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(54) **A WASHING MACHINE AND THE CONTROL METHOD**

WASCHMASCHINE UND BETRIEBSVERFAHREN

MACHINE A LAVER ET PROCEDE DE COMMANDE

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Description

[0001] The present invention relates to a washing machine, which can detect the types of the laundry and a control method thereof.

5 **[0002]** In washing machines, detecting the type and amount of the laundry is important for developing control algorithms, water, energy and detergent optimization. In state-of-the-art embodiments, various methods are utilized for detecting the type of the laundry to be washed.

[0003] In state-of-the-art International Patent Application no. WO00/09792, a washing machine is described in which the type and amount of the laundry is detected by a pressure sensor and by determining the number of opening-closings of the water intake valve and the timing between the opening and closing of the water intake valve.

10 **[0004]** In state-of-the-art German Patent Application no. DE10022863, a washing machine is described which determines the amount of the water absorbed by the laundry.

[0005] In the current state-of-the-art, in European Patent no. EP709512, a description is given of a washing machine wherein the type of laundry is determined using the amount of water taken and the laundry washing speed. A washing machine according to the preamble of claim 1 is known from EP-A-0717139.

15 **[0006]** The aim of the present invention is to design a washing machine wherein washing is performed effectively by detecting the type of the laundry to be washed and a control method thereof.

[0007] The washing machine designed to fulfill the aim of the present invention is illustrated in the attached figures, where:

20 **[0008]** Figure 1 - is the side schematic view of a washing machine.

[0009] Figure 2 - is the front schematic view of a washing machine.

[0010] Figure 3 - is the flow chart of the control method of a washing machine.

[0011] Elements shown in the figures are numbered as follows:

- 25
1. Washing machine
 2. Tub
 3. Drum
 4. Pressure sensor
 5. Flow sensor

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 6. Control card
 7. Valve
 8. Memory
 9. Motor

35 **[0012]** The washing machine (1) of the present invention comprises a tub (2), a drum (3) situated inside the tub (2), rotating within the tub (2), into which the laundry is placed, a motor (9) that actuates the drum (3), a control card (6) providing the control, a valve (7) providing intake of water into the tub (2), a pressure sensor (4) which measures the pressure of the mixture inside the tub (2) during wetting of the laundry placed inside the drum (3) and a flow sensor (5) enabling the water amount determined by the pressure sensor (4) to be taken into the tub (2).

40 **[0013]** The control card (6) comprises a memory (8) in which the experimental data is stored for comparison purposes.

[0014] The water absorbing and releasing characteristics of the laundry varies with the type and amount of the laundry. The amount of water to be absorbed by certain type and amount of laundry is known. Therefore, in the embodiment of the present invention, the pressure values corresponding to the water intake for each of the wool, cotton, synthetic laundry are determined experimentally in advance. These values are compared with the pressure values measured during the method of the present invention and the type of the laundry is detected according to the compared value. According to these detections, for a certain amount of laundry, the smallest amount of water is consumed for washing synthetic fabrics, and the biggest amount of water is consumed for washing woolens. The woolen laundry absorbs more water than the cotton laundry, and the cotton laundry absorbs more water than the synthetic laundry.

45 **[0015]** In the method which is the object of the present invention, some symbols are used for the below shown purposes,

- 50
- j: laundry types index (j=Y,P,S,K..)
 - i: laundry amount index (i=1,2,3,...)
 - Xi: laundry amount
 - L_{ji}: amount of water to be used in washing Xi amount of j type laundry;

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 - (F_{pressure}) measured pressure value
 - (BN_{ji}); the expected minimum pressure value in the soaking step of Xi amount of j type laundry;
 - (BX_{ji}); the expected maximum pressure level value in the soaking step of Xi amount of j type laundry;
 - (BN_{ji} - BX_{ji}); the expected pressure interval;

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[0016] Before starting the method of the present invention, the amount of laundry (Xi) is determined by using one of the known load sensing algorithms. The amount of water that can be absorbed by certain amount of laundry (Xi) and the required water amount (Lji) to be taken in corresponding to the amount of laundry (Xi) is determined by experimental data in the amounts table (Table 1) and is stored into the memory (8). These water amounts (Lji) are taken into the washing machine (1) by way of the flow sensor (5) in an accurate manner. Since the type of the laundry is not known, the soaking procedures for wool (Y), cotton (P) and synthetic (S) laundry are employed one after another, to make the laundry to absorb an optimum amount of water taken in. The water amounts absorbed (Lji) by different amounts (Xi) of laundry is measured by the pressure sensor (4) and the type of the laundry is determined.

[0017] Table 1: A water amount table showing the amount of water to be taken into the washing machine according to the amount and type of laundry to be washed.

[0018]

Table 1

Load amount (Xi)	Wool Water amount (LYi)	Cotton Water amount (LPi)	Synthetic Water amount (LSi)	Mixed Water amount (LK _i)
X1	LY1	LP1	LS1	LK1
X2	LY2	LP2	LS2	LK2
X3	LY3	LP3	LS3	LK3
:	:	:	:	:
Xn	LYn	LPn	LSn	LKn

[0019] The memory (8) comprises the stored maximum water intake values (Lji) determined experimentally in advance for different laundry types and amounts, the decision table (Table 2) formed by the pressure (Fpressure) intervals (BNji - BXji) determined and stored in advance for each of the wool (Y), cotton (P), synthetic (S) laundry.

[0020] Table 2: It is the decision table comprising pre-determined pressure values for detecting the type of laundry according to the amount of the laundry to be washed.

[0021]

Table 2

Load amount (Xi)	Wool Pressure interval		Cotton Pressure interval		Synthetic Pressure interval		Mixed Pressure interval	
	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
X1	BNY1	BXY1	BNP1	BXP1	BNS1	BXS1	BNK1	BXK1
X2	BNY2	BXY2	BNP2	BXP2	BNS2	BXS2	BNK2	BXK2
X3	BNY3	BXY3	BNP3	BXP3	BNS3	BXS3	BNK3	BXK3
:	:	:	:	:	:	:	:	:
Xn	BNYn	BXYn	BNPn	BXPn	BNSn	BXSn	BNKn	BXKn

[0022] In the preferred embodiment of the present invention, the control card (6) provides the water amount (LYi) stored in advance in the memory (8) for the type of laundry which absorbs the maximum amount of water, for example wool, to be taken into the tub (2), and compares the measured pressure values with the pre-stored pressure intervals (BXji - BNji) in the memory (8) enabling the starting of the method of the present invention.

