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(54) **Method for determining the quantity and/or the type of fabric introduced in a laundry washing machine, and laundry washing machine implementing such a method**

Verfahren und Vorrichtung zum Erfassen der Wäschemenge und/oder der Wäscheart in einer Waschmaschine

Procédé et dispositif pour déterminer la quantité et/ou le type de linge dans une machine à laver

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Description

[0001] The present invention refers to a method for determining the **type, or the type and the quantity**, of fabric introduced in a laundry washing machine, and to a laundry washing machine implementing such a method.

[0002] It is known to indirectly verify the quantity of clothes to be washed by measuring, with a turbine flow meter (of the type based on the Hall effect or infrared rays) being associated to a microprocessor, the quantity of water introduced in the laundry washing machine.

[0003] Said partial solution however has the drawback of requiring at least one costly additional components, with respect to those normally present in a laundry washing machine, with the consequent increase in cost.

[0004] Other known methods for measuring the weight of clothes in a laundry washing machine are the following:

- method of measuring the electric current (that is in relation with the torque) absorbed by the motor of the laundry washing machine, in order to place the basket with the clothes to be washed in motion;
- method of measuring the energy necessary for passing from a certain inertial state, being defined by a certain speed of the basket of the laundry washing machine, to another inertial state, being defined by a different speed of the same basket.

[0005] The measuring of the weight realised with said methods however have the drawback of being uncertain, due to the basket mass (which are of the same order as the clothes), the features of the means for transmitting the motion from the motor to the basket (i.e. the belt tension and its elastic and geometric features) and by the high dispersion of the characteristics of the motors used. Said systems therefore require the use of a motor having high features (i.e. which assures that the exerted torque is in fact proportional to the weight of the clothes) and means able to measure the current absorbed, with the consequent necessity of equipping the machine with a complex electronic control system.

[0006] Methods are also known, for detecting the quantity and/or the type of fabric, which are based on the monitoring of the interventions, controlled by a pressure switch, for restoring the washing liquid level in the laundry washing machine. Examples of said methods can be found for instance in DE-A-41 22 307, FR-A-2 474 547 or DE-A-34 46 288. The precision of said methods however depends upon the differential of the pressure switch, as it will be clear in the following of the present description.

[0007] Thus, in other words, said methods also have the drawback of being expensive, complex and not always reliable.

[0008] The aim of the present invention is that of in-

dicating **an improved** method for determining the **type, or the type and the quantity**, of fabric introduced in a laundry washing machine, being characterised by a great manufacturing simplicity and the absence of additional components in respect of the laundry washing machines according to the prior art.

[0009] Such an aim is reached, according to the present invention, by a method for determining the **type, or the type and the quantity**, of fabric introduced in a laundry washing machine, **and by a washing machine**, having the characterising features of the annexed claims 1 and 7.

[0010] Further characteristics and advantages of the present invention will result in being clear from the detailed description which follows and from the annexed drawings, which are supplied purely as an explanatory and non limiting example, wherein:

- figures 1A, 1B and 1C represent the operational principle of an electromechanical pressure switch, being of common use in laundry washing machines;
- figure 2 represents a typical example of an electric circuit with places in relation the pressure switch with other components of a laundry washing machine, in particular with the water supply electrovalve and the heating resistance;
- figures 3A and 4A relate to the procedures of the "water-level-renewal operations", respectively in the case of towelling and cotton fabrics, and represent the sum of the times of the water-level-renewal operations, carried out by the first-level pressure switch (being expressed in seconds), in function of the quantity of clothes (being expressed in kg);
- figures 3B and 4B relate respectively to towelling and cotton fabrics and represent the normalised Gauss function of experimental data relating to the total sum of the times of the water-level-renewal operations carried out by the first-level pressure switch, being associated to different quantities of clothes;
- figure 5 represents the composition of figures 3A and 4A on a same scale of ordinates and abscissas, for allowing the comparison;
- figures 6 and 7 relate respectively to towelling and cotton fabrics and represent the distribution over time of different water-level-renewal operations of the first-level pressure switch or, in other words, the water supply procedure in function of time;
- figures 8, 9 and 10 relate respectively to towelling, cotton and synthetic fabrics and represent the dynamics over time of the water absorption by the clothes introduced in the laundry washing machine;
- figure 11 is a comparison of the initial portion of the curves of the water absorption over time, relating to towelling, cotton, synthetic fibres and wool fabrics;
- figure 12 illustrates the link existing between the type of fabric and the time interval between the end of the first water supply and the start of the first wa-

ter-level-renewal operation;

[0011] A **know method** for determining the type and the quantity of fabrics introduced in a laundry washing machine consists in obtaining the necessary information from the observation, or monitoring, of the behaviour over time of the contact being associated to the first level electromechanical pressure switch of a laundry washing machine (**see for instance FR-A- 2 474 547**).

[0012] In particular, said information is associated to the operations for restoring the water level carried out by the first level pressure switch during the first phase of each washing cycle: said operations for restoring the water level, which in the following will be more simply indicated with *renewal* or *restoring operations*, are the direct consequence of the water absorption process by the clothes, which causes a progressive lowering of the level of the washing liquid and the consequent commutation of the contact of the pressure switch in the empty state.

[0013] To said purpose, it should be remembered that the first level pressure switch of a laundry washing machine typically has the task of maintaining the water level constant, during the first phase of any washing program, with the double intent of ensuring the heating of the same, in a safe condition (i.e. with the heater being always immersed in the water) and to ensure the presence of a minimum liquid quantity, being necessary for carrying out an effective wash.

[0014] Such maintenance function of the water level, realised by the pressure switch, consists in supplying water (by means of the activation of the suitable electrovalve) until restoration of said level is obtained (which depends upon the calibration characteristics of the pressure switch), at any time that the same lowers beyond a certain quantity (being expressed in mm-H₂O and being known as *differential* or *hysteresis* of the pressure switch) due to the effect of the absorption of the washing liquid by the clothes being present inside the laundry washing machine.

[0015] Before describing in the detail the characteristics and the advantages of the present invention, it is useful, for reasons of clarity, to describe the operation of the device, i.e. an electromechanical pressure switch of a substantially known type, onto **which the know methods for determining the type and/or the quantity of fabric are based**.

[0016] In fig. 1A the different parts realising a typical electromechanical pressure switch for a laundry washing machine are schematically represented.

[0017] Such parts are:

- an air trap 1, communicating with the tank 2 of the washing machine;
- a pressure chamber 3;
- a small plastic tube 4, connecting the air trap 1 to the pressure chamber 3;
- a diaphragm-actuator body 5;

- a calibration spring 6;
- an electric contact 7.

[0018] The water which enters the tank 2 of the laundry washing machine tends to rise through the small plastic tube 4, but is prevented in doing so by the air being present in the air trap 1; upon the increase of the water level within the tank 2, the air of the trap 1 is progressively compressed and the pressure generated in this way is transmitted to the pressure chamber 3 through the plastic tube 4.

[0019] Such pressure is typically expressed in water millimetres (mm-H₂O) and acts on the surface of an elastic diaphragm being present in the body 5, thus producing a force which is proportional to the level of water present within the tank 2 of the laundry washing machine; such force, acting on said diaphragm, counteracts, by means of a suitable actuator (figures 1B and 1C), the resistant force of the calibration spring 6.

[0020] Any pressure switch is characterised by its own calibration (calibration of the level of the pressure switch), being expressed in mm-H₂O, which is associated to the resistant force of the calibration spring.

[0021] Single pressure switches exist in commerce, being characterised by only one level, and also multiple pressure switches, being characterised by several levels; in figures 1B and 1C a double pressure switch is schematically represented, as a pure example, being characterised by two distinct levels having different calibrations, and in particular the mechanism is illustrated in detail, which allows the change of state of the two switches being associated to said levels.

[0022] Referring for example to the pressure switch with a lower calibration, which is described in the upper part of the aforementioned figures 1B and 1C, we have, when the force transmitted by the actuator, indicated with 5A, which is integral with the diaphragm shown with 5B, exceeds the resistant force of the calibration spring 6, the common electric contact 9 is moved from the rest position 10, called *empty position*, to the other position 11, called *full position*.

[0023] In particular in fig. 1C it can be noticed that the pressure switch being illustrated in the lower part, needs, if compared to that being described in the upper part, a further pressure to commute its common contact 9 from the empty state (10) to the full (11).

[0024] On the contrary, in order to allow the contact of a pressure switch to pass from the full position to the empty one, it is necessary that the pressure exercised on the membrane is reduced by a determined value under the calibration value: such pressure value is typically expressed in mm-H₂O and, as already said, is known as *differential*, or *hysteresis*, of the pressure switch.

[0025] The two positions electric contact (the empty one and the full one), that usually characterises electromechanical pressure switches for laundry washing machines, is typically able to commute currents up to a maximum of 16 resistive ampere, supplied with 220 Vac.

