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(54) Title: PROCESS FOR CONTROLLING THE DRAINAGE TIME OF A DOMESTIC APPLIANCE

(57) Abstract: The present invention is included in the field of domestic appliances and it refers to an algorithm, i.e. a method for controlling drainage time of water in domestic appliances, more specifically for the drainage of a laundry basket/tank of a washing machine. The process for controlling the drainage time, object of the present invention, effectuates a time control that is necessary for the total drainage - or, as required, partial - of a laundry tank of a washing machine without utilizing any pressure sensor, water level sensor or mechanical keys.

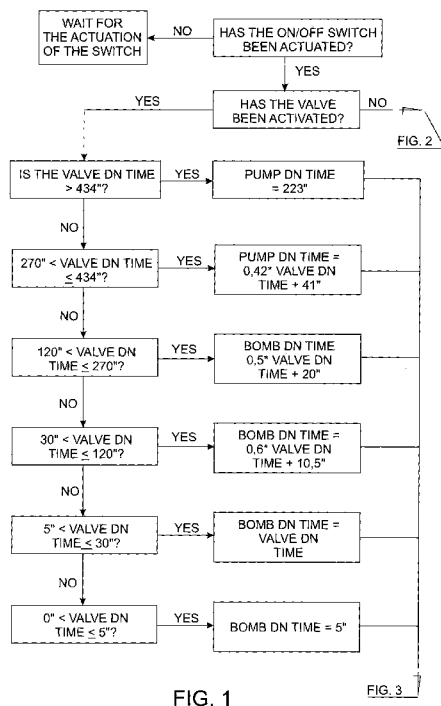


FIG. 1

FIG. 3



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ML, MR, NE, SN, TD, TG).

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PROCESS FOR CONTROLLING THE DRAINAGE TIME OF A DOMESTIC APPLIANCE

Field of the Invention

The present invention is included in the field of domestic appliances and it refers to an algorithm, i.e. a method for controlling drainage time of water in domestic appliances, more specifically for the drainage of a laundry basket/tank of a washing machine.

Background of the Invention

As commonly known, several domestic appliances – in special, washing machines – function with the storage of a certain quantity of water in a laundry tank which, after the processing stage, must be completely drained for continuing with the process.

In a general way, such equipments, which normally utilize mechanical pressure switches with a single contact, require a long time period to drain the water in the centrifugation, rising, and washing steps, wherein this condition results from the fact that the equipment “does not know” which is the level and the actual water volume in the interior of the tank that is going to be drained. Thus, the system that operates the functioning of such equipments utilizes a drainage time which has been previously set to the maximum volume of water that the tank can store. Said drainage time may also be set to drain the maximum volume of water with basis on certain extreme conditions of the product and constituent parts.

Document BR 0402550, for example, describes a method of optimizing the drainage and centrifugation time for washing machines utilizing a mechanical timer, by timing only centrifugation and agitation processes, and by controlling the beginning of centrifugation process by the actuation of the water level sensor indicating the presence of minimum water in the interior of the washing tank. Therefore, the operation of this system fundamentally depends on the existence of the level sensor, which includes costs of installation and maintenance. Other equipments, which indicate the utilization of level sensors to effectuate the same function, are described in documents US6065170, US2003-0056300, KR2005123228 e US2009-0265863.

Another example of the current prior art is described in document EP1096052 which refers to a method that utilizes fixed levels of water column height to calculate if the water is still stored in the interior of the tank and, subsequently, determinate the drainage time by monitoring the intervals between decreases and level of water to be drained. It is noted, therefore, that this system is not totally accurate, since it is not possible to identify the actual volume of water in the interior of the washing tank, rendering the system susceptible of failures that are capable of endangering the appropriate drainage of the equipment.

Document EP1942219 describes a domestic appliance that employs consecutive and intermittent drainages to detect the level of water in the interior of the tank, such system utilizing a pump that operates in a pulse form and which necessarily must be turned on to

calculate the drainage time. Therefore, it is a system that depends totally on the pump, which is one of the domestic appliances that, together with the engine, requires significant energy consumption and, consequently, renders the operation expensive.

It is noted, therefore, that the already known drainage processes for domestic appliances lack for solutions that do not depend on the utilization of water level sensors, pressure sensors, or the start of the pump to calculate the drainage time, aiming the improvement of the system and, consequently, the reduction of manufacture and operation costs.

Objectives of the Invention

In view of the foregoing, one of the objectives of the present invention is the disclosure of a process for controlling the drainage time of a domestic appliance – in special, a washing machine – which may operate with a reduced drainage time without utilizing pressure sensors.

Another objective of the present invention is the description of a process for controlling the drainage time which includes conditions related to the user's interactions such as, for example, the act of opening the movable lid and the addition of water.

It is also another objective of the present invention the provision of a process for controlling a drainage time involving specific costs so as to enable its application to low-costs products.

Still another objective of the present invention deals with the disclosure of a process that is robust in relation to variations in the specification of the pump and water inlet valve.

Another objective of the present invention is the provision of an operational process that does not employ any type of information originated, in general, from sensors of mechanical keys.

It is finally one of the objectives of the present invention the provision of a process for controlling the drainage time that utilizes, as an input data, the period of time during which the valve is turned on, converting the same to a drainage time that includes boundary conditions related to variations in the installation (hydraulic and electric) and product (variation in valve and pump and drainage hose).

Summary of the Invention

The present invention achieves the above-mentioned objectives by means of a process for controlling the drainage time of a domestic appliance, wherein said domestic appliance is composed by a structure comprising a movable lid, a washing tank, and a pump. The cited process controls the time that is necessary for the drainage by measuring the time required to fill the tank with water up to a minimum pre-established level and, with basis on the volume of water that has been added to the washing tank, it is possible to calculate the period of time during which the pump must be turned on to complete the drainage process of

the washing tank.

According to a preferred embodiment of the present invention, the cited process also comprises means of detecting when the movable lid of the domestic appliance is opened, so as to define the drainage time.

5 Optionally, the process of the present invention may further comprise means of detecting the occurrence of an electric energy outage to define the drainage time.