[0023] In the method of the present invention, the water amount (Lji) that should be taken in according to the amount of laundry (Xi) detected is taken in under the control of the flow sensor (5). In this first step of water intake, the procedure is started by taking in the wool (Y) water amount (LYi) corresponding to the measured amount of laundry. The laundry is soaked by making motor (9) movements to enable optimum amount of soaking since the type of laundry is not known. The pressure signal (F pressure) read in the waiting step is analyzed. The obtained pressure value (F pressure) is checked whether it is between BNYi and BXYi determined for the measured wool laundry amount (Xi) by the help of the decision table. If it is between these values, the laundry type is decided to be wool (Y). According to the measured pressure value (F pressure), if required for enabling optimum washing, water is taken in until reaching the water amount (LYi) determined in the table of amounts (Table 1) for the amount of laundry (Xi) measured and the main washing is started.

[0024] If the type of laundry is not wool (Y), the laundry is soaked by making the optimum motor (9) movements required for cotton laundry. The pressure sensor (4) values are read and analyzed during the waiting step. The obtained pressure value (F pressure) is checked to see if it is between BN_{Pi} and BX_{Pi} determined for the measured cotton laundry amount (X_i) by the help of the decision table (Figure 5). If it is between these values, the laundry type is decided to be cotton (P). According to the measured pressure value (F pressure), if required for enabling optimum washing, water is taken in until reaching the water amount (LP_i) determined in the table of amounts (Table 1) for the amount of laundry (X_i) measured and the main washing is started.

[0025] If the type of laundry is not cotton (P), the laundry is soaked by making the optimum motor (9) movements required for synthetic laundry. By analyzing the pressure value (F pressure) measured in the waiting step, pressure value (F pressure) is checked to see if it is between BNS_i and BXS_i by the help of the decision table (Figure 5). If it is between these values, the laundry type is decided to be synthetic (S). According to the measured pressure value (F pressure), if required for enabling optimum washing, water is taken in until reaching the water amount (LS_i) determined in the table of amounts (Table 1) for the amount of laundry (X_i) measured and the main washing is started.

[0026] If the type of laundry is not synthetic (S), it is decided that it is mixed (K). According to the measured pressure value (F pressure), if required for enabling optimum washing, water is taken in until reaching the water amount (LK_i) determined in the table of amounts (Table 1) for the amount of laundry (X_i) measured and the main washing is started.

[0027] In the control method of the present invention, the data of the flow sensor (5) and the pressure sensor (4) are utilized for detecting the laundry type. In this method, water intake into the washing machine is achieved in two basic steps. In the first step, the first water in the amount determined for wool in the water intake table is taken in according to the amount of measured laundry. In this step, the aim is to detect the type of the laundry. The water amount to be taken in is controlled in an accurate way by the flow sensor (5). After the water is taken in, the laundry is soaked by optimum motor (9) movements and the water amount absorbed and released out is analyzed by the pressure sensor (4). This information is obtained by measuring the pressure sensor (4) data. In the method of the present invention, after detecting the type of the laundry in the first phase of the water intake, the extra water required for optimum washing suitable for the type and amount of laundry is taken in and water intake step is completed and main washing is started.

[0028] As the type of the laundry is detected in the method of the present invention, other factors that might arise from different washing machine (1) models like amount of laundry (X_i), amount of water taken in (L_{ji}), washing substance (detergent), temperature, motor (9) movement parameters (rpm, duration of operating with this rpm, motor operation and motor stopping durations), and tub (2), drum (3), motor (9) water system can be effective.

[0029] In the method of the present invention, the control card (6) evaluates these factors enabling the reaching of two main aims. These two aims are the accuracy of detecting the type of the laundry and the detection duration. In the embodiment of the present invention, after water is taken into the tub (2) according to the detected laundry amount, the control card (6) enables repeating the steps of soaking, stopping, pressure measuring and comparison of measured pressure with the pressure intervals stored in the memory (8) until the measured value corresponds to one of the stored pressure intervals.

[0030] In the embodiment of the present invention, the control card (6) pressure intervals (BX_{ji} - BN_{ji}) have an order according to water absorption characteristics of the laundry and with respect to this order; the control card (6) enables the comparison of the measured pressure values until the type of the laundry is detected.

[0031] In the embodiment of the present invention, the control card (6) allows the comparison of the measured pressure values with the pressure intervals (BX_{ji} - BN_{ji}) stored in the memory (8) for a different type of laundry after each soaking, stopping step.

[0032] In the embodiment of the present invention, the control card (6) provides the execution of the soaking, stopping and comparison of the pressure values steps as much as the number of the type of laundry detected.

[0033] In the preferred embodiment of the present invention, the control card (6) provides going on to the stopping step after water is taken into the tub (2) according to the detected laundry amount, measuring the pressure by the pressure sensor (8) after each soaking and stopping step and comparing the measured pressure values with the pressure intervals (BX_{ji} - BN_{ji}) stored in the memory (8) for the amount and type of laundry, deciding on the type of the laundry when the measured pressure value is within the stored pressure interval (BX_{ji} - BN_{ji}), if the type decision can not be made, repeating the steps of soaking, stopping and measuring pressure until a decision is made and comparing the new pressure value with the pressure intervals (BX_{ji} - BN_{ji}) stored in the memory (8) for a different type of laundry, if necessary taking water into the tub (2) in the amount determined in advance according to the amount of laundry and stored in the memory (8) according to the decision made on the type, and going on to the main washing step.

