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(54) **Method for controlling a dishwashing machine**

Steuerverfahren für eine Geschirrspülmaschine

Procédé pour la commande d'un lave-vaisselle

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(56) References cited:
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Description

[0001] The invention relates to a method for controlling a dishwashing machine, in which by operation of a pumping system water can be led into a washing compartment.

[0002] Automatic dishwashers are typically provided with a control system comprising a central control unit but performs various cycles of an overall wash program. Generally, the various cycles include wash, rinse and dry operations. Prior to each wash and rinse cycle, an amount of water is admitted into a washing chamber of the dishwasher to establish a washing fluid. The dishwashing machine additionally comprises a circulation through which by operation of a pumping system comprising a circulation pump the water is pumped to one or more spray arms or equivalent water dispensers located in the washing compartment. Here, the water is sprayed onto loaded dishes to dislodge food and soil particles. The water, containing the food and soil particles, is then drained into a sump where it is usually filtered. The filtered water again circulates to wash the dishes. The success of the whole wash program depends of the choice of parameters and how well they are adapted to the actual amount, distribution and soiling of the dishes. The more dishes are loaded or the more soiled the loaded dishes are, a harder program has to be used.

[0003] Traditionally, the choice of the wash program and its parameters is a choice of the user of the washing machine. A multitude of manually effectable choices exists, resulting in the risk of operating errors.

[0004] Hence, dishwashing machines have been developed comprising a central control unit designed to adapt program parameters with respect to the actual amount, distribution and soiling of the dishes. In these methods, information about the load is gathered before or during the wash program and the wash program is adapted. These programs are normally called "automatic programs". A central object of this research is of course the creation of a control system in which no user selections are needed.

[0005] From WO-A-2006/011773 there is known a method for controlling a dishwashing machine, in which by operation of a pumping system water can be lead into a washing compartment. In this known method information tags are attached to the dishes to be cleaned, which tags contain information on the kind of the dish, the main use of the dish, the use of the dish served, and the shape of the dish. When starting a cleaning process, the tags are automatically read by a reader unit so as to determine the positions of the dishes on a plurality of racks in the washing chamber, wherein based on such determination the spray conditions for the washing water are set.

[0006] It is for example known to measure the turbidity of the water in an early phase of the wash program to determine the degree of soiling. To achieve this goal, a turbidity sensor is located in the sump of the dishwashing machine. However, such a turbidity value contains no information about the amount of dishes or their distribu-

tion.

[0007] Another used technique is to heat the water during operation of the pumping system and determine the speed of heating. This value includes information about the heat capacity of the load. A drawback is that many materials for dishes (porcelain, glass, plastics) have different heat capacitance and therefore the amount of dishes also cannot be determined precisely.

[0008] Thus, additional Information is still needed to provide a better adaptation to the loaded dishes to be washed.

[0009] It is the object of the invention to provide a control method in which Information useable to adapt wash program parameters is determined in a new and reliable way.

[0010] This object is achieved by a method as it is defined in claim 1.

[0011] The main idea of the current invention is to have a certain amount of water introduced into the dishwashing machine, when the dishes are preferably still dry. If the dishes are wetted, a certain part of the water, depending on the surface of the dishes, remains on the dishes and, of course, on the walls of the washing compartment, the basket, and so on. Therefore, by measuring the second amount of water not comprising the part remaining in the washing compartment, by comparison with the known first amount of water an information about the surface of the dishes and the components always present in the washing compartment can be derived. As the amount of water wetting the washing compartment comprising its walls, the basket and other parts of the dishwashing machine is substantially the same for all runs of the dishwashing machine, comparison with a reference value allows to eliminate the offset originating from the mentioned parts of the washing compartment, so that an information about the surface of the loaded dishes can be determined if the dishes were dry when loaded. The reference value is based on the first amount of water and a certain surface of the dishes to provide, in the case that only one reference value is used, at least an information if the measured surface is larger or smaller than the certain surface. On the other hand, if information about the amount, respectively the surface, is already available, for example from other information used to control the dishwashing machine, an information about the initial wetness of the dishes can be deduced. However, in practise, the computed value determined by the invention serves as an additional information which is combined with other determined values, e. g. a turbidity value and/or a heating speed, to derive as much information as possible about the loaded dishes to optimize the choice of program parameters. In an embodiment, it is of course possible to run a dry cycles before executing the method steps named above to ensure dryness of the loaded dishes.

[0012] In summary, the inventive method allows to gain a new, in particular additional, information to provide a better adjustment of the wash program. If a great value

for the surface is determined, a harder program can be chosen. In addition, the computed value can advantageously be combined with additional information to optimise the control of the dishwashing machine.

[0013] Usually, a dishwashing machine is already adapted to admit a certain amount of water needed for certain wash and/or rinses cycles. Therefore, in an embodiment of the current invention, the predetermined first amount of water can be discharged into the dishwasher using a time-controlled valve and/or a pressure switch or pressure sensor. A pressure sensor is normally located in a sump of the dishwashing machine and measures the water level of the water already filled in. Upon reaching certain threshold, the water supply is halted. In this manner, a predetermined first amount of water can be admitted.

[0014] However, the first amount of water admitted is usually a few litres, especially 3 to 4 litres, whereas the water remaining on the dishes usually amounts to about tenths of litres, especially 0.3 to 0.4 litres. If the first amount of water is not exactly known, measurement of the remaining part may become difficult. Due to slow variations of the flow through a valve and measurement errors, especially when the water level already resides in the compartment having a large section, deviations in the region of tenths of litres can occur, having a large influence on the accuracy of the computed value. Therefore, it has proven advantageous to measure a calibration value describing the first amount of water, in particular in the same manner as the water value is measured. After the water is admitted into the dishwashing machine, a calibration measurement is therefore performed to determine the first amount of water. It is important that the dishes are not yet wetted during this calibration phase. The inventive method, however, can also be applied if for example dishes are already slightly wet when loaded. To allow an easy comparison of the water value and the calibration value, the measurement is effected in the same manner. This can mean that the same measurement devices are used but also that the measurement conditions are the same. If the same measurement device and the same conditions are used, the calibration value can be subtracted from the water value so that a direct measure of the remaining part is obtained. According to the invention, at least one measurement can be performed using a pressure sensor located in a sump of a dishwashing machine for measuring the water level. By using this already mentioned pressure sensor, the barometric equation is used to calculate a height of water, i.e. the water level, from a pressure measured in the sump. Normally, an air chamber can be used in which air is compressed by the water in the sump and, if applicable, in the washing compartment and the pressure of the air is measured by an analogous sensor. If the geometric structure of the sump and the adjoining compartment is known, a corresponding amount of water can be derived.

