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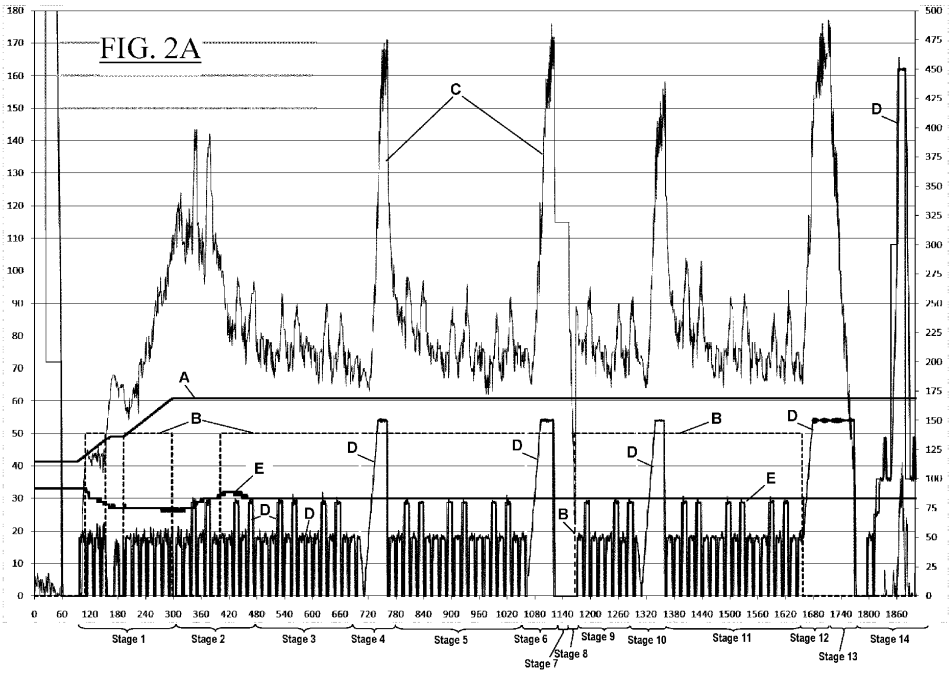
(54) **Method of rinsing laundry in a laundry machine, and laundry machine actuating the method**

(57) A method of rinsing laundry in a laundry machine **(100)** with a washing tub **(110)** accommodating a rotatable laundry drum **(115),** the method comprising the steps of: loading rinsing water into the tub; rotating the drum at a first rotation speed while recirculating the rinsing water present in the tub and spraying the recirculated rinsing water into the drum; evacuating the rinsing water present in the tub. Before said step of evacuating the rinsing water, the drum is rotated at a second rotation speed for a predetermined first time interval, said second rotation speed being higher than the first rotation speed and sufficient to cause the laundry being rinsed to stick against an inner surface of the drum due to centrifugal force. Then the drum rotation is stopped for a predetermined second time interval, and after said second time interval, a part of the rinsing water present in the tub is discharged from the tub.

FIG. 2A



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Description

Field of the invention

[0001] The present invention generally relates to laundry machines, i.e. machines for treating laundry, such as laundry washing machines (laundry washers) and laundry washing and drying machines (laundry washer/dryers).

Overview of the related state of the art

[0002] Laundry washers and washer/dryers implement laundry washing cycles that include rinsing phases, and, possibly, laundry washing cycles that essentially consist in a laundry rinsing phase alone (possibly followed by a spinning phase).

[0003] A laundry machine shall feature good laundry rinsing performance, because it is important to ensure that the detergents and other products used to wash the laundry are, as far as possible, removed from the textiles before they are subjected to drying. At the same time, the consumption of resources like water and electric energy should be as limited as possible.

[0004] Manufacturers of laundry machines have been for years developing solutions for reducing the demand of laundry machines for water and/or electric energy, without negatively impacting, or possibly even enhancing the laundry washing performance.

[0005] The rinsing phase of a laundry washing cycle is in itself rather water-demanding, so it needs a careful study.

[0006] EP 629733 discloses a solution consisting in the execution of at least one rinsing cycle effected in such a way that all the water available in the tank, even if in reduced amount, is circulated several times in forced fashion through all the laundry, by effecting one or more short periods, or impulses, of drum rotation at high speed (same speed of the spinning phase) during the rinsing cycle, in such a way that all the reduced amount of water available is made to pass through the fabrics several times.

Summary of the invention

[0007] The Applicant has faced the problem of devising a new laundry rinsing method, adapted to be implemented in laundry washers and washer/dryers without excessive burden, which improves the laundry rinsing result without impacting, or possibly even reducing, the demand for resources like water and electric energy.

[0008] According to an aspect of the present invention, there is provided a method of rinsing laundry in a laundry machine as set forth in independent method claim 1.

[0009] The laundry rinsing method comprises the steps of:

- loading rinsing water into the tub;
- rotating the drum at a first rotation speed while recirculating the rinsing water present in the tub and spraying the recirculated rinsing water into the drum;
- evacuating the rinsing water present in the tub.

[0010] Before said step of evacuating the rinsing water, the method comprises the steps of:

- rotating the drum at a second rotation speed for a predetermined first time interval, said second rotation speed being higher than the first rotation speed and sufficient to cause the laundry being rinsed to stick against an inner surface of the drum due to centrifugal force;
- stopping the drum rotation for a predetermined second time interval;
- after said second time interval, discharging from the tub a part of the rinsing water present in the tub.

[0011] Additional features that are believed to be advantageous or preferential but not essential are set forth in the dependent method claims.