[0034] The control method of the present invention comprises following steps:

- Starting the algorithm (100)
- Measuring (201) the amount of the laundry (X_i)
- Reading (202) the amount of water (LY_i) required to be taken in for the measured amount of laundry (X_i) from the memory (8)

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- Opening the valve (7), taking in (L_{ji}) amount of water into the tub (2) (203) under the control of the flow sensor (5)
- comparing (204) the water amount (L_{ji}) taken in with the amount (LY_i) read from the memory (8),
- If the water amount (L_{ji}) taken in is less than the amount (LY_i) read from the memory (8), returning back to water intake step (203);
- 5 - If the water amount (L_{ji}) taken in is equal to or more than the amount (LY_i) read from the memory (8), closing (205) the valve (7),
- Activating the drum (3), starting laundry soaking process (206) for a laundry soaking duration (tc) preset by the producer,
- After the laundry soaking duration (tc), stopping the activation of the drum (3) for a the waiting period (tb1) set by
- 10 the producer and waiting (207),
- Taking measurements (208) with the pressure sensor (4),
- Comparing (209) the value measured (F pressure) by the pressure sensor (4) with the highest wool pressure value BXY_i and the lowest wool pressure value BNY_i determined by the producer for the amount of laundry measured,
- If the value measured by the pressure sensor (4) is between the highest wool pressure BXY_i and the lowest wool
- 15 pressure BNY_i determined by the producer, detecting (210) the laundry type as "wool" (Y),
- After detecting (210) the laundry type as "wool" going on to a second water intake step (700),
- Starting the second water intake step (700), taking in the optimum amount of water (701) for washing the laundry, the amount and type of which is known,
- After taking in extra water, going on to a main washing step (702)
- 20 - If the value (Fpressure) measured by the pressure sensor (4) is not between the highest wool pressure value BXY_i and the lowest wool pressure value BNY_i determined by the producer, executing a second soaking step (401) for determining the type of the laundry,
- After soaking the laundry, stopping the activation of the drum (3) for a waiting period (tb2) set by the producer and waiting (402),
- 25 - Taking measurements (403) with the pressure sensor (4),
- Comparing (404) the value measured (F pressure) by the pressure sensor (4) with the BXP_i and BNP_i determined by the producer for the amount of laundry (X_i) measured,
- If the value measured (F pressure) by the pressure sensor (4) is between the BXP_i and BNP_i determined by the producer, detecting (405) the type of laundry as "cotton" (P),
- 30 - After detecting the type of laundry as "cotton" (P) (505), going on to a second water intake step (700),
- Starting the second water intake step (700), taking in the necessary optimum amount of water (701) for washing the laundry, the amount and type of which is known,
- After taking in extra water, going on to a main washing step (702)
- If the value measured (F pressure) by the pressure sensor (4) is not between the BXP_i and BNP_i determined by the
- 35 producer, starting a third soaking step (501) for determining the type of the laundry,
- After soaking the laundry, stopping the activation of the drum (3) for a waiting period (tb3) set by the producer and waiting (502),
- Taking measurements (503) with the pressure sensor (4)
- Comparing the value measured (F pressure) by the pressure sensor (4) with the BXS_i and BNS_i determined by the
- 40 producer for the amount of laundry (X_i) measured,
- If the value measured (F pressure) by the pressure sensor (4) is between the BXS_i and BNS_i, detecting the type of laundry as "synthetic" (S) (405), going on to a second water intake step (700),
- Starting the second water intake step (700), taking in the necessary optimum amount of water (701) for washing the laundry, the amount and type of which is known,
- 45 - After taking in extra water, going on to a main washing step (702)
- If the value measured (F pressure) by the pressure sensor (4) is not between the BXS_i and BNS_i determined by the producer for the amount of laundry measured, deciding on (600) the type of laundry as "mixed" (K),
- After detecting (600) the type of laundry as "mixed" (K), going on to a second water intake step (700),
- Starting the second water intake step (700), taking in the necessary optimum amount of water (701) for washing
- 50 the laundry, the amount and type of which is known,
- After taking in extra water, going on to a main washing step (702).

[0035] In another embodiment of the present invention, the control card (6) provides the measuring of the pressure values of the amount of water absorbed and released out by the laundry and the timing of absorbing-releasing water, comparing the measured pressure and timing values with the pre-set pressure values and water intake and release timings of the measured laundry amount stored in the memory (8) and deciding on the type of laundry during the step of soaking the laundry with optimum motor (9) movements after taking in water for the accurate detection of the laundry type. In this embodiment, laundry water discharge speed data is used for decision of laundry type, especially for cotton

and synthetic types.

[0036] With the embodiment of the present invention, it is possible to detect the type of laundry to be washed accurately without data input by the user and taking the appropriate amount of water in according to the detected amount and type. Consequently the water intake duration into the washing/drying machine (1) is reduced, optimizing time, water and energy, enabling optimum washing and developing mechanical movements suitable for the amount and type of laundry to be washed. Furthermore probable user errors are avoided and ease of use is achieved for the user.

Claims

1. A washing machine (1) comprising a tub (2), a drum (3) situated and rotating inside the tub (2), into which the laundry is placed, a motor (9) which actuates the drum (3), a control card (6) providing control, a valve (7) providing intake of water into the tub (2), a pressure sensor (4) which measures the pressure of the mixture in the tub (2), a flow sensor (5) enabling the water amount determined by the pressure sensor (4) to be taken into the tub (2) and **characterized by** a control card (6) which after water is taken into the tub (2) enables the repeating of the steps of soaking, stopping, pressure measuring and comparison of the measured pressure value with pressure intervals stored in a memory (8) until the measured value corresponds to one of the stored pressure intervals.
2. A washing machine (1) as in Claim 1, **characterized in that** the control card (6) provides starting the soaking by taking the amount of water into the tub (2) which is stored in the memory (8) in advance for the laundry type that absorbs the most amount of water.
3. A washing machine (1) as in Claim 1 to 2, **characterized in that** the control card (6) first provides the comparison of the pressure interval (BX_{ji} - BN_{ji}) that is stored in the memory (8) for the laundry type that absorbs the most water with the measured pressure values.
4. A washing machine (1) as in Claim 1 to 3, **characterized in that** the control card (6) provides the pressure intervals (BX_{ji} - BN_{ji}) to be arranged according to the water absorbing characteristics of the laundry and compares the measured pressure values with these pressure intervals (BX_{ji} - BN_{ji}) until the type of laundry is detected according to this arrangement.
5. A washing machine (1) as in Claim 1 to 4, **characterized in that** the control card (6) provides the comparison of the pressure intervals (BX_{ji} - BN_{ji}) stored in the memory (8) for a different type of laundry with the measured pressure values after each soaking, stopping step.
6. A washing machine (1) as in Claim 1 to 5, **characterized in that** the control card (6) provides the execution of steps like soaking, stopping and comparison of pressure values as much as the number of determined laundry types.
7. A washing machine (1) as in Claim 1 to 6, **characterized in that** the control card (6) provides going on to the stopping step after water is taken into the tub (2) according to the detected laundry amount, measuring the pressure by the pressure sensor (8) after each soaking and stopping step and comparing the measured pressure values with the pressure intervals (BX_{ji} - BN_{ji}) stored in the memory (8) for the amount and type of laundry, deciding on the type of the laundry when the measured pressure value is within the stored pressure interval (BX_{ji} - BN_{ji}), if the type decision could not be made, repeating the steps of soaking, stopping and measuring pressure until the decision is made and comparing the new pressure value with the pressure intervals (BX_{ji} - BN_{ji}) stored in the memory (8) for a different type of laundry, if necessary taking in water into the tub (2) in the amount determined in advance according to the amount of laundry stored in the memory (8) according to the decision made on the type and going on to the main washing step.
8. A washing machine (1) as in Claim 1 to 7, **characterized in that** the control card (6) provides taking the first water into the tub (2) in the amount stored in the memory (8) for wool water intake amount (LY_i) for the amount of laundry detected.
9. Control method for a washing machine (1) as in any one of the above claims comprising the steps of: Starting an algorithm (100); Measuring (201) the amount of the laundry (Xi) ; Reading (202) from the memory (8) the amount of water (LY_i) required to be taken in for the measured amount of laundry (Xi); Opening the valve (7), taking in (L_{ji}) amount of water into the tub (2) (203) under the control of the flow sensor (5); comparing (204) the water amount (L_{ji}) taken in with the amount (LY_i) read from the memory (8) ; If the water amount (L_{ji}) taken in is less than the