[0015] Using this method, a few considerations have

to be taken into account and some requirements have to be met. First of all, enough water is needed to wet the dishes completely without having air sucked into the circulation by the pumping system. Additionally, the measurement should be performed in a narrow area so that a slight change in the amount of water results in a measurable water level difference. This can be achieved in an area of the sump, where the walls are substantially parallel so that linearity is assured.

[0016] The first requirement usually has the consequence that if the pumping system is not driven, i.e. the water stands still, the water level already resides in the washing compartment (and not in the sump), where tenths of litres remaining on the dishes are barely measurable because of the large surface of the water in that area.

[0017] In a preferred embodiment of the invention, at least one measurement can thus be performed during operation of the pumping system. In this manner, a part of the water is circulating and therefore does not reside in the compartment so that the measurement can be effected in a narrow area, specially in the sump. Additionally, it can be assured that at the time of the measurement always the same amount of water is located in the circulation. This is especially advantageous if a calibration value is measured. In this case, amounts of water residing in the circulation as a result of a previous wash can be taken into account. If such a calibration value is measured, the pumping system should be operated at such a low pressure that loaded dishes are not wetted. This means, the speed of the circulation pump is chosen low enough so that only the lower spray arm is driven and the water preferably does not spray higher than the bottom of the lowest dish basket. Under these circumstances measurement of the calibration value can be effected with the water level being for example in the upper area of the sump.

[0018] Regarding the measurement of the water value, a few alternatives are possible when the measurement is performed during the operation of the pumping system.

[0019] In a first embodiment of the current invention, the measurement of the water value can be performed during the operation- of the pumping system such that the whole washing compartment is wetted, wherein the measurement is performed after a time sufficient to completely wet the washing compartment. It is therefore possible to measure using the same operation parameters that are used to effect wetting of the dishes. However, the measurement should not begin before the dishes are sufficiently wetted. In this embodiment, the wetting phase and the water value measurement phase of the method are combined.

[0020] In this configuration, a time dependent behaviour of the water value can be analysed, wherein a cavity value describing the presence of cavities in the dish is determined. Often, users - against all instructions - orient dishes in a way that a cavity of the dishes points upward so that during wetting water is gathering in these

cavities. This not only effects the reliability of the determination of the computed value but also removes water from the circulation which can be unfavourable for the following wash procedure. Using the inventive method, the presence of such water-gathering cavities can advantageously be detected. If these cavities exist, a time-dependent falling of the water level can be observed.

[0021] The determined cavity value can be used in several ways. If it is determined that the wrong orientation of the dishes excludes the successful washing, a warning should be output to the user. To achieve this, an optical and/or acoustical warning can be output to the user of the dishwashing machine if the cavity value exceeds a threshold value. Further, as already mentioned, as the cavities adversely effect the measurement of the water value and therefore the determination of the computed value, the determination of the computed value can be performed depending on a correction value derived from the cavity value. The time-dependent behaviour of the water value is evaluated to determine the size of the cavities and a corrected water value can be used for the determination of the computed value.

[0022] In a second embodiment of the method in which both the measurement of the calibration value and the water value are effected during operation of the pumping system, the measurement of the calibration value and the measurement of the water value can be performed using the same operation parameters of the pumping system. This variant is preferable, if the measurement conditions are ideal with these operation parameters. This allows to subtract both values so that the amount of water remaining in the washing compartment can be directly determined as both values are comparable. If - as the reference value - the amount of water remaining on parts of the dishwashing machine itself is known, the amount of water remaining on the dishes can easily be derived.

[0023] However, in most dishwashing machines, running the pumping system to determine the calibration value such that the dishes are not yet wetted results in the water level being in the area of the upper end of the sump where the measuring conditions are not optimal, so that usually the measurement of the water value is to be performed at different operation parameters. Of course, between the two measurement phases, the dishes have to be wetted.

[0024] However, a measurement during the wetting of the dishes is in most cases not possible because of the requirements named above (no sucking in of air during wetting, measurement of the calibration value possible while the water level resides in the sump) lead to a scant amount of water so that hardly any water remains in the sump during wetting, rendering an exact measurements impossible. Thus, in a third embodiment of the inventive method, the measurement of the water value is neither performed using the operation parameters of the calibration measurement nor at the operation parameters of the wetting of the dishes, but using conditions which are op-

timal for the measurement, i.e. with the water level being in a narrow area of the sump. In this variant, the measurement of the water value is performed after wetting the washing compartment using operation parameters optimal for the measurement. The method comprises at least three phases with different operating parameters of the pumping system, namely a calibration phase, a wetting phase and a measurement phase. In the optional calibration phase the calibration value describing the first amount of water is determined, so that the correct reference values for the comparison with the water value can be determined. The reference values, which most likely are also taken from measurements, in this case are determined using the operation parameters in the measurement phase.

[0025] There is, however, a fourth possibility to effect the measurement of the water value during operation of the pumping system. In this embodiment, for measuring the water value after wetting of the washing compartment, the speed of a motor driving the pumping system is increased in steps or continuously until a water level measured by a sensor, in particular a pressure sensor located in the sump to measure the water level, has fallen below a predetermined or determinable level value, wherein the speed at the time the water level has fallen under the level value is used as the water value. For example, the speed of a circulation pump can be increased in steps of i.e. 100 rpm or continuously until a certain water level is reached. This is an indirect way to measure the second amount of water, as a combination of a water level and a speed of the circulation pump always define a certain amount of water. Advantageously in this embodiment the water level defined by the level value can always be chosen in a manner such that the measuring conditions are optimal.

[0026] If a calibration value is measured and the operation parameters during the measurement of the calibration value and the measurement of the water value are not the same, preferably a plausibility value is measured under the same circumstances as the calibration value after the measurement of the water value, wherein the plausibility value is used in a plausibility check. Even if the measurement conditions during the measurement of the calibration value are not optimal, a comparison of the calibration value and a plausibility value recorded after the wetting of the dishes can serve to perform a plausibility check and see if the computed value is plausible. This reduces the risk of basing the control of the dishwashing machine on a measurement error.