The process of the present invention is characterized in that it comprises the following steps:

i) verifying if the on/off switch was actuated;

10 ii) verifying if the water inlet valve was actuated;

- if the water inlet valve has not been actuated, the process effectuates the following steps: it verifies if a predefinition of the pressure sensor has occurred; if the pressure sensor has been predefined, the system activates the drainage time with basis on the worst case; it verifies if the user has set the domestic appliance in stand-by to start the rinsing cycle; if the domestic appliance has been set in stand-by for rinsing, the filling valve is activated; if the domestic appliance has not been set in stand-by for rinsing, it verifies if the user has set the domestic appliance in stand-by to start the centrifugation cycle; if positive, it waits for an instant to activate and start the centrifugation, and if the domestic appliance has not been set in stand-by for centrifugation, it waits the user's actuation;

20 - if the water inlet valve has been activated, the process effectuates the following steps: it verifies the period of time during which the water inlet valve had been operating to determinate the period of time for the pump operation;

iii) verifying if a predefinition of the pressure sensor has occurred, wherein:

- if the predefinition of the pressure sensor has not occurred, it verifies if the movable lid has been opened during the filling, and if the lid has been opened during the filling, the system activates the drainage time with basis on the worst possible case; if the lid has not been opened during the filling, the system carries out the drainage in accordance with a reference table; it verifies if the function Skip Steps has been activated since the beginning until the drainage is over, and, if the function Skip Steps has been activated, the system changes the indicative led to a new selected step and it does not interrupt the drainage until the process is over, and, if the function Skip Steps has not been activated, the system keeps draining until the drainage time is over;

- if a predefinition of the pressure sensor has occurred: it verifies if the time for setting the predefinition has been minor than 141 seconds; if the time for setting the predefinition has been minor than 141 seconds, the system activates the drainage time with basis on the worst possible case, it verifies if the function Skip Steps has been activated since the beginning until the drainage is over, and, if the function Skip Steps has been

activated, the system changes the indicative led to a new selected step and it does not interrupt the drainage until the process is over, and if the function Skip Steps has not been activated, the system keeps draining until the drainage time is over; if the time for setting the predefinition has been greater than 141 seconds, the system verifies if the machine has been disconnected from the socket before the filling was over, or if an electric energy outage has occurred before the drainage step, if the machine has been disconnected from the socket or an electric energy outage has occurred, the system activates the drainage time with basis on the worst possible case, it verifies if the function Skip Steps has been activated since the beginning until the drainage is over, and, if the function Skip Steps has been activated, the system changes the indicative led to a new selected step and it does not interrupt the drainage until the process is over, and, if the function Skip Steps has not been activated, the system keeps draining until the drainage time is over;

iv) if the machine has not been disconnect from the socket or an electric energy outage has not occurred, it is verified if the machine has not been set in stand-by before the filling is over;

v) if the machine has been set in stand-by before the filling is over, it saves the filling time that had been spent before setting the machine in stand-by;

vi) if the machine has not been set in stand-by before the filling is over, it verifies if the movable lid has been opened;

- if the movable lid has been opened, the system activated the drainage time with basis on the worst possible case, it verifies if the function Skip Steps has been activated since the beginning until the drainage is over, and, if the function Skip Steps has been activated, the system changes the indicative led to a new selected step and it does not interrupt the drainage until the process is over, and, if the function Skip Steps has not been activated, the system keeps draining until the drainage time is over;

- if the movable lid has not been opened, it drains in accordance with the equations indicated in the reference table and it respects Δt (for reset), wherein Δt (for reset) is equal to the theoretical time calculated by the equation that is indicated in the reference table minus 52 seconds;

vii) respecting the period of time for draining reset = 52 seconds;

viii) verifying if Δt (for reset) < theoretical time that is calculated by the equation presented on the table of step 4:

-if positive, the remaining time for draining will be equal to the initial theoretical drainage time minus the already spent drainage time;

- if negative, it waits up to 180 seconds for the rest of the safety time and which will form the time-out of the pump; after the reset, it effectuated the drainage during 70 seconds and if the reset does not occur 180 seconds after the Δt for reset, the equipment is turned off;

ix) verifying if the function Skip Steps has been activated since the beginning until the drainage is over.

- if the function Skip Steps has been activated, the system changes the indicative led to a new selected step and it does not interrupt the drainage until the process is over.

5 - if the function Skip Steps has not been activated, the system keeps draining until the drainage time is over.

Short Description of the Drawings

Figures 1 to 5 – illustrate a complete operational block diagram regarding the process for controlling the drainage time that is object of the present invention.

10 Detailed Description of the Invention

The present invention will be described below, in detail, with basis on the operational block diagram that is illustrated in the appended drawings.

The process for controlling the drainage time, object of the present invention, effectuates a time control that is necessary for the total drainage – or, as required, partial – of
15 a laundry tank of a washing machine without utilizing any pressure sensor, water level sensor or mechanical keys.

Such process is based on the measurement of water inlet time, calculating the drainage time just after the filling of the washing tank, without requiring the actuation of the pump that is responsible for the drainage of the water per se. Moreover, the present
20 invention enables to calculate the drainage time for any level of water, differently from the majority of the already known processes which are restricted to specific predefined levels.

Other distinct feature of the process of the present invention refers to the fact that it utilizes, as input data, the water inlet time. Thus, the time that has been spent to achieve any water column height is measured, so as to determinate, with basis on the volume of water
25 that has been added to the washing tank, the period of time during which the pump must be operating to complete the process of draining the tank.

In short, the present process calculates the period of time, just after filling the tank, during which the pump must be operating, without utilizing any other signal originated from any other additional device to assist this calculation. Thus, the period of time during which
30 the pump must be operating is reduced, resulting in a decrease of energy consumption and, reducing, consequently, the costs of utilizing the equipment. Another advantage of the present invention is directed to the reduction of time during which the pump remains operating and making noise, even when there is no water in the interior of tank, a solution to a problem that was used to generate inconveniences to the consumers.

35 It shall be further clarified that the process described herein detects the act of opening or not the “movable lid of the washing machine”, since it is of common use the utilization of mechanical or magnetic keys for monitoring. If the lid is opened, the user may

have added water to the washing machine by means, for example, of a bucket or a hose. Thus, the algorithm deals with the "worst case" of a period of time during which the pump will operate.

As explained, a similar idea is considered when an electric energy outage occurs, since the equipment may lose the calculation of the drainage time. It is further considered the possibility of the user adding water to the equipment during the interval of electric energy outage.

