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(54) **ADAPTATIVE WASHING SYSTEM FOR DIFFERENT WATER AND/OR LOAD LEVELS**

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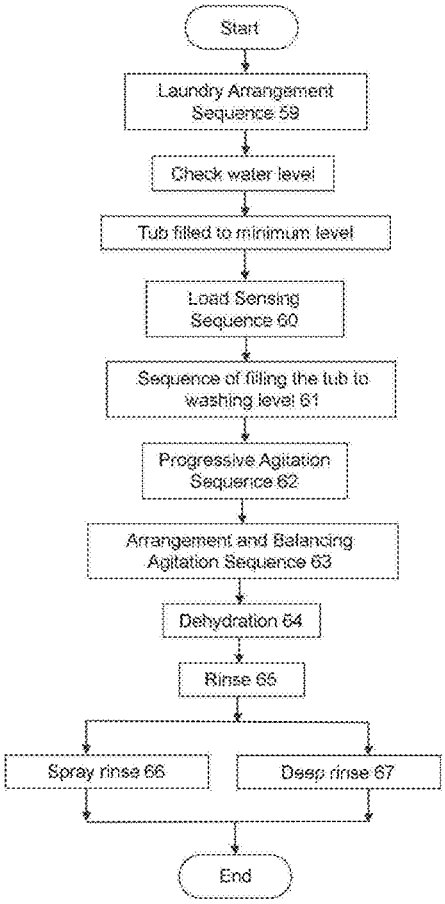
(57) **ABSTRACT**

The present invention relates to the field of washing machines, in particular a domestic washing machine, keeping in mind that the objects to be washed are of different nature, manufacture, materials, geometry and volume, in addition to having different types and levels of dirt. Therefore, different types of washing patterns have been developed in order to wash them effectively, ensuring as little damage and wear as possible; the agitation sequence proposed by the washing method of the present invention is carried out progressively, both incrementally and decrementally, using progressive agitation blocks that comprise a sequence of agitation patterns, wherein according to the user's preferences, laundry load and water level inside the washing machine, the number of agitation blocks is determined, the type of agitation sequences to be used for each agitation block, a first initial agitation pattern, the changes in the variables of arc or paddle stroke length, spm, and agitation period, of the subsequent agitation patterns as well as the number of patterns to be used per progressive agitation block.



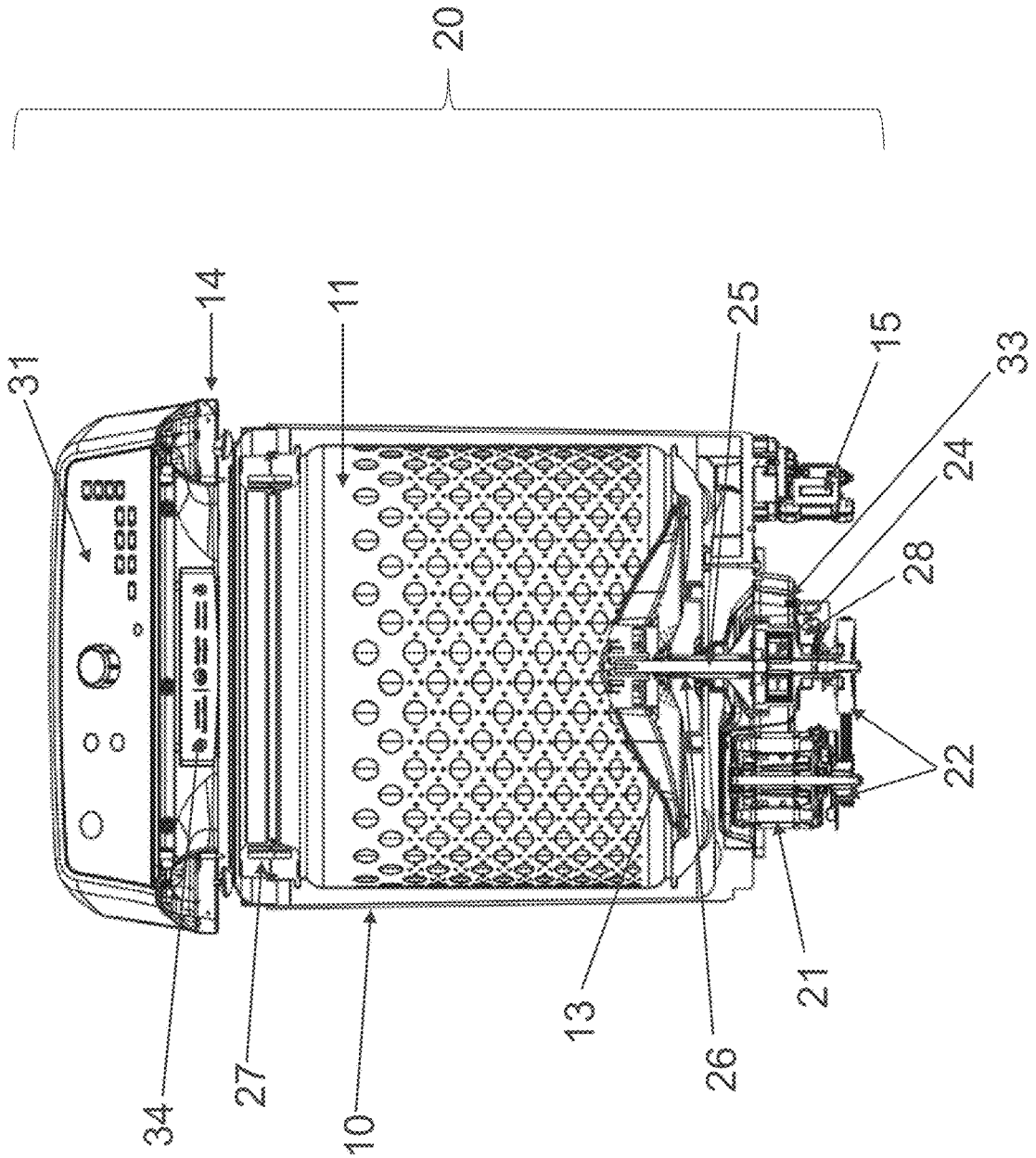


Figure 1

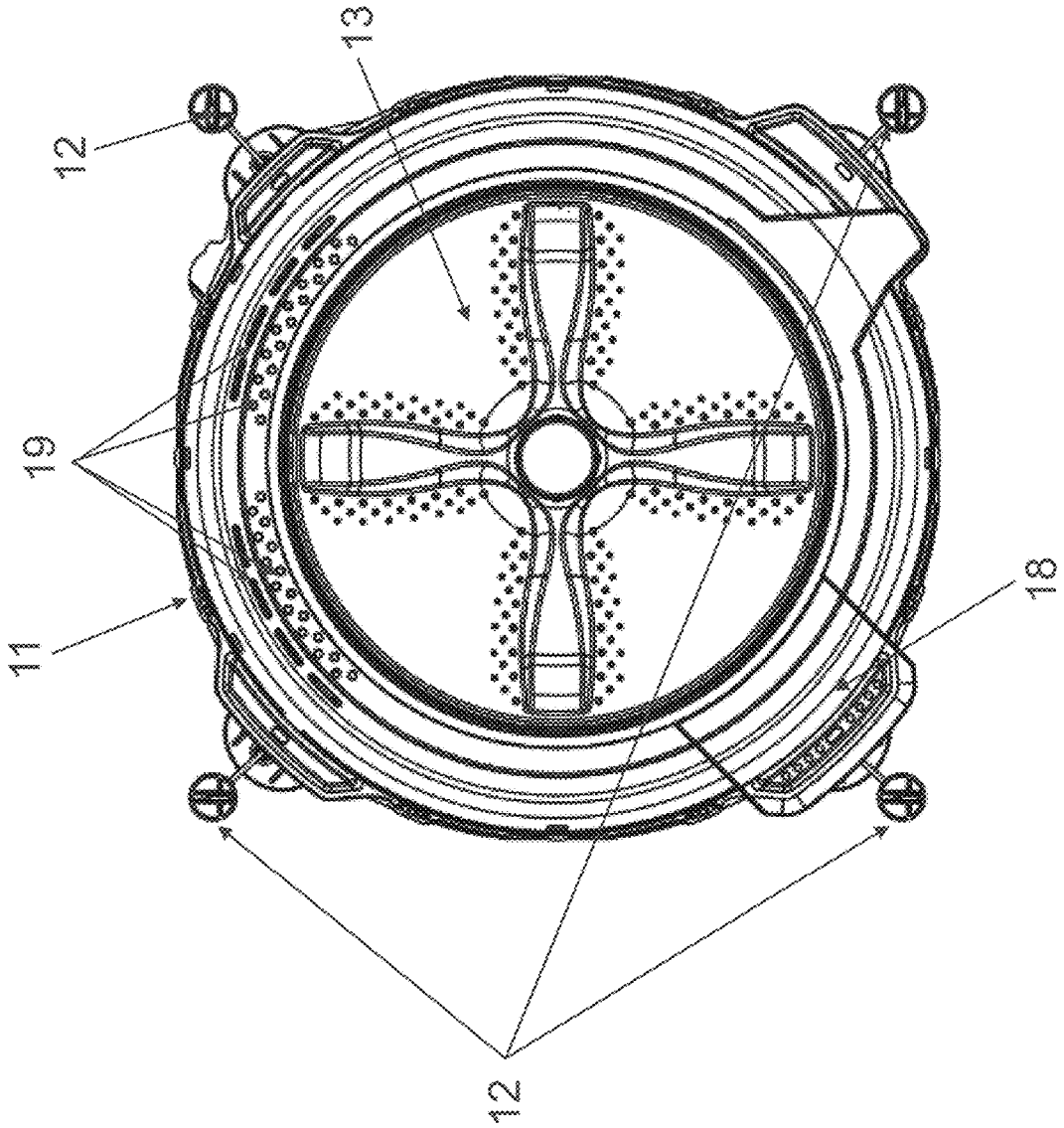


Figure 2

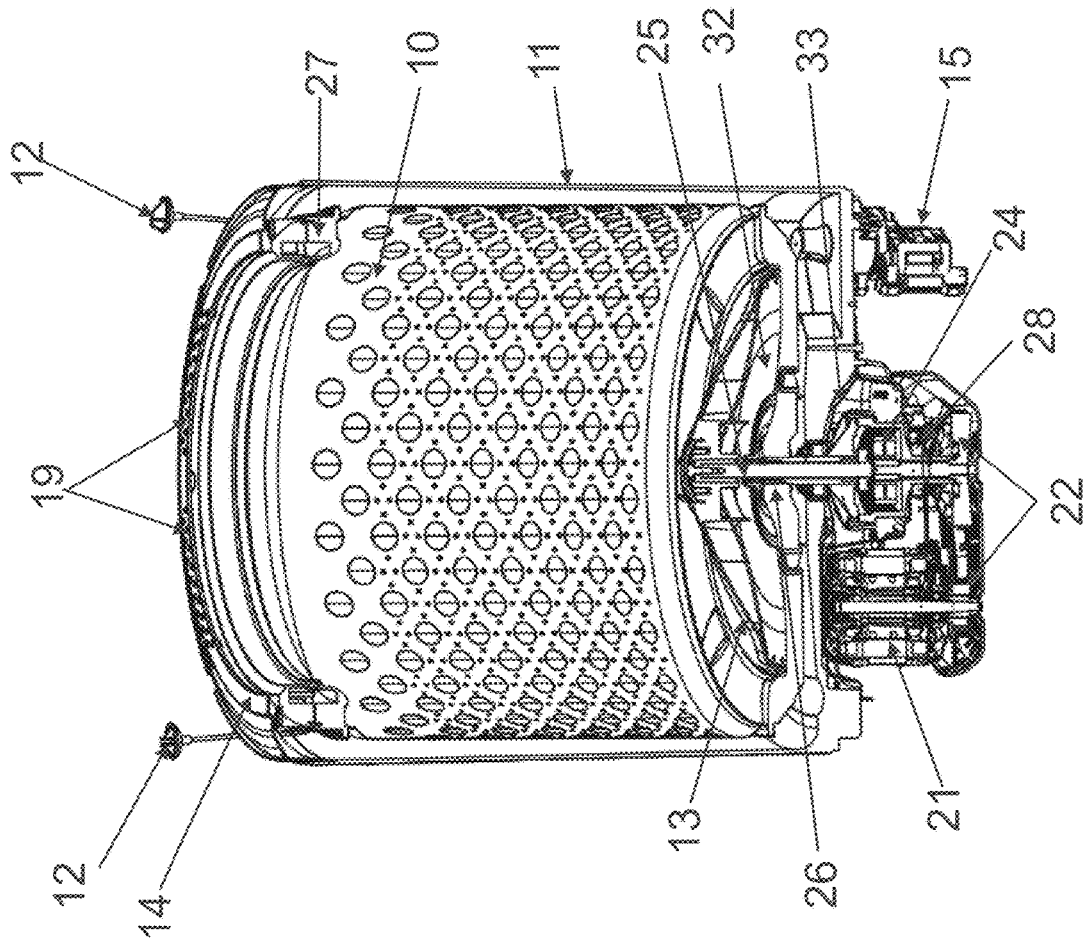


Figure 3

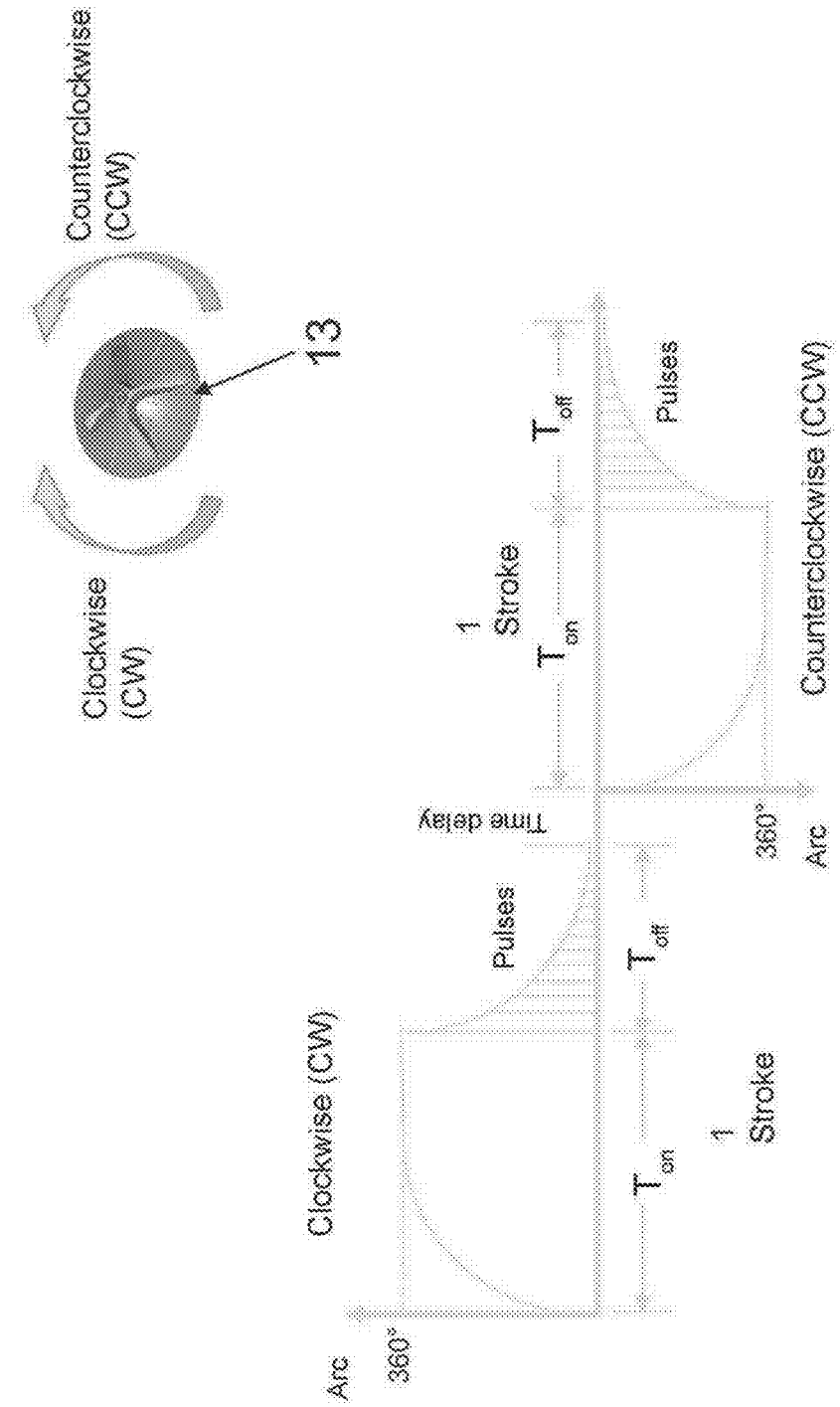

Counterclockwise (CCW)
13
Clockwise (CW)
Arc
360°
Clockwise (CW)
Pulses
Time delay
1 Stroke
T_{on}
T_{off}
T_{on}
T_{off}
Pulses
360°
Arc
Counterclockwise (CCW)
1 Stroke