[0026] In a laundry washing machine, the empty contact usually supplies an electrovalve provided for the supplying water to the tank, while the full contact enables the current flow to the heating resistor of the same water.

[0027] This is schematically represented in figure 2, wherein the common contact 9 of the pressure switch can assume the empty position 10 or the full position 11, on the basis of the value of the pressure exercised by the water level present in the tank.

[0028] When the common contact 9 is in the empty position 10 and the command contact 15 of the control system (electromechanical or electronic timer) is closed, the electrovalve 13 is supplied through the mains voltage and allows to load water to the inside of the tank of the laundry washing machine, until the generated pressure reaches the calibration value of the pressure switch, thus causing the commutation of the common contact 9 in the full state (11).

[0029] On the contrary, when the common contact 9 is in the full position 11 and the contact 14 of the control system of the temperature of the washing water is closed, the water heating resistor 12 is supplied through the mains voltage and produces heat in safe conditions (by virtue of the presence of water assured by the full state of the pressure switch).

[0030] As previously mentioned, the renewal operation of the pressure switch is the direct consequence of the water absorption process by the clothes, which causes a progressive lowering of the washing liquid level and the consequent commutation of the contact of the first level pressure switch to the empty state.

[0031] Such a commutation, in accordance with the electric diagram of figure 2, produces the recall of further water, through the electrovalve 13, until the contact of the pressure switch once again assumes the full state (11).

[0032] An example of the information that can be extracted from the observation of the water level renewal processes of the first level pressure switch of a laundry washing machine is described in graphic form in the following figures.

[0033] In particular, figures 3A and 4A, which refer respectively to towelling and cotton fabrics, describe the relation which exists between the quantity in weight (being expressed in kg) of fabric introduced in the laundry washing machine and the total time (expressed in seconds) associated to the different renewal operations carried out by the first level pressure switch during the first phase of the washing cycle, until the absorption process of water by the clothes has not reached saturation.

[0034] As can be easily ascertained from the graphs in figures 3A and 4B, the total duration of the water level renewal phases, i.e. the sum of the duration of the single renewal operations, (which is directly proportional to the water quantity supplied, supposing the electrovalve flow rate as being constant) is linked to the weight of the

clothes to be washed by a simple linear relation.

[0035] In fact, as it can be imagined, the greater the quantity of clothes introduced in the laundry washing machine, the greater the quantity of water that the clothes subtract from the washing chamber due to absorption and, consequently, the greater is the water quantity that must be "recalled" in the tank.

[0036] The fact that distinguishes towelling fabric from cotton is only that of the different slope of the two straight lines, as is better illustrated in figure 5; thus, in other words, the speed of the water absorption differs for the two kinds of fabric (in particular it is greater for cotton than towelling).

[0037] From what has been explained above, it is clear that, once the type of fabric has been detected, (for example in the way that will be described in the following) and knowing the sum of the duration of the single renewal operations, also its quantity may be determined, as shown from the figures 3A, 4A and 5.

[0038] The values being represented in figures 3A and 4A are average values, derived from a high number of experimental tests carried out with different fabric loads. The quality of the information being associated to such average values is made evident by the low dispersion shown by figures 3B and 4B, which relate respectively to towelling and cotton and represent the normalised Gauss function of the sums of the times of the renewal operations being associated to the different cloth quantities placed under observation.

[0039] Figures 6 and 7 represent the result of two experimental surveys, which refer respectively to a washing load of 4 kg of towelling and cotton fabrics; such figures make evident the dynamics of the renewal operations over time and express in a more intuitive way the quality of the information being associated to the operation of the electromechanical first level pressure switch; for example, it is possible to detect

- the different number of renewal operations (twelve for towelling and nine for cotton),
- the different distribution over time of the renewal operations associated to a same quantity of towelling and cotton fabrics,
- the different total duration of the renewal operations depending upon the type of fabric,
- the different duration of the pause elapsing between the first water supply and the first renewal operation of the level of the same, carried out by the pressure switch, depending upon the type of fabric,

this information allows to manage the machine, as will be better understood in the following of the present description.

[0040] The figures 3, 4, 5, 6 and 7 that have just been examined mainly illustrate the stationary situation which is reached at the end of the water absorption process by fabrics, and highlight the fact that the quantity of clothes and the type of fabric are functions both of the

sum of the times of the renewal operations and their number.

[0041] However, such relations are not independent from each other, because in practice they describe the same phenomenon by different parameters.

[0042] In order to have further information, being necessary for extracting in an independent manner the value of the quantity of clothes and the type of fabric, the dynamic evolution of the water absorption process by the fabrics has been examined in greater detail.

[0043] The result of such an experimental survey is reported in figures 8, 9, 10, 11 and 12.

[0044] In particular, figures 8, 9 and 10 represent the relation of the exponential type (which is typical for processes being characterised by saturation) that describes the quantity of water absorbed over time by different quantities of fabrics, with regards respectively to towel-lin, cotton and synthetics.

[0045] On the ordinates axis the water quantity is shown (being expressed in litres), supplied during the water level renewal phases of the pressure switch, and on the abscissas axis the sum of times (being expressed in seconds) is reported of the pauses elapsing between one renewal operation and another, i.e. the speed with which the clothes absorb the washing liquid.

[0046] From an examination of such figures we can detect that the initial proceedings of the curves being associated to the different quantities of clothes is practically independent from the quantity itself and mainly depends upon the type of fabric, as it is better explained in fig. 11, wherein the slopes of the absorption curves of the different fabrics have been reported (figures 8, 9 and 10), being calculated in the area of the cartesian axes origin.

[0047] Even if the validity of the proceedings reported in fig. 11 is limited to a area being restricted to the origin, they evidence however a very important aspect: the fact that it is possible to deduce the type of fabric from the observation of the behaviour of the pressure switch in the first phase of the water supply and, in particular, by the simple measure of the duration of the pause elapsing between the first water supply and the first operation of renewal of the water level carried out by the pressure switch (thus, once the type of clothes has been obtained in such a way, as a consequence its quantity is also identified, as shown in the above described figures 3A, 4A and 5).

[0048] This is even better explained by fig. 12 (which links the proceedings in the area of the origin of the fig. 11 to the real physical phenomenon of the water absorption controlled by the pressure switch), wherein on the ordinates axis the value (being expressed in litres) of the water supplied in occasion of the first renewal operation is reported, which is practically independent from the type of fabric, and on the abscissas axis the value (being expressed in seconds) of the pause elapsing between the end of the initial water supply and the beginning of the first renewal operation of the water level car-

ried out by the pressure switch is shown.

[0049] The water supplied in occasion of the first renewal operation (ordinates axis) has the aim to restore up to the initial value (that referring to the instant wherein the first supply ends) the level of the washing liquid, thus exactly compensating the quantity absorbed by the clothes in the time interval between the end of the first supply and the beginning of the first renewal operation itself (abscissas axis).

10 [0050] From the examination of figure 12 the different slope is evident, that characterises the different kinds of fabrics and that physically expresses the different speed of the water absorption by the same.

15 [0051] From what has just been described with regards to figures 11 and 12, it therefore appears clear how it is possible to recognise the type of fabrics introduced in the laundry washing machine, by the simple measure of the duration of the pause which elapses between the first water supply and the first renewal operation of the level of water carried out by the pressure switch; as already said, once the type of fabric has been obtained in such a way, as a consequence its quantity is also identified (figures 3A, 4A and 5).

25 [0052] The fact should also be considered that the data reported in figure 12, even if it has the important advantage of being independent from the quantity of clothes introduced in the laundry washing machine, depend however upon the characteristics of the pressure switch, and in particular from the value of its differential or hysteresis: for such a reason, it is necessary to know the differential of the first level pressure switch, which is therefore an imposed parameter.

30 [0053] From what has been described above it is clear that, by suitably elaborating the information taken from the observation of the behaviour of the first level pressure switch of a laundry washing machine, it is possible to derive the value of the quantity of clothes to be washed introduced in the machine and to recognise their type (and, of course, knowing the volume of water supplied).

40 [0054] The above described method for determining the quantity and/or the type of clothes is based on the observation of "natural" renewal operations of the pressure switch, i.e. those renewal operations of the level being caused directly by the closure of the empty contact of the pressure switch, which allows to excite the water supply electrovalve.

45 [0055] **According to the present invention, a new method is proposed, providing for analogue results, which** consists in considering the case of the observation of "forced" renewal operations of the water level, by using the empty contact of the pressure switch solely for sending a criteria to the control system, rather than for directly exciting the water supply electrovalve, which will be managed by the same control system through a suitable actuator (e.g.. a relay).

[0056] Therefore, **according to the present invention**, the control system, after having carried out the first

water supply keeping the clothes steady, will begin to suitably rotate the basket of the laundry washing machine (for favouring the water absorption by the clothes) and will maintain steadily this situation for an established time T, the duration of which will be such as to allow the pressure switch to reset, i.e. its passage from the full state to the empty state.