[0027] When measuring with the pumping system in operation and if a calibration value is measured, the operation parameters of the pumping system during the wetting and/or measurement of the water value and/or the plausibility value can be adjusted depending on the calibration value and respectively the first amount of water. Depending on the first amount of water, i.e. the amount of water actually present in the dishwashing machine, different optimal operation parameters for the

measurement are found, so that the actually used operation parameters can be adjusted to provide better measurement conditions. The same applies for the wetting of the dishes. For example, tables can be used which allocate certain operation parameters and reference values to intervals of the calibration value. Of course, also a functional dependence is possible.

[0028] During operation of the pumping system, water is in motion and therefore the water level in the sump is not constant over time, but oscillates about an average value. In a preferred embodiment of the invention, the determination of the measured value or the measured values can therefore be performed by calculating an average value over multiple measurements in a predetermined time span. In this manner, the oscillations are averaged out and a more reliable measured value is obtained.

[0029] Generally speaking, it was already mentioned that the computed value can advantageously be used as an additional information, so that as much information as possible is gathered about the amount and type of the dishes. Thus, additionally to the computed value a heating velocity of the water during operation of the pumping system and/or a turbidity value of a turbidity sensor can be determined and the dishwashing machine can be controlled also depending on the heating velocity and the turbidity value. Another possibility is to measure the cooling of water. In this case, additional cold water is admitted to the dishwashing machine and is circulated without heating. The water temperature reflecting the amount of cooling measured thereafter gives an information on how much mass is present in the machine. Other additional information can also be used. Preferably, the information is combined to describe as exact as possible the load of the dishwashing machine. The heating speed, for example, can be checked against the computed value to determine whether the surface is plausible or if the dishes were likely already wet.

[0030] To obtain a measure for the surface of the dishes from the computed value, preferably at least two reference values are used, wherein one reference value is determined when no dishes are loaded and another reference value is determined when a certain amount of dishes are loaded. In good approximation, the amount of water remaining on the dishes depends linearly on the surface of the dishes. Assuming this linear relationship, from each computed value a corresponding surface can be calculated. The more reference values are used, the better the actual relationship can be determined.

[0031] The inventive method can also be used to determine the distribution of dishes between several areas of the washing compartment, especially several dish baskets. To obtain this additional information, in first substep only a first area of the washing compartment containing dishes, especially one of more than one dish baskets, is wetted, whereupon a first computed value with respect to the first area is determined, whereupon a second area of the washing compartment containing dishes, especial-

ly the contents of a second dish basket, is wetted, whereupon a second computed value with respect to the first and the second area is computed, wherein the distribution of the dishes is determined and the dishwashing machine is controlled depending on the distribution. It is of course also possible to divide the washing compartment into more than two areas and determine a computed value for each area. In this case, of course, also the reference values depend on the area as not all parts belonging to the dishwashing machine are wetted in the first substep. As an example, consider a dishwashing machine with two dish baskets and two spray arms located below the dish baskets. In the first substep, the pumping system is driven in a manner that only the lower basket is wetted, i.e. only the lower spray arm is driven or the upper spray arm is driven at such a low pressure that only the lower basket is wetted. In the second wetting step, the pumping system is driven at full power so that both baskets are wetted. This determination of the distribution of dishes is especially advantageous in a dishwasher wherein the distribution of water can also be controlled during the wash and rinses cycles. For example, most dish washers allow to decide whether only the lower, only the upper or both spray arms are driven. The distribution of the water during the wash and rinses cycles can then be adapted to the distribution of the dishes. Note that also the turbidity value and the heating speed can be determined for both areas.

[0032] The control of the dishwashing machine of course depends on the type of the dishwashing machine and its capabilities. For example, when controlling the dishwashing machine, at least one parameter of a wash program and/or a drying program, in particular the temperature and/or duration of steps and/or the number of cleaning phases and/or the amount of water to be substituted and/or the amount of detergent and/or rinse aid to be added and/or the speed of a motor driving the pumping system and/or the distribution of the water into different areas of the washing compartment, can be adjusted. In this manner, the wash program can be optimised.

[0033] Further advantages and details of the current invention can be learned from the following description of preferred embodiments in connection with the drawings, wherein:

Fig. 1 is a schematic cross sectional view of a dishwashing machine,

Fig. 2 is a flow chart of a first embodiment of a method according to the invention,

Fig. 3 is a graph showing exemplary water levels during different phases of the method of Fig. 2,

Fig. 4 is a flow chart of a second embodiment of a method according to the invention,

Fig. 5 is a graph showing exemplary water levels dur-

ing different phases of the method of Fig. 4,

Fig. 6 is a graph showing exemplary water levels during the measurement phase of the method of Fig. 4,

Fig. 7 is a flow chart of a third embodiment of a method according to the invention,

Fig. 8 is a graph showing exemplary water levels during different phases of the method of Fig. 7, and

Fig. 9 is a flow chart of a fourth embodiment of a method according to the invention.

[0034] First of all, please note that the following description is based on dishes loaded in an at least near-dry condition. The method, however, is not limited to that case. It is also possible to dry the dishes in a dry cycle before the various measurement steps of the invention, or it is possible to use additional information to determine whether the loaded dishes were initially wet.

[0035] Fig. 1 shows as an example a dishwasher 1 which can be controlled by a method according to the invention. It comprises a washing compartment 2 with a front loading opening closed by a pivotable front door 3. An upper dish basket 4 and a lower dish basket 5 are retractably mounted inside the washing compartment 2. These baskets 4 and 5 receive dishes 6 to be washed. Also located in the washing compartment 2 are an upper spray arm 7 and a lower spray arm 8 mounted below the respective dish baskets 4, 5.

[0036] Water can be admitted into the dishwashing machine via an inlet pipe 9. The water supply is controlled by a controllable valve 10. During a wash or rinse cycle, the water is sprayed onto the dishes via the spray arms 7 and 8. The water flowing from the dishes is collected in a sump 11. The water can then be reused and be pumped into the spray arms again by a pumping system 13 comprising a pump 14. Water in the sump 11 is first filtered in a filtering device 12 and enters the circulation 15. Additionally, the water can be heated via a heating device 16. A switching device 17 can be provided to select which of the spray arm 7 and 8 should be active or if both should be active.

[0037] All components of the dishwashing machine 1 are controlled by a control system comprising a centralised control unit 18. The control unit 18 is designed to carry out the method according to the invention.