Figure 4

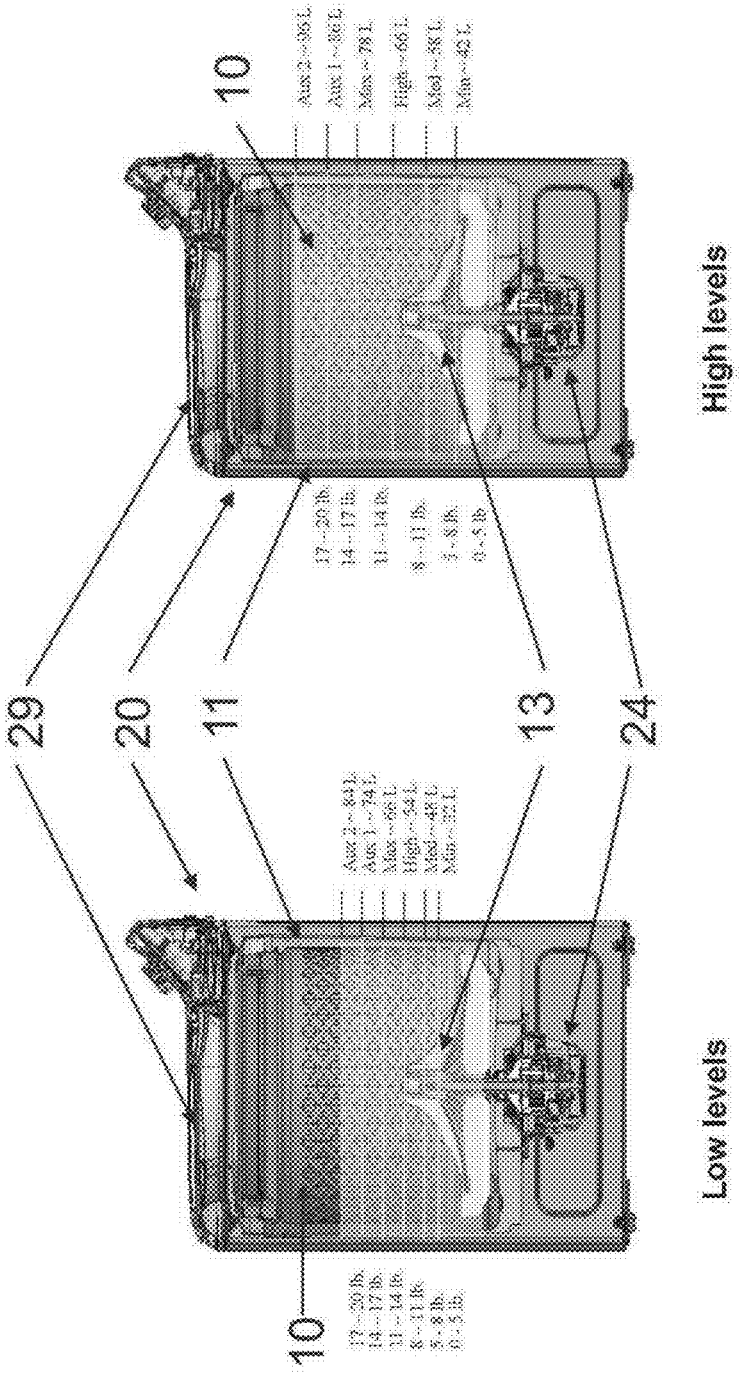
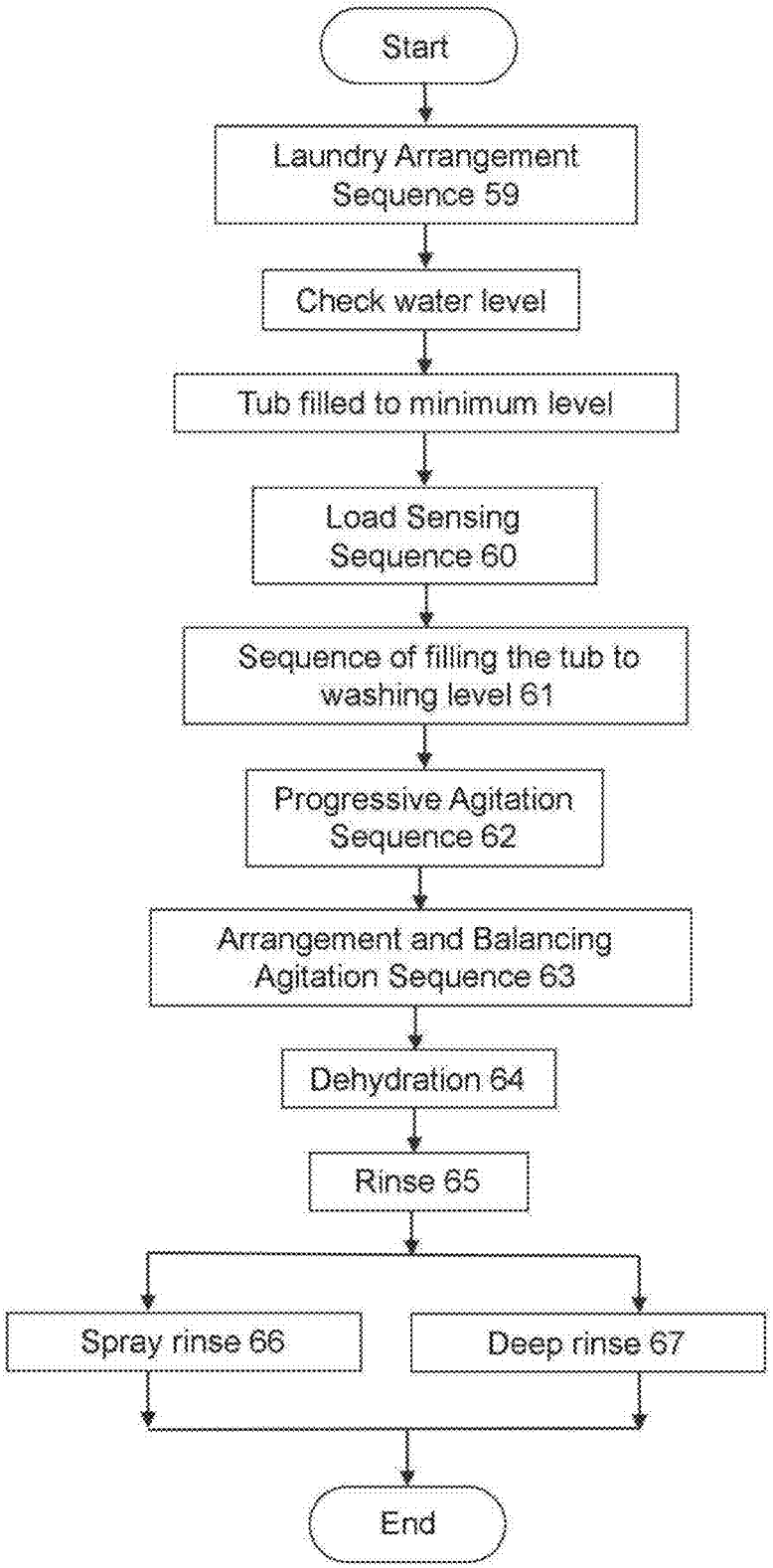


Figure 5

Figure 6


Start
Laundry Arrangement Sequence 59
Check water level
Tub filled to minimum level
Load Sensing Sequence 60
Sequence of filling the tub to washing level 61
Progressive Agitation Sequence 62
Arrangement and Balancing Agitation Sequence 63
Dehydration 64
Rinse 65
Spray rinse 66
Deep rinse 67
End

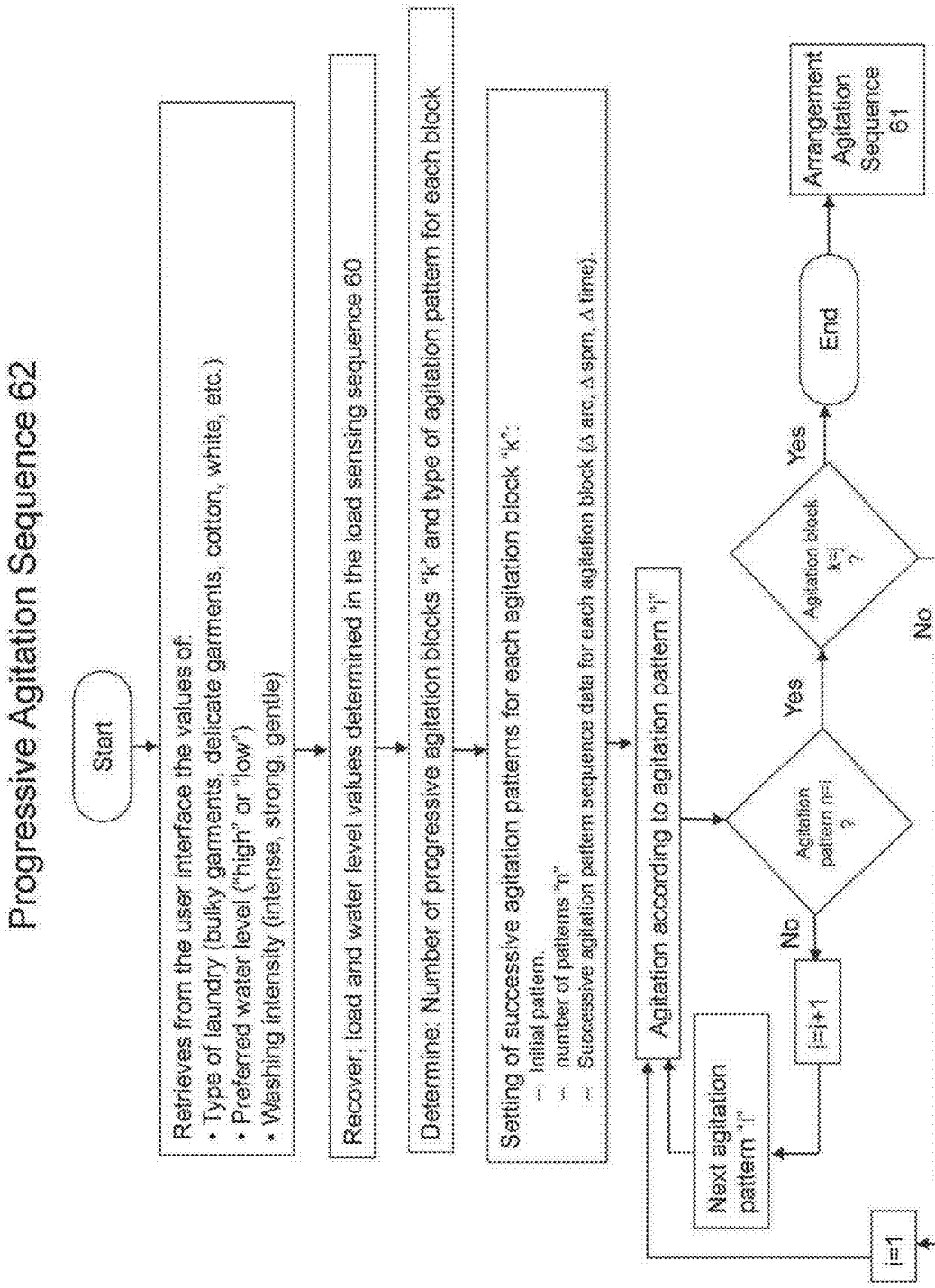

Progressive Agitation Sequence 62
Start
Retrieves from the user interface the values of:
• Type of laundry (bulky garments, delicate garments, cotton, white, etc.)
• Preferred water level ("high" or "low")
• Washing intensity (intense, strong, gentle)
Recover, load and water level values determined in the load sensing sequence 60
Determine: Number of progressive agitation blocks "K" and type of agitation pattern for each block
Setting of successive agitation patterns for each agitation block "k":
-- Initial pattern,
-- number of patterns "n"
-- Successive agitation pattern sequence data for each agitation block (Δ arc, Δ spin, Δ time).
Agitation according to agitation pattern "i"
Agitation pattern n=i ?
No
Yes
Next agitation pattern "i"
i=i+1
i=1
Next agitation block "j"
j=j+1
Agitation block k=j ?
No
Yes
End
Arrangement Agitation Sequence 61

Figure 7

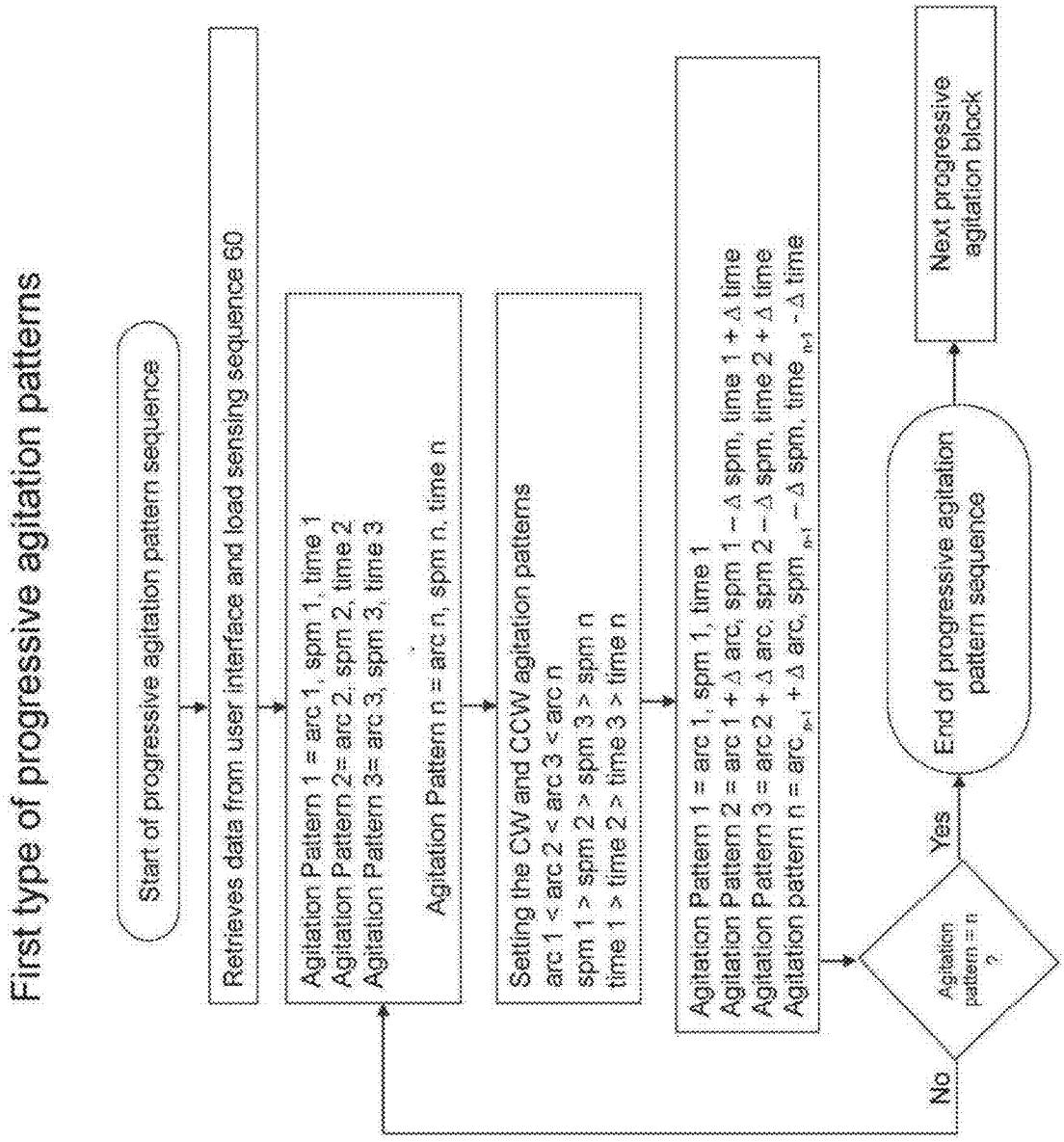

First type of progressive agitation patterns
Start of progressive agitation pattern sequence
Retrieves data from user interface and load sensing sequence 60
Agitation Pattern 1 = arc 1, spm 1, time 1
Agitation Pattern 2= arc 2, spm 2, time 2
Agitation Pattern 3= arc 3, spm 3, time 3
Agitation Pattern n = arc n, spm n, time n
Setting the CW and CCW agitation patterns
arc 1 < arc 2 < arc 3 < arc n
spm 1 > spm 2 > spm 3 > spm n
time 1 > time 2 > time 3 > time n
Agitation Pattern 1 = arc 1, spm 1, time 1
Agitation Pattern 2 = arc 1 + Δ arc, spm 1 – Δ spm, time 1 + Δ time
Agitation Pattern 3 = arc 2 + Δ arc, spm 2 – Δ spm, time 2 + Δ time
Agitation pattern n = arc n-1 + Δ arc, spm n-1 – Δ spm, time n-1 - Δ time
Agitation pattern == n ?
No
Yes
End of progressive agitation pattern sequence
Next progressive agitation block