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amount (LY_i) read from the memory (8), returning back to water intake step (203); If the water amount (L_{ji}) taken in is equal to or more than the amount (LY_i) read from the memory (8), closing (205) the valve (7) ; Activating the drum (3) and starting laundry soaking process (206) for a laundry soaking duration (t_c) preset by the producer; After the laundry soaking duration (t_c), stopping the activation of the drum (3) for a waiting period (t_{b1}) set by the producer and waiting (207); Taking measurements (208) with the pressure sensor (4); Comparing (209) the value measured (F pressure) by the pressure sensor (4) with the highest wool pressure value BXY_i and the lowest wool pressure value BNY_i determined by the producer for the amount of laundry measured; If the value measured by the pressure sensor (4) is between the highest wool pressure value BXY_i and the lowest wool pressure value BNY_i determined by the producer, detecting (210) the laundry type as "wool" (Y); After detecting (210) the laundry type as "wool" going on to a second water intake step (700); Starting the second water taking step (700), taking in the necessary optimum amount of water (701) for washing the laundry, the amount and type of which is known; After taking in extra water going on to a main washing step (702); If the value (Fpressure) measured by the pressure sensor (4) is not between the highest wool pressure value BXY_i and the lowest wool pressure value BNY_i determined by the producer, executing a second soaking step (401) for determining the type of the laundry; After soaking the laundry, stopping the activation of the drum (3) for a waiting period (t_{b2}) set by the producer and waiting (402); Taking measurements (403) with the pressure sensor (4); Comparing (404) the value measured (F pressure) by the pressure sensor (4) with the BXP_i and BN_{Pi} determined by the producer for the amount of laundry (X_i) measured; If the value measured (F pressure) by the pressure sensor (4) is between the BXP_i and BN_{Pi} determined by the producer, detecting (405) the type of laundry as "cotton" (P); After detecting (505) the type of laundry as "cotton" (P) (505), going on to a second water intake step (700); Starting the second water intake step (700), taking in the necessary optimum amount of water (701) for washing the laundry, the amount and type of which is known; After taking in extra water going on to a main washing step (702). If the value measured (F pressure) by the pressure sensor (4) is not between the BXP_i and BN_{Pi} determined by the producer, starting a third soaking step (501) for determining the type of the laundry; After soaking the laundry, stopping the activation of the drum (3) for a waiting period (t_{b3}) set by the producer and waiting (502); Taking measurements (503) with the pressure sensor (4); Comparing (504) the value measured (F pressure) by the pressure sensor (4) with the BXS_i and BNS_i determined by the producer for the amount of laundry (X_i) measured; If the value measured (F pressure) by the pressure sensor (4) is between the BXS_i and BNS_i, detecting the type of laundry as "synthetic" (S) (405), going on to a second water intake step (700); Starting the second water intake step (700), taking in the necessary optimum amount of water (701) for washing the laundry, the amount and type of which is known. After taking in extra water going on to a main washing step (702). If the value measured (F pressure) by the pressure sensor (4) is not between the BXS_i and BNS_i determined by the producer for the amount of laundry measured, deciding on (600) the type of laundry as "mixed" (K); After detecting (600) the type of laundry as "mixed" (K), going on to a second water intake step (700); Starting the second water intake step (700), taking in the necessary optimum amount of water (701) for washing the laundry, the amount and type of which is known; After taking in extra water going on to a main washing step (702).

Patentansprüche

1. Waschmaschine (1), umfassend einen Laugenbehälter (2), eine Trommel (3), die im Laugenbehälter (2) angeordnet ist und sich darin dreht, und in die die Wäsche gegeben wird, einen Motor (9), der die Trommel (3) antreibt, eine Steuerungskarte (6), die die Steuerung vorsieht, ein Ventil (7), das das Einlassen von Wasser in den Laugenbehälter (2) ermöglicht, einen Drucksensor (4), der den Druck des Gemischs im Laugenbehälter (2) misst, einen Durchflusssensor (5), der es ermöglicht, die vom Drucksensor (4) bestimmte Wassermenge in den Laugenbehälter (2) einzulassen, und **dadurch gekennzeichnet, dass** die Steuerungskarte (6) es ermöglicht, nach dem Einlassen von Wasser in den Laugenbehälter (2) die Schritte des Einweichens, Anhaltens, Druckmessens und Vergleichens des gemessenen Druckwertes mit Druckintervallen, die in einem Speicher (8) gespeichert sind, zu wiederholen, bis der gemessene Wert einem der gespeicherten Druckintervalle entspricht.
2. Waschmaschine (1) nach Anspruch 1, **dadurch gekennzeichnet, dass** die Steuerungskarte (6) vorsieht, das Einweichen zu starten, indem sie die Menge an Wasser in den Laugenbehälter (2) einlässt, die zuvor für den Wäschetyp, der die größte Menge an Wasser absorbiert, im Speicher (8) gespeichert wurde.
3. Waschmaschine (1) nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** die Steuerungskarte (6) zunächst vorsieht, das Druckintervall (BX_{ji} - BN_{ji}), das im Speicher (8) für den Wäschetyp, der die größte Menge an Wasser absorbiert, gespeichert wurde, mit den gemessenen Druckwerten zu vergleichen.
4. Waschmaschine (1) nach den Ansprüchen 1 bis 3, **dadurch gekennzeichnet, dass** die Steuerungskarte (6) vor-

sieht, dass die Druckintervalle (BX_{ji} - BN_{ji}) entsprechend den Wasserabsorptionseigenschaften der Wäsche angeordnet sind, und die gemessenen Druckwerte mit diesen Druckintervallen (BX_{ji} - BN_{ji}) vergleicht, bis der Wäschetyp detektiert wird, der dieser Anordnung entspricht.