[0038] To automatically adjust the parameters of a wash program the control unit 18 can collect various information by sensors, for example a turbidity sensor 19 in the sump to measure the turbidity of the water and a temperature sensor 20 to measure the speed of heating of circulating water. From the measured values of these sensors a turbidity value and a speed of heating can be obtained. These procedures are well known in the state of the art and are not described in detail.

[0039] During each cycle, a certain amount of water is needed. Thus, the dishwashing machine 1 can control the valve 10 to open for a certain time, so that a certain amount of water is admitted to the dishwashing machine 1. As the water pressure at the valve 10 and therefore the flow through the open valve 10 varies over time, the dishwashing machine 1 also comprises a pressure sensor 21 located at the bottom of the sump. From the measured pressure, a water level can be calculated, i.e. the height of the water in the sump or the washing compartment 2. If the water level, respectively the pressure, reaches a certain predetermined level, the control unit 18 can close the valve 10. These predetermined water levels or pressures can easily be derived from the known geometrical shape of the sump and the washing compartment.

[0040] It is understood by the person skilled in the art that the method according to the invention can also be performed in other dishwashing machines. The dishwashing machine 1 described here is only an illustrative example.

[0041] The object of the method according to the invention is to obtain information about the dishes 6 in the washing compartment 2 to control the dishwashing machine 1 according to this information. The method is preferably carried out at the beginning of an automatic wash program when the dishes 6 are still dry. The further course of the wash program is then adjusted according to the information. For example, the temperature and/or the duration of steps and/or the number of cleaning phases and/or the amount of water to be substituted and/or the amount of detergent and/or rinse aid to be added and/or the speed of a motor driving the pumping system and/or the distribution of the water into different areas of the washing compartment 2 can be adjusted.

[0042] In the following, certain preferred embodiments of the method according to the invention are described in detail. In all these exemplary embodiments, values describing the amount of water are measured by the pressure sensor 21 in the sump. As already explained in the general description, certain requirements have to be met to provide optimal measuring conditions. Hence, in the following embodiments, all measurements are performed during operation of the pumping system 13.

[0043] It should also be noted that during the various phases of the method of the invention also the turbidity in form of the turbidity value and the speed of heating of the circulated water can be determined. This information is advantageously combined with the computed value according to the invention to realise optimal control of the dishwashing machine.

[0044] Fig. 1 shows a flow chart of a first embodiment of the method according to the invention.

[0045] In phase 1, the first amount of water is let into the dishwashing machine 1 via the inlet pipe 9. Therefore, the control unit 18 opens the valve 10 until a certain water level measured by the pressure sensor 21 is reached. Then, the valve 10 is closed. To allow for wetting of the

whole washing compartment 2, a certain amount of water is needed. Therefore, about 3 to 4 litres of water are admitted to the dishwashing machine, so that no air is sucked into the circulation 15 during wetting.

[0046] However, in most cases, there are variations in the first amount of water filled into the dishwashing machine 1. Sources of this variation are manifold, for example water still remaining in the circulation 15 or measurement errors of the pressure sensor 21. Additionally, as the volume of the sump usually is smaller than 3 to 4 litres, the water level resides in the washing compartment 2, so that a large surface exists. That means that a measurable change in the water level corresponds to a larger amount of water. In any case, it should be possible to admit a first amount of water within a certain range of for example 3 to 3.4 litres. Other methods to admit the first amount of water can be used with which the amount of water inlet could be more precisely determined. In this case, the following calibration phase, phase II, can be skipped.

[0047] In phase II, a calibration value describing the first amount of water is measured. This phase is optional, as already mentioned. It is not needed if the amount of water admitted in phase I is determinable precisely enough. Therefore, the pump 14 of the pumping system is driven at a low speed so that water is circulating but the dishes are wetted as less as possible, preferably none are wetted at all. In other words, only the lower spray arm 8 is active while the water is not sprayed higher than the bottom of the lower dish basket 5. In comparison to the water level without operation of the pumping system 13, the water level is now lower but slightly oscillating. Examples for the time dependent behaviour of the water level in the first embodiment of the invention are shown in fig. 3. Three graphs are shown, wherein one corresponds to no loaded dishes, a second to a low surface of load and a third to a high surface of load. As can be seen in the area marked as phase II in fig. 3, the value of the water level drops during operation of the pumping system 13 at a low speed, but oscillates over time as the water is moved. The water level resides in the upper part of the sump which is formed conically, so that still a high surface of the water is given. This means, the measurement conditions are not ideal, but improved compared to the water level without operation of the pumping system 13. The value of the water level is measured over a certain time span and an average value is calculated to eliminate the oscillations. This value is called calibration value or CL. It describes the actual first amount of water in the dishwashing machine 1.

[0048] In phase III, the washing compartment 2 and therefore the dishes residing in the dish baskets 4 and 5 are wetted. The pumping system 13 works at a high power, the pump 14 is driven at a high speed. As just enough water to allow the wetting operation without sucking air into the circulation is inlet into the dishwashing machine 1, the water level in the sump 11 is extremely low so that an exact measurement is nearly impossible. This can be

seen by the high amplitude of the oscillations in the area designated phase III in fig. 3. Thus, a measurement should not be performed during the wetting phase.

[0049] In phase IV, the measurement of a water value is effected. During this measurement, the pump 14 is driven at a medium speed so that the water level preferably resides in the narrow area 22 with parallel walls in the sump 11. As can be seen from fig. 3, a notable difference between the three graphs is visible despite a certain oscillation. Again, the water level is measured over a certain time span and then averaged. The resulting water value is called ML. As can be seen from fig. 3, the higher the surface of the dishes 6 is, the lower is the water level, which means, more water remains on the dishes.

[0050] The speed with which the pump is driven in phase III and IV can be dependent on the calibration value CL. Dependent on the first amount of water in the dishwashing machine 1 the ideal measuring area 22 can only be used at different speeds. Therefore, the control unit 18 may comprise a table allocating certain speeds of the pump 14 to certain measured values or intervals of the calibration value CL.

[0051] It should also be noted that the measurement phase IV can also be performed using the same operation parameters as for the calibration measurement in phase II. This is sensible if the calibration value is already measured in a suitable area of the sump. In such a configuration, the water value ML can be directly compared to the calibration value CL. Additionally, phase VI is not applicable in such a configuration.