Figure 8

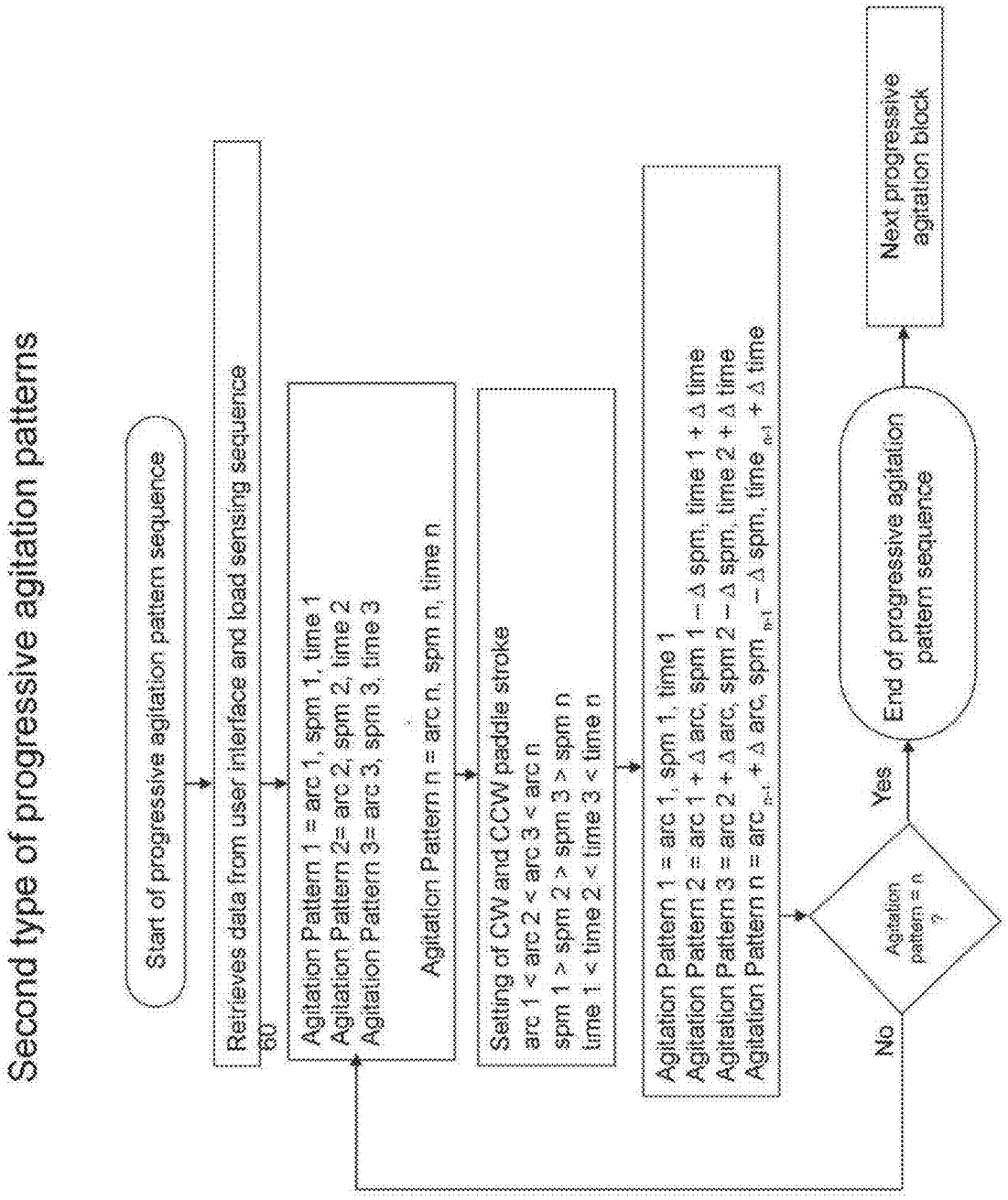

Second type of progressive agitation patterns
Start of progressive agitation pattern sequence
Retrieves data from user interface and load sensing sequence
60
Agitation Pattern 1 = arc 1, spm 1, time 1
Agitation Pattern 2= arc 2, spm 2, time 2
Agitation Pattern 3= arc 3, spm 3, time 3
Agitation Pattern n = arc n, spm n, time n
Setting of CW and CCW paddle stroke
arc 1 < arc 2 < arc 3 < arc n
spm 1 > spm 2 > spm 3 > spm n
time 1 < time 2 < time 3 < time n
Agitation Pattern 1 = arc 1, spm 1, time 1
Agitation Pattern 2 = arc 1 + Δ arc, spm 1 – Δ spm, time 1 + Δ time
Agitation Pattern 3 = arc 2 + Δ arc, spm 2 – Δ spm, time 2 + Δ time
Agitation Pattern n = arc n-1 + Δ arc, spm n-1 – Δ spm, time n-1 + Δ time
Agitation pattern = n ?
No
Yes
End of progressive agitation pattern sequence
Next progressive agitation block

Figure 9

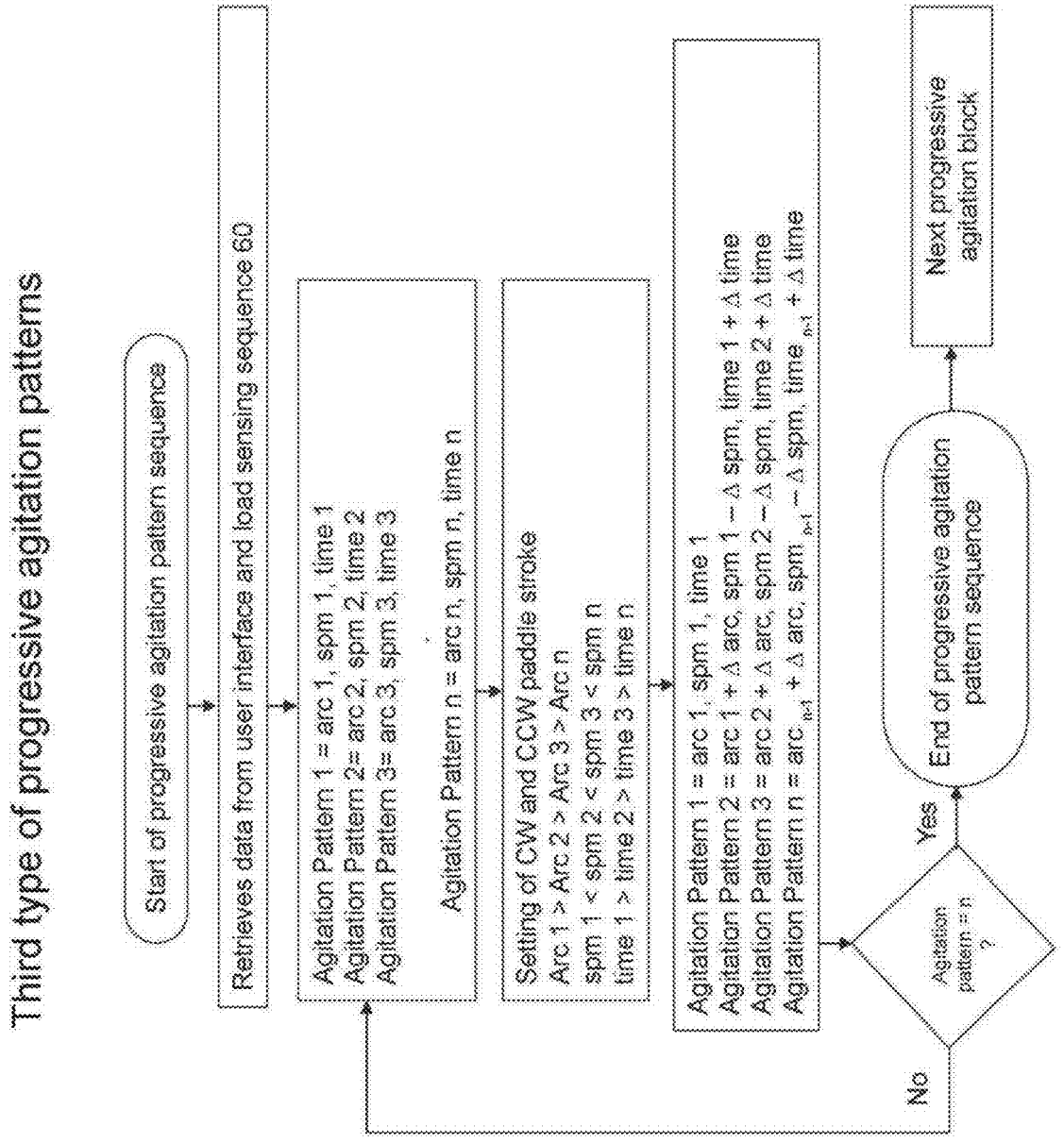

Third type of progressive agitation patterns
Start of progressive agitation pattern sequence
Retrieves data from user interface and load sensing sequence 60
Agitation Pattern 1 = arc 1, spm 1, time 1
Agitation Pattern 2= arc 2, spm 2, time 2
Agitation Pattern 3= arc 3, spm 3, time 3
Agitation Pattern n = arc n, spm n, time n
Setting of CW and CCW paddle stroke
Arc 1 > Arc 2 > Arc 3 > Arc n
spm 1 < spm 2 < spm 3 < spm n
time 1 > time 2 > time 3 > time n
Agitation Pattern 1 = arc 1, spm 1, time 1
Agitation Pattern 2 = arc 1 + Δ arc, spm 1 − Δ spm, time 1 + Δ time
Agitation Pattern 3 = arc 2 + Δ arc, spm 2 − Δ spm, time 2 + Δ time
Agitation Pattern n = arc n-1 + Δ arc, spm n-1 − Δ spm, time n-1 + Δ time
Agitation pattern = n ?
No
Yes
End of progressive agitation pattern sequence
Next progressive agitation block

Figure 10

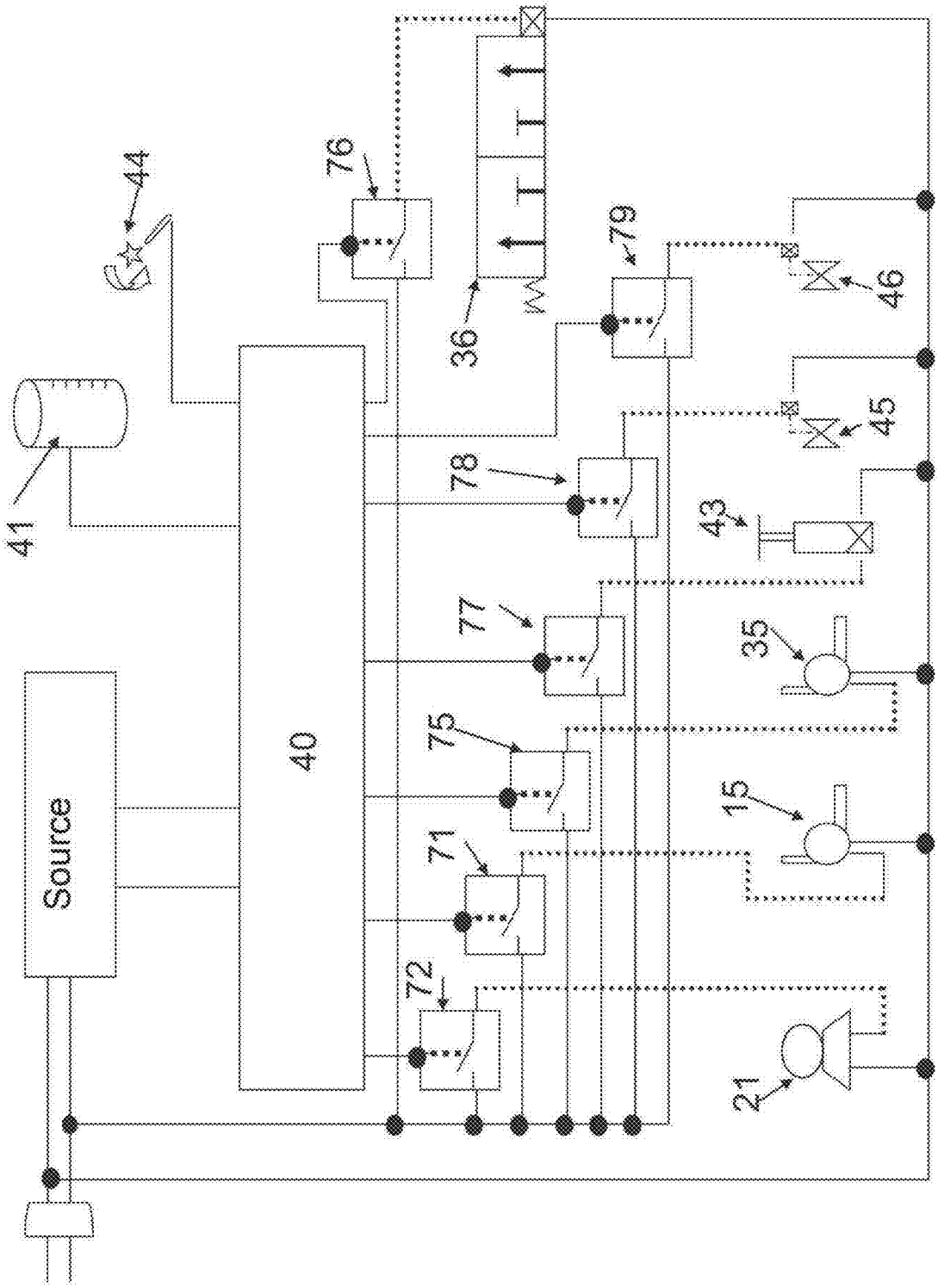


Figure 11

ADAPTATIVE WASHING SYSTEM FOR DIFFERENT WATER AND/OR LOAD LEVELS

FIELD OF THE INVENTION

[0001] This invention refers to a washing method, specifically a washing method in automatic washing machines with a basket that rotates concentrically inside a tub, said basket is driven by a motor equipped with a rotor position sensor, wherein the washing method carries out the sequences of: arranging the laundry, detecting (sensing) the load, filling of the tub to washing level, progressive agitation either incrementally or decrementally, arrangement and balancing agitation, dehydration, rinse.