[0012] In this way, by stopping the drum rotation, the rinsing water with detergents diluted therein has time to deposit at the bottom of the tub. By subsequently discharging a part of the rinsing water, a significant part of the detergents residues are also discharged.

[0013] During said steps of stopping the drum rotation and discharging from the tub a part of the rinsing water present in the tub, the rinsing water present in the tub is preferably not recirculated.

[0014] Preferably, during said step of rotating the drum at the second rotation speed, the rinsing water present in the tub is recirculated and sprayed into the drum. In this way, the rinsing water hits and penetrates into the laundry being rinsed (which, thanks to the rotation of the drum, is almost evenly distributed along the periphery of the drum).

[0015] Said second rotation speed is for example of about 150 RPM. Said first rotation speed is for example of about 50 RPM.

[0016] Preferably, during said step of rotating the drum at the first rotation speed, the drum is rotated at least once at an intermediate rotation speed, intermediate between the first and the second rotation speeds, for example of about 75 RPM.

[0017] During the laundry rinsing phase, said step of rotating the drum at the second rotation speed may be additionally performed at least once without however being followed by said steps of stopping the drum rotation and discharging from the tub a part of the rinsing water present in the tub.

[0018] In an embodiment of the present invention, before said step of evacuating the rinsing water from the tub, the drum rotation speed is brought to said second rotation speed.

[0019] The drum rotation speed may be kept at the second rotation speed for a time before starting to evac-

uate the rinsing water from the tub. The drum rotation is then stopped after an amount of rinsing water has been evacuated from the tub sufficient to cause a level of the remaining rinsing water remaining in the tub to be below the bottom of the drum.

[0020] After having evacuated the rinsing water from the tub, a step of spinning the drum at a spinning speed higher than said second rotation speed is preferably performed.

[0021] Preferably, the drum is rotated at the first rotation speed alternately clockwise and counter-clockwise.

[0022] Another aspect of the present invention relates to a laundry washing cycle including at least one laundry rinsing phase implemented according to the laundry rinsing method set forth hereabove.

[0023] Still another aspect of the present invention relates to a laundry machine adapted to implement the laundry rinsing method, or the laundry washing cycle, set forth above.

[0024] The present patent application also discloses a laundry washing method in a laundry machine comprising a washing tub accommodating a rotatable drum, the method comprising the steps of:

- before submitting the laundry to a spinning phase to extract water therefrom, and while in the washing tub there is still water sufficient to cause the laundry in the drum being wetted, causing the drum to rotate at a speed lower than the rotation speed in the spinning phase but sufficient to cause the laundry to distribute along the periphery of the drum due to centrifugal force;
- after a predetermined time of rotation of the drum, starting to evacuate water from the tub,
- stopping the drum rotation when a level of the water remaining in the washing tub is below the bottom of the drum.

Brief description of the drawings

[0025] These and other features and advantages of the present invention will be made apparent by the following detailed description of some exemplary and non-limitative embodiments thereof, description that will be made more intelligible by the aid of the attached drawings, wherein:

Figure 1 schematically shows a laundry machine according to an embodiment of the present invention, adapted to implement a laundry rinsing method according to an embodiment of the present invention;

Figures 2A, 2B and **2C** are time diagrams depicting the evolution in time of some control signals and measured quantities of the laundry machine while performing a laundry rinsing procedure according to an embodiment of the present invention.

Detailed description of exemplary embodiments of the invention

[0026] Referring to the drawings, in **Figure 1** there is schematically shown a laundry machine **100,** for example a laundry washer (the present invention nevertheless applies as well to a laundry washer/dryer).

[0027] The laundry machine **100** comprises a cabinet **105** enclosing a washing tub **110** and, rotatably accommodated therein, a perforated laundry drum **115,** for containing the laundry to be washed; the drum **115** is caused to rotate by a - preferably electric - motor (not shown).

[0028] The laundry machine **100** has a clean water load system and a waste water/washing liquid discharge system.

[0029] The clean water load system preferably comprises a dosing device, *e.g.* an electrovalve, **120,** whose inlet is connectable (for example *via* a hose) to a water spigot (hose and water spigot not shown). In some embodiments of the invention, the laundry machine may be equipped with a dosing device adapted to allow selectively providing, at its outlet, cold water or hot water; for example, the dosing device may comprise two electrovalves, one connectable to a cold water spigot and the other connectable to a hot water spigot, or the dosing device may comprise one electrovalve with one outlet and two inlets, one of which connectable to a cold water spigot and the other connectable to a hot water spigot.

[0030] A metering device, for example a flowmeter **125,** may advantageously be connected to the dosing device **120** *(e.g.,* electrovalve) outlet, for measuring the amount of clean water loaded.

[0031] The loaded water may be caused to pass through a container of detergents **135** and be then supplied to the washing tub **110.** A by-pass circuit may be provided, internally or externally to the container of detergents **135,** adapted to allow the loaded water to be supplied to the washing tub **110** directly, i.e. without being mixed with one or more detergents contained in the container **135.**

[0032] The waste water/washing liquid discharge system may comprise a discharge duct **145,** for example at the bottom of the washing tub **110,** preferably closable in a selective way by means of a valve **150.** Downstream the valve **150,** an anti-fluff / anti-clog filter **155** is preferably provided, upstream a discharge pump **160** whose outlet is connected to a discharge hose **165,** for example connectable to a drain spigot (not shown).

[0033] A pressure sensor **170** (which may be a pressure switch) may also be provided, adapted to sense the pressure of the liquid present in the washing tub **110.**

[0034] A heater **173** is provided for heating the liquid present within the washing tub **110.** The heater **173** may comprise one or more electric resistors, and may conveniently be arranged proximate to the bottom of the washing tub **110.**

[0035] The laundry machine **100** preferably comprises a washing/rinsing liquid recirculation system, comprising

a recirculation pump **175,** (a) recirculation conduit(s) **175** and (a) nozzle(s) **180** arranged to spray recirculated washing/rinsing liquid inside the drum **115,** for example towards the center thereof.