[0052] From the known water value ML and the calibration value CL the computed value describing the actual surface of the dishes 6 in the washing compartment 2 can be determined. Therefore, the water value ML is compared to two reference values RL based on the calibration value CL, respectively the first amount of water, and certain surfaces of the dishes. Preferably, one reference value RL 1 has been previously measured according to the method while no dishes are loaded, i.e. the surface is zero. As the area 22 of the sump 11 has parallel walls of the sump 11, the water level corresponds linearly to the amount of water measured. Additionally, one can assume that the water remaining on the dishes increases linearly with their surface. All in all, there is consequently a linear relationship between the water value ML and the surface of the dishes. As two reference values for different surfaces are known, each water value ML can be allocated to a corresponding surface. This corresponding surface or value describing this corresponding surface is called the computed value and can be further evaluated to control the dishwashing machine 1 as described above.

[0053] The table stored in the control unit 18 containing the different operation parameters and reference values for certain calibration value intervals is given below as an example.

CL	RPM	RL 1	RL 2
3.0 - 3.1	3500	2.0	1.9
3.1 - 3.2	3600	2.15	2.04
3.2 - 3.3	3700	2.27	2.13
3.3 - 3.4	3800	2.41	2.25

[0054] Finally, in phase VI the plausibility check is performed. Therefore, a measurement of a plausibility value PL is effected under the same conditions, i.e. at the same rotation speed, as in the measurement of the calibration value CL. As can be seen from fig. 3, differences according to the surface of the dishes can be measured, but a smaller with respect to the oscillations compared to the measurement phase IV. However, the plausibility value PL can be used for a plausibility check to see if the determined computed value is sensible.

[0055] In the following embodiments of the method according to the invention only the phases differing from those of the first embodiment are described in detail. The description regarding the first embodiment of the invention applies here unchanged.

[0056] Fig. 4 shows a flow chart of a second embodiment of the method of the invention. Phases III and IV differ from the first embodiment. In this embodiment, a higher first amount of water is admitted into the dishwashing machine 1 so that the measurement conditions are optimal in the wetting phase III. Thus, the measurement of the water level is performed in phase III, so that no separate measurement phase is needed. However, in phase IV of the second embodiment of the invention, additionally the temporal behaviour of the water level is analyzed to determine a cavity value and the water value ML.

[0057] In phase III, the measurement of the water level is started after a time sufficient to wet all the dishes 6 in the washing compartment 2. Water levels for the respective phases are shown in fig. 5.

[0058] In phase IV, the time-dependent behaviour of the water level is analyzed. In this manner, cavities of wrongly oriented dishes that are filling with water over time can be detected. As can be seen from fig. 5, after the time needed to wet all the dishes, the water level apart from the oscillation remains constant. That means, no cavities are filled, so no water is removed from the circulation. All dishes are placed correctly.

[0059] Another example of a water level in the wetting phase III is shown in fig. 6. Here, at least one cavity exists but is filled with water over time, for example a pot placed with its opening upwards. As can be seen, the water level drops due to the water loss in the cavity of the cavities. Once the cavity is filled, the water level remains substantially constant. From this behaviour a cavity value can be derived that describes the volume of the cavities. If a certain threshold is surpassed, an acoustic and/or

optical warning can be given to a user of the dishwashing machine 1. In critical cases, the wash program can even be terminated.

[0060] The cavity value is also used to determine the correct water value ML. Obviously, the water value ML, in a case like in fig. 6, can not simply taken as the average over the measured water level value. A correction value is calculated which is added to the average to compensate for the cavities. In this manner, the correct water value ML, from which the computed value can be derived, can be determined.

[0061] Fig. 7 shows the flow chart of a third embodiment of the method according to the invention. Only phase IV differs from the first embodiment. In this configuration, the water value ML is not measured at some fixed operation parameters via the water level, but the operation parameters of the pumping system 13 are changed. As already discussed above, it is complicated to create ideal measuring conditions for all possible surfaces of dishes. The idea underlying this third embodiment is to use varying operation parameters and find the operation parameters where a certain water level is reached. This predetermined water value is chosen so that optimal measurement conditions are existing. In this manner, it is assured that the decisive measurement always takes place under good measurement conditions.

[0062] After the dishes and the washing compartment have been wetted in phase III, the speed of the motor of the pump 14 is stepwise, e.g. in steps of 100 rpm, increased, so that the water level consequently drops in steps. This is shown in fig. 8, which shows the time-dependent behaviour of the water level in the measurement phase IV. As can be seen, with each change of the speed of the pump 14, the water level also drops. Once the water level has fallen below the level value, the process is stopped and the current speed of the pump is determined as the water value ML. The level value and the rotation speed of the motor of the pump are sufficient to determine the amount of water.

[0063] The reference values used in phase V for the comparison are of course determined using the same method and can themselves represent rotation speeds.

[0064] The method according to the invention can also be used to determine the distribution of dishes between - in the example of fig. 1 - the upper and the lower basket 4 and 5. A further, fourth embodiment of the method according to the invention is shown as a flow chart in fig. 9. Here, the method according to one of the first three embodiments is used two successive times to determine the distribution of the dishes 6 between the upper and the lower baskets 4 and 5. The phases I and II are unchanged compared to the first three embodiments and are not repeated. In a first substep I, only the dishes in the lower basket 5 are wetted. That means, the pumping system 13 is operated in a manner that the dishes in the upper basket 4 still remain dry. Corresponding to any of the phases III to VI of one of the first embodiments, a first, computed value is determined. As only the dishes

in the lower basket 5 have been wetted, the first computed value describes only the surface of the dishes in the lower basket 5.

[0065] In a second substep II, the pumping system 13 is driven in a way such that all the dishes are wetted, including the dishes in the upper basket 4. Then again, corresponding to the phases III to VI of any of the embodiments above, a second computed value is determined. This second computed value describes the surface of all the dishes 6 in the dishwashing machine 1.

[0066] For example, the circulation pump 14 is operated at a low speed in sub step I and at a high speed in sub step II.

[0067] From the first and the second computed values the distribution of the dishes can be determined. The method of the invention also allows to measure a turbidity value and a heating speed in both substeps, but can also be used in the determination of the distribution. The information about the distribution can for example be used to control the distribution of water in the subsequent steps of the washing program. This fourth embodiment of the method can also be iterated, for example, if the dishwashing machine comprises more than two baskets. In this case, the pumping system can be driven so that in a first substep the lowest basket is wetted, in a second substep the middle basket is wetted and in a third substep the upper basket is wetted.