Thus, the process for controlling the drainage time of the domestic appliance, which is object of the present invention, comprises the following steps:

1. verifying if the on/off switch was actuated;
2. verifying if the water inlet valve was actuated;

If the water inlet valve has not been actuated, the process effectuates the following steps:

3. verifying if a predefinition of the pressure sensor has occurred;

3.1. if the pressure sensor has been predefined, the system activates the drainage time with basis on the worst possible case – this "worst case" regards the calculation considering the worst case of: voltage in the entrance of the network, height of the drainage hose, water inlet valve with its maximum flow, electric pump with its minimum flow.

3.2. it verifies if the user has set the domestic appliance in stand-by to start the rinsing cycle;

3.2.1. If positive, it actuates the filling valve;

3.2.2. If negative, it verifies if the user has set the domestic appliance in stand-by to start the centrifugation cycle;

3.2.2.1. If affirmative, it waits for the time to actuate the actuator and to start the centrifugation (shall require, on average, a period of time minor than 40 seconds);

3.2.2.2. If negative, it waits for the user's actuation.

If the water inlet valve has been actuated, the process effectuates the following steps:

4. verifying the period of time during which the water inlet valve had been operating to determinate the period of time for the pump operation;

The parameters of such definition are disclosed in the following table:

Time of water inlet valve operating	Time of pump operating (t_b) / Time of water inlet valve operating (t_v)
$> 434 \text{ s}$	223 s
$270 \text{ s} < t < 434 \text{ s}$	$t_b = 0.42 \text{ s} / t_v + 41 \text{ s}$
$120 \text{ s} < t < 270 \text{ s}$	$t_b = 0.5 \text{ s} / t_v + 20 \text{ s}$

$30 \text{ s} < t < 120 \text{ s}$	$t_b = 0.6 \text{ s} / t_v + 10.5 \text{ s}$
$5 \text{ s} < t < 30 \text{ s}$	$t_b = t_v$
$0 \text{ s} < t < 5 \text{ s}$	$t_b = 0.5$

It shall be emphasized that the above-mentioned table is specific to a feasible embodiment, as well as other times described herein, so that the values presented in the instant specification are mere examples, non-restrictive.

5. verifying if a predefinition of the pressure sensor has occurred;

5 If the answer of step 5 is negative, the following steps are carried out:

6.1. verifying if the movable lid has been opened during the filling of the tank;

6.1.1. if the lid has been opened, the system activated the drainage time with basis on the worst possible case;

6.1.2. if the movable lid has not been opened, the system effectuates the drainage in accordance with the table described above;

6.2. verifying if the function Skip Steps has been activated since the beginning until the drainage is over;

6.2.1. if the function Skip Steps has been activated, the system changes the indicative led to a new selected step and it does not interrupt the drainage until the process is over;

6.2.2. if the function Skip Steps has not been activated, the system keeps draining until the drainage time is over;

If the answer of step 5 is negative, the following steps are carried out:

7. verifying if the time for setting the predefinition has been minor than 141 seconds;

8. if the time for setting the predefinition has been minor than 141 seconds, the system activates the drainage time with basis on the worst possible case;

8.1 it verifies if the function Skip Steps has been activated since the beginning until the drainage is over;

8.1.1. if the function Skip Steps has been activated, the system changes the indicative led to a new selected step and it does not interrupt the drainage until the process is over;

8.1.2. if the function Skip Steps has not been activated, the system keeps draining until the drainage time is over;

9. if the time for setting the predefinition has been greater than 141 seconds, the system verifies if the machine has been disconnected from the socket before the filling was over, or if an electric energy outage has occurred before the drainage step;

10. if the machine has been disconnect from the socket or an electric energy outage has occurred, the system activates the drainage time with basis on the worst case.

10.1 it verifies if the Skip Steps has been activated since the beginning until the

drainage is over.

10.1.1. if the function Skip Steps has been activated, the system changes the indicative led to a new selected step and it does not interrupt the drainage until the process is over.

5 10.1.2. if the function Skip Steps has not been activated, the system keeps draining until the drainage time is over.

11. if the machine has not been disconnect from the socket or an electric energy outage has not occurred, it is verified if the machine has not been set in stand-by before the filling is over;

10 12. if the machine has been set in stand-by before the filling is over, it saves the filling time that had been spent before setting the machine in stand-by;

13. if the machine has not been set in stand-by before the filling is over, it verifies if the movable lid has been opened;

15 14. if the movable lid has been opened, the system activated the drainage time with basis on the worst possible case;

14.1 it verifies if the function Skip Steps has been activated since the beginning until the drainage is over;

20 14.1.1. if the function Skip Steps has been activated, the system changes the indicative led to a new selected step and it does not interrupt the drainage until the process is over;

14.1.2. if the function Skip Steps has not been activated, the system keeps draining until the drainage time is over;

15. if the movable lid has not been opened, it drains in accordance with the equations indicated in the reference table of step 4 and it respects Δt (for reset).

25 It shall be detached that Δt (for reset) is equal to the theoretical time calculated by the equation that is indicated in the reference table of step 4 minus 52 seconds.

16. respecting the period of time for draining reset = 52 seconds;

17. verifying if Δt (for reset) < theoretical time that is calculated by the equation presented on the table of step 4.

30 18. If the verification of step 17 is positive, the remaining time for draining will be equal to the initial theoretical drainage time minus the already spent drainage time. It shall be clarified that in this case the reset does not have priority, being mandatory the drainage time that is calculated by the above-mentioned equation.

35 19. If the verification of step 17 is negative, it waits up to 180 seconds for the rest of the safety time and which will form the time-out of the pump; after the reset, it effectuated the drainage during 70 seconds. If the reset does not occur 180 seconds after the Δt for reset, the equipment is turned off.

20. verifying if the function Skip Steps has been activated since the beginning until the drainage is over.

20.1. if the function Skip Steps has been activated, the system changes the indicative led to a new selected step and it does not interrupt the drainage until the process is
5 over.

20.2. if the function Skip Steps has not been activated, the system keeps draining until the drainage time is over.

It shall be emphasized that, although a preferred embodiment of the present invention has been disclosed, it is understood that eventual omissions, substitutions, and
10 constructive changes can be effectuated by a skilled in the art without escaping from the spirit and scope of the claimed protection. It is also clearly foreseen that all combinations of elements that have the same function and achieve the same results are within the scope of the invention. Substitutions of elements of a described embodiment by others are also totally considered and intended.