[0057] Once said time interval T has elapsed, the control system will provide to excite the water supply electrovalve until the water level is restored, i.e. **until the pressure switch passes from the empty state to the full state.**

[0058] The quantity of water that the system must load to restore the initial level will represent the liquid quantity that the fabrics have absorbed during the pause T, i.e. it will provide information about the kind of water absorption by the clothes, and therefore on the type of fabric.

[0059] **The method according to the invention** therefore has the advantage of being independent from the characteristics of the pressure switch, in particular from its differential.

[0060] As previously said, an excellent method for encoding in a compact form the great quantity of information that the control unit has to deal with, is that supplied by the control technology based on the fuzzy logic, which is already widely used in the field of consumer products and, in particular, in the field of household appliances.

[0061] The knowledge basis of the method according to the invention, obtained by experts in the field of washing and by way of experimental surveys, are encoded, inside of the permanent memory of the microcontroller in the form of "rules" (IF...THEN rules) by means of the fuzzy logic techniques. Considering that almost all modern laundry washing machines are equipped with a microcontroller (for instance machines with an electronic timer or with a digital motor control), it appears evident that the latter, once appropriately programmed, can carry out the monitoring of the pressure switch and obtain, in the above described ways and without any increase in cost, the required information.

[0062] Said information on the quantity and the type of clothes introduced in the laundry washing machine can therefore be used for managing the operation of the machine, for instance in order to determine the detergent dosage being optimal for carrying out a correct washing, thus avoiding wastage and reducing as far as possible the polluting substances contained in the drainage water. To this purpose the invention could be advantageously used for managing the operation of a device for the automatic dosage of the washing agents.

[0063] From the above description the characteristics of the method according to the invention are clear.

[0064] The advantages of the method **according to the invention** are also clear, being mainly represented by the fact that the same laundry washing machine is able to determine the quantity and/or the type of fabrics loaded, in a simple and economic way, without the ne-

cessity of any additional components, **the measure of the type of fabric being independent from the characteristics of the pressure switch, in particular from its differential.**

Claims

1. Method for determining the type, or the type and quantity, of fabric introduced in a laundry washing machine, said laundry washing machine comprising:

- a washing tank (2), for containing a washing liquid,
- an electrovalve (13), for controlling the supply of said washing liquid to said tank (2),
- a basket, rotatable within said tank (2), for containing the laundry to be washed,
- a level sensor (1,3-7) of the washing liquid within said tank (2),
- an electronic control system, comprising permanent memory means within which operational instructions are stored,

wherein at the beginning of a washing program,

- the control system controls said electrovalve (13) for carrying out a first washing liquid supply to said tank (2) up to an initial level;
- said basket is then suitably rotated for favouring the washing liquid absorption by the laundry and the consequent lowering of the liquid level in the tank (2),

the method being characterised in that

- after said first washing liquid supply up to said initial level is performed, said basket is rotated for an established time interval (T), the duration of which being such to allow the passage of said level sensor (1,3-7) from its full state to its empty state;
- once said established time interval (T) has elapsed, the control system controls said electrovalve (13) for supplying new washing liquid to said tank, until the passage of said level sensor (1,3-7) from its empty state to its full state is determined, so restoring said initial level of the washing liquid within said tank (2);
- the control system determines the type of fabric of the laundry contained in the basket in function of operational instructions stored within said memory means and the quantity of said new washing liquid supplied to said tank (2), which represents the quantity of washing liquid absorbed by the fabric during said established time interval (T).

2. Method, according to claim 1, characterised in that, after the type of fabric has been determined by the control system, further restoring operations of the liquid level within said tank (2) are controlled through said level sensor (1,3-7).

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3. Method, according to claim 2, characterised in that said control system provides for a count of the number of the restoring operations controlled through said level sensor (1,3-7) and/or the detection of the distribution over time of the restoring operations controlled through said level sensor (1,3-7) and/or the measurement of the sum of the times of the restoring operations.

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4. Method, according to claim 3, characterised in that the control system determines the quantity of laundry contained in the basket in function of the measure of the total time of said restoring operations and in function of the type of fabric.

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5. Method, according to at least one of the preceding claims, characterised in that the type and/or the quantity of fabric is determined by the control system using the fuzzy logic technique.

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6. Method, according to at least one of previous claims, characterised in that the information concerning the type and/or and the quantity of fabric is used by the control system for managing the operation of the laundry washing machine, in particular for determining the detergent dosage.

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7. Laundry washing machine comprising:

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- a washing tank (2), for containing a washing liquid,
- an electrovalve (13), for controlling the supply of said washing liquid to said tank (2),
- a basket, rotatable within said tank, for containing the laundry to be washed,
- a level sensor (1,3-7) of the washing liquid within said tank (2),
- an electronic control system having permanent memory means within which operational instructions are stored, said electronic control system comprising:

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- means for controlling, at the beginning of a washing program, said electrovalve (13) in order to carry out a first washing liquid supply to said tank (2) up to an initial level;
- means for suitably rotating said basket, in order to favour the washing liquid absorption by the laundry and the consequent lowering of the liquid level in the tank (2),

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characterised in that said control system further

comprises

- means for rotating said basket for an established time interval (T) once said first washing liquid supply up to said initial level is performed, the duration of said time interval (T) being such to allow the passage of said level sensor (1,3-7) from its full state to its empty state;
- means for controlling said electrovalve (13) once said established time interval (T) has elapsed, in order to supply new washing liquid to said tank until the passage of the level sensor (1,3-7) from its empty state to the full state is determined;
- means for determining the type of fabric of the laundry contained in the basket in function of operational instructions stored within said memory means and the quantity of said new washing liquid supplied to said tank (2).

8. Laundry washing machine, according to claim 7, characterised in that said level sensor is an electromechanical pressure switch (1,3-7).

9. Laundry washing machine, according to claim 7, characterised in that said control system comprises a microcontroller.

30 Patentansprüche

1. Verfahren zum Bestimmen der Art oder der Menge von Textilien, die in eine Waschmaschine für Wäsche eingebracht werden, wobei die Waschmaschine enthält:

- einen Waschtank (2) zur Aufnahme einer Waschflüssigkeit,
- ein Elektroventil (13) zum Steuern der Zuführung der Waschflüssigkeit zu dem Tank (2),
- einen innerhalb des Tanks (2) drehbar angeordneten Korb zum Aufnehmen der zu waschenden Wäsche,
- einen Pegelsensor (1, 3-7) für die Waschflüssigkeit innerhalb des Tankes (2),
- ein elektronisches Steuersystem, welches Permanentspeichermittel aufweist, in denen Betriebsbefehle gespeichert sind,

wobei zu Beginn eines Waschprogramms

- das Steuersystem das Elektroventil (13) zum Ausführen einer ersten Zufuhr an Waschflüssigkeit in den Tank (2) bis zum Erreichen eines Anfangspegels steuert und
- anschließend der Korb in geeigneter Weise zur Unterstützung der Absorption der Waschflüssigkeit durch die Wäsche, wodurch der Flüssig-

keitspegel in dem Tank (2) sinkt, in Drehung versetzt wird,

wobei das Verfahren dadurch gekennzeichnet ist,

- daß nach dem Ausführen der ersten Zufuhr an Waschlüssigkeit bis zum Anfangspegel der Korb für ein festgelegtes Zeitintervall (T) in Drehung versetzt wird, dessen Dauer so bemessen ist, daß der Pegelsensor (1, 3-7) von seinem Anzeigezustand "voll" zu seinem Anzeigezustand "leer" gelangen kann,
- daß nach Verstreichen dieses festgelegten Zeitintervalls (T) das Steuersystem das Elektroventil (19) zum Zuführen einer neuen Waschlüssigkeit in den Tank steuert, bis der Durchgang des Pegelsensors (1, 3-7) von seinem Anzeigezustand "leer" zu seinem Anzeigezustand "voll" erfaßt wird, wodurch der Anfangspegel der Waschlüssigkeit innerhalb des Tanks (2) wieder erreicht wird, und
- daß das Steuersystem die Art der Textilien der in dem Korb aufgenommenen Wäsche entsprechend den in den Speichermitteln gespeicherten Betriebsbefehlen sowie die Menge der neuen dem Tank (2) zugeführten Waschlüssigkeit bestimmt, die der Menge der Waschlüssigkeit entspricht, welche durch die Textilien während des festgelegten Zeitintervalls (T) absorbiert wurde.

2. Verfahren nach Anspruch 1,

dadurch gekennzeichnet, daß, nachdem die Art der Textilien durch das Steuersystem bestimmt worden ist, weitere Auffüllvorgänge für den Flüssigkeitspegel innerhalb des Tankes (2) durch den Pegelsensor (1, 3-7) gesteuert werden.

3. Verfahren nach Anspruch 2,

dadurch gekennzeichnet, daß das Steuersystem ein Zählen der Anzahl der durch den Pegelsensor (1, 3-7) gesteuerten Auffüllvorgänge und/oder das Erfassen der Verteilung der durch den Pegelsensor (1, 3-7) gesteuerten Auffüllvorgänge über die Zeit und/oder das Messen der Summe der Zeiten der Auffüllvorgänge vornimmt.