- 5 5. Waschmaschine (1) nach den Ansprüchen 1 bis 4, **dadurch gekennzeichnet, dass** die Steuerungskarte (6) vorsieht, nach jedem Einweich- und Anhalteschritt die Druckintervalle (BX_{ji} - BN_{ji}), die im Speicher (8) für einen anderen Wäschetyp gespeichert sind, mit den gemessenen Druckwerten zu vergleichen.
- 10 6. Waschmaschine (1) nach den Ansprüchen 1 bis 5, **dadurch gekennzeichnet, dass** die Steuerungskarte (6) die Ausführung der Schritte wie Einweichen, Anhalten und Vergleichen von Druckwerten in einer Zahl vorsieht, die der Anzahl der bestimmten Wäschetypen entspricht.
- 15 7. Waschmaschine (1) nach den Ansprüchen 1 bis 6, **dadurch gekennzeichnet, dass** die Steuerungskarte (6) vorsieht, zum Anhalteschritt überzugehen, nachdem das Wasser entsprechend der detektierten Wäschemenge in den Laugenbehälter (2) eingelassen wurde, den Druck nach jedem Einweich- und Anhalteschritt mittels des Drucksensors (8) zu messen und die gemessenen Druckwerte mit den Druckintervallen (BX_{ji} - BN_{ji}) zu vergleichen, die im Speicher (8) für die Menge und den Typ der Wäsche gespeichert sind, den Wäschetyp zu erkennen, wenn der gemessene Druckwert innerhalb des gespeicherten Druckintervalls (BX_{ji} - BN_{ji}) liegt, im Falle der Unmöglichkeit einer Erkennung die Schritte des Einweichens, Anhaltens und Druckmessens zu wiederholen, bis die Erkennung erfolgt, und den neuen Druckwert mit den Druckintervallen (BX_{ji} - BN_{ji}) zu vergleichen, die im Speicher (8) für einen anderen Wäschetyp gespeichert sind, bei Bedarf entsprechend der Wäschemenge, die im Speicher (8) gespeichert ist, aufgrund der Erkennung des Typs Wasser in der im Voraus festgelegten Menge in den Laugenbehälter (2) einzulassen, und zum Hauptwaschschritt überzugehen.
- 20 8. Waschmaschine (1) nach den Ansprüchen 1 bis 7, **dadurch gekennzeichnet, dass** die Steuerungskarte (6) vorsieht, das erste Wasser in derjenigen Menge in den Laugenbehälter (2) einzulassen, die im Speicher (8) für die Einlassmenge für Wolle (LY_i) gespeichert ist, und zwar für die detektierte Wäschemenge.
- 25 9. Steuerungsverfahren für eine Waschmaschine (1) nach einem der vorangehenden Ansprüche, folgende Schritte umfassend: Starten eines Algorithmus (100); Messen (201) der Wäschemenge (X_i); Auslesen (202) der Wassermenge (LY_i) für die gemessene Wäschemenge (X_i), die eingelassen werden muss, aus dem Speicher (8); Öffnen des Ventils (7), Einlassen der Wassermenge (L_{ji}) in den Laugenbehälter (2) (203) unter Steuerung durch den Durchflusssensor (5); Vergleichen (204) der eingelassenen Wassermenge (L_{ji}) mit der Menge (LY_i), die aus dem Speicher (8) ausgelesen wurde; wenn die eingelassene Wassermenge (L_{ji}) unter der Menge (LY_i) liegt, die aus dem Speicher (8) ausgelesen wurde, Zurückkehren zum Schritt des Einlassens des Wassers (203); wenn die eingelassene Wassermenge (L_{ji}) gleich wie oder größer als die Menge (LY_i) ist, die aus dem Speicher (8) ausgelesen wurde, Schließen (205) des Ventils (7); Aktivieren der Trommel (3) und Starten des Wäscheeinweichvorgangs (206) für eine Wäscheeinweichdauer (t_c), die vom Hersteller voreingestellt wurde; nach der Wäscheeinweichdauer (t_c), Anhalten der Aktivierung der Trommel (3) für eine Warteperiode (t_{b1}), die vom Hersteller eingestellt wurde, und Warten (207); Durchführen von Messungen (208) mit dem Drucksensor (4); Vergleichen (209) des durch den Drucksensor (4) gemessenen Wertes (F Druck) mit dem höchsten Wolldruckwert BXY_i und dem niedrigsten Wolldruckwert BNY_i, die vom Hersteller für die gemessene Wäschemenge festgelegt wurden; wenn der vom Drucksensor (4) gemessene Wert zwischen dem höchsten Wolldruckwert BXY_i und dem niedrigsten Wolldruckwert BNY_i liegt, die vom Hersteller festgelegt wurden, Detektieren (210) des Wäschetyps als "Wolle" (Y); nach dem Detektieren (210) des Wäschetyps als "Wolle" Übergehen zu einem zweiten Wassereinlassschritt (700); Starten des zweiten Wassereinlassschritts (700), Einlassen der benötigten optimalen Wassermenge (701) zum Waschen der Wäsche, deren Menge und Typ bekannt sind; nach dem Einlassen von zusätzlichem Wasser Übergehen zu einem Hauptwaschschritt (702); wenn der Wert (F Druck), der vom Drucksensor (4) gemessen wurde, nicht zwischen dem höchsten Wolldruckwert BXY_i und dem niedrigsten Wolldruckwert BNY_i liegt, die vom Hersteller festgelegt wurden, Ausführen eines zweiten Einweichschritts (401) zum Bestimmen des Wäschetyps; nach dem Einweichen der Wäsche, Anhalten der Aktivierung der Trommel (3) für eine Warteperiode (t_{b2}), die vom Hersteller eingestellt wurde, und Warten (402); Durchführen von Messungen (403) mittels des Drucksensors (4); Vergleichen (404) des vom Drucksensor (4) gemessenen Wertes (F Druck) mit BXP_i und BN_{Pi}, die vom Hersteller für die gemessene Wäschemenge (X_i) festgelegt wurden; wenn der vom Drucksensor (4) gemessene Wert (F Druck) zwischen BXP_i und BN_{Pi}, die vom Hersteller festgelegt wurden, liegt, Detektieren (405) des Wäschetyps als "Baumwolle" (P); nach dem Detektieren (505) des Wäschetyps als "Baumwolle" (P) (505), Übergehen zum zweiten Wassereinlassschritt (700); Starten des zweiten Wassereinlassschritts (700), Einlassen der benötigten optimalen Wassermenge (701) zum Waschen der Wäsche, deren Menge und Typ bekannt sind; nach dem Einlassen von zusätzlichem Wasser Übergehen zu einem
- 30 35 40 45 50 55