CLAIMS

1. A process for controlling the drainage time of a domestic appliance, wherein said domestic appliance is composed by a structure comprising a movable lid, a washing tank, and a pump, **CHARACTERIZED** in that said process controls the time that is necessary for the drainage by measuring the time required to fill the tank with water up to a minimum pre-established level and, with basis on the volume of water that has been added to the washing tank, it calculates the period of time during which the pump must be operating to complete the drainage process of the washing tank.

2. The process of Claim 1, **CHARACTERIZED** in that it comprises means of detecting when the movable lid of the domestic appliance is opened, so as to define the drainage time.

3. The process of Claim 1, **CHARACTERIZED** in that it further comprises means of detecting the occurrence of an electric energy outage to define the drainage time.

4. The process of Claim 1, **CHARACTERIZED** in that it comprises the following steps:

i) verifying if the on/off switch was actuated;

ii) verifying if the water inlet valve was actuated;

- if the water inlet valve has not been actuated, the process effectuates the following steps: it verifies if a predefinition of the pressure sensor has occurred; if the pressure sensor has been predefined, the system activates the drainage time with basis on the worst case; it verifies if the user has set the domestic appliance in stand-by to start the rinsing cycle; if the domestic appliance has been set in stand-by for rinsing, the filling valve is activated; if the domestic appliance has not been set in stand-by for rinsing, it verifies if the user has set the domestic appliance in stand-by to start the centrifugation cycle; if positive, it waits for an instant to activate and start the centrifugation, and if the domestic appliance has not been set in stand-by for centrifugation, it waits the user's actuation;

- if the water inlet valve has been activated, the process effectuates the following steps: it verifies the period of time during which the water inlet valve had been operating to determinate the period of time for the pump operation;

iii) verifying if a predefinition of the pressure sensor has occurred, wherein:

- if the predefinition of the pressure sensor has not occurred, it verifies if the movable lid has been opened during the filling, and if the lid has been opened during the filling, the system activates the drainage time with basis on the worst possible case; if the lid has not been opened during the filling, the system carries out the drainage in accordance with a reference table; it verifies if the function Skip Steps has been activated since the beginning until the drainage is over, and, if the function Skip Steps has been activated, the system changes the indicative led to a new selected step and it does not interrupt the

drainage until the process is over, and, if the function Skip Steps has not been activated, the system keeps draining until the drainage time is over;

- if a predefinition of the pressure sensor has occurred: it verifies if the time for setting the predefinition has been minor than 141 seconds; if the time for setting the predefinition has been minor than 141 seconds, the system activates the drainage time with basis on the worst possible case, it verifies if the function Skip Steps has been activated since the beginning until the drainage is over, and, if the function Skip Steps has been activated, the system changes the indicative led to a new selected step and it does not interrupt the drainage until the process is over, and if the function Skip Steps has not been activated, the system keeps draining until the drainage time is over; if the time for setting the predefinition has been greater than 141 seconds, the system verifies if the machine has been disconnected from the socket before the filling was over, or if an electric energy outage has occurred before the drainage step, if the machine has been disconnected from the socket or an electric energy outage has occurred, the system activates the drainage time with basis on the worst possible case, it verifies if the function Skip Steps has been activated since the beginning until the drainage is over, and, if the function Skip Steps has been activated, the system changes the indicative led to a new selected step and it does not interrupt the drainage until the process is over, and, if the function Skip Steps has not been activated, the system keeps draining until the drainage time is over;

iv) if the machine has not been disconnect from the socket or an electric energy outage has not occurred, it is verified if the machine has not been set in stand-by before the filling is over;

v) if the machine has been set in stand-by before the filling is over, it saves the filling time that had been spent before setting the machine in stand-by;

vi) if the machine has not been set in stand-by before the filling is over, it verifies if the movable lid has been opened;

- if the movable lid has been opened, the system activated the drainage time with basis on the worst possible case, it verifies if the function Skip Steps has been activated since the beginning until the drainage is over, and, if the function Skip Steps has been activated, the system changes the indicative led to a new selected step and it does not interrupt the drainage until the process is over, and, if the function Skip Steps has not been activated, the system keeps draining until the drainage time is over;

- if the movable lid has not been opened, it drains in accordance with the equations indicated in the reference table and it respects Δt (for reset), wherein Δt (for reset) is equal to the theoretical time calculated by the equation that is indicated in the reference table minus 52 seconds;

vii) respecting the period of time for draining reset = 52 seconds;

viii) verifying if Δt (for reset) < theoretical time that is calculated by the equation presented on the table of step 4:

-if positive, the remaining time for draining will be equal to the initial theoretical drainage time minus the already spent drainage time;

- 5 - if negative, it waits up to 180 seconds for the rest of the safety time and which will form the time-out of the pump; after the reset, it effectuated the drainage during 70 seconds and if the reset does not occur in 180 seconds after the Δt for reset, the equipment is turned off;

10 ix) verifying if the function Skip Steps has been activated since the beginning until the drainage is over.

- if the function Skip Steps has been activated, the system changes the indicative led to a new selected step and it does not interrupt the drainage until the process is over.

- if the function Skip Steps has not been activated, the system keeps draining until the drainage time is over.

AMENDED CLAIMS

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1. A process for controlling the drainage time of a domestic appliance, wherein said domestic appliance is composed by a structure comprising a movable lid, a washing tank, a pump and a system for measuring the time required to fill the tank
5 **CHARACTERIZED** in that said process controls the time that is necessary for the drainage by measuring the time required to fill the tank with water up to a minimum pre-established level and, with basis on the volume of water that has been added to the washing tank, it calculates the period of time during which the pump must be operating
10 to complete the drainage process of the washing tank, the process further comprising means of detecting when the movable lid of the domestic appliance is opened, so as to define the drainage time.

2. The process of Claim 1, **CHARACTERIZED** in that it further comprises means of detecting the occurrence of an electric energy outage to define the drainage
15 time.