4. Verfahren nach Anspruch 3,

dadurch gekennzeichnet, daß das Steuersystem die Menge der Wäsche, die in dem Korb aufgenommen ist, als Funktion der Messung der Gesamtzeit der Auffüllvorgänge und als Funktion der Art der Textilien bestimmt.

5. Verfahren nach zumindest einem der vorstehenden Ansprüche,

dadurch gekennzeichnet, daß die Art und/oder die Menge der Textilien durch das Steuersystem

unter Einsatz der Fuzzylogik bestimmt wird.

6. Verfahren nach zumindest einem der vorstehenden Ansprüche,

dadurch gekennzeichnet, daß die Informationen betreffend die Art und/oder die Menge der Textilien durch das Steuersystem zum Steuern des Betriebs der Waschmaschine, insbesondere zum Bestimmen der Waschmitteldosierung verwendet werden.

7. Waschmaschine für Wäsche, enthaltend:

- einen Waschtank (2) zur Aufnahme einer Waschlüssigkeit,
- ein Elektroventil (13) zum Steuern der Zuführung der Waschlüssigkeit zu dem Tank (2),
- einen innerhalb des Tankes drehbar angeordneten Korb zur Aufnahme der zu waschenden Wäsche,
- einen Pegelsensor (1, 3-7) für die Waschlüssigkeit innerhalb des Tanks (2),
- ein elektronisches Steuersystem, das Permanentspeichermittel aufweist, in denen Betriebsbefehle gespeichert sind, wobei das elektronische Steuersystem enthält:
 - Mittel zum Steuern des Elektroventils (13) zu Beginn eines Waschprogrammes, um eine erste Zufuhr an Waschlüssigkeit in den Tank (2) bis zum Erreichen eines Anfangspegels auszuführen, und
 - Mittel zum geeigneten Drehen des Korbes, um die Absorption der Waschlüssigkeit durch die Wäsche mit nachfolgendem Absenken des Flüssigkeitspegels in dem Tank (2) zu unterstützen,

dadurch gekennzeichnet, daß das Steuersystem weiterhin enthält:

- Mittel zum Drehen des Korbes für ein vorbestimmtes Zeitintervall (T), nachdem die erste Zufuhr an Waschlüssigkeit bis zum Erreichen des Anfangspegels erfolgt ist, wobei die Dauer des Zeitintervalls (T) so bestimmt ist, daß der Pegelsensor (1, 3-7) von seinem Anzeigezustand "voll" zu seinem Anzeigezustand "leer" gelangen kann,
- Mittel zum Steuern des Elektroventils (13), nachdem das vorbestimmte Zeitintervall (T) verstrichen ist, um neue Waschlüssigkeit dem Tank zuzuführen, bis der Durchgang des Pegelsensors (1, 3-7) von seinem Anzeigezustand "leer" zu seinem Anzeigezustand "voll" erreicht ist; und
- Mittel zum Bestimmen der Art der Textilien der in dem Korb aufgenommenen Wäsche entsprechend den im Speichermittel gespeicher-

ten Betriebsbefehlen und der Menge der neuen dem Tank (2) zugeführten Waschflüssigkeit.

8. Waschmaschine nach Anspruch 7, **dadurch gekennzeichnet**, daß der Pegelsensor ein elektromechanischer Druckschalter (1, 3-7) ist. 5
9. Waschmaschine nach Anspruch 7, **dadurch gekennzeichnet**, daß das Steuersystem eine Mikroprozessorsteuerung enthält. 10

Revendications

1. Procédé pour déterminer le type, ou le type et la quantité, de linge introduit dans une machine à laver le linge, ladite machine à laver le linge comprenant :

- une cuve de lavage (2), pour contenir un liquide de lavage, 20
- une électrovanne (13), pour commander l'amenée dudit liquide de lavage à ladite cuve (2),
- un panier, pouvant tourner à l'intérieur de ladite cuve (2), pour contenir le linge à laver, 25
- un capteur de niveau (1, 3 à 7) du liquide de lavage à l'intérieur de ladite cuve (2),
- un système électronique de commande, comprenant des moyens formant mémoire permanente à l'intérieur de laquelle on stocke des instructions opérationnelles, 30

dans lequel, au commencement d'un programme de lavage,

- le système de commande commande ladite électrovanne (13) pour exécuter une première alimentation de liquide de lavage vers ladite cuve (2) jusqu'à un niveau initial ; 35
- on met ensuite ledit panier en rotation pour favoriser l'absorption du liquide de lavage par le linge et l'abaissement qui en découle du niveau de liquide dans la cuve (2), 40

le procédé étant caractérisé en ce que :

- après la réalisation de ladite première alimentation en liquide de lavage jusque audit niveau initial, on met ledit panier en rotation pendant un intervalle de temps établi (T), dont la durée fait en sorte de permettre le passage dudit capteur de niveau (1, 3 à 7) de son état à plein à son état à vide ; 45
- une fois l'écoulement dudit intervalle de temps établi (T), le système de commande commande ladite électrovanne (13) pour amener du nouveau liquide de lavage à ladite cuve, jusqu'à ce que l'on détermine le passage dudit 50

capteur de niveau (1, 3 à 7) de son état à vide à son état à plein, rétablissant ainsi ledit niveau initial du liquide de lavage à l'intérieur de ladite cuve (2) ;

- le système de commande détermine le type de tissu du linge contenu dans le panier en fonction d'instructions opérationnelles stockées à l'intérieur desdits moyens formant mémoire et la quantité dudit nouveau liquide de lavage amené à ladite cuve (2), qui représente la quantité de liquide de lavage absorbée par le linge pendant ledit intervalle de temps établi (T).

2. Procédé selon la revendication 1, caractérisé en ce que, après la détermination du type de linge par le système de commande, des opérations supplémentaires de rétablissement du niveau de liquide à l'intérieur de ladite cuve (2) sont commandées par l'intermédiaire dudit capteur de niveau (1, 3 à 7).

3. Procédé selon la revendication 2, caractérisé en ce que ledit système de commande prévoit le comptage du nombre d'opérations de rétablissement commandées par l'intermédiaire dudit capteur de niveau (1, 3 à 7) et/ou la détection de la répartition en fonction du temps des opérations de rétablissement commandées par l'intermédiaire dudit capteur de niveau (1, 3 à 7) et/ou la mesure de la somme des durées des opérations de rétablissement.

4. Procédé selon la revendication 3, caractérisé en ce que le système de commande détermine la quantité de linge contenu dans le panier en fonction de la mesure du temps total desdites opérations de rétablissement et en fonction du type de linge. 35

5. Procédé selon au moins l'une des revendications précédentes, caractérisé en ce que le type et/ou la quantité de linge sont déterminés par le système de commande en utilisant la technique de logique floue.

6. Procédé selon au moins l'une des revendications précédentes, caractérisé en ce que les informations concernant le type et/ou la quantité de linge sont utilisées par le système de commande pour gérer la mise en oeuvre de la machine à laver le linge, en particulier pour déterminer le dosage de la lessive.

7. Machine à laver le linge, comprenant :

- une cuve de lavage (2), pour contenir un liquide de lavage,
- une électrovanne (13), pour commander l'amenée dudit liquide de lavage à ladite cuve (2),
- un panier, pouvant tourner à l'intérieur de ladite cuve, pour contenir le linge à laver,
- un capteur de niveau (1, 3 à 7) du liquide de 55

- lavage à l'intérieur de ladite cuve (2),
- un système électronique de commande, comprenant des moyens formant mémoire permanente à l'intérieur de laquelle on stocke des instructions opérationnelles, ledit système électronique de commande comprenant :
 - des moyens pour commander, au commencement d'un programme de lavage, ladite électrovanne (13) pour exécuter une première alimentation de liquide de lavage vers ladite cuve (2) jusqu'à un niveau initial ;
 - des moyens pour mettre ledit panier en rotation, pour favoriser l'absorption du liquide de lavage par le linge et l'abaissement qui en découle du niveau de liquide dans la cuve (2),
- caractérisé en ce que ledit système de commande comprend de plus :
- des moyens pour mettre ledit panier en rotation pendant un intervalle de temps établi (T), après la réalisation de ladite première alimentation en liquide de lavage jusque audit niveau initial, la durée dudit intervalle de temps (T) faisant en sorte de permettre le passage dudit capteur de niveau (1, 3 à 7) de son état à plein à son état à vide ;
 - des moyens pour commander ladite électrovanne (13) une fois l'écoulement dudit intervalle de temps établi (T), afin d'amener du nouveau liquide de lavage à ladite cuve, jusqu'à ce que l'on détermine le passage dudit capteur de niveau (1, 3 à 7) de son état à vide à son état à plein ;
 - des moyens pour déterminer le type de tissu du linge contenu dans le panier en fonction d'instructions opérationnelles stockées à l'intérieur desdits moyens formant mémoire et la quantité dudit nouveau liquide de lavage amené à ladite cuve (2).
8. Machine à laver le linge selon la revendication 7, caractérisé en ce que ledit capteur de niveau est un mano-contact électromécanique (1, 3 à 7).
9. Machine à laver le linge selon la revendication 7, caractérisé en ce que ledit système de commande comprend un microrégisseur.