Hauptwaschschritt (702); wenn der Wert (F Druck), der vom Drucksensor (4) gemessen wurde, nicht zwischen BXPi und BNPi liegt, die vom Hersteller festgelegt wurden, Starten eines dritten Einweichschritts (501) zum Bestimmen des Wäschetyps; nach dem Einweichen der Wäsche, Anhalten der Aktivierung der Trommel (3) für eine Warteperiode (tb3), die vom Hersteller eingestellt wurde, und Warten (502); Durchführen von Messungen (503) mittels des Drucksensors (4); Vergleichen (504) des vom Drucksensor (4) gemessenen Wertes (F Druck) mit dem BXSi und dem BNSi, die vom Hersteller für die gemessene Wäschemenge (Xi) festgelegt wurden; wenn der vom Drucksensor (4) gemessene Wert (F Druck) zwischen BXSi und BNSi liegt, Detektieren (505) des Wäschetyps als "Synthetik" (S) (405), Übergehen zu einem zweiten Wassereinlassschritt (700); Starten des zweiten Wassereinlassschritts (700), Einlassen der benötigten optimale Wassermenge (701) zum Waschen der Wäsche, deren Menge und Typ bekannt sind; nach dem Einlassen von zusätzlichem Wasser Übergehen zu einem Hauptwaschschritt (702); wenn der Wert (F Druck), der vom Drucksensor (4) gemessen wurde, nicht zwischen BXSi und BNSi liegt, die vom Hersteller für die gemessene Wäschemenge (Xi) festgelegt wurden, Erkennen (600) über den Wäschetyp als "gemischt" (K); nach dem Erkennen (600) des Wäschetyps als "gemischt" (K), Übergehen zu einem zweiten Wassereinlassschritt (700); Starten des zweiten Wassereinlassschritts (700), Einlassen der benötigten optimale Wassermenge (701) zum Waschen der Wäsche, deren Menge und Typ bekannt sind; nach dem Einlassen von zusätzlichem Wasser Übergehen zu einem Hauptwaschschritt (702).

Revendications

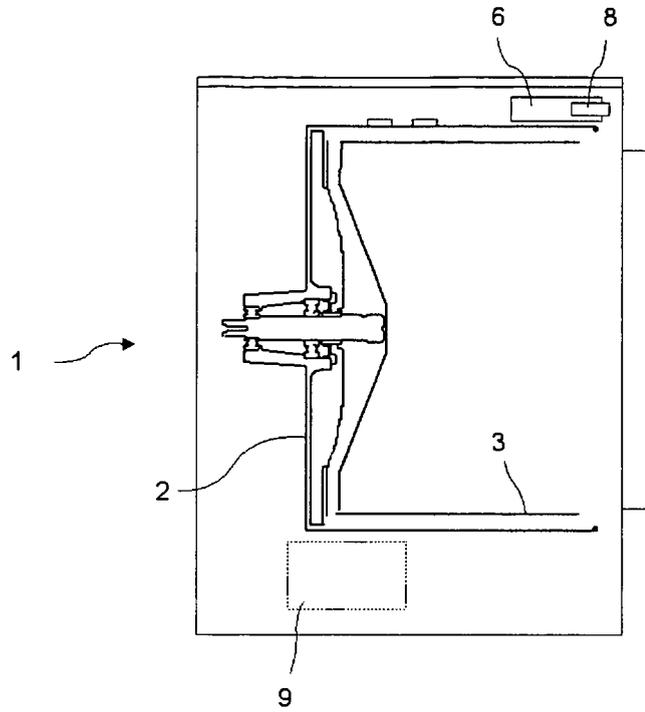
1. Une machine à laver (1) comprenant une cuve (2), un tambour (3) situé et tournant dans la cuve (2), dans lequel le linge est placé, un moteur (9) qui met en marche le tambour (3), une carte de contrôle (6) assurant le contrôle, une soupape (7) assurant la prise d'eau dans la cuve (2), un capteur de pression (4) qui mesure la pression du mélange dans la cuve (2), un capteur de flux (5) permettant la quantité d'eau déterminée par le capteur de pression (4) d'être prise dans la cuve (2) et **caractérisée par** la carte de contrôle (6) qui, après l'eau est prise dans la cuve (2), permet la répétition des étapes de trempage, arrêt, mesure de pression et comparaison de la valeur de pression mesurée avec les intervalles de pression stockés dans une mémoire (8) jusqu'à ce que la valeur mesurée correspond à un des intervalles de pression stockés.
2. Une machine à laver (1) selon la Revendication 1, **caractérisée en ce que** la carte de contrôle (6) permettant le démarrage de trempage en prenant la quantité d'eau dans la cuve (2) qui est stockée dans la mémoire (8) à l'avance pour le type de linge qui absorbe la quantité d'eau la plus grande.
3. Une machine à laver (1) selon la Revendication 1 et 2, **caractérisée en ce que** la carte de contrôle (6) permettant la comparaison de l'intervalle de pression (BXji - BNji) qui est stocké dans la mémoire (8) pour le type de linge qui absorbe la quantité d'eau la plus grande avec les valeurs de pression mesurées.
4. Une machine à laver (1) selon l'une quelconque des Revendications de 1 à 3, **caractérisée en ce que** la carte de contrôle (6) permet les intervalles de pression (BXji - BNji) d'être arrangés selon les caractéristiques d'absorption d'eau du linge et compare les valeurs de pression mesurées avec lesdits intervalles de pression (BXji - BNji) jusqu'à ce que le type de linge est détecté selon cette disposition.
5. Une machine à laver (1) selon l'une quelconque des Revendications de 1 à 4, **caractérisée en ce que** la carte de contrôle (6) permettant la comparaison des intervalles de pression (BXji - BNji) stockés dans la mémoire (8) pour un autre type de linge avec les valeurs de pression mesurées après chaque étape de trempage et d'arrêt.
6. Une machine à laver (1) selon l'une quelconque des Revendications de 1 à 5, **caractérisée en ce que** la carte de contrôle (6) permet les exécutions des étapes comme trempage, arrêt et comparaison des valeurs de pression autant que le nombre des types de linge déterminés.
7. Une machine à laver (1) selon l'une quelconque des Revendications de 1 à 6, **caractérisée en ce que** la carte de contrôle (6) permet de passer à l'étape d'arrêt après l'eau est prise dans la cuve (2) selon la quantité de linge détectée, de mesurer la pression par le capteur de pression (8) après chaque étape de trempage et arrêt et de comparer les valeurs de pression mesurées avec les intervalles de pression (BXji - BNji) stockés dans la mémoire (8) pour la quantité et type de linge, de décider du type de linge quand la valeur de pression mesurée est dans l'intervalle de pression stocké (BXji - BNji), si la décision de type ne pouvait pas être faite, de répéter les étapes de trempage, arrêt et mesure de pression jusqu'à ce que la décision est faite et comparer la nouvelle valeur de pression avec les intervalles de pression (BXji - BNji) stockés dans la mémoire (8) pour un autre type de linge, si nécessaire,

