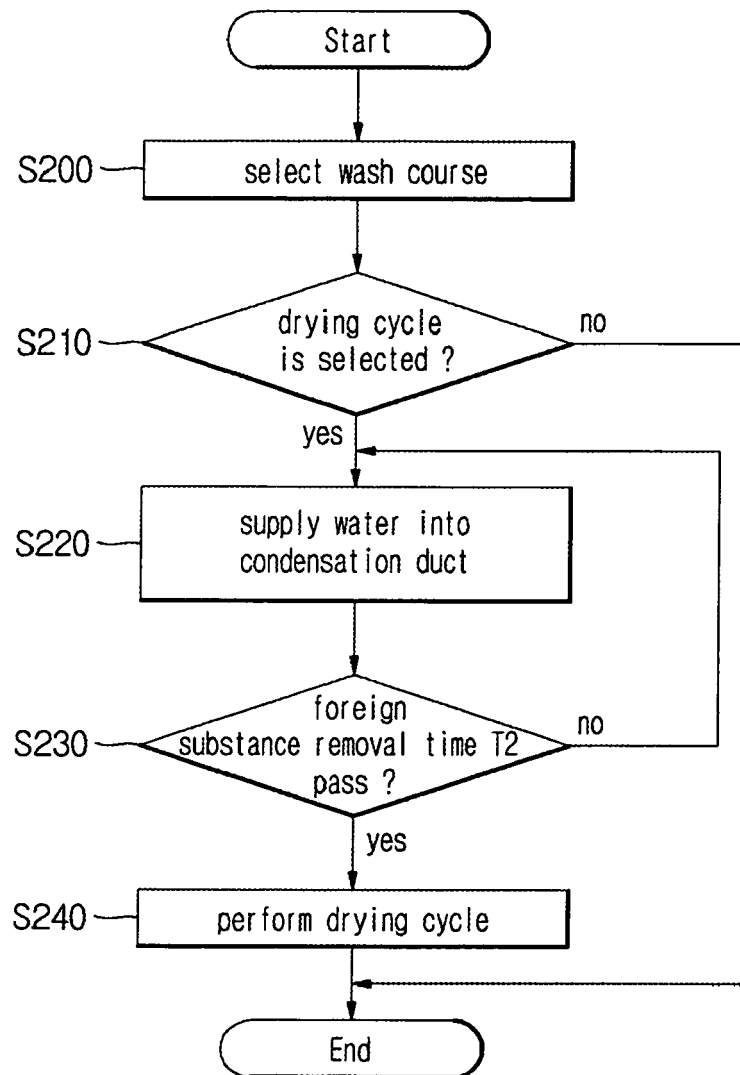


FIG. 7





European Patent  
Office

# EUROPEAN SEARCH REPORT

Application Number  
EP 05 02 5157

| DOCUMENTS CONSIDERED TO BE RELEVANT                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                       |                                             |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|
| Category                                                                                                                                                                                                                                               | Citation of document with indication, where appropriate, of relevant passages                                                                                                                                                                                                                         | Relevant to claim                                                                                                                                                                                                                                                                     | CLASSIFICATION OF THE APPLICATION (IPC)     |
| X                                                                                                                                                                                                                                                      | EP 1 473 403 A (SAMSUNG ELECTRONICS CO., LTD) 3 November 2004 (2004-11-03)<br>* paragraphs [0016] - [0021] *<br>* figures 1-5 *                                                                                                                                                                       | 1-7,12,<br>17,18                                                                                                                                                                                                                                                                      | INV.<br>D06F25/00<br>D06F39/06<br>D06F58/20 |
| X                                                                                                                                                                                                                                                      | -----<br>PATENT ABSTRACTS OF JAPAN<br>vol. 2003, no. 12,<br>5 December 2003 (2003-12-05)<br>-& JP 2005 027766 A (MITSUBISHI ELECTRIC CORP; NIPPON KENTETSU CO LTD),<br>3 February 2005 (2005-02-03)<br>* abstract; figures 1,4,5 *<br>* paragraphs [0010] - [0018] *<br>* paragraphs [0024], [0037] * | 1-18                                                                                                                                                                                                                                                                                  |                                             |
| X                                                                                                                                                                                                                                                      | -----<br>FR 2 711 153 A (ESSWEIN SA)<br>21 April 1995 (1995-04-21)<br>* page 1, lines 27-33 *<br>* page 2, lines 1-10 *<br>* page 5, lines 4-26 *<br>* figures 1-4 *                                                                                                                                  | 1-6,12,<br>13,16-18                                                                                                                                                                                                                                                                   |                                             |
| X                                                                                                                                                                                                                                                      | -----<br>EP 0 340 403 A (A. MERLONI S.P.A)<br>8 November 1989 (1989-11-08)<br>* column 2, line 3 - column 3, line 16 *<br>* figure 1 *                                                                                                                                                                | 1-6,17,<br>18                                                                                                                                                                                                                                                                         |                                             |
| The present search report has been drawn up for all claims                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                       | TECHNICAL FIELDS<br>SEARCHED (IPC)<br>D06F  |
| Place of search<br>Munich                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                       | Date of completion of the search<br>16 June 2006                                                                                                                                                                                                                                      | Examiner<br>Weinberg, E                     |
| CATEGORY OF CITED DOCUMENTS<br>X : particularly relevant if taken alone<br>Y : particularly relevant if combined with another document of the same category<br>A : technological background<br>O : non-written disclosure<br>P : intermediate document |                                                                                                                                                                                                                                                                                                       | T : theory or principle underlying the invention<br>E : earlier patent document, but published on, or after the filing date<br>D : document cited in the application<br>L : document cited for other reasons<br>-----<br>& : member of the same patent family, corresponding document |                                             |

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**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 05 02 5157

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| Patent document<br>cited in search report |   | Publication<br>date | Patent family<br>member(s) | Publication<br>date |
|-------------------------------------------|---|---------------------|----------------------------|---------------------|
| EP 1473403                                | A | 03-11-2004          | US 2004216327 A1           | 04-11-2004          |
| JP 2005027766                             | A | 03-02-2005          | NONE                       |                     |
| FR 2711153                                | A | 21-04-1995          | NONE                       |                     |
| EP 0340403                                | A | 08-11-1989          | IT 1217490 B               | 22-03-1990          |