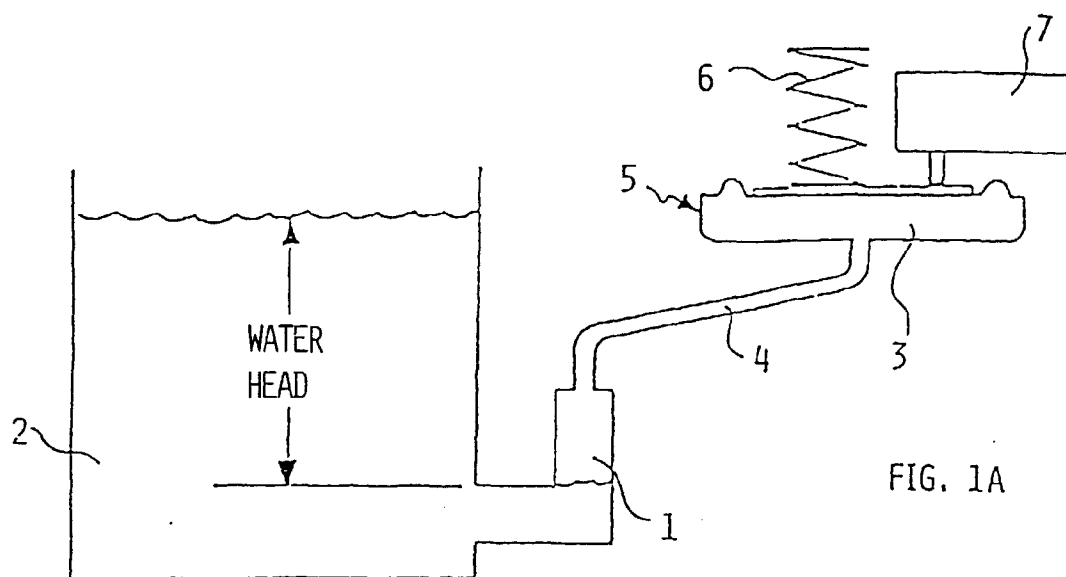


FIG. 1A

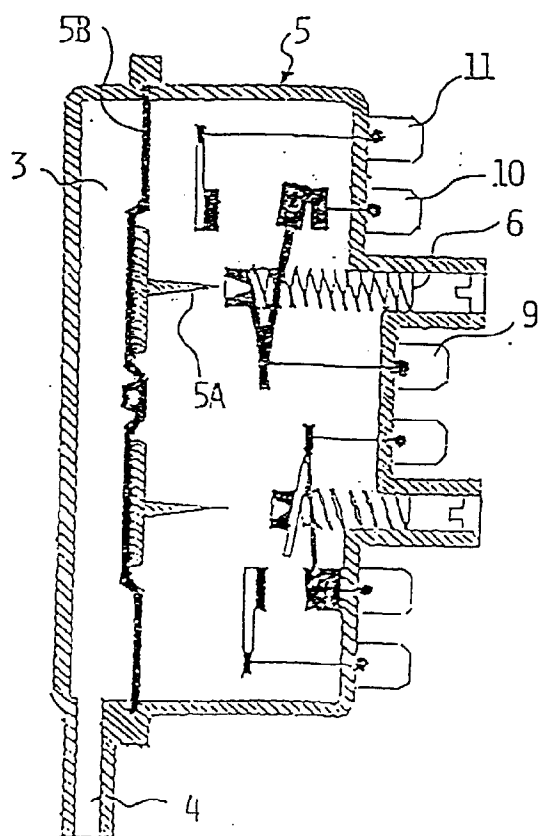


FIG. 1B

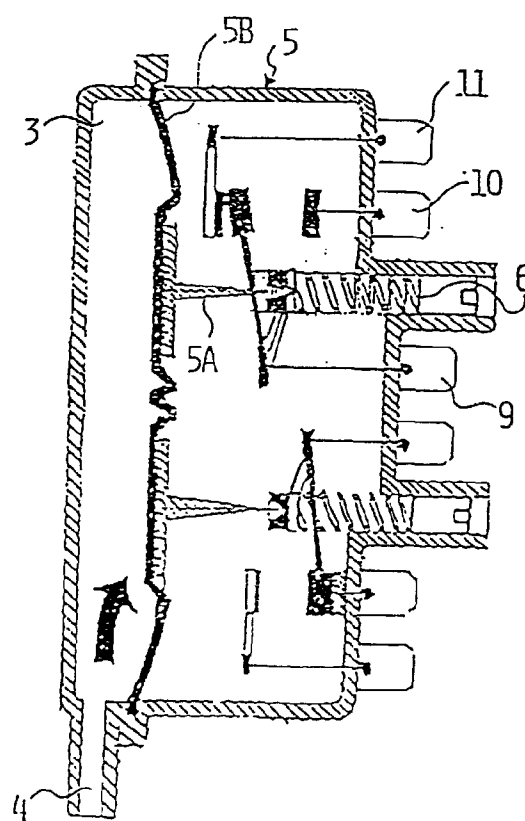


FIG. 1C

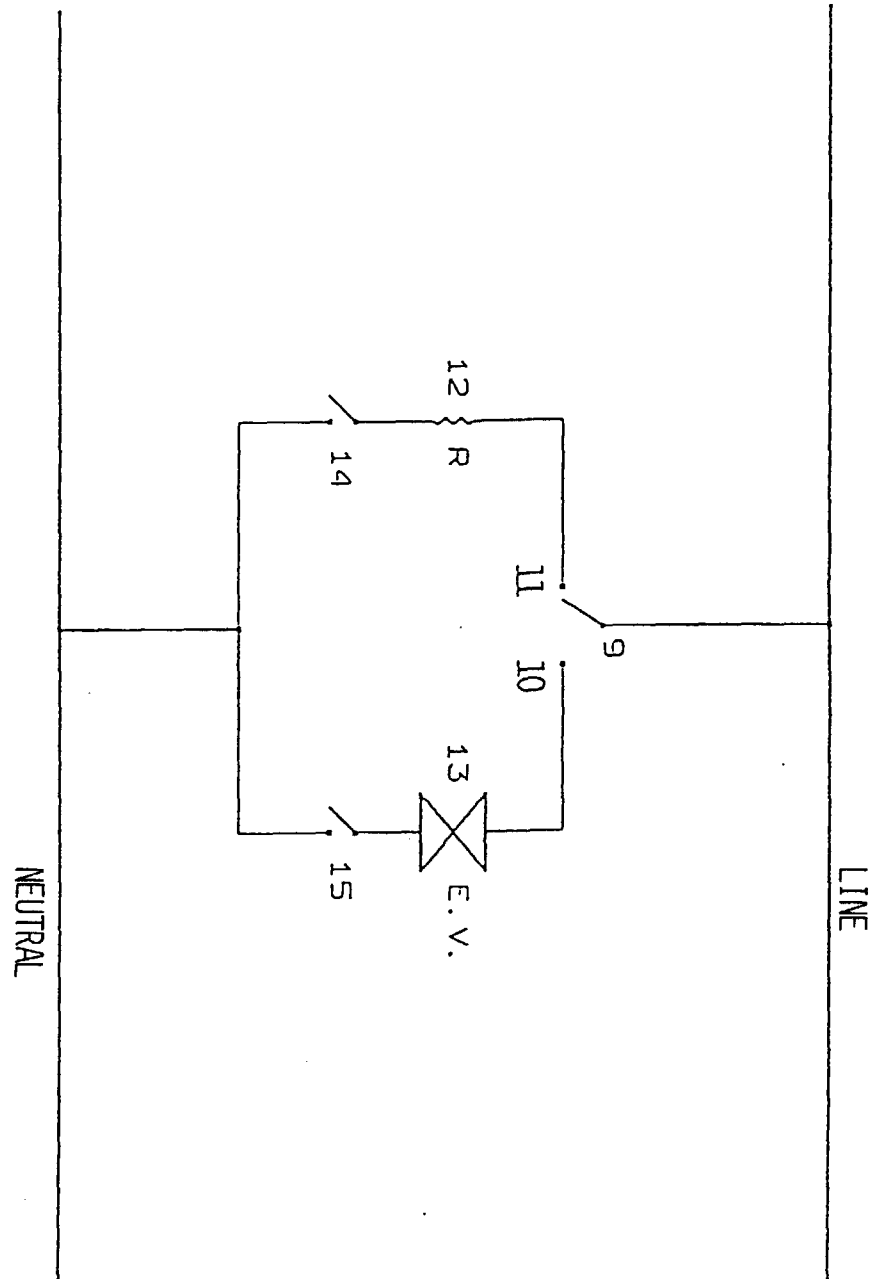


FIG. 2

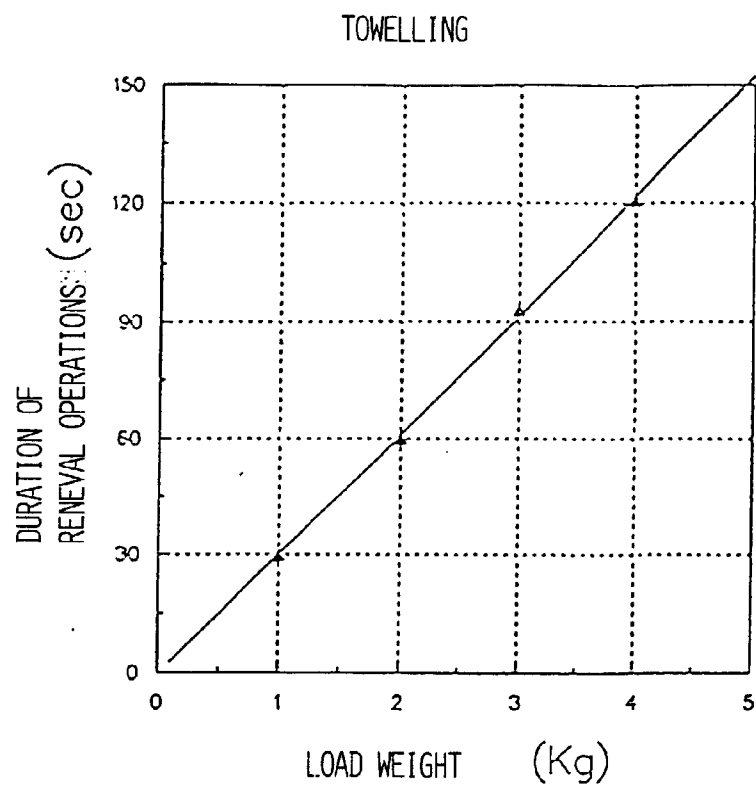