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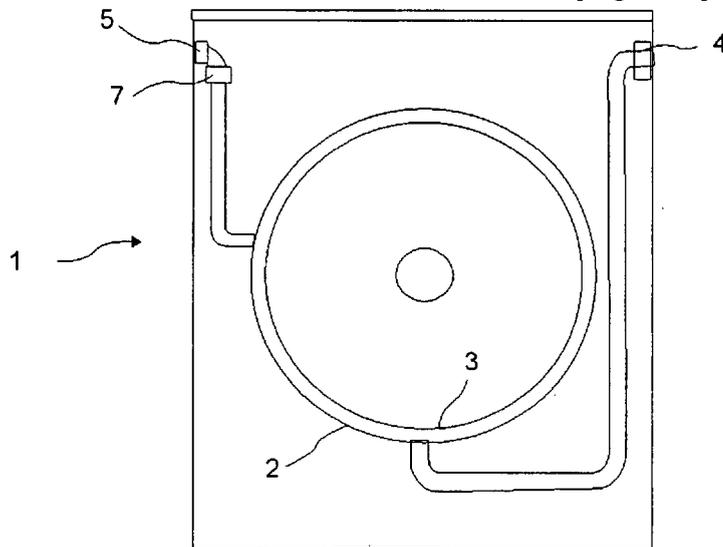
de prendre l'eau dans la cuve (2) à la quantité déterminée à l'avance selon la quantité de linge stocké dans la mémoire (8) conformément à la décision prise sur le type et de passer à l'étape de lavage principal.

- 5 8. Une machine à laver (1) selon l'une quelconque des Revendications de 1 à 7, **caractérisée en ce que** la carte de contrôle (6) permettant la première prise de l'eau dans la cuve (2) à la quantité stockée dans la mémoire (8) pour la quantité de prise d'eau de laine (LYi) pou la quantité de linge détectée.
- 10 9. Une méthode de contrôle pour une machine à laver (1) selon l'une quelconque des Revendications précédentes, comprenant les étapes de: Démarrant un algorithme (100) ; Mesurant (201) la quantité de linge (Xi) ; Lisant (202) de la mémoire (8) la quantité de l'eau (LYi) qui est nécessaire d'être prise pour la quantité de linge mesurée (Xi) ; ouvrant la soupape (7), prenant la quantité de l'eau (Lji) dans la cuve (2) (203) sous la contrôle du capteur de flux (5) ; Comparant (204) la quantité de l'eau (Lji) prise avec la quantité (LYi) lue de la mémoire (8) ; Si la quantité de l'eau (Lji) prise est moins que la quantité (LYi) lue de la mémoire (8), retournant à l'étape de prise d'eau (203) ; Si la quantité de l'eau (Lji) prise est égale ou supérieure à la quantité (LYi) lue de la mémoire (8), fermant (205) la soupape (7) ; Mettant en marche (3) et démarrant le processus de lavage de linge (206) pour une durée de trempage de linge (tc) pré réglée par le producteur ; Après la durée de trempage de linge (tc), arrêtant le tambour (3) pour une période d'attente (tb1) pré réglé par le producteur et attendant (207) ; Mesurant (208) au moyen du capteur de pression (4) ; Comparant (209) la valeur mesurée (F pression) par le capteur de pression (4) avec la valeur la plus élevée de pression de laine BXYi et la valeur la plus basse de pression de laine BNYi déterminées par le producteur pour la quantité de linge mesurée ; Si la valeur mesurée par le capteur de pression (4) est entre la valeur la plus élevée de pression de laine BXYi et la valeur la plus basse de pression de laine BNYi déterminées par le producteur, détectant (210) le type de linge comme « laine » (Y) ; Après détectant (210) le type de linge comme « laine » (Y) passant à une seconde étape de prise d'eau (700) ; Démarrant la seconde étape de prise d'eau (700), prenant la quantité optimale d'eau nécessaire (701) pour le lavage de linge, la quantité et le type duquel sont connus ; Après prenant l'eau supplémentaire, passant à l'étape de lavage principal (702) ; Si la valeur (F pression) mesurée par le capteur de pression (4) n'est pas entre la valeur la plus élevée de pression de laine BXYi et la valeur la plus basse de pression de laine BNYi déterminées par le producteur, démarrant une seconde étape de trempage (401) pour la détermination du type de linge ; Après le trempage de linge, arrêtant le tambour (3) pour une période d'attente (tb2) pré réglé par le producteur et attendant (402) ; Mesurant (403) au moyen du capteur de pression (4) ; Comparant (404) la valeur mesurée (F pression) par le capteur de pression (4) avec BXPi et BNPi déterminés par le producteur pour la quantité de linge (Xi) mesurée ; Si la valeur mesurée par le capteur de pression (4) est entre BXPi et BNPi déterminées par le producteur, détectant (405) le type de linge comme « coton » (P) ; Après détectant (505) le type de linge comme « coton » (P) (505), passant à une seconde étape de prise d'eau (700) ; Démarrant la seconde étape de prise d'eau (700), prenant la quantité optimale d'eau nécessaire (701) pour le lavage de linge, la quantité et le type duquel sont connus ; Après prenant l'eau supplémentaire, passant à l'étape de lavage principal (702) ; Si la valeur (F pression) mesurée par le capteur de pression (4) n'est pas entre BXPi et BNPi déterminées par le producteur, démarrant une troisième étape de trempage (501) pour la détermination du type de linge ; Après le trempage de linge, arrêtant le tambour (3) pour une période d'attente (tb3) pré réglé par le producteur et attendant (502) ; Mesurant (503) au moyen du capteur de pression (4) ; Comparant (504) la valeur mesurée (F pression) par le capteur de pression (4) avec BXS_i et BNS_i déterminés par le producteur pour la quantité de linge (Xi) mesurée ; Si la valeur mesurée par le capteur de pression (4) est entre BXS_i et BNS_i déterminées par le producteur, détectant le type de linge comme « synthétique » (S) (405), passant à une seconde étape de prise d'eau (700) ; Démarrant la seconde étape de prise d'eau (700), prenant la quantité optimale d'eau nécessaire (701) pour le lavage de linge, la quantité et le type duquel sont connus ; Après prenant l'eau supplémentaire, passant à l'étape de lavage principal (702) ; Si la valeur (F pression) mesurée par le capteur de pression (4) n'est pas entre BXS_i et BNS_i déterminées par le producteur, détectant (600) le type de linge comme « mixtes » (K) ; Après détectant (600) le type de linge comme « mixtes » (K), passant à une seconde étape de prise d'eau (700) ; Démarrant la seconde étape de prise d'eau (700), prenant la quantité optimale d'eau nécessaire (701) pour le lavage de linge, la quantité et le type duquel sont connus ; Après prenant l'eau supplémentaire, passant à l'étape de lavage principal (702).