[0036] The laundry machine **100** is equipped with a control unit, **130,** for example a programmable logic control unit **130.** The control unit **130** governs the operation of the laundry machine. For example: the control unit **130** may advantageously control the electrovalve **120,** possibly on the basis of readings received from the flowmeter **125,** when the latter is provided for; the control unit **130** may advantageously control the energization of the heater **173;** the control unit **130** may advantageously control the activation/deactivation of the recirculation pump **175** and the discharge pump **160;** the control unit **130** may advantageously control the rotation of the drum **115** by the motor. The control unit **130** may advantageously operate taking into account user's settings, like for example the selection of a particular laundry washing cycle among a plurality of washing cycles available *(e.g.:* cotton, wool, synthetics, etc.).

[0037] Referring now to **Figures 2A - 2C,** a rinsing procedure implementing a rinsing method according to an embodiment of the present invention will be described. The rinsing procedure that will be described may apply to any one of the rinsing phases of a laundry washing cycle, for example, albeit not limitatively, to the last rinsing phase of a laundry washing cycle (generally, but not necessarily, a laundry washing cycle may include more than one rinsing phases), or to a laundry washing cycle essentially consisting in a laundry rinsing phase alone.

[0038] In the diagrams of **Figures 2A - 2C,** the abscissa represents the time, expressed in seconds. In ordinate there are shown: in all the diagrams, on the left, the level of water inside the tub **110,** expressed in millimeters (referred for example to the bottom of the drum **115);** in the diagrams of **Figures 2A** and **2C,** on the right, the rotation speed of the drum **115,** expressed in Revolutions *per* Minute - RPM. Several curves are depicted in the diagrams of **Figures 2A**, **2B** and **2C:**

- curve **A** (depicted only in **Figure 2A)** represents the (incremental) amount of clean water loaded during the rinsing phase *(e.g.,* as measured by the flow meter **125);**
- the square-wave curve **B** (the dotted line, depicted only in **Figures 2A** and **2C)** represents the ON/OFF status of the recirculation pump **175** (the OFF status is indicated by the value 0);
- curve **C** (depicted only in **Figures 2A** and **2B)** represents the level of water within the tub **110** *(e.g.,* as measured by the pressure sensor **170);**
- curve **D** (depicted only in **Figures 2A** and **2C)** represents the drum rotational speed as set by the control unit **130;**
- curve **E** (depicted only in **Figure 2A)** represents the variation of the temperature of the water inside the tub **110;**
- curve **F** (the dotted line visible only in **Figure 2B)** represents the ON/OFF status of the discharge pump **160** (the OFF status is indicated by the value 0).

[0039] The rinsing procedure can be regarded as (and is better understood if regarded as) comprising a sequence of stages, for example fourteen stages in the exemplary embodiment depicted in **Figures 2A - 2C.** However, the subdivision of the rinsing procedure in a succession of stages, and the number and the sequence of stages illustrated in the following, are not to be construed limitatively, and are just for better intelligibility.

- First stage **(Stage 1)**

[0040] The rinsing procedure starts by causing the laundry machine **100** to load clean water. The control unit **130** commands the opening of the electrovalve **120,** for example for a predetermined time interval, or, in case the flow meter **125** is provided, until the reading of the flow meter **125** itself about the amount of clean water loaded reaches a predetermined value. In the example of **Figure 2A,** the amount of clean water loaded in the first stage is advantageously approximately 20-22 liters; the water may be loaded in one or more shots.

[0041] During the first stage, the drum **115** is caused to rotate; preferably, the rotation speed is kept at a first, low RPM value, equal for example to approximately 50 RPMs; preferably, the sense of rotation of the drum is alternately clockwise and counter-clockwise. Also, during the first stage, the recirculation pump **175** is activated, either for part of the time or continuously. The heater **173** is, for example, kept de-energized (however the heater **173** may also be energized, at least for part of the first stage duration).

[0042] The first stage of the rinsing procedure may for example last about 300 seconds. This first stage of the rinsing procedure is useful for wetting the laundry to be rinsed.

- Second stage **(Stage 2)**

[0043] In the second stage, preferably, the control unit **130** energizes the heater **173,** in order to at least slightly heat the rinsing water up. For example, the heater **173** may be kept energized for about 2 minutes. Heating the rinsing water up promotes the dissolving of detergents that are present in the laundry. During the second stage, the drum **115** is caused to rotate alternately clockwise and counter-clockwise at the first, low RPM value *(e.g.,* about 50 RPMs). Possibly, but not necessarily, during the second stage, for one or more of the clockwise or counter-clockwise rotation pulses of the drum **115** the

rotation speed may be slightly increased to an RPM value of, for example, approximately 75 RPM (in the example of **Figures 2A - 2C,** in the second stage of the rinsing procedure, four of the rotation pulses of the drum are at 75 RPM); for example, the generic clockwise or counter-clockwise drum rotation pulse at the first RPM value of *e.g.* 50 RPM may last about 6 seconds, whereas the generic drum rotation pulse at the increased RPM value of *e.g.* 75 RPM may last about 3 seconds. During the second stage, the recirculation pump **175** is preferably kept activated, at least for part of the time, for recirculating the rinsing water and spraying it inside the drum, against the laundry to be rinsed.