FIG. 3A

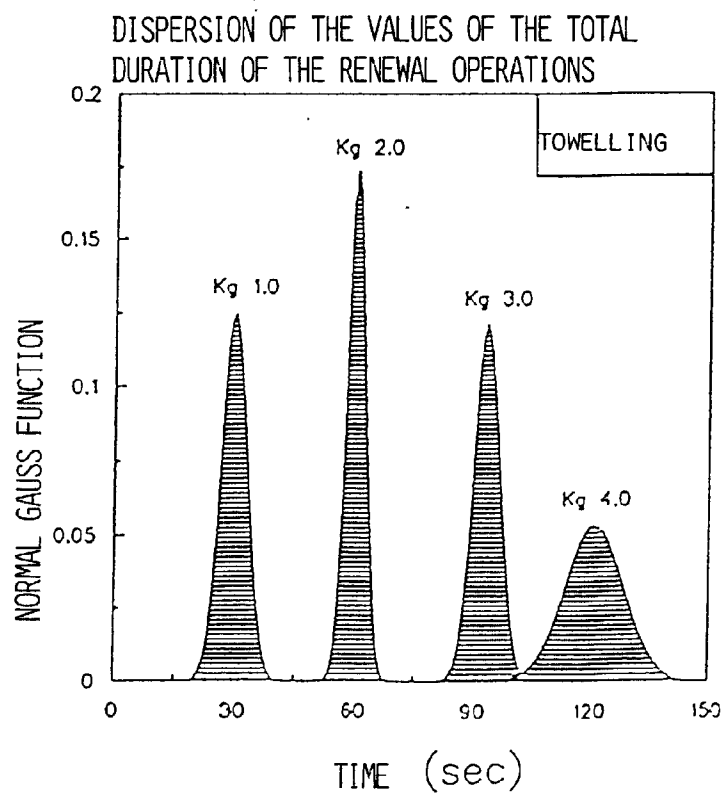


FIG. 3B

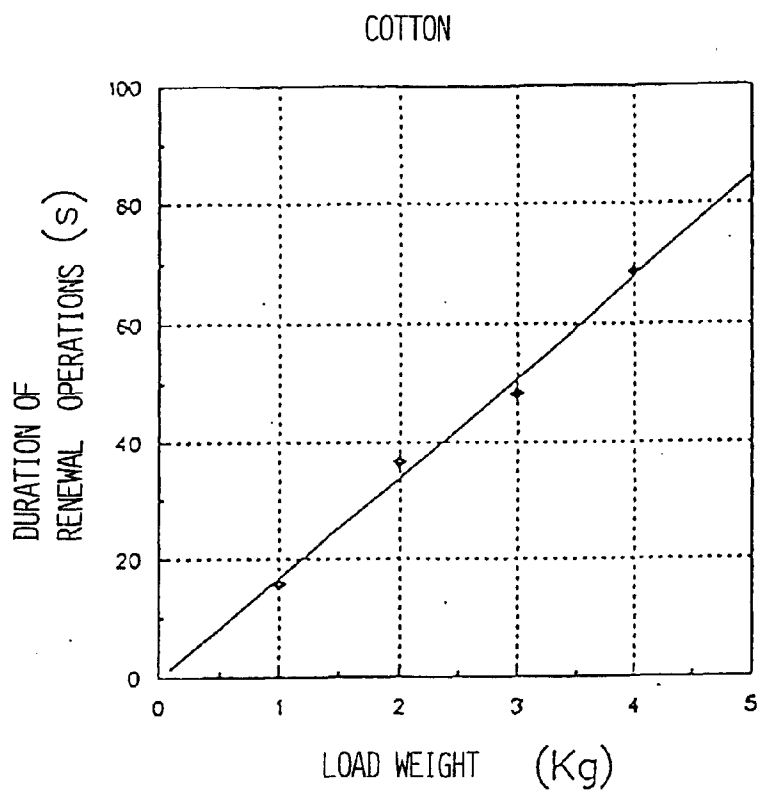


FIG. 4A

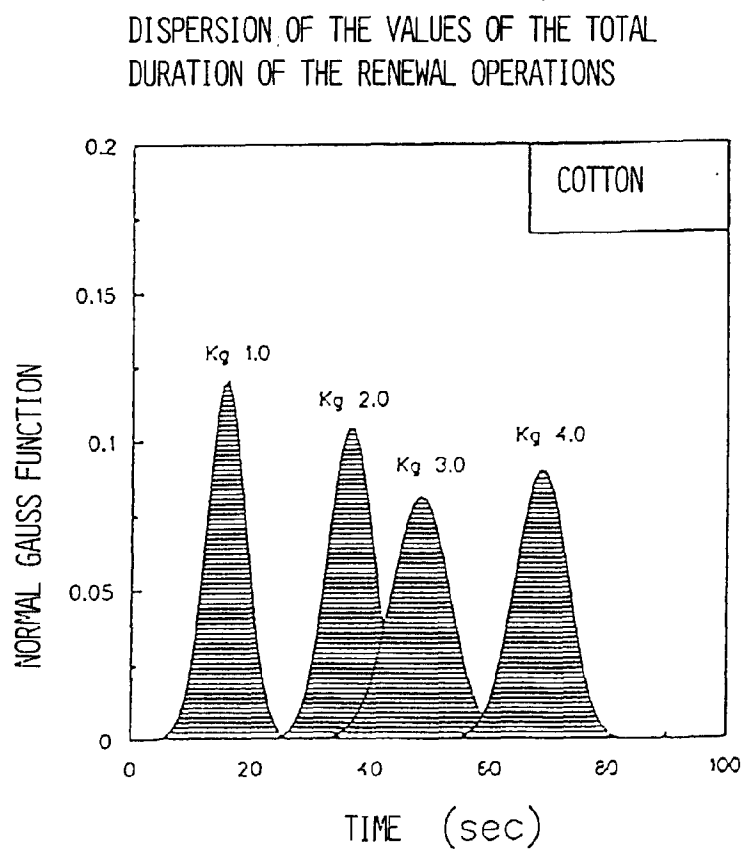


FIG. 4B

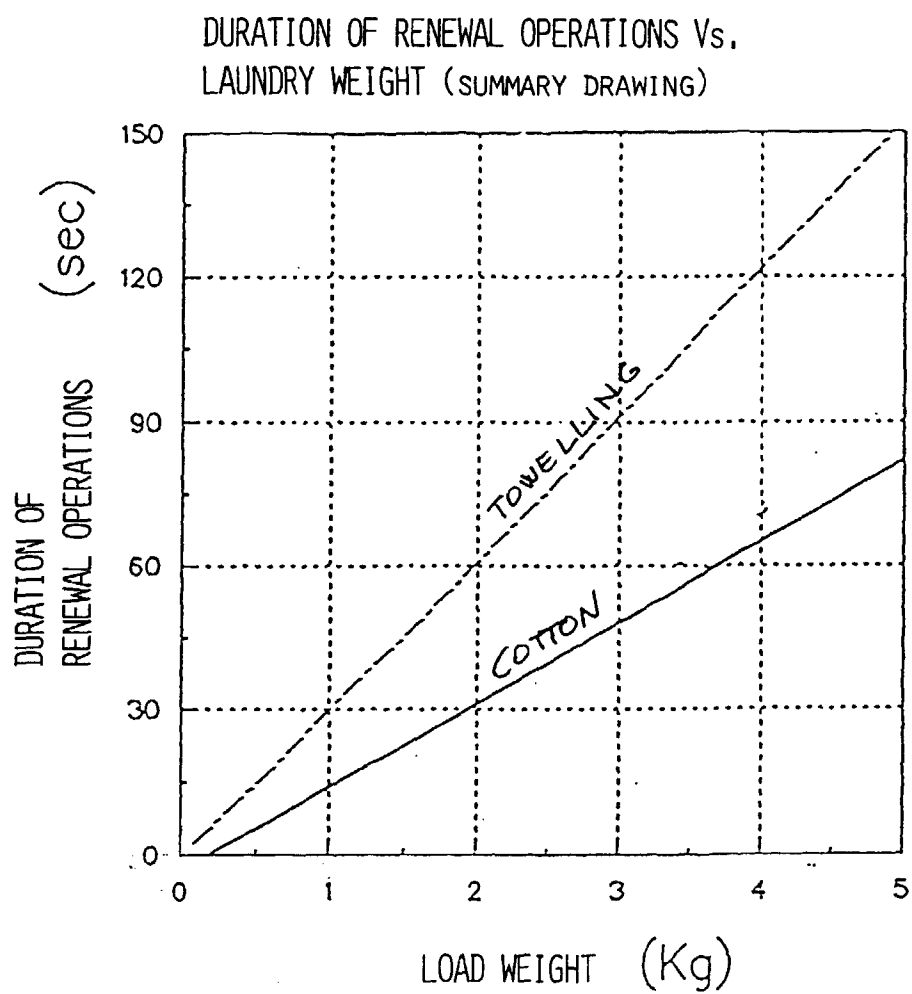


FIG. 5

TYPE/COLOR FABRIC: TOWELLING