3. The process of Claim 1, **CHARACTERIZED** in that it comprises the following steps:

i) verifying if the on/off switch was actuated;
ii) verifying if the water inlet valve was actuated;
20 - if the water inlet valve has not been actuated, the process effectuates the following steps: it verifies if a predefinition of the pressure sensor has occurred; if the pressure sensor has been predefined, the system activates the drainage time with basis on the worst case; it verifies if the user has set the domestic appliance in stand-by to start the rinsing cycle; if the domestic appliance has been set in stand-by for
25 rinsing, the filling valve is activated; if the domestic appliance has not been set in stand-by for rinsing, it verifies if the user has set the domestic appliance in stand-by to start the centrifugation cycle; if positive, it waits for an instant to activate and start the centrifugation, and if the domestic appliance has not been set in stand-by for centrifugation, it waits the user's actuation;

30 - if the water inlet valve has been activated, the process effectuates the following steps: it verifies the period of time during which the water inlet valve had been operating to determinate the period of time for the pump operation;

iii) verifying if a predefinition of the pressure sensor has occurred, wherein:
- if the predefinition of the pressure sensor has not occurred, it verifies if the
35 movable lid has been opened during the filling, and if the lid has been opened during the filling, the system activates the drainage time with basis on the worst possible case; if the lid has not been opened during the filling, the system carries out the drainage in

accordance with a reference table; it verifies if the function Skip Steps has been activated since the beginning until the drainage is over, and, if the function Skip Steps has been activated, the system changes the indicative led to a new selected step and it does not interrupt the drainage until the process is over, and, if the function Skip Steps has not been activated, the system keeps draining until the drainage time is over;

- if a predefinition of the pressure sensor has occurred: it verifies if the time for setting the predefinition has been minor than 141 seconds; if the time for setting the predefinition has been minor than 141 seconds, the system activates the drainage time with basis on the worst possible case, it verifies if the function Skip Steps has been activated since the beginning until the drainage is over, and, if the function Skip Steps has been activated, the system changes the indicative led to a new selected step and it does not interrupt the drainage until the process is over, and if the function Skip Steps has not been activated, the system keeps draining until the drainage time is over; if the time for setting the predefinition has been greater than 141 seconds, the system verifies if the machine has been disconnected from the socket before the filling was over, or if an electric energy outage has occurred before the drainage step, if the machine has been disconnected from the socket or an electric energy outage has occurred, the system activates the drainage time with basis on the worst possible case, it verifies if the function Skip Steps has been activated since the beginning until the drainage is over, and, if the function Skip Steps has been activated, the system changes the indicative led to a new selected step and it does not interrupt the drainage until the process is over, and, if the function Skip Steps has not been activated, the system keeps draining until the drainage time is over;

iv) if the machine has not been disconnect from the socket or an electric energy outage has not occurred, it is verified if the machine has not been set in stand-by before the filling is over;

v) if the machine has been set in stand-by before the filling is over, it saves the filling time that had been spent before setting the machine in stand-by;

vi) if the machine has not been set in stand-by before the filling is over, it verifies if the movable lid has been opened;

- if the movable lid has been opened, the system activated the drainage time with basis on the worst possible case, it verifies if the function Skip Steps has been activated since the beginning until the drainage is over, and, if the function Skip Steps has been activated, the system changes the indicative led to a new selected step and it does not interrupt the drainage until the process is over, and, if the function Skip Steps has not been activated, the system keeps draining until the drainage time is over;

- if the movable lid has not been opened, it drains in accordance with the

equations indicated in the reference table and it respects Δt (for reset), wherein Δt (for reset) is equal to the theoretical time calculated by the equation that is indicated in the reference table minus 52 seconds;

vii) respecting the period of time for draining reset = 52 seconds;

5 viii) verifying if Δt (for reset) < theoretical time that is calculated by the equation presented on the table of step 4:

-if positive, the remaining time for draining will be equal to the initial theoretical drainage time minus the already spent drainage time;

10 - if negative, it waits up to 180 seconds for the rest of the safety time and which will form the time-out of the pump; after the reset, it effectuated the drainage during 70 seconds and if the reset does not occur in 180 seconds after the Δt for reset, the equipment is turned off;

ix) verifying if the function Skip Steps has been activated since the beginning until the drainage is over.

15 - if the function Skip Steps has been activated, the system changes the indicative led to a new selected step and it does not interrupt the drainage until the process is over.

- if the function Skip Steps has not been activated, the system keeps draining until the drainage time is over.