- Third stage **(Stage 3)**

[0044] In the third stage of the rinsing procedure, the drum **115** is caused to rotate, preferably alternately clockwise and counter-clockwise, at the first RPM value, *e.g.* 50 RPM, and for one or more of the clockwise or counter-clockwise rotation pulses the drum **115** may be caused to rotate at an increased RPM value of, for example, approximately 75 RPM (in the example of **Figures 2A - 2C,** four rotation pulses are at 75 RPM). For example, the generic clockwise or counter-clockwise drum rotation pulse at the first RPM value of, *e.g.,* 50 RPM may last about 6 seconds, whereas the generic drum rotation pulse at the increased RPM value of, *e.g.,* 75 RPM, may last about 3 seconds. During the third stage, the recirculation pump **175** is preferably kept activated, to cause recirculation of the rinsing water with spray thereof inside the drum against the laundry to be rinsed. The duration of this third stage may be dependant on the overall duration of the rinsing phase; in the example of **Figures 2A - 2C, the duration of the third rinsing procedure stage is about 3 minutes.**

- Fourth stage **(Stage 4)**

[0045] In the fourth stage of the rinsing procedure, the rotation speed of the drum is increased to reach a second RPM value (higher than the increased RPM value of, *e.g.,* 75 RPM), for example of about 150 RPM; for example, the rotation speed increase rate is of about 5 RPM *per* second, so that a time of about 30 seconds is needed to reach the second RPM value. Since there is water in the tub **110,** the drum rotation speed increase rate is deliberately rather slow, in order not to stress the motor.

[0046] The drum rotation speed is then kept at the second RPM value for a predetermined time, for example about 20 seconds. The recirculation pump **175** is advantageously kept on, so as to cause recirculation of the rinsing water with spray thereof inside the drum **115** against the laundry to be rinsed.

[0047] Thanks to the relatively high drum rotation speed *(e.g.,* 150 RPM), the laundry is caused to more or less stick against the inner wall of the drum **115** (due to the experienced centrifugal force); thanks also to the fact that there is a relatively high amount of water in the tub **110,** there is a good exchange of water between the laundry and the water in the tub. The Applicant has found that if, as mentioned, the recirculation pump **175** is preferably kept activated, the thrust of the water sprayed by the nozzle **185** is increased, so that the sprayed rinsing water reaches a longer distance and better penetrates through the laundry that is stuck against the inner wall of the drum, promoting the removal of detergents trapped therein, rather uniformly for all the laundry items being rinsed.

- Fifth stage **(Stage 5)**

[0048] During the fifth stage, similarly to the third stage, the drum **115** is caused to rotate, preferably alternately clockwise and counter-clockwise, at the first RPM value, *e.g.* 50 RPM, and for one or more of the clockwise or counter-clockwise rotation pulses the drum **115** may be caused to rotate at the increased RPM value of, for example, approximately 75 RPM (in the example of **Figures 2A - 2C,** six rotation pulses are at 75 RPM). For example, the generic clockwise or counter-clockwise drum rotation pulse at the first RPM value of, *e.g.,* 50 RPM may last about 6 seconds, whereas the generic drum rotation pulse at the increased RPM value of, *e.g.,* 75 RPM may last about 3 seconds. During the third stage, the recirculation pump **175** is preferably kept activated, to cause recirculation of the rinsing water with spray thereof inside the drum against the laundry to be rinsed.

- Sixth stage **(Stage 6)**

[0049] The sixth stage may be similar to the fourth stage: the rotation speed of the drum **115** is increased - at a controlled increase rate - to reach a relatively high RPM value, for example the second RPM value, *e.g.* of about 150 RPM; for example, the rotation speed increase rate is of about 5 RPM *per* second, so that a time of about 30 seconds is needed to reach the second RPM value. The drum rotation speed is then kept at the second RPM value for a predetermined time, for example about 20 seconds. The recirculation pump **175** is advantageously kept on, so as to cause recirculation of the rinsing water with spray thereof inside the drum against the laundry to be rinsed.

[0050] Thanks to the relatively high drum rotation speed *(e.g.,* 150 RPM), the laundry is again caused to more or less stick against the inner wall of the drum **115** (due to the experienced centrifugal force); thanks also to the fact that there is a relatively high amount of water in the tub **110,** there is a good exchange of water between the laundry and the water in the tub. The Applicant has found that if, as mentioned, the recirculation pump **175** is preferably kept activated, the thrust of the water sprayed by the nozzle **185** is increased, so that the sprayed rinsing water reaches a longer distance and better penetrates through the laundry that is stuck against the inner wall of the drum, promoting the removal of de-

tergents trapped therein, rather uniformly for all the laundry items being rinsed.

- Seventh stage **(Stage 7)**

[0051] During this stage, the control unit **130** stops the motor that causes the drum **115** to rotate. The drum **115** thus stops to rotate. Preferably, the control unit **130** also stops the recirculation pump **175,** so as to stop the forced recirculation of the rinsing water with spray thereof inside the drum against the laundry to be rinsed.

[0052] This stage of the rinsing procedure lasts for a predetermined, relatively short time, for example 50 seconds. This allows the detergents diluted in the rinsing water depositing at the bottom of the tub **110** (and in the tub bottom sump). The Applicant has found that by stopping the drum **115,** and simultaneously stopping the recirculation pump **175,** the residues of detergents in the rinsing water more easily concentrate proximate to the sump of the tub **110.**

- Eighth stage **(Stage 8)**

[0053] After the stop of the drum **115** rotation and of the recirculation pump **175,** the control unit **130** activates the discharge pump **160,** for discharging an amount of rinsing water sufficient to remove the detergent residuals accumulated at the bottom (in the sump) of the tub **110.** For example, the discharge pump **160** may be kept activated for a time sufficient to discharge about 1 liter - 1 liter and a half; for example, a discharge pump activation time of about 6 seconds has been found to be suitable.