BRIEF DESCRIPTION OF THE PRIOR ART

[0002] This invention lies in the field of automatic domestic washing machines, which have recently generated growing concerns about their water consumption, energy consumption and washing efficiency. This has led to the design of various alternatives that allow a rational use of this vital liquid, as well as a rational use of energy, in addition to various washing methods that promote efficient dirt removal.

[0003] On the other hand, some types of washing machines, such as front-loading washing machines, which use little water, have in many cases compromised their stain removal performance, and the washing cycle becomes longer or they have to use means for raising the temperature of the water (a process that in turn consumes high amounts of energy) in order to improve the chemical power of the detergents or other additives that are added to the water to form the wash liquor. These front-loading or horizontal axis washing machines face the problem described above; although their water consumption is reduced compared to a top-loading or vertical axis washing machine, they have very long cycles and need to heat the water, thus increasing their power consumption. By not having an agitator or propeller, they do not generate large currents of water that go through the fabrics of the objects to be washed and since they do not have scrubbers, the "scrubbing" effect is not carried out, so their surfaces are not strongly rubbed against the surface of the objects to be washed. Likewise, the aforementioned front-loading or horizontal axis washing machines also require sleepers attached to the length of the cylinder or basket that help turn and stir the laundry, creating friction between them, as well as against the referred sleepers and the inner surface of the basket. These significant differences, on the one hand, mean that the washing cycles of a front-loading or vertical axis washing machine are long washing cycles, evidently due to the low friction created between the objects to be washed, these are less mistreated, which makes it more difficult to remove stains or dirt adhered to the fibers of the fabrics, namely that there are low currents of water or wash liquor that go through said fabrics, coupled with low friction between the laundry items themselves, thus resorting to the chemical action of the wash liquor, which in order to enhance said detergent action requires heating the wash liquor in addition to lengthening the washing cycle in order to obtain a good washing action on the textiles or objects to be washed.

[0004] On the other hand, top-loading or vertical axis washers require large amounts of water for the propeller or agitator to create large currents of water that, together with the action of the propeller or agitator scrubbers, rub on the surface or fabrics of the objects to be washed, in addition to the chemical action of the detergents that helps to remove stains strongly adhered to the fibers of the textiles. This system achieves shorter washing cycles that use less energy, but at the cost of greater water consumption, also in some cases creating unnecessary friction or scrubbing during agitation, excessively wearing down the objects to be washed, or otherwise having a very gentle agitation that does not remove the dirt.

[0005] Therefore, there is a need for a new washing technology which must: have low water consumption in combination with low energy consumption, create strong water currents that pass the wash liquor between the fibers of the fabrics, vigorously scrub the items to be washed without damaging them, mix the water with the chemicals before the latter come into contact with the objects to be washed, which helps, among other things, to start the chemical action quickly by homogenizing the mixture, making better use of its chemical action to achieve good washing efficiency together with an agitation sequence that allows varying the intensity of agitation, helping to avoid unnecessary wear on the garments to be washed. These and other reasons lead us to think of a vertical load washing machine, which must have a very particular agitator or propeller that allows washing with a small volume of water. Thus, it should also have a washing method that helps conserve energy, as well as efficient washing, these being, among others, the object of the present invention.

[0006] Various efforts have been made with a view to reducing water and energy consumption in domestic washing machines, such as in the case of document U.S. Pat. No. 4,986,093 by Pastryk et al., which describes a recirculation system provided with a tank that mechanically adheres to the washing machine tub. Said tank receives the detergent or chemicals and a certain volume of water, the tank is used to mix the detergent with the chemicals so that they can be poured as a shower on the objects to be washed. This solution has the drawback of using large volumes of water for the washing cycle, namely that it is carried out in the traditional way, that is: the tub is filled up to a certain level of water, immersing the objects to be washed completely in said liquid, immediately after which the agitation cycle begins, with the variant that before said agitation, the mixture or wash liquor contained in the tank is pumped towards a nose or shower that sprays the objects to be washed with said wash liquor. We can deduce that this method and arrangement of the tank do not contribute greatly to substantial water or energy savings; although it is a starting point for future developments, namely that mixing water with detergents or chemicals before they come into contact with the objects to be washed prevents an unwanted chemical attack on the textiles and improves the mixing proportions for a more uniform wash liquor, coupled with the fact that this increases the performance of detergents or washing chemicals.

[0007] A second example is document EP 0 668 389 by Kretchman et al., which represents an improvement with respect to the previously cited document. Specifically, the space between the bottom of the basket and the bottom of the tub has been used to store water, to which are added detergent or washing chemicals once a certain level of liquid has been reached in the area in question, which are mixed to

form a wash liquor, by means of a pump placed in a well and hoses, the wash liquor is extracted to be sprayed over the upper part of the basket, while the bottom of the basket rotates with one or two degrees of freedom. Thus, once again, we can deduce that, although the small improvement of storing water in the bottom of the tub is of great help, the circular and undulating movement of the bottom of the basket, rather than helping, would seem more like an artifice found in a fairground attraction. However, this does not represent an improvement in the performance of removing stains or dirt from the objects to be washed.

[0008] Thus, in view of the problems described above, coupled with a greater demand by household appliance consumers of more efficient appliances, with better features, low cost, reliability, and in particular with reduced water consumption, we have developed the present invention.

BRIEF DESCRIPTION OF THE INVENTION

[0009] The hybrid washing method of the present invention has the peculiarity of adapting to the different washing conditions imposed by the different washing habits of the users. Thus, the washing sequences are not fixed, but rather tend to vary in the period in which they are executed, with vigorous agitation at the beginning of the sequence to end with gentle agitation or vice versa, agitating the objects according to the level of dirt of the laundry that varies as the agitation sequence progresses.

[0010] The washing method of the preferred embodiment of the invention begins when the user has introduced a certain amount of items to be washed, optionally a certain amount of washing additives, has selected the program to be used and has instructed the washing machine to start. This initiates a laundry arrangement sequence, then checks the water level, to then fill with water to a minimum level, carries out a load detection or sensing sequence wherein it determines the amount of objects to be washed inside the basket, with the aim of being able to determine the suitable amount or level of water, so once the size of the load is determined, water is introduced up to the predetermined level according to the amount of load determined (minimum, medium, high, maximum, Aux**1**, Aux**2**), after which the progressive agitation sequence begins for a certain period and then the arrangement and balancing agitation sequence for another certain period; subsequently, dehydration is carried out to subsequently rinse the objects to be washed deposited inside the basket, ending with the final dehydration. Yes, as can be deduced, this innovative washing method is efficient in both energy use and water consumption, and reduces unnecessary friction on the objects to be washed, preventing mistreatment, and ensuring efficient scrubbing.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] FIG. **1** is a cross section of a washing machine.

[0012] FIG. **2** is a top view of a sub-washer, that is, a washer without a cabinet.

[0013] FIG. **3** is an isometric cross section of a sub-washer.

[0014] FIG. **4** is a diagram of arc length versus time that allows visualizing how an arc or paddle stroke is built.

[0015] FIG. **5** are two cross-sectional views of a washing machine, in which we can see the "low" washing levels as well as the "high" washing levels.

[0016] FIG. **6** is a block diagram of the high efficiency washing method of the present invention.

[0017] FIG. **7** is a block diagram of the progressive agitation sequence.

[0018] FIG. **8** is a block diagram of the first exemplary embodiment of progressive agitation pattern sequences.

[0019] FIG. **9** is a block diagram of the second exemplary embodiment of progressive agitation pattern sequences.

[0020] FIG. **10** is a block diagram of the third exemplary embodiment of progressive agitation pattern sequences.

[0021] FIG. **11** is an electrical diagram of the components required by the high efficiency washing method of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

Definitions

[0022] The following definitions are provided for the purpose of allowing a better understanding of the invention:

[0023] Arc. Angular distance that the agitator or propeller **13** moves, measured in degrees from its state of rest until it returns to the rest position.

[0024] Target Arc. The expected angular distance that the agitator or propeller **13** must travel while the motor **21** is energized.

[0025] Arc measurement. Carried out in the preferred embodiment of the present invention preferably by means of a Hall rotor position sensor **44** installed in the motor **24**, which reports a certain number of pulses to the electronic control **40** each time the motor **24** is actuated in each direction, said number of pulses is directly proportional to the arc length, so a certain number of pulses can be related to a given arc length. Thus the electronic control **40** compares the pulses measured by the rotor position sensor **44** per stroke or paddle stroke against a certain target range of pulses.

[0026] Paddle stroke. The clockwise (CW) or counterclockwise (CCW) circular displacement (or angular path) of the agitator or propeller **13** over a certain period of time; this is achieved when the clutch **28** is in agitating mode, the electronic control **40** starts the timing with an internal timer and at the same time sends a signal to the motor **21** driver **72** to energize the motor **21**, thus driving the agitator or propeller **13** which will describe a certain arc that is measured thanks to the rotor position sensor **44**, namely that the latter sends a string of pulses to the electronic control **40**, which counts them, since said electronic control **40** has a directly proportional reference between the number of pulses counted and the arc described by the agitator or propeller **13**; thus, when the electronic control **40** detects that the target arc has been reached, the signal to the motor **21** driver **72** is interrupted and stops the counting of the internal timer, namely that the agitator or propeller **13** to carry out its displacement and comply with the trajectory of the target arc has a specified period of time, if this time elapses before the agitator or propeller **13** reaches its angular displacement, the electronic control **40** will begin counting for a certain waiting time that ranges from 0.01 second to 5 seconds, once the angular displacement condition or the time elapsed condition has been fulfilled; said

waiting time must elapse before starting a new paddle stroke in the opposite direction to the immediately preceding one.

[0027] Strokes per minute. SPM by its initials, refers to the number of continuous paddle strokes in both directions that the agitator or propeller **13** makes (i.e. clockwise (CW) and counterclockwise (CCW)) in one minute, including the waiting time between paddle strokes.

[0028] Agitation. Movement imparted to the objects to be washed by the action of the agitator or propeller **13** on the aforementioned objects to be washed immersed in wash liquor arranged in the basket **10** of the washing machine **20**.

[0029] Target arc of agitation. Angular displacement of a certain point of the agitator or propeller **13** which has an arc length that oscillates between 180 and 2160 degrees with a frequency between 30 and 100 strokes per minute (spm).

[0030] Jam. According to the arc measurement, if the arc of a paddle stroke is found to be significantly less than the target agitation arc, the electronic control **40** assumes that the agitator or propeller **13** has become stuck or jammed due to the resistance that the load or the objects to be washed imposes on it, or that a high concentration of objects to be washed has accumulated in a reduced volume inside the basket, causing an undesired high density of objects to be washed in some area inside the basket **12**.

[0031] Agitation pattern. This refers to the CW and CCW paddle stroke pattern used to achieve an agitation mode; the agitation pattern is made up of a paddle stroke with a target arc and a certain SPM (see FIG. **4**), which in a preferred embodiment is carried out for a certain time, or in an alternative mode is carried out for a certain number of paddle strokes.

[0032] Mechanical fixing, mechanical fastening, mechanical joining or mechanical anchoring.—This refers to the joining of two or more parts by means of bolts and nuts; rivets; arc, wire or friction welding; or binders, among other mechanical means known in the field.

[0033] Mechanically coupled, mechanical coupling or mechanical joint.—This refers to the transmission of mechanical energy from one element to another by means of gears, friction pulleys, belt pulleys, magnetic means, mechanical transmissions, among others.

[0034] "Approximately"—The use of the term "approximately" provides a certain additional range with respect to the numerical value to which it is applied. Such additional range is approximately ±10%. In an exemplary but non-limiting manner, where "approximately 40 grams" is stated, the exact range that is described and/or claimed comprises between 36 grams and 44 grams.

[0035] FIGS. **1** to **11** are used interchangeably in the present description.

[0036] The washing machine object of the present invention, illustrated in FIGS. **1**, **2** and **3**, is of the top-loading or vertical axis type, for which it has a cabinet to which four suspension bars **12** are attached. Said suspension bars **12** support the weight of the tub **11** together with the rest of accessories of the aforementioned cabinet, in addition to acting as a damper of the vibration that occurs during the washing process. Thus, the tub **11** is hung from the aforementioned suspension bars **12** by means of lugs arranged in the lower part of the aforementioned tub **11**. The rest of the peripheral equipment is mounted on said tub **11**, such as the motor **21**, optionally a planetary reduction box **24**, which in an alternative embodiment of the present invention can be omitted, adjusting the relationship of the pulleys **22**, that is, the pulley **22** with the largest diameter will fit on the internal shaft **25**, which will receive power from the electric motor **21** thanks to the arrangement of the pulleys **22** and belt. Optionally, the shaft **25** at its upper end is coupled to a planetary box **24**, with the aim of reducing the angular speed and thus obtaining greater torque, the output shaft of the planetary box **24** is reintegrated into a shaft **25**, at the upper end of which sits the agitator or propeller **13**. Optionally, the internal shaft **25** has the pulley **22** of greater diameter coupled at its lower end and the agitator or propeller **13** coupled at its upper end. The hollow shaft **26** houses inside it the internal shaft **25**. Said hollow shaft **26** is mechanically coupled to a clutch **28** that can make both shafts **25**, **26** rotate together or independently (spin mode or agitation mode, respectively). Said hollow shaft **26** is mechanically coupled to the center of the basket or to the "hub" **32**, so that when the shafts **25**, **26** are engaged rotating together (spin mode), the hollow shaft **26** will transmit energy to the basket **10** so that it rotates together with the agitator **13**.

[0037] The basket **10** is crowned with a balance ring **27** which counteracts the unbalance caused by placing the objects to be washed in the basket **10**. The tub **11**, for its part, has a tub cover **14** assembled at its upper end, which houses a grill **19** and a spray deflector **18**. For its part, the cabinet is covered by the main cover **30** that covers the upper part of the washing machine **20**. Said main cover **30** serves as a support for a top **31** that houses the electronic components such as the control **40**, the drivers **71** to **79**, the pressure sensor or pressure switch **41**, among others, as well as the door or lid of the washing machine **29** through which the objects to be washed are introduced.

[0038] FIG. **11** details the connection of the electronic control **40** with the various sensors or actuators that it controls, which allows the correct operation of the washing machine **20** by sending signals to the different actuators at the times determined by the method that is the subject matter of the present invention. Thus, the electric motor **24** is energized by means of a driver **72** that receives signals from the electronic control **40**. The aforementioned electronic control **40** sends a pulse of a certain length to the driver **72** so that, during the time said pulse length lasts, it energizes the motor **24** in one direction. The same happens to energize the motor **24** in the opposite direction, with a certain waiting time between paddle strokes or pulse widths.

[0039] The washing method illustrated in FIG. **6** comprises a series of sequences that in a preferred embodiment follow the order proposed in the aforementioned FIG. **6**; however, as a person skilled in the art can observe, the order of the sequences can be altered and some sequences even repeated, or sequences inserted between others, which should not depart from the spirit of the present invention; therefore, each of the sequences represented in FIG. **6** will first be presented independently; and finally a preferred embodiment of the washing method that is the subject matter of the present invention will be presented.

Laundry Arrangement Sequence **59**

[0040] This laundry arrangement sequence **59** serves to evenly distribute the objects to be washed inside the basket

10, avoiding concentrations of objects to be washed in a small space, which causes high densities of objects to be washed or clumping of the objects to be washed inside the basket **10**, not allowing efficient contact with the agitator or propeller **13**, which leads to an undesirable movement of the objects to be washed inside the basket **10** by not being able to follow the flow of wash liquor generated by the agitator or propeller **13**; consequently, the currents of wash liquor that pass through the fibers of the objects to be washed do not have sufficient strength, thus reducing their washing capacity. It is for these reasons, together with others, that it is necessary to carry out an efficient laundry arrangement inside the basket **10** prior to the agitation sequence, with the aim of achieving good washability of the objects to be washed.