20

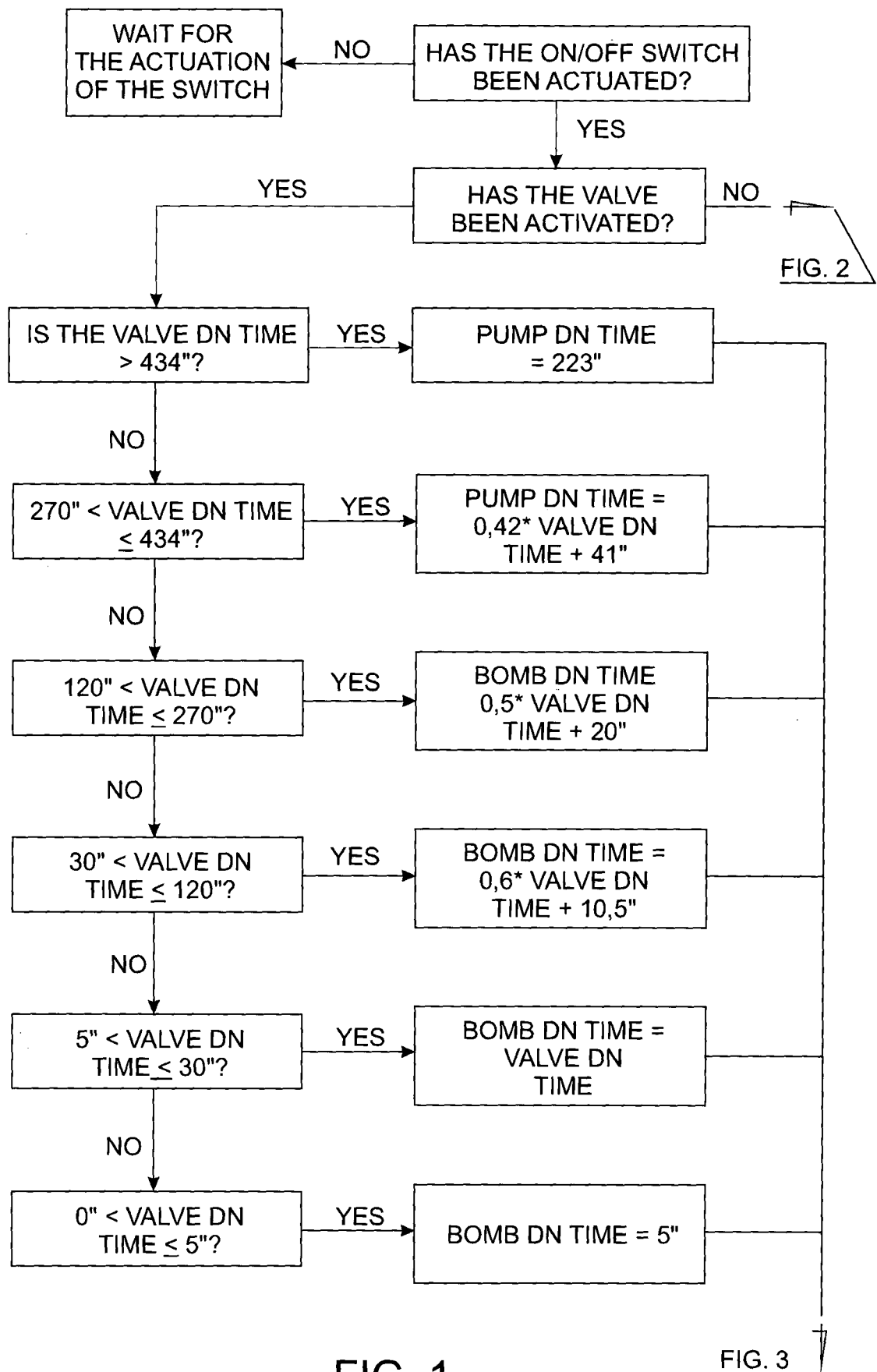


FIG. 1

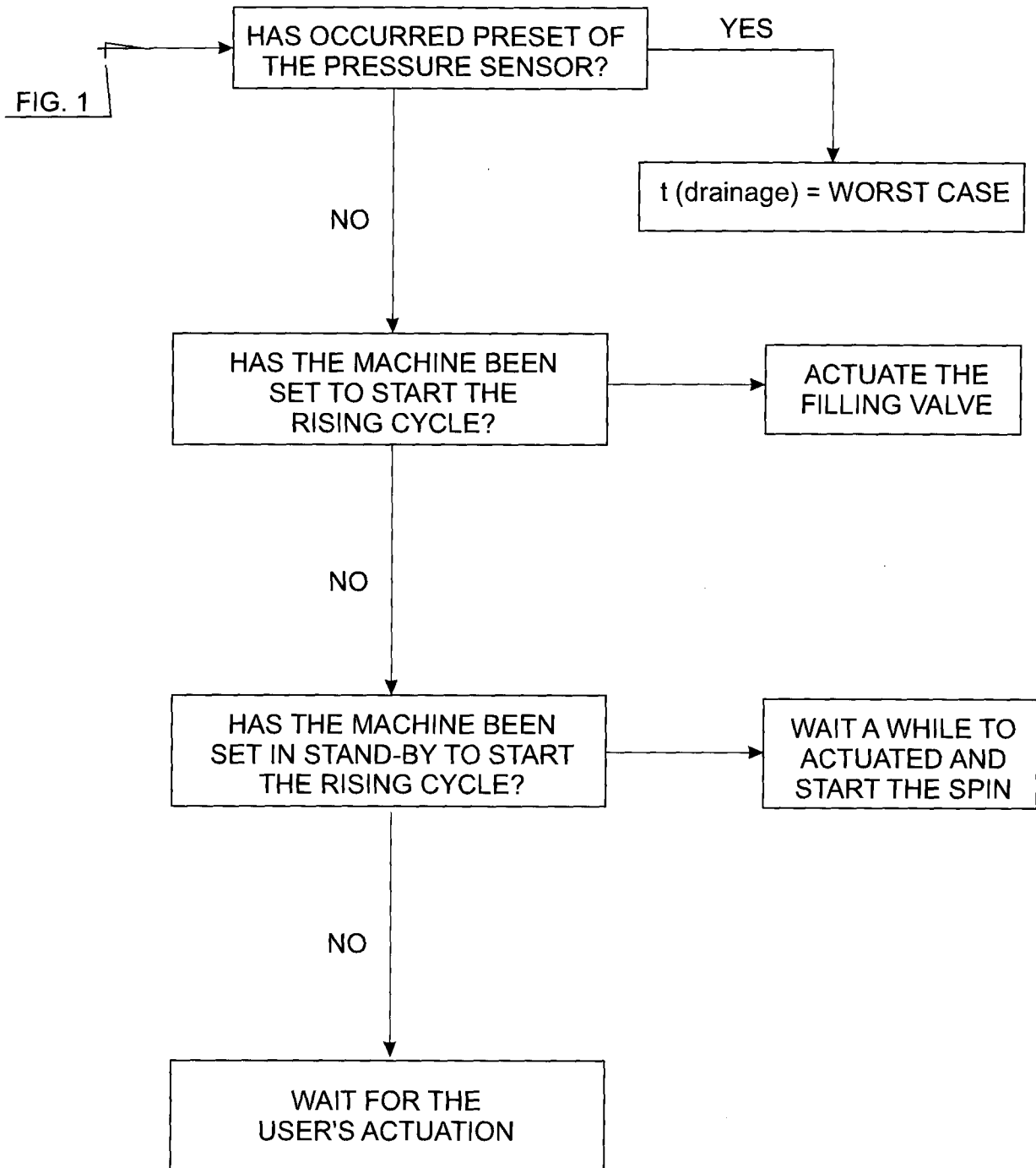


FIG. 2