[0054] Optionally, after this stage, a certain additional amount of clean water might be loaded, for example an amount corresponding to the discharged amount of rinsing water; this might for example be useful in those cases where the amount of water loaded at the beginning of the rinsing procedure is relatively small.

- Ninth stage **(Stage 9)**

[0055] The ninth stage is similar to the fifth stage: the drum **115** is caused to rotate, preferably alternately clockwise and counter-clockwise, at the first RPM value, *e.g.* 50 RPM, and for one or more of the clockwise or counter-clockwise rotation pulses the drum **115** rotation speed may be increased to an RPM value of, for example, approximately 75 RPM (in the example of **Figures 2A - 2C,** three rotation pulses are at 75 RPM). For example, the generic clockwise or counter-clockwise drum rotation pulse at the first RPM value of, *e.g.,* 50 RPM may last about 6 seconds, whereas the generic drum rotation pulse at the increased RPM value of, *e.g.,* 75 RPM may last about 3 seconds. During the third stage, the recirculation pump **175** is preferably reactivated, to re-start recirculation of the rinsing water with spray thereof inside the drum against the laundry to be rinsed. The duration of the ninth stage may be similar to, or lower than (as in the example of **Figure 2),** the duration of the fifth stage.

- Tenth stage **(Stage 10)**

[0056] The tenth stage is similar to the fourth stage: the drum rotation speed is increased - at a controlled increase rate - to reach the second RPM value, for example of about 150 RPM; for example, the rotation speed increase rate is of about 5 RPM *per* second, so that a time of about 30 seconds is needed to reach the third RPM value. The drum rotation speed is then kept at the second RPM value for a predetermined time, for example about 20 seconds. The recirculation pump **175** is advantageously kept on, so as to cause recirculation of the rinsing water with spray thereof inside the drum against the laundry to be rinsed.

- Eleventh stage **(Stage 11)**

[0057] The eleventh stage is similar to the fifth (and ninth) stage: the drum **115** is caused to rotate, preferably alternately clockwise and counter-clockwise, at the first RPM value, *e.g.* 50 RPM, and for one or more of the clockwise or counter-clockwise rotation pulses the drum **115** rotation speed may be increased to, for example, approximately 75 RPM (in the example of **Figures 2A - 2C,** three rotation pulses are at 75 RPM). For example, the generic clockwise or counter-clockwise drum rotation pulse at the first RPM value of, *e.g.,* 50 RPM may last about 6 seconds, whereas the generic drum rotation pulse at the increased RPM value of, *e.g.,* 75 RPM may last about 3 seconds. During the third stage, the recirculation pump **175** is preferably kept activated, to cause recirculation of the rinsing water with spray thereof inside the drum against the laundry to be rinsed. The duration of the ninth stage may be similar to the duration of the fifth stage (as in the example of **Figures 2A - 2C),** or different (longer or shorter).

- Twelfth stage **(Stage 12)**

[0058] Similarly to the fourth, sixth and eleventh stages, the drum rotation speed is increased to reach the second RPM value, for example of about 150 RPM; for example, the rotation speed increase rate is of about 5 RPM *per* second. The drum rotation speed is then kept at the second RPM value for a predetermined time, for example about 30 seconds. In the twelfth stage the recirculation pump **175** is advantageously turned off.

- Thirteenth stage **(Stage 13)**

[0059] This stage of the rinsing procedure precedes the spinning phase. The drum rotation speed is brought to the second RPM value of, *e.g.,* approximately 150 RPM, the recirculation pump **175** is maintained off; the discharge pump **160** is initially kept off. After some time, for example about 20 seconds, the discharge pump **160**

is activated. The drum continues to rotate at the second RPM value, then, after the amount of discharged rinsing water is approximately 15 liters, and the level of rinsing water in the tub **110** has fallen below the bottom of the drum **115** (thereby the contact of the laundry in the drum with the rinsing water is thus almost null) the motor that makes the drum to rotate is stopped.

[0060] The Applicant has found that in this way the distribution of the laundry within the drum **115** is more uniform: due to the presence of some rinsing water in the drum **115,** the laundry does not get packed and distributes rather uniformly at the periphery of the drum **115.** This enhances the performance of the following spinning phase, since the laundry is distributed inside the tub in a more symmetrical or uniform way.

- Fourteenth stage **(Stage 14)**

[0061] Finally, the spinning phase of the washing cycle is started. In this stage, the remaining water in the tub is discharged. The drum rotation speed is increased relatively quickly to a high RPM value, for example 450 RPM or more (depending for example on the washing cycle selected by the user).

[0062] The present invention has been described by presenting an exemplary embodiment thereof, which comprises several optional and non-essential features. Several modifications to the described embodiments are possible and straightforward for those skilled in the art, as well as other practical embodiments of the invention may be devised, without departing from the scope of protection set forth in the following claims.

[0063] It is pointed out that the implementation, before a spinning phase, of a stage like the thirteenth stage **Stage 13** described above - in which, starting with water in the tub at a level sufficient for the laundry to be partly immersed, the drum is rotated at a speed that is sufficiently high *(e.g.,* about 150 RPM) to cause (by centrifugal force) the laundry in the tub to more or less stick around the periphery of the drum, and after some time the discharge pump is activated to start discharging the water from the tub, while the drum is continued to rotate until, after some time, an amount of water has been discharged that is sufficient to cause the level of rinsing water in the tub to fall below the bottom of the drum, thereby the drum rotation is stopped - is believed to be *per se* advantageous, because it allows a better, more uniform distribution of the laundry within the drum (thanks to the fact that while the drum is rotated there is still water wetting the laundry), so that the latter is prevented from closely packing in, possibly, just one location inside the drum.