Claims

1. Method for controlling a dishwashing machine, in which by operation of a pumping system water can be led into a washing compartment, **characterized in that:**

- a predetermined or subsequently determined first amount of water is admitted into the dishwashing machine,
- a wetting of the washing compartment, especially loaded dishes, is effected using the first amount of water, wherein a part of the first amount of water remains within the washing compartment and another part of the water collects within a sump below the washing compartment,
- a water value describing a second amount of water comprising the part of the water collected within the sump is measured,
- by comparison of the water value with at least one previously determined reference value which describes the first amount of water a computed value describing the actual surface and/or the initial wetness of the dishes is determined, and
- the dishwashing machine is controlled depending on the computed value.

2. Method according to claim 1, **characterized in that** the water value is determined by measuring the water level within the sump while operating the pumping system at varying speeds and comparing the data thus obtained.
3. Method according to claim 1 or 2, **characterized in that** a calibration value describing the first amount of water is measured, especially in the same manner as the water value.
4. Method according to claim 3, **characterized in that** the measurement of the calibration value is performed during the operation of the pumping system at such a low pressure that loaded dishes are not wetted.
5. Method according to any one of claims 2 to 4, **characterized in that** the measurement of the water value is performed during the operation of the pumping system such that the whole washing compartment is wetted, wherein the measurement is performed after a time sufficient to completely wet the washing compartment.
6. Method according to claim 5, **characterized in that** a time dependent behaviour of the water value is analyzed, wherein a cavity value describing the presence of cavities in the dishes is determined.
7. Method according to claim 6, **characterized in that** when the cavity value exceeds a threshold value an optical and/or acoustical warning is output to the user of the dishwashing machine.
8. Method according to claim 6 or 7, **characterized in that** the determination of the computed value is performed depending on a correction value derived from the cavity value.
9. Method according to claim 4, **characterized in that** the measurement of the calibration value and the measurement of the water value are performed using the same operation parameters of the pumping system.
10. Method according to claim 2 or any claim that is dependent on claim 2, **characterized in that** for measuring the water value after wetting of the washing compartment the speed of a motor driving the pumping system is increased in steps or continuously until a water level measured by a sensor, especially a pressure sensor, located in the sump to measure the water level has fallen under a predetermined or determinable level value.
11. Method according to one of the Claims 5 to 8 or 10, **characterized in that** after the measurement of the

water value a plausibility value is measured under the same circumstances as the calibration value, wherein the plausibility value is used in a plausibility check.

12. Method according to one of the claim 2 to 9, **characterized in that** if a calibration value is measured the operation parameters of the pumping system during the wetting and/or the measurement of the water value and/or the plausibility value are adjusted depending on the calibration value and respective the first amount of water. 5
13. Method according to one of the Claims 2 to 12, **characterized in that** the determination of the measured value or the measured values is performed by calculating an average value over multiple measurements in a predetermined time span. 10
14. Method according to one of the preceding claims, **characterized in that** additionally to the computed value a heating velocity of the water during operation of the pumping system and/or a turbidity value of a turbidity sensor are determined and the dishwashing machine is controlled also depending on the heating velocity and the turbidity value. 15
15. Method according to one of the preceding claims, **characterized in that** at least two reference values are used, wherein one reference value is determined when no dishes are loaded and another reference value is determined when a certain amount of dishes are loaded. 20
16. Method according to one of the preceding claims, **characterized in that** in a first substep only a first area of the washing compartment containing dishes, especially one of more than one dish baskets, is wetted, whereupon a first computed value with respect to the first area is determined, whereupon a second area of the washing compartment containing dishes, especially the contents of a second dish basket, is wetted, whereupon a second computed value with respect to the first and the second area is computed, wherein the distribution of the dishes is determined and the dishwashing machine is controlled depending on the distribution. 25
17. Method according to one of the preceding claims, **characterized in that** when controlling the dishwashing machine at least one parameter of a wash program and/or a drying program, especially the temperature and/or the duration of steps and/or the number of cleaning phases and/or the amount of water to be substituted and/or the amount of detergent and/or rinse aid to be added and/or the speed of a motor driving the pumping system and/or the distribution of the water into different areas of the washing 30

compartment, is adjusted.

18. Method according to one of the preceding claims, **characterized in that** the predetermined first amount of water is discharged into the dishwashing machine using a time-controlled valve and/or a pressure switch or pressure sensor. 35
19. Method according to one of the preceding claims, **characterized in that** at least one measurement is performed using a pressure sensor located in a sump of the dishwashing machine for measuring the water level. 40

Patentansprüche

1. Verfahren zum Steuern einer Geschirrspülmaschine, bei welchem durch Betrieb eines Pumpsystems Wasser in einem Waschbehälter eingebracht werden kann, **dadurch gekennzeichnet dass:**
 - eine vorbestimmte oder nachfolgend bestimmte erste Menge an Wasser in die Geschirrspülmaschine eingelassen wird,
 - ein Benetzen des Waschbehälters, insbesondere eingebrachter Geschirrstücke, unter Verwendung der ersten Menge an Wasser bewirkt wird, wobei ein Teil der ersten Wassermenge innerhalb des Waschbehälters verbleibt und ein anderer Teil des Wassers sich innerhalb eines Sumpfes unterhalb des Waschbehälters sammelt,
 - ein Wasserwert, der eine zweite Wassermenge beschreibt, die den Teil des sich in dem Sumpf gesammelten Teil des Wassers umfasst, gemessen wird,
 - durch Vergleich des Wasserwertes mit mindestens einem zuvor bestimmten Referenzwert, welcher die erste Wassermenge beschreibt, ein berechneter Wert bestimmt wird, welcher die tatsächliche Oberfläche und/oder die anfängliche Feuchte der Geschirrstücke beschreibt, und
 - die Geschirrspülmaschine in Abhängigkeit von dem berechneten Wert gesteuert wird.
2. Verfahren gemäß Anspruch 1, **dadurch gekennzeichnet, dass** der Wasserwert durch Messung des Wasserpegels innerhalb des Sumpfes bestimmt wird, während das Pumpsystem bei unterschiedlichen Drehzahlen betrieben wird und die so erhaltenen Daten verglichen werden.
3. Verfahren gemäß Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** ein Kalibrierwert, der die erste Wassermenge beschreibt, gemessen wird und zwar insbesondere in der gleichen Weise wie der Wasserwert.