[0041] The electronic control **40** checks that the basket **10** is in its rest state by reading the signal from the rotor position sensor **44** while the basket **10** recovers its rest state, having detected this condition when the electronic control **40** confirms the absence of pulses from the rotor position sensor **44**, once the basket **10** is checked to be in a state of rest, the electronic control **40** sends a pulse of between 8 to 12 seconds to the driver **78** of the filling or water intake valve **45** to allow the flow of fresh water into the tub **11**, which, in an alternative embodiment of the invention, can be hydraulically connected to the chemical dispenser **34**, thus the electronic control **40** also sending a pulse for the same period of time to the driver **74** of the aforementioned chemical dispenser **34**; in yet another alternative embodiment of the invention, the electronic control **40** sends a pulse for a certain period of time to the driver **79** of the liquid bleach intake valve **46**, so that it allows the admission of this liquid in the event that the user has deposited a certain volume of liquid bleach in the corresponding compartment of the chemical dispenser **34**. Thus, when the liquid bleach intake valve **46** opens, a flow of water is admitted that is led through the chemical dispenser **34**, taking with it the volume of bleach deposited in said chemical dispenser **34**, which directs the washing so that it falls like a waterfall through the buffer onto the grid **19**, which allows the passage of the wash liquor between the tub **11** and the basket **10**, avoiding contact with the objects to be washed, thus depositing the wash liquor at the bottom of the basket, which allows a uniform mixture of the chemicals with the water, without throwing the chemicals directly onto the objects to be washed, which can cause stains caused by chemical attack on the surface of the objects to be washed due to a poor dilution and mixing of the chemicals with the water.

[0042] Once the aforementioned pulse width of the driver **79** of the liquid bleach intake valve **46** has been exhausted, the electronic control sends a pulse of between 2 to 20 seconds to the driver **71** of the pump **15**, which allows it to dispense wash liquor during the width of said pulse to the spray deflector **18**, spraying with wash liquor the objects to be washed that are inside the cone of action of said spray deflector **18**. Once the duration of the pulse to the driver **71** of the pump **15** in question has expired, these steps are repeated for a certain period of time ranging from 30 to 60 seconds, or at least one revolution of the basket **10**, in such a way that the objects to be washed contained in the basket **10** are soaked with the wash liquor accumulated in the bottom of the tub **11**. Immediately afterwards, once all or most of the volume of water accumulated in the bottom of the tub **11** has been transferred to the objects to be washed, the electronic control **40** sends a pulse that oscillates between 5 and 15 seconds to the driver **72** of the motor **21**, remembering that the clutch **28** is in dehydration mode; this allows the basket **10** to rotate the hydrated objects to be washed contained in the basket **10**—it should be noted here that the hydrated objects to be washed are heavier because they now hold between their fibers the volume of water that was introduced to the bottom of the tub **11**, so by subjecting them to a centrifugal force greater than the force exerted by gravity for a certain time, the textiles will tend to settle by adhering to the circular wall of the basket **10**, in addition to promoting the extraction of the wash liquor contained in said objects to be washed and therefore dehydrating them, with the wash liquor collecting at the bottom of the tub **11** to, in a preferred embodiment, proceed with its extraction by means of the drain pump **35** and drain hose **16** or, in an alternative embodiment, to store it there for its subsequent use in the laundry arrangement sequence **59** under discussion or in another alternative embodiment for use in the following sequence of the washing method. However, in any embodiment, while the basket is rotating, the rotor position sensor **44** sends a string of pulses to the electronic control **40**, which in turn determines the speed at which the motor **21** is rotating thanks to its internal logic. Thus, when the motor **21** reaches a speed that oscillates between 90 to 150 rpm, the electronic control **40** de-energizes the driver **72** of the motor **21**, causing the immediate deceleration of the basket **10** until the basket **10** recovers its state of rest, the electronic control **40** having detected this condition thanks to the absence of pulses from the rotor position sensor **44**; in an alternative embodiment of the present invention the steps of this sequence are repeated at least once, which will help to better accommodate the textiles inside the basket **10**.

Water Level Check

[0043] From reading the previous lines, it can be deduced that at the end of some sequences of the washing method being disclosed there may be remnants of water, or the water level may be low when resuming a sequence of the washing method due to a failure with the power supply or an interruption of the washing method by the user; thus, there is a specialized block or sequence within the washing method to detect the water level inside the tub.

[0044] In order to detect the water level inside the tub **11**, the electronic control **40** receives signal values from the level sensor or pressure switch **41** and processes them by comparing them against the data stored in its data memory for different pressure sensor or pressure switch **41** signal values associated with a certain volume of water inside the tub **11**, in such a way that the electronic control can know the amount of water inside the tub **11** by processing a signal value from the pressure sensor or pressure switch **41**, thus in this water level check sequence, it requires that the electronic control **40** read the value of the signal coming from the pressure switch **41** and from this value determine the volume of water inside the tub and, if applicable, know if said volume of water is associated with a predetermined level such as those illustrated in FIG. **5** (minimum, medium, high, max, Aux**1**, Aux**2**, for "high" or "low" levels); or failing that, when water enters the tub **11** to know when said water levels have been reached so that the electronic control **40** can take the corresponding action.

Tub Filled to Minimum Level.

[0045] The electronic control **40** is arranged to introduce water up to a certain minimum level or also called load sensing level within the tub **11**, for this, in a preferred embodiment the electronic control **40** has already checked the water level in the tub **11** as mentioned above; in the event that the electronic control notices that the level inside the tub **11** is less than the minimum level, the electronic control **40** then sends a signal to the driver **78** of at least one water intake valve **45** to energize at least one intake valve **45**, it should be mentioned that in a preferred alternative embodiment, the electronic control **40** may send a control signal simultaneously or alternately to the corresponding drivers **78** of the corresponding hot water and cold water intake valves (valves **45**), allowing the flow of water into the tub **11** until reaching the water level, at which point the level sensor or pressure switch **41** sends a signal to the electronic control **40** which, upon receiving it, will stop the control signal towards the driver **78** of the at least one filling valve **45**; now, in another case, that is, that the electronic control **40** detects that there is a water level equal to or greater than the minimum level, the electronic control **40** will proceed to the next sequence of the washing method (see FIG. **6**) without admitting more water into the tub **11**.

Load Detection or Sensing Sequence **60**

[0046] The purpose of this sequence is to determine, using a particular agitation pattern, the amount and type of objects to be washed, so that depending on the resistance that said load offers to the movement of the agitator or propeller **13**, the corresponding water levels can be defined for agitation during the washing phase (in the particular case of the present invention it is the progressive agitation sequence **62**), the dehydration steps **69** and the rinse **65** in any of its modalities (**66**, **67**).

[0047] The electronic control **40** must somehow collect qualitative data on the amount of objects to be washed inside the basket **10** in order to determine the water level to be used during the progressive agitation sequence **62**, the dehydration step **64** and the rinse steps **65** in any of its modalities (**66**, **67**), the determination of the level of water to be used also impacts the profile of spin ramps to be used in the dehydration step **64** or spinning in general of the objects arranged in the basket **10**.

[0048] Thus, the present sequence was ingeniously developed without the need to use other sensors apart from the rotor position sensor **44** located on the motor **21**. In a preferred embodiment, this sequence is carried out once a minimum volume of water has been admitted to the tub **11**, which, as noted above, is measured by the pressure sensor or pressure switch **41**; in an alternative embodiment, the load sensing sequence can be carried out without having previously admitted water to the tub **11** or in another alternative embodiment with the volume of water recovered and not drained from the laundry arrangement sequence **59**; in any embodiment, the sequence in question begins when the electronic control **40** sends a signal to the driver **72** of the motor **21**, simultaneously the electronic control **40** counts the pulses sent by the rotor position sensor **44**, measuring the arc, with a target arc between 180 to 2160 degrees with a frequency of 20 to 220 spm until a certain number of strokes or paddle strokes have been counted. After this period, the agitation continues with a target arc of 180 to 2160 degrees, counting a certain number of paddle strokes that can preferably range between 10 and 40, or for a second period of time that can preferably last between 20 and 40 seconds. It is here, during this second period of time, where after executing each paddle stroke or rotation that preferably oscillates between 180 and 2160 degrees, wherein the electronic control **40**, upon detecting that the rotation angle in question has been reached and has interrupted the signal to the driver **72** of the motor **21**, begins to count the pulses sent by the rotor position sensor **44** until the agitator or impeller **13** reaches its rest position, which interrupts the string of pulses that the rotor position sensor **44** sends to the electronic control **40**; thus, the electronic control **40**, upon each paddle stroke or angular path, registers the number of pulses that the rotor position sensor **44** has sent while the motor **21** is de-energized, said data is stored in the memory of the aforementioned electronic control **40**, together with the data of the immediately following paddle stroke or angular path in the opposite direction. This pair of data is continuously averaged and stored in memory in such a way that each paddle stroke or angular path is averaged with the immediately following one, erasing the data from the immediately preceding pair of paddle strokes. This happens until the second time interval expires, when this condition takes effect, the last averaged data that remains in the memory of the electronic control **40** is compared with predetermined values obtained from measurements in the laboratory, which indicate the level of water to be used, based on the inertia presented by the amount of water (if any) and objects to be washed inside the basket **10**, said data is stored in the memory of the electronic control **40** to be used in the sequence of filling the tub to washing level **61**, as well as in the progressive agitation sequence **62**, the arrangement and balancing agitation sequence **63**, dehydration **64**, rinse **65** (in any of its modalities **66**, **67**).

Sequence of Filling the Tub to Washing Level **61**.

[0049] Thus, once the size of the load has been determined, water is introduced up to the predetermined level according to the amount of load determined for "high" or "low" water levels (minimum, medium, high, maximum, Aux**1**, Aux**2**, for each level, respectively); in this sequence **61** water is filled to the level determined or desired by the user, namely that, in an alternative embodiment of the present invention, the user can determine the level of water to be used, in a preferred alternative embodiment the user can also determine if they want to use "high" or "low" levels of water, which have been mentioned above; in a preferred embodiment, once the amount of objects to be washed inside the basket **10** has been estimated, the electronic control **40** reviews the mode or "setting" of the type of laundry that the user has established, based on these two data it consults a pre-programmed table with which it determines the level of water to be used for the rest of the washing cycle (i.e., progressive agitation sequence **62**, arrangement and balancing agitation sequence **63**, dehydration sequence **64** and rinse sequence **65** in any of its modalities **66**, **67**); however, in a preferred embodiment of the present invention, various fill levels are used, which can be seen graphically and as an example in FIG. **5**, thus in the figure of the washing machine **20** on the left, the volumes of the "low" levels (minimum, medium, high, maximum, Aux**1**, Aux**2**) are marked, noting that the washing machine **20** on the right has the volumes of the "high" levels (minimum, medium, high, maximum,

Aux**1**, Aux**2**) marked as an example; the "low" levels (minimum, medium, high, maximum, Aux**1**, Aux**2**) are useful to maximize water savings during the washing cycle, in view of the type of fabric or materials used in the manufacture of the objects to be washed coupled with their geometry and volume; therefore, the "low" levels are oriented to objects to be washed of small size or small laundry, light fabrics that are usually synthetic such as intimate clothing, lingerie, underwear, baby clothes, among others of similar nature, which can be wash with minor amounts of water or "low" water levels; on the other hand, the "high" levels (minimum, medium, high, maximum, Aux**1**, Aux**2**) are oriented to bulky objects to be washed with cotton- or wool-based fabrics that will tend to absorb and retain more water between their fabrics, such as quilts, blankets, bedding, towels, cushions, and even stuffed animals or stuffed cloth objects, winter jackets, etc.; to a lesser degree, "jeans" or denim pants, adult clothing with a large percentage of cotton, among other similar items tend to absorb and retain a large volume of water or wash liquor during the washing cycle; hence the determination of having at least two different types of washing water levels; also, on certain occasions, the experience and preferences of the user can play an important role in the selection of the washing level to be used, thus in an alternative embodiment of the present invention the user can determine the water level that they wish to use or in another preferred embodiment select between "high" or "low" levels via the user interface provided on the washer **20**.

[0050] Once the required level of water has been determined after having estimated the amount of laundry housed in the basket **10**, in addition to taking into account the type of laundry and material with which it has been manufactured, the electronic control **40** selects a particular water level between the "high" and "low" levels available within the tub **11**, thus the electronic control **40** sends a signal to the driver **78** of at least one water intake valve **45** to energize the at least one water intake valve **45**, allowing water to flow into the tub **11**; it is worth mentioning that in a preferred alternative embodiment the electronic control **40** can send a control signal simultaneously or alternately to the corresponding drivers **78** of the corresponding hot water and cold water intake valves (valves **45**), simultaneously the electronic control **40** will send control pulses to the driver **72** of the motor **21** to be able to carry out a gentle agitation that helps to uniformly arrange or distribute the objects arranged inside the basket **10**, which prevents them from clumping or conglomerating in a single point or area inside the basket **11**, the filling and gentle agitation are carried out simultaneously until the level of water has been reached, when this happens, the level sensor or pressure switch **41** sends a signal to the electronic control **40** which, upon receiving it, will stop the control signal to the driver **78** of the at least one filling valve **45** in addition to interrupting the string of control pulses to the controller **72** of the motor **21**, thus interrupting the agitation.

Progressive Agitation Sequence **62**

[0051] The progressive agitation sequence **62** consists of several subsequent progressive agitation patterns within a progressive agitation block (block); namely, that a given pattern of paddle strokes or arcs (rotation of the agitator **13** clockwise and counterclockwise) is determined progressively either incrementally or decrementally, said pattern is built with data on the required arc magnitude (target arc or paddle stroke) in a clockwise (CW) or counterclockwise (CCW) direction, the strokes per minute (spm) or number of times it rotates to each side in a minute and the period that an agitation pattern is performed; in such a way that for a first progressive agitation block a first pattern of paddle strokes or arcs is determined, for a second progressive agitation block a second pattern of paddle strokes or arcs is determined, thus for a block "k" of progressive agitation we have a pattern of paddle strokes or arcs "n" thus forming the progressive agitation sequence **62**, which is explained below in conjunction with its modalities.

[0052] In general, the arc is determined as a function of the laundry-washing liquid density, power transmission and the capacity of the motor **21** in terms of torque availability; in this respect, the prior art focused on designing a special agitation pattern for each type of laundry, namely that in mechanical washing machines, meaning whose motor is mechanically coupled to a transmission that provides the oscillating CW and CCW movement, the arc was fixed by the design of said transmission; since the electric motor **21** coupled to said transmission worked at a single speed, only the agitation time could be modified to obtain the different washing cycles that could successfully wash the different types of textiles, clothes or objects arranged in the basket **10**; however, in an advance of the technique, it was coupled to the electromechanical control of the washing machine **20** with a speed variator based on pulses, frequency, voltage or current, in such a way that it was possible to vary the speed of the motor, this seeking the result of being able to modify the spm, being able to obtain a "gentle" agitation to a "vigorous" agitation, with the same arc length, thus the different washing cycles were based on combinations of spm variations associated with a certain period of agitation; now, from the experience acquired in laboratory tests, it has been determined that an agitating pattern with an arc or paddle that can vary during the washing cycle is beneficial for stain removal, prevents conglomerations or clumping of the objects to be washed, without affecting the scrubbing of the objects to be washed, without increasing the wear or mistreatment of the laundry; thus, taking advantage of this knowledge, the present invention is provided with an electronic control **40** in electronic communication with a driver **72** of the electric motor **21**, which consists of a rotor position sensor **44**, which in turn is in electronic communication with the electronic control **40** making it possible to have a progressive arc (with both incremental and decremental variance) that can be varied during the agitation sequence, together with the possibility of also progressively varying (with both incremental and decremental variance) the spm during a certain period or time that can also be varied progressively (with both incremental and decremental variance); therefore being able to generate agitation sequences according to the type of material, geometry and volume of the objects to be washed as well as the amount of these (load) arranged in the basket **10**.