LAUNDRY QUANTITY: 4.0 Kg

WATER PRESSURE: 2BAR

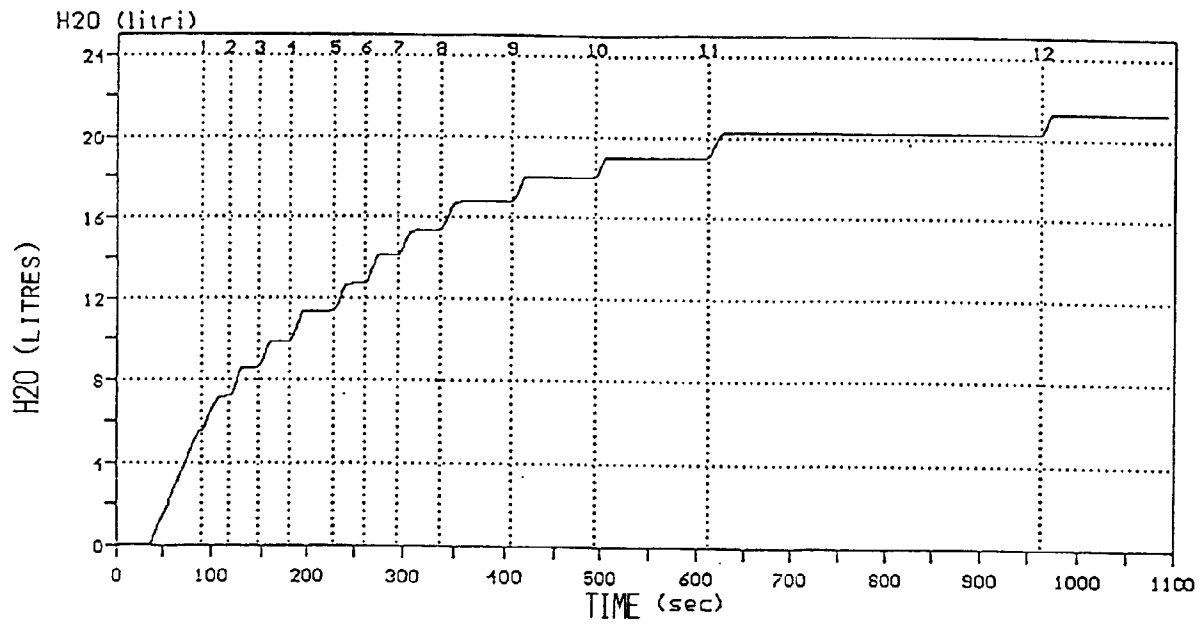


FIG. 6

TYPE/COLOR FABRIC: COTTON
LAUNDRY QUANTITY: 4.0 Kg

WATER PRESSURE: 2 BAR

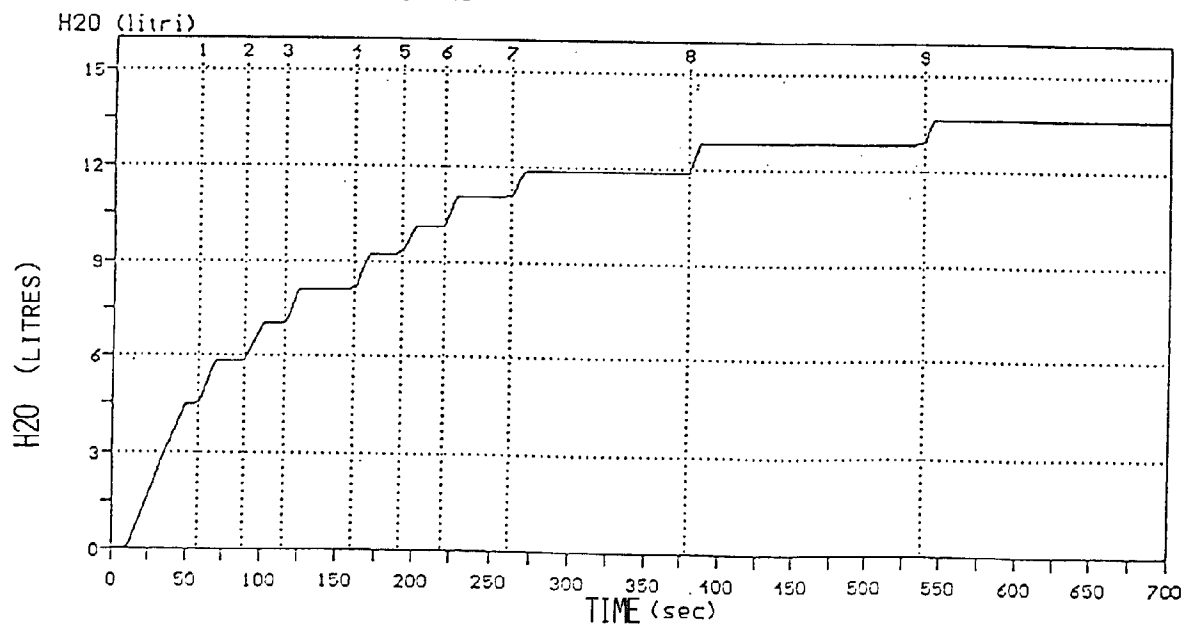


FIG. 7