4. Verfahren gemäß Anspruch 3, **dadurch gekennzeichnet, dass** die Messung des Kalibrierwertes durchgeführt wird, während das Pumpsystem bei einem derartig niedrigen Druck betrieben wird, dass die eingebrachten Geschirrstücke nicht benetzt werden. 5
5. Verfahren gemäß einem der Ansprüche 2 bis 4, **dadurch gekennzeichnet, dass** die Messung des Wasserwertes durchgeführt wird, während das Pumpsystem so betrieben wird, dass der gesamte Waschbehälter benetzt wird, wobei die Messung nach einer Zeitdauer durchgeführt wird, die ausreichend ist, um den Waschbehälter vollständig zu benetzen. 10
6. Verfahren gemäß Anspruch 5, **dadurch gekennzeichnet, dass** ein zeitabhängiges Verhalten des Wasserwertes analysiert wird, wobei ein Kavitätswert bestimmt wird, der das Vorhandensein von Hohlräumen in den Geschirrstücken beschreibt. 20
7. Verfahren gemäß Anspruch 6, **dadurch gekennzeichnet, dass** wenn der Kavitätswert einen Grenzwert übersteigt, eine optische und/oder akustische Warnung an den Benutzer der Geschirrspülmaschine ausgegeben wird. 25
8. Verfahren gemäß Anspruch 6 oder 7, **dadurch gekennzeichnet, dass** die Bestimmung des berechneten Wertes in Abhängigkeit von einem von dem Kavitätswert abgeleiteten Korrekturwert durchgeführt wird. 30
9. Verfahren gemäß Anspruch 4, **dadurch gekennzeichnet, dass** die Messung des Kalibrierwertes und die Messung des Wasserwertes unter Verwendung der gleichen Betriebsparameter des Pumpsystems durchgeführt werden. 35
10. Verfahren gemäß Anspruch 2 oder einem der von Anspruch 2 abhängigen Ansprüche, **dadurch gekennzeichnet, dass** zum Messen des Wasserwertes nach dem Benetzen des Waschbehälters die Drehzahl eines das Pumpsystems antreibenden Motors schrittweise oder kontinuierlich erhöht wird, bis ein Wasserpegel, der mittels eines Sensors, insbesondere eines Drucksensors, der im Sumpf zum Messen des Wasserpegels angeordnet ist, gemessen wird, unter einen vorbestimmten oder bestimm- 40
baren Pegelwert gefallen ist. 45
11. Verfahren gemäß einem der Ansprüche 5 bis 8 oder 10, **dadurch gekennzeichnet, dass** nach der Messung des Wasserwertes ein Plausibilitätswert unter den gleichen Umständen wie der Kalibrierwert gemessen wird, wobei der Plausibilitätswert als eine Plausibilitätsprüfung verwendet wird. 55
12. Verfahren gemäß einem der Ansprüche 2 bis 9, **dadurch gekennzeichnet, dass** falls ein Kalibrierwert gemessen wird, die Betriebsparameter des Pumpsystems während dem Benetzen und/oder die Messung des Wasserwertes und/oder des Plausibilitätswertes in Abhängigkeit von dem Kalibrierwert bzw. der ersten Wassermenge eingestellt werden.
13. Verfahren gemäß einem der Ansprüche 2 bis 12, **dadurch gekennzeichnet, dass** die Bestimmung des gemessenen Wertes oder der gemessenen Werte durch Berechnung eines Mittelwerts über eine Mehrzahl von Messungen in einer vorbestimmten Zeitdauer durchgeführt wird.
14. Verfahren gemäß einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** zusätzlich zu dem berechneten Wert eine Aufheizgeschwindigkeit des Wassers während dem Betrieb des Pumpsystems und/oder ein Trübungswert eines Trübungssensors bestimmt werden und die Geschirrspülmaschine ferner in Abhängigkeit von dem Aufheizwert und dem Trübungswert gesteuert wird.
15. Verfahren gemäß einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** mindestens zwei Referenzwerte verwendet werden, wobei ein Referenzwert bestimmt wird, wenn keine Geschirrstücke eingebracht wurden, und ein weiterer Referenzwert bestimmt wird, wenn eine bestimmte Menge an Geschirrstücken geladen wurde.
16. Verfahren gemäß einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** in einem ersten Teilschritt nur ein erster Bereich des Waschbehälters, der Geschirrstücke enthält, insbesondere einer von mehreren Geschirrkörben, benetzt wird, woraufhin ein erster berechneter Wert mit Bezug auf den ersten Bereich bestimmt wird, woraufhin ein zweiter Bereich des Waschbehälters, der Geschirrstücke enthält, insbesondere der Inhalt eines zweiten Geschirrkorbes, benetzt wird, woraufhin ein zweiter berechneter Wert mit Bezug auf den ersten und den zweiten Bereich berechnet wird, wobei die Verteilung der Geschirrstücke bestimmt wird und die Geschirrspülmaschine in Abhängigkeit von der Verteilung gesteuert wird.
17. Verfahren gemäß einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** beim Steuern der Geschirrspülmaschine mindestens ein Parameter eines Waschprogramms und/oder eines Trocknungsprogramms, insbesondere die Temperatur und/oder die Dauer von Schritten und/oder die Anzahl der Reinigungsphasen und/oder die Menge an zu ersetzendem Wasser und/oder die Menge an zuzugebendem Waschmittel und/oder Klarspüler und/oder die Drehzahl eines das Pumpsystem an-

treibenden Motors und/oder die Verteilung des Wassers in unterschiedliche Bereiche des Waschbehälters eingestellt wird.

18. Verfahren gemäß einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die vorbestimmte erste Wassermenge unter Verwendung eines zeitgesteuerten Ventils und/oder eines Druckschalters oder Drucksensors in die Geschirrspülmaschine abgegeben wird.
19. Verfahren gemäß einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** mindestens eine Messung unter Verwendung eines in einem Sumpf der Geschirrspülmaschine zum Messen des Wasserpegels vorgesehenen Drucksensors durchgeführt wird.

Revendications

1. Procédé permettant de commander une machine à laver la vaisselle, dans lequel par le fonctionnement d'un système de pompage, l'eau peut être conduite dans un compartiment de lavage, **caractérisé en ce que** :

une première quantité d'eau prédéterminée ou ultérieurement déterminée est reçue dans la machine à laver la vaisselle,
un mouillage du compartiment de lavage, en particulier la vaisselle chargée, est effectué en utilisant la première quantité d'eau, dans lequel une partie de la première quantité d'eau reste dans le compartiment de lavage et une autre partie de l'eau s'accumule dans un puisard au-dessous du compartiment de lavage,
une valeur relative à l'eau décrivant une deuxième quantité d'eau comprenant la partie de l'eau collectée dans le puisard est mesurée,
par comparaison de la valeur relative à l'eau à au moins une valeur de référence préalablement déterminée qui décrit la première quantité d'eau, une valeur calculée décrivant la surface effective et/ou l'humidité initiale de la vaisselle est déterminée, et
la machine à laver la vaisselle est commandée en fonction de la valeur calculée.