[0053] Now, each stroke or paddle stroke is monitored by comparing its arc length versus the target arc length, said arc measurement being carried out in the preferred embodiment of the present invention by means of a rotor position sensor **44** installed in the motor **24**, which reports a certain number of pulses to the electronic control **40** each time the motor **24** is actuated in each direction by means of the driver **72**, which receives a control signal from the electronic control

40. Said number of pulses is directly proportional to the arc length, so it is possible to relate a certain number of pulses with a given arc length. Thus, the electronic control **40** compares the pulses measured per stroke or paddle stroke against a certain range of target pulses; the target agitation arc for a certain agitation sequence ranges from 180 to 2160 degrees, obtaining 30 to 100 strokes per minute (spm), which arc lengths allow correct friction between the agitator **13** scrubbers and the objects to be washed, as well as contributing to a better distribution of the objects to be washed inside the basket **10**, ensuring that they have an suitable movement of garments; with this in mind, we can think that an efficient washing mode that can be adapted to the type of objects to be washed (i.e., characteristics or manufacturing materials of the fabric, geometry, and volume of the objects to be washed) as well as the amount of load, it being desirable to have a progressive washing pattern in which the agitation parameters can be varied, which, as we have already mentioned, are: the arc or paddle stroke, the spm, and the period during which the agitation pattern or duration of the agitation pattern is carried out. The present invention therefore presents a washing method wherein the period or duration of the agitation pattern in a certain agitation sequence is not fixed as those of the state of the art, but rather the washing patterns can be variable, that is, as mentioned above, for a certain agitation sequence, such as a specialized agitation sequence for washing baby clothes and lingerie (small and delicate garments), only one washing pattern is used in the period or duration in which the agitation sequence is carried out, let's say that there is an arc or paddle stroke of between 180 to 200 degrees, with about 30 to 40 spms, the duration of the agitation sequence being from about 5 minutes to 8 minutes; this supposed special agitation pattern for baby clothes and lingerie does not change during the period or duration in which the washing sequence in question is carried out, therefore, in contrast to the washing method of the present invention, there are a series of agitation patterns for each agitation sequence, that is, the agitation pattern varies during the duration or period in which the washing sequence is carried out, so we can have an "aggressive" agitation pattern that helps remove stains and dirt which is carried out for a first duration, and then gradually "softening" the agitation pattern in subsequent periods or durations when the objects to be washed are no longer as dirty and do not require such excessive scrubbing or agitation; in another case, a "gentle" wash pattern can be used in an initial duration, finishing with a "vigorous" wash pattern in the last duration, thus allowing the objects to be washed to be "soaked" first, gradually loosening the dirt or stains, allowing time for the detergents to affect the dirt, and then ending with a "vigorous" agitation in the final period of the agitation sequence in question.

[0054] By way of non-limiting example, a "gentle" agitation pattern for small and delicate garments can be understood as those that have an arc or paddle stroke length of approximately between 180 and 750 degrees and with an spm that oscillates approximately between 20 and 70; a "gentle" agitation pattern for bulky items will have an arc or paddle stroke length of approximately 280 to 750 degrees with a spm of approximately 20 to 70; a "medium" or "moderate" agitation pattern is considered to have an arc or paddle stroke length of approximately 340 to 700 degrees with approximately 40 to 80 spm; a "vigorous" agitation pattern is considered to have an arc length of approximately between 250 to 750 degrees as a general rule, however, as an exception to the general rule we can mention that for small garments (e.g.: lingerie, baby clothes, among others) a "vigorous" arc can be considered to be from 250 degrees to 1080 degrees; thus, arcs greater than 750 degrees to 1080 degrees exerted on objects to be washed other than small garments are considered an exception to the rule, such is the case that by subjecting various garments to arcs greater than 750 degrees they will tend to get tangled or clump together creating an imbalance of the load inside the basket **10**; however, with an spm of approximately between 40 to 90.

Progressive Agitation Patterns.

[0055] In particular, the washing method of the present invention, as illustrated in FIG. **7**, the agitation sequence is proposed to be progressive, incrementally as well as decreasingly in blocks (progressive agitation blocks) that are repeated, this will depend on the sequence of specialized or progressive agitation patterns in particular in question, because as already discussed above, the objects to be washed have different levels of dirt, are of a different nature, manufacture, materials, geometry and volume, therefore different types of agitating patterns have been developed to be able to wash them effectively, ensuring as little damage and wear as possible; keeping these ideas in mind, the sequences of progressive agitation patterns (i.e., a concatenation of agitation patterns) that the present invention posits are embedded or nested within a progressive agitation block (block), thus each progressive agitation block is made up of a given sequence of progressive agitation patterns (with increasing or decreasing variances), and a preferred alternative embodiment, the blocks can be repeated successively; however, returning to said progressive washing patterns, they use an initial agitation pattern that is carried out for a certain initial period or duration with initial conditions of arc or paddle stroke length, spm; once the certain initial period or duration has elapsed, there is a second agitation pattern which is carried out for a second period or duration that can be greater or less than the initial period (variance in time or Δtime), the arc or secondary paddle stroke length, for its part, can also be greater or less than the length of the initial arc or paddle stroke (variance in arc or Δarc), as well as the secondary spm can be greater or less than the initial spm (variance in spm or Δspm), and so on until reaching an umpteenth agitation pattern within a block, wherein the period or duration can be greater or less than that used for the immediately preceding period or span, something similar happens with the arc or paddle stroke wherein this can be greater or less than the immediately preceding arc or paddle stroke length; for their part, the spm are in the same context, wherein the nth spm can be greater or less than the immediately previous spm; however, the difference or variance between the nth period or duration and the immediately preceding period or duration (n−1) can be considered as Δtime or variance in time, similarly, there are values of Δarc or variance in arc, which represents the difference or variance between the length of the nth arc or paddle stroke and the length of the immediately preceding arc or paddle stroke (n−1); along the same line of thought, we have the Δspm value or variance in spm, which represents the difference or variance between the nth spm value and the immediately previous spm value (n−1); thus, in a preferred embodiment we have the agitation patterns made up of: the variance values of the agitation pattern (i.e., Δtime, Δarc, Δspm), in

addition to the initial values of the agitation pattern (i.e., period or duration (time), arc and spm), which are fixed values determined based on laboratory tests for different types of objects to be washed (i.e., materials, manufacture, geometry, volume, among others), loads, water levels and degrees of dirt, said determined values of Δtime, Δarc, Δspm, number of patterns "n" that a block must have, as well as the number of blocks "k", among other initial values of period or duration, arc length and spm, to be carried out in a certain sequence of agitation patterns are stored in the memory of the electronic control **40** which will recover them based on the type of laundry selected in the user interface of the washing machine **20**, together with other user preferences such as: "high" or "low" water levels, and wash intensity.

[0056] The electronic control **40**, in addition to recovering the data of the load inside the basket **10**, the water level determined in the load sensing sequence **60**, the type of agitation pattern determined for the progressive agitation block in course, with which the initial values or values of the first agitation pattern will be determined, number of progressive agitation patterns "n" within a block, number of blocks "k" required in addition to the decreasing or increasing values of the particular sequence of agitation patterns in question.

[0057] To illustrate the foregoing, we can assume by way of example that delicate laundry such as lingerie will not require a sequence of vigorous agitation patterns, but rather a sequence of gentle agitation patterns in a single progressive agitation block; however, continuing with our example, we can now assume that for baby clothes the first progressive washing block would be required to have a sequence of "gentle" tending to "moderate" washing patterns.

[0058] As mentioned above, the user will have to indicate via the user interface arranged on the top **31** the intensity of washing (strong, intense, gentle) with which the user in some way qualitatively indicates the level of dirt on the laundry or the intensity with which it can be treated during the washing process, the water level selected by the user ("high" or "low"), as well as the type of laundry in question (whites, baby, lingerie, towels, sheets, cotton, synthetic, etc.), also considering the load detected or determined inside the basket **10** and the water level determined in the load determination or sensing sequence **60**; with these data, as previously mentioned, the electronic control **40** determines by means of a table of values obtained through laboratory tests, which is stored in the memory of the electronic control **40**, the type of agitation pattern for each block, which will be used to determine the sequence and number of agitation patterns in particular for each block, including the start data for the first agitation pattern of each block.

[0059] Now, by way of non-limiting example, three types or modalities of progressive agitation pattern sequences are presented that are part of the present invention and that can form a progressive agitation block; said exemplary modalities or types of progressive agitation pattern sequences are illustrated in FIGS. **8**, **9**, **10**, respectively, which we will discuss below: thus we have that the first type of progressive agitation pattern sequence or first exemplary embodiment of progressive agitation pattern sequences is illustrated in FIG. **8**; the agitation pattern is that the period or duration of each agitation pattern will decrease in a certain Δtime, in such a way that the initial agitation pattern will have a longer duration than the secondary agitation pattern, and so on until the nth agitation pattern that will last less than the immediately preceding agitation pattern (n−1); for its part, the length of the arc or paddle stroke will be incremental, increasing a value of Δarc given in each subsequent agitation pattern, thus the length of the nth arc or paddle stroke will be greater than the length of the immediately preceding arc or paddle stroke (n−1); regarding the spm, we can observe in FIG. **8** that these are also decreasing, so the nth value of each spm will be less than the value of the immediately preceding spm (n−1) by an amount equal to Δspm; in a didactic and exemplary way we can consider the following scenario: the user has selected high water levels, bulky garments (towels or sheets), a "strong" wash intensity in the user interface of the washing machine **20**, and has introduced in the basket **10** a load of approximately eighteen pounds of objects to be washed; once the load sensing sequence **60** and the tub filling sequence have been carried out, the electronic control **40** has registered a load of approximately eighteen pounds, and therefore allowed the entry of approximately eighty-six liters of water into the tub **11**; in this scenario, the electronic control **40** retrieved a Δarc value of 90 degrees, a Δspm value of 10, a Δtime value of 2 minutes, the number of patterns "n" to use in this exemplary agitation sequence is four, with initial arc or paddle stroke values of 360, 70 spm and duration of the initial agitation pattern of 7 minutes; the values of each particular exemplary agitation pattern are summarized in the following table:

TABLE 1

exemplary values of the first type of agitation pattern sequences.

"i" agitation pattern number	Value in degrees of the length of the arc or paddle stroke	Spm (strokes per minute) value	Period during which the agitation pattern is carried out in minutes.
1	360	70	7
2	450	60	5
3	540	50	3
4	630	40	1

[0060] The second type of agitation pattern sequence or second exemplary embodiment of progressive agitation pattern sequences is illustrated in FIG. **9**; the agitation pattern establishes that the period or duration of each agitation pattern will be incremental in a certain Δtime, in such a way that the initial agitation pattern will have a shorter duration than the secondary agitation pattern, and so on until the nth agitation pattern, which will last longer than the immediately preceding agitation pattern (n−1); for its part, the length of the arc or paddle stroke will be incremental, increasing a given value of Δarc in each subsequent agitation pattern, thus the length of the nth arc or paddle stroke will be greater than the length of the immediately preceding arc or paddle stroke (n−1); regarding the spm we can see from FIG. **9** that these are decreasing, so the nth value of the spm will be less than the value of the immediately previous spm (n−1) by an amount equal to Δspm; in a didactic way we can consider the following scenario: the user has selected low water levels, denim pants "jeans", "intense" washing intensity, in the user interface of the washing machine **20**, and has introduced a load of approximately nine pounds of objects to be washed into the basket **10**; once the load sensing sequence **60** and the tub filling sequence have been carried

out, the electronic control **40** registered a load of nine pounds, therefore allowing the entry of fifty-four liters of water into the tub **11**; in this scenario, the electronic control **40** retrieved an Δarc value of 90 degrees, an Δspm value of 20, a Δtime value of 2 minutes, the number of patterns "n" to use in this exemplary agitation sequence is five, with initial length of arc or paddle stroke values of 360, at 40 spm and a period or duration of the initial agitation pattern of 2 minutes; the values of each particular exemplary agitation pattern are summarized in the following table:

TABLE 2

exemplary values of the second type of agitation pattern.

"i" agitation pattern number	Value in degrees of the length of the arc or paddle stroke	Spm (strokes per minute) value	Period during which the agitation pattern is carried out in minutes.
1	360	70	2
2	450	60	4
3	540	50	6
4	630	40	8
5	720	30	10

[0061] The third type of agitation pattern sequence or third exemplary embodiment of progressive agitation pattern sequences is illustrated in FIG. **10**; the agitation pattern establishes that the period or duration of each agitation pattern will decrease in a certain Δtime, in such a way that the initial agitation pattern will have a longer duration than the secondary agitation pattern, and so on until the nth agitation pattern, which will last less than the immediately preceding agitation pattern (n−1); for its part, the length of the arc or paddle stroke will decrease, decreasing a given value of Δarc in each subsequent agitation pattern, thus the length of the nth arc or paddle stroke will be less than the length of the immediately preceding arc or paddle stroke (n−1); regarding the spm we can see from FIG. **10** that these are incremental, so the nth value of the spm will be greater than the value of the immediately previous spm (n−1) by an amount equal to Δspm; in a didactic way we can consider the following scenario: the user has selected: high water levels, bedspreads and duvets, "gentle" wash intensity on the selector knobs arranged on the user interface of the washing machine **20**, and has introduced into the basket **10** a load of approximately nineteen pounds of objects to be washed; once the load sensing sequence **60** and the tub filling sequence have been carried out, the electronic control **40** has registered a load of nineteen pounds, therefore allowing the entry of eighty-six liters of water to the tub **11**, in this scenario, the electronic control **40** retrieved a value of Δarc of 90 degrees, a value of Δspm of 5, a value of Δtime of 3 minutes, the number of patterns "n" to use in this exemplary agitation sequence is five, with initial arc or paddle stroke values of 720, at 35 spm and a period or duration of the initial agitation pattern of 14 minutes; the values of each particular exemplary agitation pattern are summarized in the following table:

TABLE 3

exemplary values of the third type of agitation pattern.

"i" agitation pattern number	Value in degrees of the length of the arc or paddle stroke	Spm (strokes per minute) value	Period during which the agitation pattern is carried out in minutes.
1	720	35	14
2	630	40	11
3	540	55	8
4	450	60	5
5	360	65	1

Progressive Agitation Block.

[0062] As mentioned above and as can be observed in FIG. **7**, a progressive agitation block (block) is made up of a given sequence of progressive agitation patterns (increasing or decreasing), being that in a preferred alternative embodiment the progressive agitation block can be repeated successively a "k" number of times, in such a way that once the i-th agitation pattern "i" has been carried out, meaning that when the pattern number "i" is equal to the value "n" of target agitation patterns to be used in a given "jth" block, the electronic control **40** proceeds to verify if the number of the "jth" agitation block is equal to the predetermined number "k" (target) of agitation blocks, if so, the electronic control **40** proceeds to carry out the arrangement and balancing agitation sequence **63** (see FIG. **6**); otherwise, it means that there are "j-th" progressive agitation blocks pending, so the electronic control **40** gives way to the new subsequent "j-th" block (i.e., j+1) updating the "j" block counter; immediately afterwards, the electronic control **40** recovers the data of the progressive agitation patterns (i.e., i=1 to i=n) that made up the block k=1; once this task has been carried out, the electronic control **40** proceeds to repeat the progressive agitation patterns in question, thus subjecting the objects to be washed to a new progressive agitation block, that is, to move the agitator or propeller **13** according to the progressive agitation pattern sequence that makes up the block until the condition of number of blocks k=j is met.

[0063] For ease of comprehension of the agitation sequence **62** illustrated in FIG. **7**, let us assume the following scenario as an example, as well as a didactic one: the user has selected "low" levels of water, small items, an "intense" washing intensity, in the user interface of the washer **20**, and has loaded into the basket **10** a load of approximately 7 pounds of objects to be washed; once the load sensing sequence **60** and the tub filling sequence have been carried out, the electronic control **40** has registered a load of approximately 7 pounds, thus allowing the entry of approximately forty-eight liters of water into the tub **11**; in this scenario, the electronic control **40** determines that two stir blocks are required (k=2); immediately afterwards, the electronic control **40** begins the configuration of the successive agitation patterns, so the electronic control **40** recovers a value of Δarc of 120 degrees, a value of Δspm of 10, a value of Δtime of 3 minutes, the number of patterns "n" to be used in this exemplary agitation sequence is four, with initial values of arc or paddle stroke length of 270, at 70 spm and a period or duration of the initial agitation pattern of 3 minutes; the values of each particular exemplary agitation pattern are summarized in the following table:

TABLE 4

exemplary values of the first progressive agitation block.