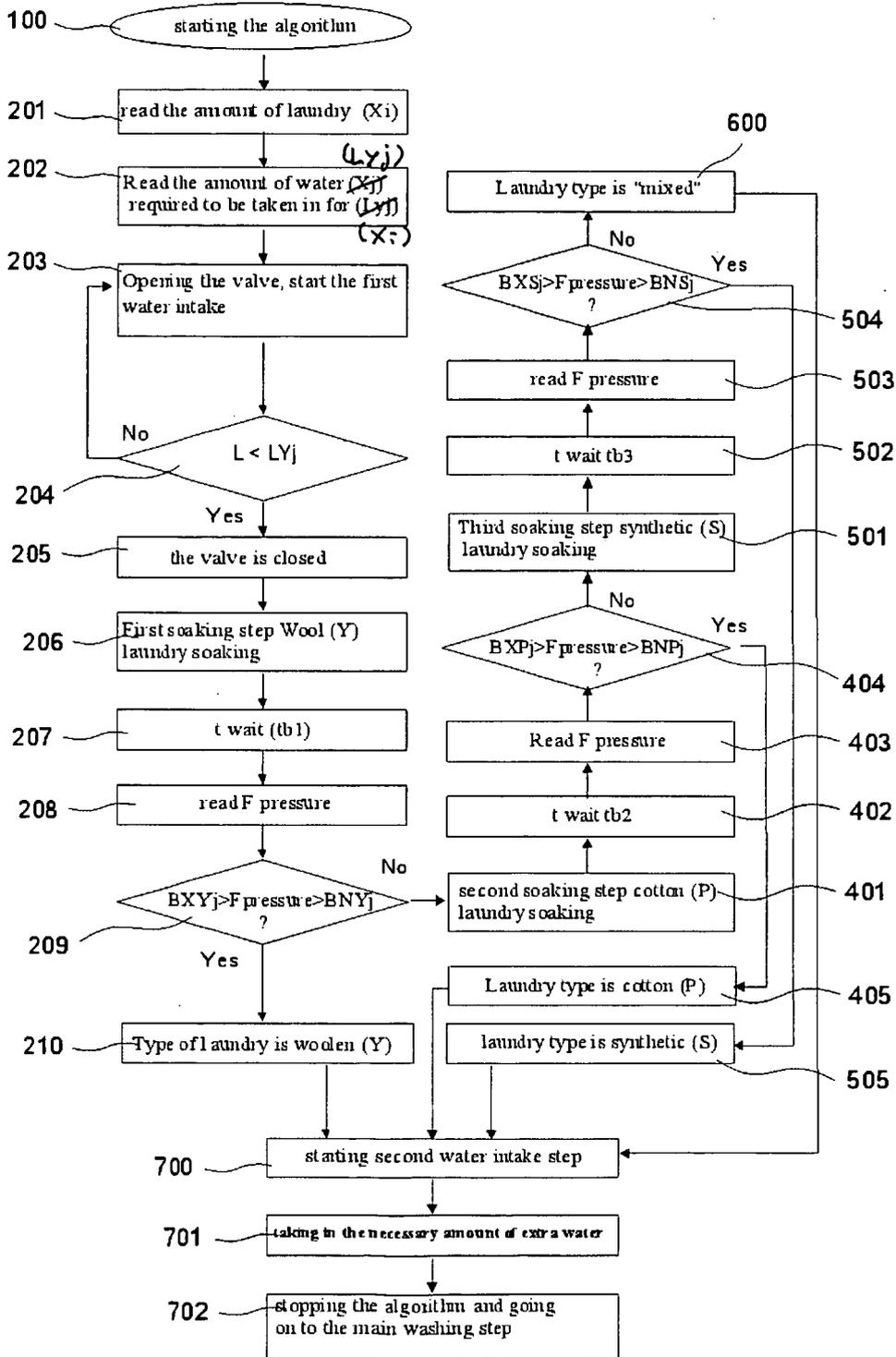
[Fig. 001]



[Fig. 002]



[Fig. 003]



REFERENCES CITED IN THE DESCRIPTION

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