Claims

1. A method of rinsing laundry in a laundry machine **(100)** with a washing tub **(110)** accommodating a rotatable laundry drum **(115),** the method comprising the steps of:

- loading rinsing water into the tub;
- rotating the drum at a first rotation speed while recirculating the rinsing water present in the tub and spraying the recirculated rinsing water into the drum;
- evacuating the rinsing water present in the tub,

characterized by comprising, before said step of evacuating the rinsing water:

- rotating the drum at a second rotation speed for a predetermined first time interval, said second rotation speed being higher than the first rotation speed and sufficient to cause the laundry being rinsed to stick against an inner surface of the drum due to centrifugal force;
- stopping the drum rotation for a predetermined second time interval;
- after said second time interval, discharging from the tub a part of the rinsing water present in the tub.

2. The method of claim 1, wherein during said steps of stopping the drum rotation and discharging from the tub a part of the rinsing water present in the tub, the rinsing water present in the tub is not recirculated.

3. The method of claim 1 or 2, wherein during said step of rotating the drum at a second rotation speed, the rinsing water present in the tub is recirculated and sprayed into the drum.

4. The method of any one of the preceding claims, wherein said second rotation speed is of about 150 RPM.

5. The method of any one of the preceding claims, wherein said first rotation speed is of about 50 RPM.

6. The method of claim 5, wherein during said step of rotating the drum at the first rotation speed, the drum is rotated at least once at an intermediate rotation speed, intermediate between the first and the second rotation speeds.

7. The method of claim 6, wherein said intermediate rotation speed is of about 75 RPM.

8. The method of any one of the preceding claims, wherein said step of rotating the drum at the second rotation speed is additionally performed at least once without being followed by said steps of stopping the drum rotation and discharging from the tub a part of the rinsing water present in the tub.

9. The method of any one of the preceding claims, wherein before said step of evacuating the rinsing

water from the tub, the drum rotation speed is brought to said second rotation speed.

10. The method of claim 9, wherein before said step of evacuating the rinsing water from the tub, and after having brought the drum rotation speed to said second rotation speed, the drum rotation speed is kept at the second rotation speed for a time before starting to evacuate the rinsing water from the tub.

11. The method of claim 10, wherein the drum rotation is stopped after an amount of rinsing water has been evacuated from the tub sufficient to cause a level of the remaining rinsing water remaining in the tub to be below the bottom of the drum.

12. The method of claim 11, wherein after having evacuated the rinsing water from the tub, a step of spinning the drum at a spinning speed higher than said second rotation speed is performed.

13. The method of any one of the preceding claims, wherein said rotating the drum at the first rotation speed comprises alternately rotating the drum clockwise and counter-clockwise.

14. A laundry washing cycle for a laundry machine, comprising a laundry rinsing phase according to any one of the preceding claims.

15. A laundry machine comprising a tub **(110)** accommodating a rotatable drum **(115),** a discharge pump **(160)** activatable for evacuating at least partly liquid present in the tub, and a liquid recirculation system **(175,180,185)** adapted to recirculated liquid present in the tub and spraying the recirculated liquid into the drum, and a control unit **(130)** operable to control the operation of the machine, **characterized in that** the control unit is adapted to cause the machine perform a laundry rinsing method according to any one of claims 1 to 13.