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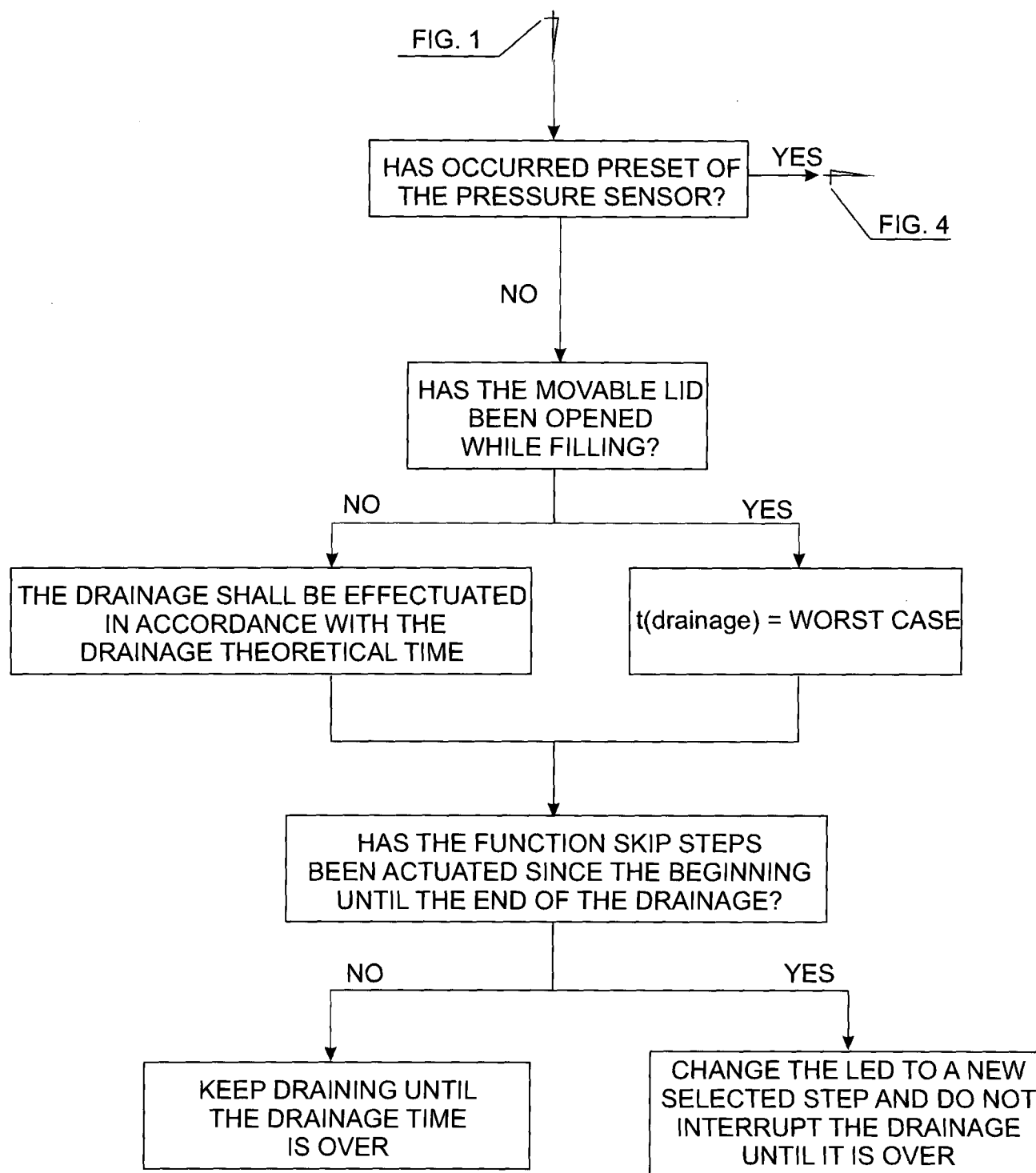
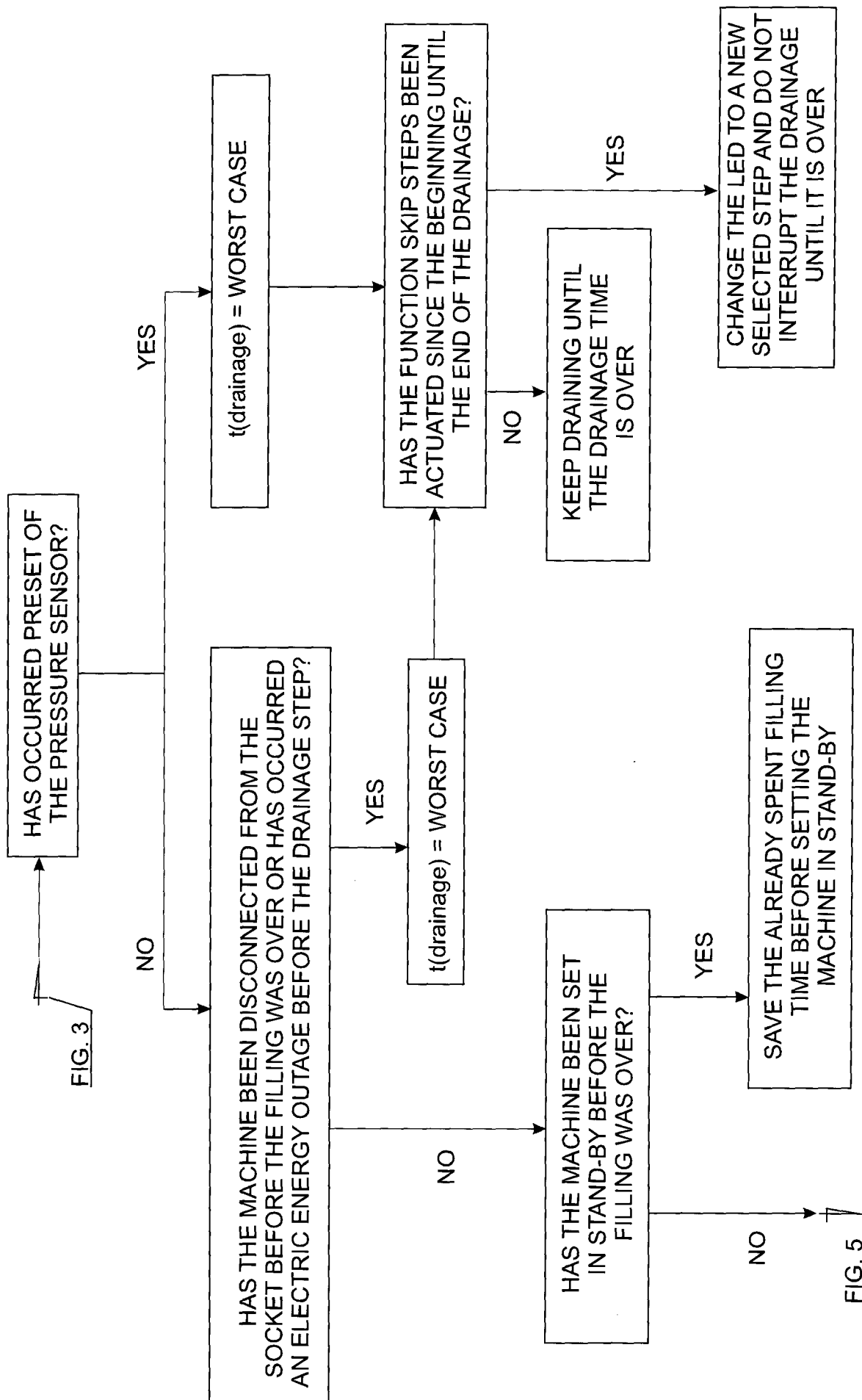