"i" agitation pattern number	Value in degrees of the length of the arc or paddle stroke	Spm (strokes per minute) value	Period during which the agitation pattern is carried out in minutes.
1	270	70	1
2	390	60	4
3	510	50	7
4	630	40	10

[0064] Once the last agitation pattern (i=4) has been carried out, the electronic control **40**, by comparing the value "i" with the target number of patterns "n", determines that the condition (i=n) has been met, then proceeding to compare the value "j" of the current agitation block with the objective value "k", wherein it determines that the condition (k=j) has NOT been met, immediately afterwards the electronic control **40** increases the agitation block counter (j+1) and moves on to the next agitation block (j=2); when doing this, the electronic control **40** recovers the values of the block j=1 that in our example are displayed in table **4**, and having done this, the electronic control **40** acts again on the agitator or propeller **13** according to the agitation patterns that make up the block.

[0065] Once the last agitation pattern (i=4) of this second agitation block (j=2) has been carried out, the electronic control **40**, by comparing the value "i" with the objective number of patterns "n" determines that the condition (i=n) has been met, then proceeding to compare the value "j" of the current agitation block with the objective value "k", wherein it determines that the condition (j=k) has been met, so the progressive agitation sequence **62** is considered to be completed, giving way to the arrangement and balancing agitation sequence **63** of the load or objects to be washed inside the basket **10**.

Arrangement and Balancing Agitation Sequence **63**

[0066] The purpose of this special agitation sequence is to evenly distribute or spread the objects to be washed within the basket **10** within the work volume contained within the basket **10**, to avoid imbalance in the dehydration or spin stage as much as possible. The basket **10** in said spin stage rotates at high revolutions, and it is always desirable to have the load or objects to be washed inside the basket **10** as evenly distributed as possible within the work volume, avoiding clumps or high densities of laundry in a reduced volume that could cause an imbalance in the basket **10**. Thus, while the clutch is in agitation mode, the electronic control **40** orders a paddle stroke with a target arc of 180 degrees to 550 degrees, with such a frequency as to obtain between 30 to 90 spm, for a period of between 1 to 20 minutes.

Dehydration **64**

[0067] The dehydration stage serves to extract the wash liquor. This sequence is carried out by rotating the basket **10** so that, by centrifugal force, the wash liquor approaches the wall with holes of the basket **10** to be evacuated through said holes towards the tub **11**, wherein the extracted wash liquor is pumped to the outside by means of the drain pump **35**, which has a drain hose **16** connected to its outlet. The electronic control **40** then sends a pulse for a certain time of between 2 to 8 minutes to the driver **75** of the drain pump **35**; at the same time, it also sends a signal to the driver **73** of the clutch **28** for it to change from agitation mode to dehydration mode. In an alternative embodiment of the present invention, the clutch can be a floating clutch that, in the presence or absence of wash liquor, can engage or disengage shafts **25** and **26**, it being evident that said floating clutch would not use an actuator, so the electronic control will not be able to send any signal to activate or deactivate it. Thus, when the clutch is in dehydration mode, the electronic control also sends a pulse for a certain period of time to the driver **72** so that it energizes the motor **21**, thus rotating the basket **10** in unison with the agitator or propeller **13**. The aforementioned pulse sent by the electronic control **40** can vary depending on the type of spin desired. Thus, in an alternative embodiment, it is even possible to send a string of pulses of varied widths with the aim of accelerating and decelerating the basket **10** in order to extract less water by decelerating the basket, giving the drain pump **35** time to extract the wash liquor accumulated in the bottom of the tub **11**, in addition to avoiding problems with the accumulation of foam between the tub **11** and the basket **10**, causing the phenomenon called "sudsing".

[0068] In an alternative embodiment of the present invention, the motor **24** can be energized intermittently, allowing the basket **12** to slow down, giving the pump time to dislodge the wash liquor accumulated in the bottom of the tub, in an effort to avoid "sudsing", which is created due to the accumulation of water at the bottom of the tub in such a way that when the wash liquor comes into contact with the basket while it rotates, the friction causes the wash liquor coupled with the speed with which said wash liquor is projected on the circular wall of the tub **11** to generate a high concentration of foam between the annular space of the basket and the tub, which can cause the basket **12** to stop and the energized motor **24** to suddenly increase its temperature. Some other method for the prevention or management of "sudsing" available in the state of the art may be used.

Rinse **65**

[0069] The rinse stage removes the residues of detergent, additives or chemicals dissolved in the wash liquor remaining in the objects to be washed. This can be done in various ways; in the present invention, two ways of rinsing are considered, which are: deep rinse **67** and spray rinse **66**; which will be discussed in detail below; at this point, as can be seen in FIG. **6**, the electronic control **40** has completed the dehydration stage **64**, wherein the drain pump **35** has extracted the wash liquor accumulated at the bottom of the tub **11**, making it evident that the objects to be washed inside the basket **10** are dehydrated, retaining in their manufacturing materials (fabric or fibers) a high amount of detergent, which for obvious reasons is undesirable in the textiles, fibers or materials of the objects to be washed; thus, to remove the remaining wash liquor, in addition to removing the detergent trapped in the textiles or fibers of the objects to be washed, a rinsing process is required, wherein fresh water is used to help remove the remaining wash liquor and detergent in the objects to be washed; the present invention contemplates two ways of carrying out the rinsing process, one of them is the "traditional" way, wherein the tub **11** is filled with fresh water up to a certain level and then proceeds to agitation by means of the agitator or propeller **13** for a

certain period of time; immediately afterwards, the wash liquor is extracted by means of the drain pump **35**, which is in fluid communication with a drain hose that transports the water out of the tub **11** and to the drain of the house or place where the washing machine **20** is operating and the objects to be washed contained in the basket **10** are spun; the other way of rinsing that the present invention proposes is by means of a spray rinse, that is, contrary to the "traditional" deep rinse where a certain volume of fresh water is allowed to enter the tub **11** and is then sprayed by means of a deflector **18** arranged in the cover **14**, which is in fluid connection with a spray pump **15** by means of a spray hose **17**, this allows taking water from the bottom of the tub **11** and spraying it on the upper surface of the objects to be washed arranged in the basket **10**; immediately afterwards the basket is rotated and water is sprayed again, repeating this operation until at least one revolution of the basket **10** has been achieved; the present invention then allows the user to choose the form of rinsing, thus in the user interface of the washing machine **20**, the user can choose between "deep rinse **67**" or "spray rinse **66**"; once again, when the electronic control **40** has completed the dehydration **64**, it retrieves from the user interface of the washing machine **20** the rinse method selected by the user as well as the water level (high or low), and the type of laundry, also retrieving the data on the laundry load determined in the load sensing sequence **60**, as well as the water level used in the progressive agitation sequence **62**, at this point, the electronic control **40** makes sure that there is no water or wash liquor inside the tub **11** by taking and analyzing the signal from the pressure sensor or pressure switch **41**; immediately afterwards, the electronic control **40** will carry out the corresponding rinse block (**66** or **67**).

Spray Rinse Sequence **66**

[0070] This sequence as a preferred alternative embodiment of the washing method, object of the present invention; namely, that this spray rinse **66** sequence allows saving water in the process of rinsing the objects to be washed arranged in the basket **10**; carrying out the spray rinse **66** requires that the clutch **28** be in spin mode, in addition to admitting a minimum amount of fresh water to the tub.

[0071] In a preferred embodiment of the spray rinse sequence **66** the electronic control **40** sends a control pulse to the driver **78** of the water intake valve **45**, which promotes the passage of water into the tub **11**, this happens until the pressure sensor or pressure switch **41** sends a control signal to the electronic control **40** that the desired water level has been reached; immediately afterwards, the electronic control **40** sends a pulse for a certain period of time which can oscillate between 0.5 seconds to 2 seconds to the driver **71** of the spray pump **15** so that it sends water towards the spray deflector **18** through the spray hose **17**, in order to soak the objects to be washed inside the basket **10** that are exposed or at the top. Immediately afterwards, the electronic control **40** counts a certain waiting time; once elapsed, the electronic control **40** sends a control pulse to the driver **72** of the motor **21** so that it makes a paddle stroke of between approximately 30 degrees to 60 degrees with the aim of positioning a different section of the basket **10** under the deflector of spray **18**, promoting the wetting of another section of objects to be washed by receiving the water that is expelled from the spray deflector **18**; these steps are repeated until the basket **10** has been rotated at least 360 degrees (one revolution); once the objects to be washed have been hydrated (i.e., the objects to be washed have received the water ejected by the spray deflector **18** and the basket **10** has been rotated at least one revolution), the electronic control **40** orders the basket **10** to be spun for a certain period that oscillates between 1 min and 10 min; to do this, the electronic control **40** orders the motor driver **72** to energize, causing the basket **10** to rotate, subjecting the objects contained in it to a centrifugal force, causing the wash liquor to approach the wall with holes of the basket **10** and to be evacuated through said holes towards the tub **11**, wherein the extracted wash liquor is pumped outside by means of the drain pump **35** that has a drain hose **16** connected to its outlet, thus while the motor **21** is energized the drain pump **35** is energized, sensing once the spin period has elapsed, the electronic control **40** jointly de-energizes the motor **21** and the drain pump **35**; it should be noted at this point that it is the electronic control **40** that determines the volume of water that is introduced into the tub **11**, the number of times that the basket **11** will be rotated to spray the objects to be washed under the spray deflector **18** and the spin period, thanks to a table obtained from experimental values in the laboratory and stored in its memory based on the laundry load detected, the type of laundry, and the level of water used.

[0072] An alternative embodiment of the present spray rinse sequence **66** comprises the use of a directional valve **36**, the inlet of which is in fluid connection with the outlet of the drain pump **36** by means of a duct or hose (not shown). One of the outlets of the aforementioned directional valve **36** is connected to the spray hose **17** and the rest to the drain hose **16**.

[0073] As in the previous embodiment, the entry of a certain volume of fresh water into the tub **11** is promoted, which will be sprayed onto the objects to be washed inside the basket **10**; for this embodiment said volume of water inside the tub **11** is greater than or equal to the mean water level for any case of water level i.e., "high" or "low" levels (see FIG. **5**); the electronic control **40** sends a pulse for a certain period of time, which can range from 0.5 seconds to 2 seconds, to the driver **75** of the drain pump **35**; at the same time, it sends a pulse for the same certain period of time to the driver **76** of the directional valve **36** so that it sends water towards the spray deflector **18** through the spray hose **17** in order to soak the objects to be washed inside the basket **10** below the spray deflector. Immediately afterwards, the electronic control **40** counts a certain waiting time. Once this time has elapsed, the electronic control **40** sends a control pulse to the driver **72** of the motor **21** that causes a movement of the basket **10** of approximately between 30 degrees to 60 degrees with the aim of positioning a different section of the basket **10** under the spray deflector **18**, promoting the wetting of another section of objects to be washed by receiving the water that the spray deflector **18** expels; these steps are repeated until the basket **11** has been rotated at least 360 degrees (one revolution); once the objects to be washed have been hydrated (i.e., the objects to be washed have received the water ejected by the spray deflector **18** and the basket **10** has been rotated at least one revolution), the electronic control **40** orders the basket **10** to be spun for a certain period that oscillates between 1 min and 10 min; to do this, the electronic control **40** orders both the driver **76** of the directional valve **36** so that it sends the wash liquor inside the tub **11** to the outside of the washing machine **20** through the drain hose **16**, and at the same time

commands the motor driver **72** to energize causing the basket **10** to rotate, subjecting the objects contained in it to a centrifugal force, causing the wash liquor to approach the wall with holes of the basket **10** and to be evacuated through said holes to the tub **11**, wherein the extracted wash liquor is pumped outside by the drain pump **35**, which is in fluid connection with the drain hose **16** by means of the directional valve **36**; thus, while the motor **21** is energized the direction of the directional valve **36** is changed and the drain pump **35** is energized, noting that once the spin period is over, the electronic control **40** jointly de-energizes the motor **21** and the drain pump **35** coupled with the change of direction of the directional valve **36**; it should be noted at this point that it is the electronic control **40** that determines the volume of water that is entered into the tub **11**, the number of times that the basket **11** will be rotated to spray the objects to be washed under the spray deflector **18**, and the spin period, thanks to a table obtained from experimental values in the laboratory and stored in its memory based on the laundry load detected, the type of laundry, and the level of water used.

[0074] In an alternative preferred mode of spray rinse **66**, a certain volume of water is allowed to enter (which depends on the load size determined during the load sensing sequence **60**), to then be sprayed by means of the spray pump **15** onto the objects to be washed contained in the basket **10**, while the basket **10** rotates at a constant low speed that allows the centrifugal force that the rotation of the basket **10** exerts on the objects to be washed and allowing the passage of fresh water through the textiles or fibers from the objects to be washed, thus hydrating the objects to be washed and at the same time removing the wash liquor, which is recovered by the cylindrical wall and bottom of the tub **10**; for this, as in the previous embodiment, the entry of a certain volume of fresh water into the tub **11** is promoted, which will be sprayed onto the objects to be washed inside the basket **10**; for this embodiment said volume of water within the tub **11** is greater than or equal to the average water level in any case, i.e., "high" or "low" levels (see FIG. **5**); thus, in the present embodiment the electronic control **40** sends a control pulse to at least one driver **78** of at least one filling valve **45** promoting the flow of water into the tub **11** as well as the relevant accumulation of water inside it; however, when the electronic control **40** detects through the signals emitted by the pressure sensor **41** that the minimum level in any of the cases of water levels in which it is operating, i.e., "high" or "low", the electronic control **40** initializes a timer that will stop when the electronic control **40** determines through the signals emitted by the pressure sensor **40** that the average level of the level case in question has been reached, said time data will be stored in the memory of the microprocessor of the electronic control **40**, calling it: "tfill", as it will be used in the future; continuing, the electronic control **40** now sends a pulse for a certain period of time to the driver **71** of the spray pump **15** with the particularity that the value of said period of time value is approximated to the time value of "tfill" (which can range from 1 minute to 10 minutes) noting that in this mode the spray pump **15** has a fluid connection with the deflector **18** by means of the hose **17**; it should be noted at this point that in an alternative mode, the electronic control **40** sends a control pulse whose time value is approximated to the time value of "tfill" (which can range from 1 min. to 10 min.) to the driver **75** of the drain pump **35** and at the same time sends a pulse for the same certain period of time (which is also approximated to the time value of "tfill") to the driver **76** of the directional valve **36** so that it sends water towards the deflector spray hose **18** via the spray hose **17**; in any of the modes, the deflector **18** emits a fan of water onto the objects to be washed that are instantly below it while the basket **10** rotates, thus hydrating or soaking them; for this purpose, with the basket **10** in spin mode, at the same time that the electronic control **40** acts for a time approximated to the time value of "tfill" to one of the pumps **15** or **35** depending on the mode, it sends a control pulse to the driver **72** of the motor **21** for a period of time approximated to the time value of "tfill" so that it rotates and promotes the movement in unison of the basket **10** with the agitator or propeller **13** (spin mode) at a speed of rotation between 5 rpm to 100 rpm, making the objects to be washed rotate inside said basket **10** so that a section of these when passing under the spray nozzle **18** will be subjected to the fan of water emanating from the spray nozzle **18**, hydrating them in this way and promoting a slow dehydration by spinning, which causes the water sprayed on the top or surface of the objects to be washed in the basket **10** to permeate the objects to be washed during its journey between the textiles and fibers of the aforementioned objects to be washed until it reaches the circular wall or bottom of the basket **10**, dragging the detergent or wash liquor with it during its journey or path and depositing it inside the tub **11**; as can be seen from the description above, the time that one of the pumps **15** or **35**, depending on the mode, is energized, as well as the time that the motor **21** is energized, making the basket **10** rotate, is approximately the time value of "tfill"; in another preferred alternative embodiment of the present spray rinse mode **66**, once the approximate time value of "tfill" has elapsed and the electronic control **40** has de-energized either of the pumps **15** or **35** depending on the mode, as well as the motor **21**, the electronic control **40** sends a control pulse to the driver **75** of the drain pump **35** (and, if applicable, to the driver **76** of the directional valve to operate in drain mode) to dislodge the wash liquor contained at the bottom of the tub **11**, the duration in time of the pulse being between 0.5 minutes and 5 minutes depending on the case of the water levels ("high" or "low") used; thus, once the duration of the referred control pulse to the driver **75** of the drain pump **35** expires, said pump **35** is de-energized, starting over again this spray rinse mode, so that the electronic control **40** again promotes the entry of a certain volume of water into the tub **11** and continues with the steps described above for the present mode.