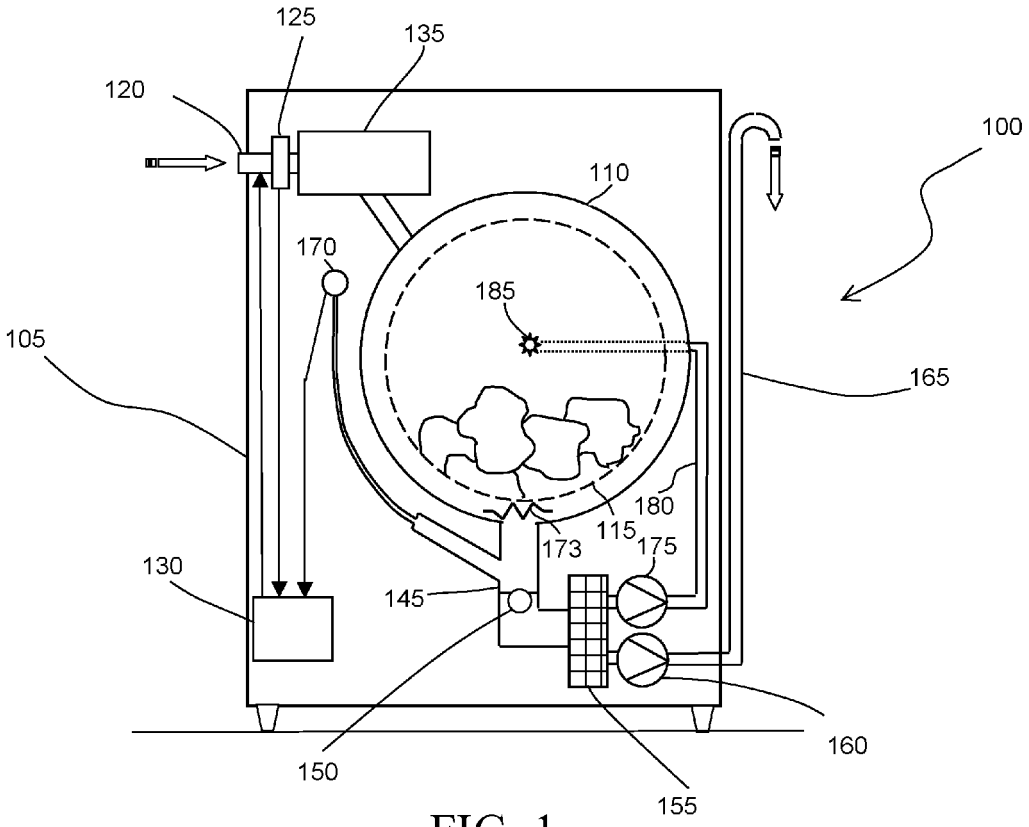

125
135
120
100
110
170
185
105
165
180
115
173
175
130
145
160
150
155

FIG. 1

FIG. 2A

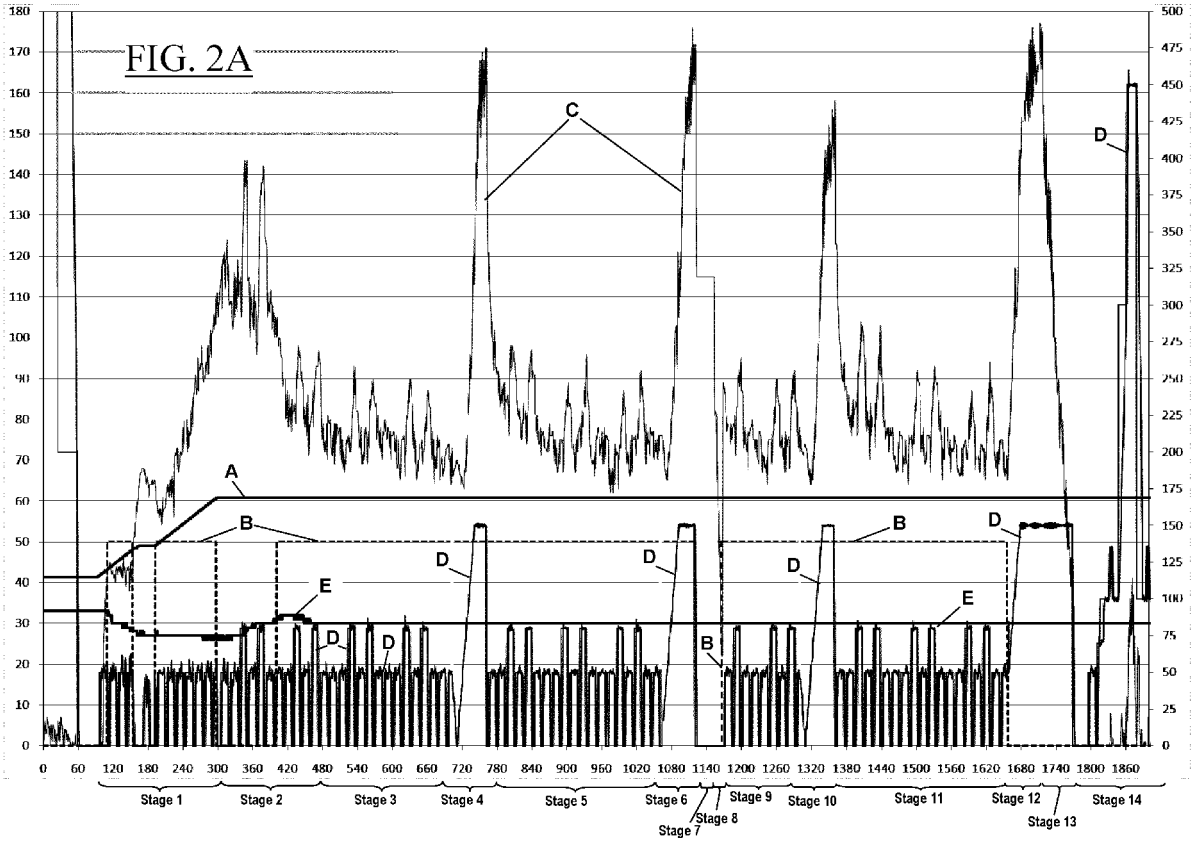

A
B
C
D
E
Stage 1
Stage 2
Stage 3
Stage 4
Stage 5
Stage 6
Stage 7
Stage 8
Stage 9
Stage 10
Stage 11
Stage 12
Stage 13
Stage 14