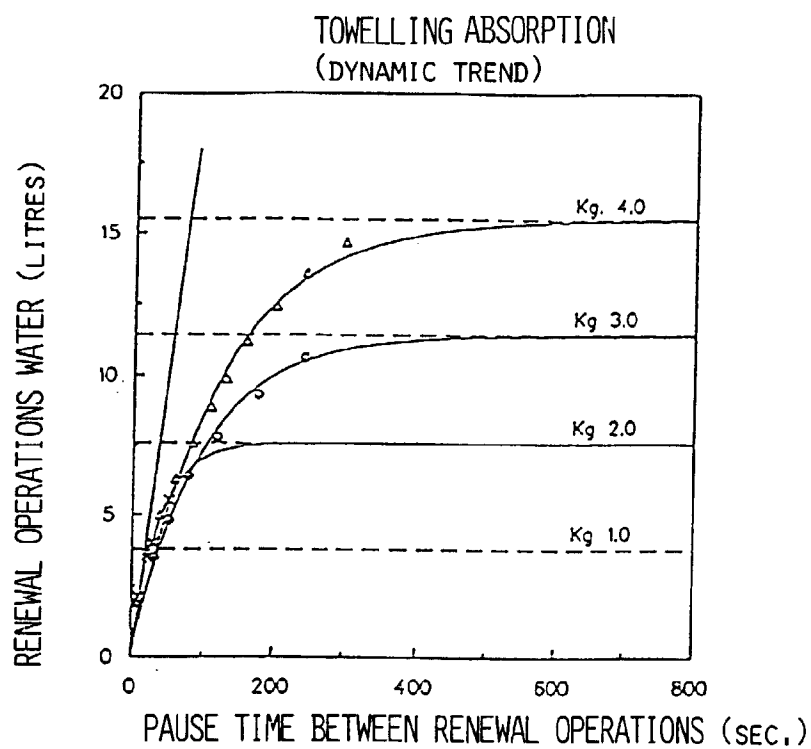
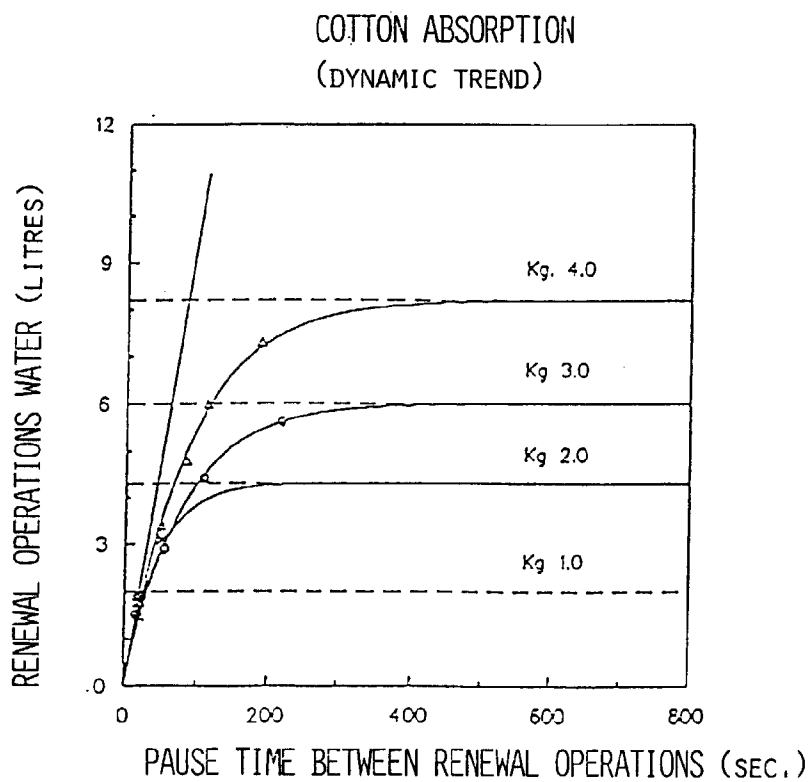


FIG. 8



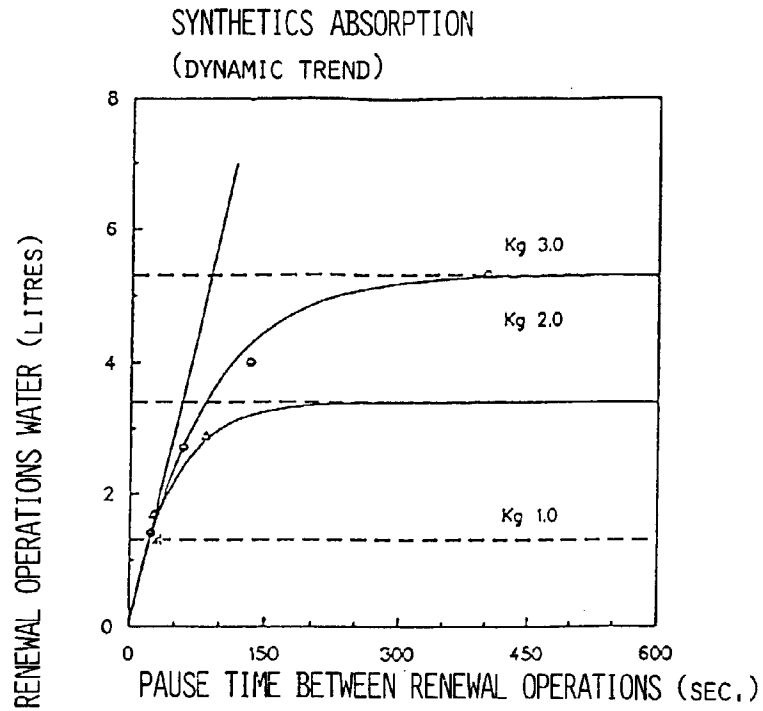


FIG. 10

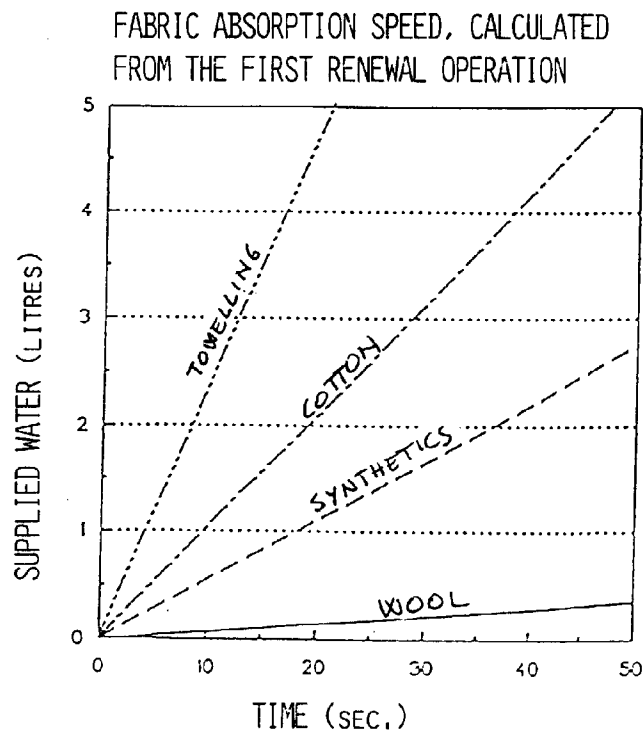


FIG. 11

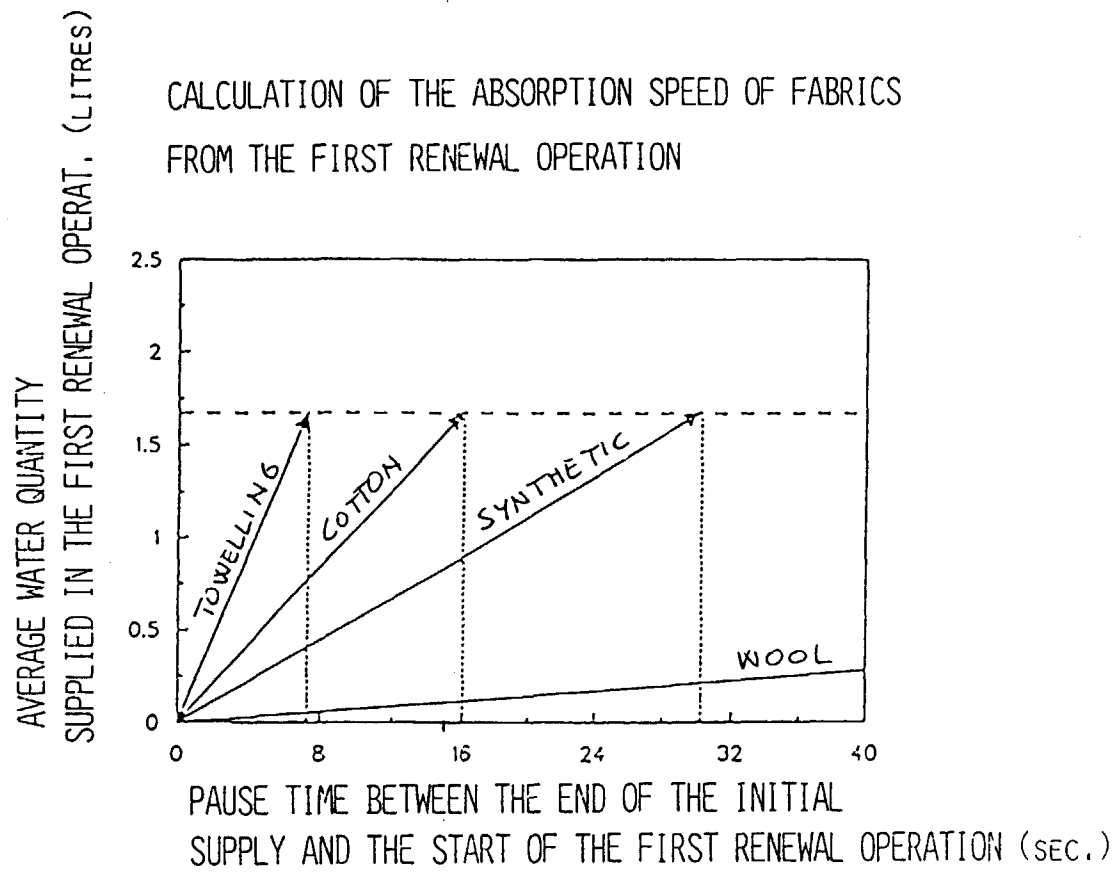


FIG. 12