FIG. 3



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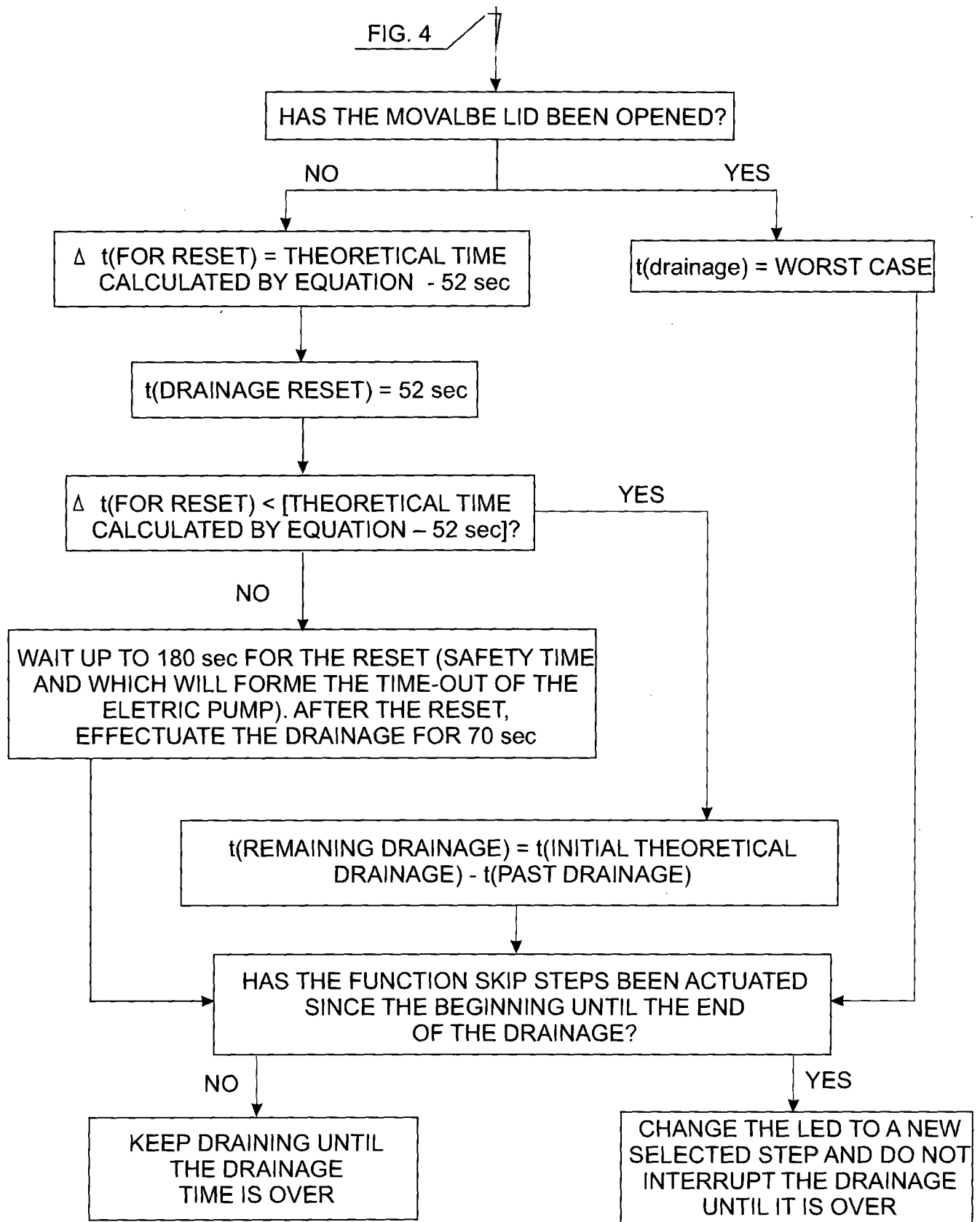


FIG. 3

INTERNATIONAL SEARCH REPORT

International application No

PCT/BR2012/000349

A. CLASSIFICATION OF SUBJECT MATTER

INV. A47L15/00 D06F33/02 D06F39/08
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

D06F A47L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 1 063 341 A2 (WHIRLPOOL CO [US]) 27 December 2000 (2000-12-27) paragraph [0002] paragraph [0027]; figures 6-8 -----	1
A	US 4 184 347 A (MORI TOSHIO [JP] ET AL) 22 January 1980 (1980-01-22) column 1, line 7 - column 1, line 13 column 7, line 34 - column 7, paragraph 60; figures 10-12 -----	1
A	EP 1 197 593 A2 (FISHER & PAYKEL [NZ] FISHER & PAYKEL APPLIANCES LTD [NZ]) 17 April 2002 (2002-04-17) paragraph [0022]; figures 3-6 -----	1



Further documents are listed in the continuation of Box C.



See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search

18 March 2013

Date of mailing of the international search report

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/BR2012/000349

Patent document cited in search report		Publication date		Patent family member(s)		Publication date
EP 1063341	A2	27-12-2000	BR	0002855 A		30-01-2001
			CN	1278568 A		03-01-2001
			EP	1063341 A2		27-12-2000
			MX	PA00006076 A		08-03-2002
			NZ	505314 A		28-02-2003
			US	6269666 B1		07-08-2001
			US	2001047670 A1		06-12-2001
			US	2001049947 A1		13-12-2001
			US	2001052249 A1		20-12-2001

US 4184347	A	22-01-1980	AU	509103 B2		17-04-1980
			AU	4341479 A		09-08-1979
			CA	1100323 A1		05-05-1981
			JP	S6039399 B2		05-09-1985
			JP	S54100157 A		07-08-1979
			US	4184347 A		22-01-1980

EP 1197593	A2	17-04-2002	AU	767824 B2		27-11-2003
			AU	7932201 A		11-04-2002
			EP	1197593 A2		17-04-2002
			NZ	507419 A		29-08-2003
			US	2002046428 A1		25-04-2002