[0075] In any embodiment of the spray rinse block **66**, once the wash liquor is extracted from the tub **11** by means of the drain pump **35** that has a drain hose **16** connected to its outlet that leads the liquid to the outside of the tub **11**, preferably towards the drain of the place wherein the washing machine **20** is operating; once the liquid has been drained from the tub **11**, which is verified when the electronic control **40** the signal emitted by the pressure sensor or pressure switch **41** indicates this fact, with the tub **11** in the absence of liquid and spin mode to spin in unison the basket **10** with the propeller **13** centrifuging the basket **10** for a certain period that oscillates between 1 min. and 5 min.; to do this, the electronic control **40** orders the motor driver **72** to energize, causing the basket **10** to rotate, subjecting the objects contained in it to a centrifugal force, causing the wash liquor to approach the wall with holes of the basket **10**

and to be evacuated through said holes towards the tub **11**, where the extracted wash liquor is pumped outside by means of the drain pump **35** that has a drain hose **16** connected to its outlet (or, where appropriate, a directional valve **36** that in turn has one of its outlets fluidly connected to the drain hose **16**), so while the motor **21** is energized, the drain pump **35** is energized (and, when appropriate, the directional valve so that it is in drain mode) noting once the period of spinning has expired, the electronic control **40** de-energizes the motor **21** and the drain pump **35** together.

[0076] In an alternative embodiment, any of the modes of the spray rinse block **66** described herein is repeated at least once.

Deep Rinse **67**

[0077] In case the electronic control **40** has determined that the user has selected the use of a deep rinse, that is, the electronic control **40** detects that the user determined the use of the deep rinse in the user interface of the washing machine **20**, the electronic control **40** arranges for the clutch **28** to be in agitation mode; once the change has been made or it has been verified that the clutch **28** is in agitation mode the electronic control is ready to admit fresh water into the tub **11** up to the level used for the progressive agitation sequence **62**; to do this the electronic control **40** sends a control pulse to the driver **78** of the water intake valve **45**, which promotes the passage of water into the tub **11**; this happens until the pressure sensor or pressure switch **41** sends a control signal to the electronic control **40** that the desired water level has been reached (level used for the progressive agitation sequence **62**), to then proceed to agitate by means of the agitator or propeller **13** for a certain period of time preferably between 1 minute and 8 minutes, the electronic control **40** determining the duration of said agitation period in addition to the agitation pattern to be used, and the spinning period, by checking a table obtained from experimental values in the laboratory and stored in its memory based on the laundry load detected, the type of laundry, and level of water used. Immediately afterwards, the electronic control **40**, once the agitation period has ended, the wash liquor is extracted from the tub **11** by means of the drain pump **35**, which has a drain hose **16** connected to its outlet that preferably leads the liquid to the outside of the tub **11** towards the drain of the place where the washing machine **20** is operating; once the liquid has been drained from the tub **11**, which is verified when the electronic control **40** the signal emitted by the pressure sensor or pressure switch **41** indicating this fact, with the tub **11** in the absence of liquid, the electronic control **40** changes the state of the clutch **28** to spinning mode, sending a signal to the driver **73** of the clutch **28** to make the change from agitation mode to dehydration mode, to then spin the basket **10** for a certain period that oscillates between 1 min. and 5 min.; to do this, the electronic control **40** sends a command to the motor driver **72** to energize, causing the basket **10** to rotate, subjecting the objects it contains to a centrifugal force, causing the wash liquor to approach the wall with holes of the basket **10** and to be evacuated through said holes towards the tub **11**, wherein the extracted wash liquor is pumped outside by means of the drain pump **35** that has a drain hose **16** connected to its outlet, thus while the motor **21** is energized the drain pump **35** is energized, sensing once the spin period expires the electronic control **40** jointly de-energizes the motor **21** and the drain pump **35**.

In an alternative embodiment, the deep rinse block **67** described herein is repeated at least once.

Washing Method.

[0078] The method of the washing method object of the present invention referred to in FIG. **6** begins when the user has introduced a certain amount of items to be washed, a certain corresponding amount of washing additives, selected the program to be used, selected the desired water level if appropriate or if the washing machine **20** should be operated at high tub **11** fill levels or low tub **11** fill levels of (see FIG. **5**) and has instructed the washing machine **20** to start. The electronic control **40** thus first initiates the laundry arrangement sequence **59**, in which the basket **10** is rotated at a speed that causes the centrifugal force experienced by the objects to be washed inside the basket **10** to be greater than the force of gravity, which causes the objects to be washed to stick to the cylindrical wall of the basket **10**; immediately afterwards, the electronic control **40** starts the sequence for checking the water level which considers the signal obtained from the pressure switch **41**, which indicates the water level inside the tub **11** according to the water level detected by the pressure switch **41**, thus the electronic control determines whether or not it is necessary to admit water into the tub **11**; in case the admission of water to the tub **11** is required, the electronic control **40** orders energizing at least one of the filling valves **45**, until the pressure switch **41** detects the desired water level inside the tub **11**; at this point the desired level is the minimum level or sensing level, the electronic control **40** therefore, if it has detected that the water level inside of the tub **11** is less than the minimum level or even that there is no water inside the tub **11**, at least one of the filling valves **45** or both valves is energized depending on the desired temperature level (hot water valve **45** or cold water valve **45**); immediately afterwards the electronic control **40** initiates the load detection or sensing sequence **60** which estimates the amount by weight of the objects to be washed inside the basket **10**, thereby determining the level of water required for the progressive agitation sequences **62**, arrangement **63**, dehydration **64** and rinse **65** sequences; once the load has been estimated (amount by weight of the objects to be washed inside the basket **10**), the electronic control **40** saves in memory the estimated textile load data as well as the water level associated with said textile load, then the electronic control **40** energizes at least one of the water intake valves **45** until the water level determined by the electronic control **40** is reached; in an alternative embodiment, the filling of water to a certain level is done by opening at least one or both water intake valves **45** according to the temperature selected by the user; in any case, during the filling of water, the objects to be washed are gently agitated inside the basket **11** with a washing pattern of short paddle strokes with low spm (e.g., an arc of 200° to 270°, with an spm of 20 to 40); once the certain level of water has been reached, the electronic control **40** interrupts the energization of at least one water intake valve **45** in addition to also interrupting the gentle agitation pattern that was used during the filling of water inside the tub **11**; immediately afterwards, the electronic control **40** starts the progressive washing sequence **67** by agitating the objects to be washed contained within the basket **10**, thus promoting the washing of the objects arranged inside the basket **10**, the aforementioned progressive washing sequence **67** is carried out during a certain time that ranges from 1 minute to 50

minutes, depending on the type of laundry to be washed, the load, the agitation pattern to be used, the number of washing blocks to be used, the washing cycle to be used, among other factors specific to the construction and geometry of the washing machine **20**; once the progressive agitation sequence **67** has been carried out, the electronic control **40** starts the arrangement and balancing agitation sequence **61**, which has the function of uniformly distributing the objects arranged in the basket **10**, trying to avoid the clumping of objects in a small area of the basket **10**, with a view to facilitating dehydration by spinning of the objects arranged in the basket **10**; once the arrangement and balancing agitation sequence **63** has been carried out, the electronic control **40** starts the dehydration sequence **64**, in which the objects to be washed arranged in the basket **10** are dehydrated by means of centrifugal force by rotating the basket **10** for such an effect; once the load of textiles is dehydrated, the electronic control **40** starts the rinse sequence **65** in any of its modalities (spray rinse sequence **66** or deep rinse sequence **67**), wherein the objects to be washed are rinsed inside the basket **10** culminating in their subsequent dehydration by extracting the wash liquor from the tub **11** by means of the drain pump **35** and drain hose **16**; once this is done, the washing method object of the present invention is completed.

[0079] Thus, having broadly described the invention in question, it is found with a high degree of inventive step, its industrial application being undeniable, also noting that a person skilled in the art can glimpse alternative embodiments that must be included in the scope and spirit of the following claims.

1. In a washing machine that consists of a cabinet that supports a tub which houses a basket that rotates concentrically inside the tub, the basket being driven by a motor which is mechanically coupled to an agitator and said basket, a clutch that allows coupling and uncoupling between the basket and agitator, a user interface that allows the user to select water levels, type of laundry, washing intensity, rinse mode, and an electronic control that controls actuators by means of drivers, a level sensor and a rotor position sensor inside the motor, and a spray system, a washing method comprising the following sequences:

a. laundry arrangement sequence, which evenly distributes the objects to be washed inside the basket;

b. water level check, to determine the water level inside the tub by means of the level sensor that is in communication with the electronic control;

c. filling the tub to a minimum level, with the reading from step b. the electronic control determines the volume of water to be admitted in the tub in order to carry out step d.;

d. load sensing sequence, wherein the electronic control determines the amount of objects to be washed arranged in the basket (load) and the type of objects to be washed based on the resistance that said load offers to the movement of the agitator or propeller;

e. sequence of filling the tub to washing level, wherein the water level inside the tub required for step f. is determined according to the user preference of the water level to be used selected in the user interface, as well as with the data of step d.

f. progressive agitation sequence, wherein according to the user preferences selected in the user interface regarding the level of water to be used, the type of laundry, and wash intensity, together with the data of the load level determined in step d. and based on a table of initial values as well as variance of the agitation patterns, a plurality of progressive agitation patterns are formed within an agitation block; wherein the agitation pattern comprises a period of time during which the agitator or propeller is operated with a length of arc or paddle stroke in a clockwise and counterclockwise direction, with a paddle stroke frequency that is determined by strokes per minute (spm) that cause agitation on the objects to be washed inside the basket.

g. arrangement and balancing agitation sequence, in which the objects to be washed are spread and distributed inside the basket, avoiding excessive imbalance when spinning the basket;

h. dehydration, wherein the basket is rotated to generate a centrifugal force greater than the force of gravity, which causes the dehydration of the objects to be washed inside the basket;

i. rinse, wherein the wash liquor residues are removed, hydrating the objects to be washed followed by dehydration.

2. The method of claim **1**, further comprising:

g. a spray sequence which can be activated together with any of sequences (b) to (i).

3. The method of claim **1**, wherein according to the user's selection in the user interface the rinse sequence h. comprises a deep rinse.

4. The method of claim **1**, wherein according to the user's selection in the user interface the rinse sequence h. comprises a spray rinse.

5. The method of claim **4**, wherein the spray system comprises a spray pump in fluid connection with a spray hose that conveys water to a spray deflector.

6. The method of claim **4**, wherein the spray system comprises a directional valve with a first fluid connection to a drain pump, a second fluid connection to a spray hose that conveys water to a spray deflector, and a third fluid connection with a drain hose that transports the water outside of the washing machine; wherein said directional valve is controlled by the electronic control which orders the direction in which the fluid must be transported.

7. The method of claim **1**, wherein the progressive agitation sequence comprises a method for an agitation pattern sequence comprising the following steps:

i. obtaining the user preferences selected in the user interface regarding the level of water to be used, the type of laundry and wash intensity, together with the load level data determined in step d. and the water level of the tub;

ii. producing an agitation pattern with the data obtained in step i. based on a table of initial values, also producing the number of patterns "n" to be used;

iii. based on the table of variance values, determining the variance of the arc length of the series of paddle strokes in a Δarc value;

iv. based on the table of variance values, determining the variance of the frequency or spm of the series of paddle strokes in a Δspm value;

V. based on the table of variance values, determining the variance of the certain period in which the series of paddle strokes is executed in a Δtime value;

vi. agitating the objects to be washed inside the basket according to agitation pattern "i", where "i" is the number of the current agitation pattern;
vii. producing an agitation pattern i+1 with the data obtained in iii., iv., v.;
viii. repeating steps iii. to vii. until the condition "i"="n" is met.

8. The method of claim **7**, wherein the progressive agitation sequence further comprises the following steps:
ix. determining the number of agitation blocks "k" with the data obtained in i. according to the table of values obtained through laboratory tests;
x. determining the number of agitation patterns with the values obtained in i. for a block "j" according to the table of values obtained through laboratory tests, where "j" is the current block number;
xi. producing an agitation block j+1 with the data obtained in iii., iv., v., ix., x.
xii. repeating steps viii. to x. until the condition "j"="k" is met.

9. A method for a progressive agitation pattern sequence that operates in a washing machine that consists of a cabinet that supports a tub which houses a basket that rotates concentrically within it, the basket driven by a motor which is mechanically coupled to an agitator or propeller and the basket, a clutch that allows coupling and uncoupling between the basket and the agitator or propeller, an electronic control that controls actuators by means of drivers, a level sensor or pressure switch and a rotor position sensor inside the motor, a spray system, a user interface that allows the user to choose settings for: water level, type of objects to be washed, wash intensity, a load sensing sequence, and a sequence of filling the tub to washing level, this method comprising the following steps:
a. retrieving user interface settings data, as well as tub load and water level;
b. producing an agitation pattern with the data retrieved in step a. according to the table of values obtained through laboratory tests, wherein the agitation pattern consists of a period of time during which the agitator or propeller is operated with a length of arc or paddle stroke in a clockwise and counterclockwise direction, with a paddle stroke frequency that is determined by the strokes per minute (spm) that cause agitation on the objects to be washed inside the basket;
c. increasing or decreasing the arc length of the series of paddle strokes by a Δarc value;
d. increasing or decreasing the frequency or spm of the series of paddle strokes by a Δspm value;
e. increasing or decreasing the certain period in which the series of paddle strokes is executed by a Δtime value.
f. agitating the objects to be washed inside the basket according to the agitation pattern.

10. A method for a progressive agitation sequence operating in a washing machine consisting of a cabinet supporting a tub which houses a basket that rotates concentrically within it, the basket driven by a motor which is mechanically coupled to an agitator and the basket, a clutch that allows coupling and uncoupling between the basket and agitator, an electronic control that controls actuators by means of drivers, a level sensor or pressure switch and a rotor position sensor inside the motor, a spray system, a user interface that allows the user to choose settings for the water level, type of objects to be washed, washing intensity, a load sensing sequence and sequence of filling the tub to washing level, said method comprising the following steps:
a. retrieving data from the user interface settings, as well as the tub load or water level;
b. determining the number of agitation blocks with the data retrieved from step a. according to the table of values obtained through laboratory tests;
c. determining the number of agitation patterns for a given block with the data retrieved from step a. according to the table of values obtained through laboratory tests;
d. producing an agitation pattern with the data retrieved from step a. according to the table of values obtained through laboratory tests, wherein the agitation pattern consists of a period of time during which the agitator or propeller is operated with a length of arc or paddle stroke in a clockwise and counterclockwise direction, with a paddle stroke frequency that is determined by the strokes per minute (spm) that cause agitation on the objects to be washed inside the basket;
e. increasing or decreasing the arc length of the series of paddle strokes by a Δarc value;
f. increasing or decreasing the frequency or spm of the series of paddle strokes by a Δspm value;
g. increasing or decreasing the certain period in which the series of paddle strokes is executed by a Δtime value;
h. agitating the objects to be washed inside the basket according to the agitation pattern;
i. performing steps d. to h. the number of times determined in c.
j. performing step i. the number of times determined in b.

11. The method of claim **5**, wherein the spray rinse comprises the following steps: allowing a certain volume of water to enter the tub, spraying water through the spray deflector onto the objects to be washed contained in the basket while the basket rotates at a constant speed.

12. The method of claim **5**, wherein the spray rinse comprises the following steps: allowing a certain volume of water to enter the tub, spraying water through the spray deflector onto the objects to be washed contained in the basket while the basket rotates being energized by a string of pulses, resulting in a non-constant rotation speed.

13. The method of claim **6**, wherein the spray rinse comprises the following steps: allowing a certain volume of water to enter the tub, spraying water through the spray deflector onto the objects to be washed contained in the basket while the basket rotates at a constant speed.

14. The method of claim **6**, wherein the spray rinse comprises the following steps: allowing a certain volume of water to enter the tub, spraying water through the spray deflector onto the objects to be washed contained in the basket while the basket rotates being energized by a string of pulses, resulting in a non-constant rotation speed.

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