FIG. 2B

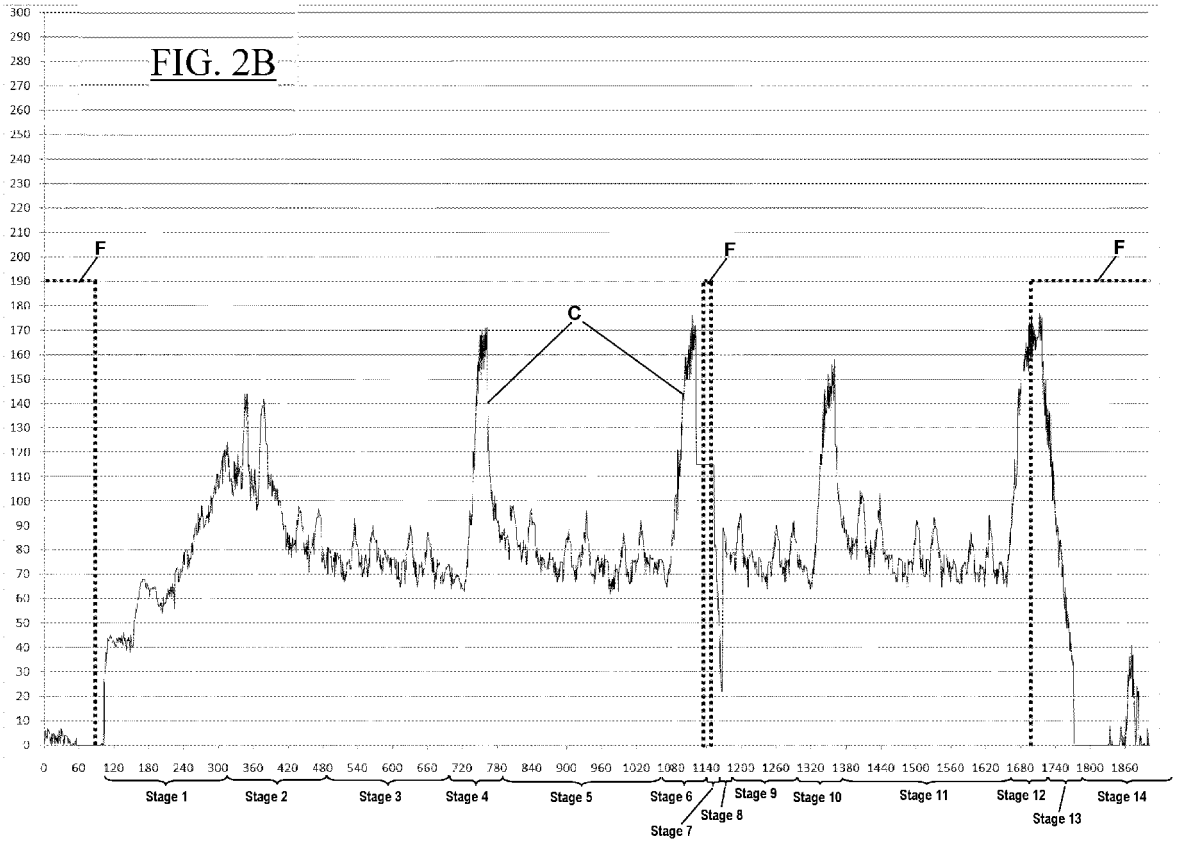
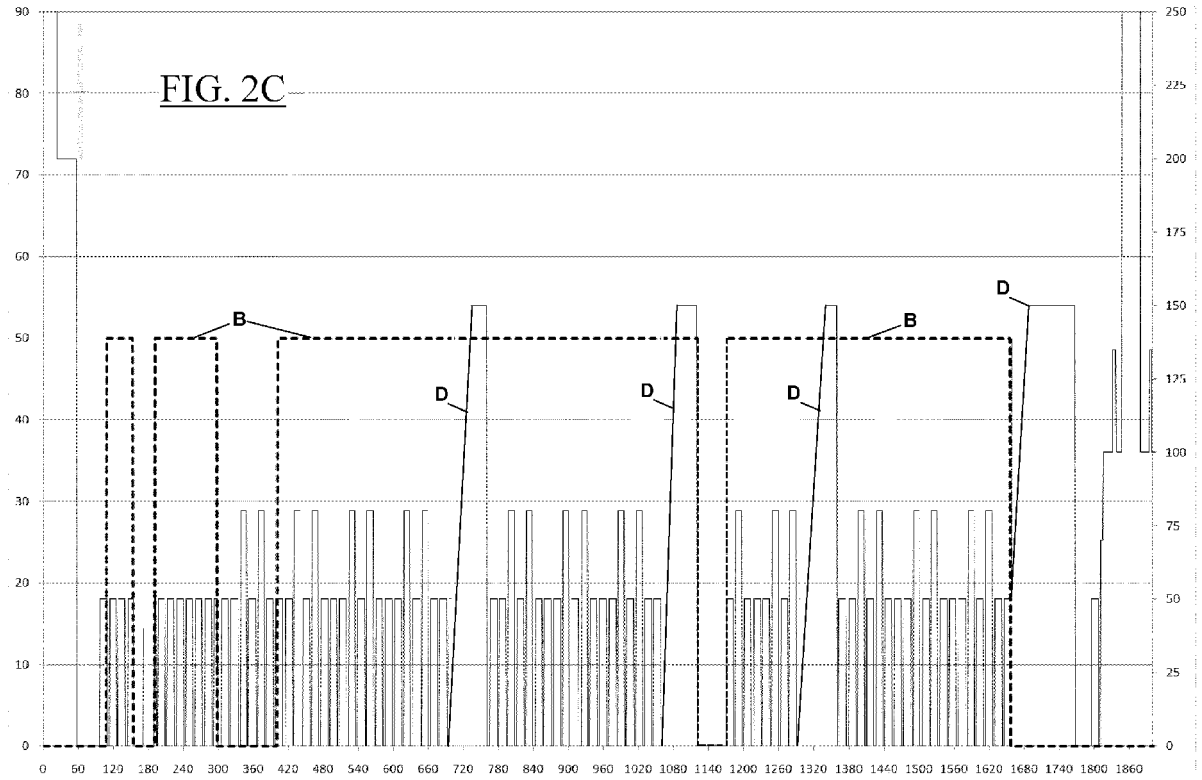

F
F
F
C
Stage 1
Stage 2
Stage 3
Stage 4
Stage 5
Stage 6
Stage 7
Stage 8
Stage 9
Stage 10
Stage 11
Stage 12
Stage 13
Stage 14

FIG. 2C


B
B
D
D
D
D
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70
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50
40
30
20
10
0
250
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200
175
150
125
100
75
50
25
0
0 60 120 180 240 300 360 420 480 540 600 660 720 780 840 900 960 1020 1080 1140 1200 1260 1320 1380 1440 1500 1560 1620 1680 1740 1800 1860

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