2. Procédé selon la revendication 1, **caractérisé en ce que** la valeur relative à l'eau est déterminée en mesurant le niveau d'eau dans le puisard tout en faisant fonctionner le système de pompage à des vitesses variables et en comparant les données ainsi obtenues.
3. Procédé selon la revendication 1 ou 2, **caractérisé en ce qu'**une valeur d'étalonnage décrivant la pre-

mière quantité d'eau est mesurée, particulièrement de la même manière que la valeur relative à l'eau.

4. Procédé selon la revendication 3, **caractérisé en ce que** la mesure de la valeur d'étalonnage est effectuée pendant le fonctionnement du système de pompage à une pression faible de façon à ne pas mouiller la vaisselle chargée.
5. Procédé selon l'une quelconque des revendications 2 à 4, **caractérisé en ce que** la mesure de la valeur relative à l'eau est effectuée pendant le fonctionnement du système de pompage de sorte que l'ensemble du compartiment de lavage soit mouillé, où la mesure est effectuée après un temps suffisant pour mouiller complètement le compartiment de lavage.
6. Procédé selon la revendication 5, **caractérisé en ce qu'**un comportement dépendant du temps de la valeur relative à l'eau est analysé, où une valeur relative aux cavités décrivant la présence de cavités dans la vaisselle est déterminée.
7. Procédé selon la revendication 6, **caractérisé en ce que** lorsque la valeur relative aux cavités dépasse une valeur seuil, un avertissement optique et/ou acoustique est délivré à l'utilisateur de la machine à laver la vaisselle.
8. Procédé selon la revendication 6 ou 7, **caractérisé en ce que** la détermination de la valeur calculée est effectuée en fonction d'une valeur de correction déduite de la valeur relative aux cavités.
9. Procédé selon la revendication 4, **caractérisé en ce que** la mesure de la valeur d'étalonnage et la mesure de la valeur relative à l'eau sont réalisées en utilisant les mêmes paramètres de fonctionnement du système de pompage.
10. Procédé selon la revendication 2 ou n'importe quelle revendication dépendante de la revendication 2, **caractérisé en ce que**, pour mesurer la valeur relative à l'eau après le mouillage du compartiment de lavage, la vitesse d'un moteur entraînant le système de pompage est graduellement ou continuellement augmentée jusqu'à ce qu'un niveau d'eau mesuré par un capteur, en particulier un capteur de pression, situé dans le puisard pour mesurer le niveau d'eau, est passé sous une valeur de niveau déterminable ou prédéterminée.
11. Procédé selon l'une quelconque des revendications 5 à 8 ou 10, **caractérisé en ce qu'**après la mesure de la valeur relative à l'eau, une valeur de plausibilité est mesurée dans les mêmes circonstances de mesure que la valeur d'étalonnage, où la valeur de plausibilité est utilisée dans un test de plausibilité.

12. Procédé selon l'une des revendications 2 à 9, **caractérisé en ce que**, si une valeur d'étalonnage est mesurée, les paramètres de fonctionnement du système de pompage lors du mouillage et/ou de la mesure de la valeur relative à l'eau et/ou de la valeur de plausibilité, sont ajustés en fonction de la valeur d'étalonnage, et respectivement de la première quantité d'eau. 5
13. Procédé selon l'une des revendications 2 à 12, **caractérisé en ce que** la détermination de la valeur mesurée ou des valeurs mesurées est réalisée en calculant une valeur moyenne de plusieurs mesures pendant une durée prédéterminée. 10
14. Procédé selon l'une des revendications précédentes, **caractérisé en ce qu'en plus** de la valeur calculée, une vitesse de chauffage de l'eau pendant le fonctionnement du système de pompage et/ou une valeur de turbidité d'un capteur de turbidité sont déterminée(s) et la machine à laver la vaisselle est également commandée en fonction de la vitesse de chauffage et de la valeur de turbidité. 20
15. Procédé selon l'une des revendications précédentes, **caractérisé en ce qu'au moins** deux valeurs de référence sont utilisées, où une valeur de référence est déterminée lorsqu'aucune vaisselle n'est chargée et une autre valeur de référence est déterminée, lorsqu'une certaine quantité de vaisselle est chargée. 25 30
16. Procédé selon l'une des revendications précédentes, **caractérisé en ce que** dans une première sous-étape, seulement une première zone du compartiment de lavage contenant la vaisselle, en particulier l'un des plusieurs paniers à vaisselle, est mouillée, après quoi une première valeur calculée par rapport à la première zone est déterminée, après quoi une deuxième zone du compartiment de lavage contenant la vaisselle, en particulier le contenu d'un deuxième panier de vaisselle, est mouillée, après quoi une deuxième valeur calculée par rapport aux première et deuxième zones est calculée, où la distribution de la vaisselle est déterminée et la machine à laver la vaisselle est commandée en fonction de la distribution. 35 40 45
17. Procédé selon l'une des revendications précédentes, **caractérisé en ce que** lors de la commande de la machine à laver la vaisselle, au moins un paramètre d'un programme de lavage et/ou d'un programme de séchage, en particulier la température et/ou la durée des étapes et/ou le nombre de phases de nettoyage et/ou la quantité d'eau à substituer et/ou la quantité de détergent et/ou de produit de rinçage à ajouter et/ou la vitesse d'un moteur entraînant le système de pompage et/ou la distribution d'eau dans des zones différentes du compartiment de lavage, est ajusté. 50
18. Procédé selon l'une des revendications précédentes, **caractérisé en ce que** la première quantité d'eau prédéterminée est déversée dans la machine à laver la vaisselle en utilisant une soupape à commande temporelle et/ou un pressostat ou un capteur de pression. 55
19. Procédé selon l'une des revendications précédentes, **caractérisé en ce qu'au moins** une mesure est effectuée en utilisant un capteur de pression situé dans un puisard de la machine à laver la vaisselle pour mesurer le niveau d'eau.

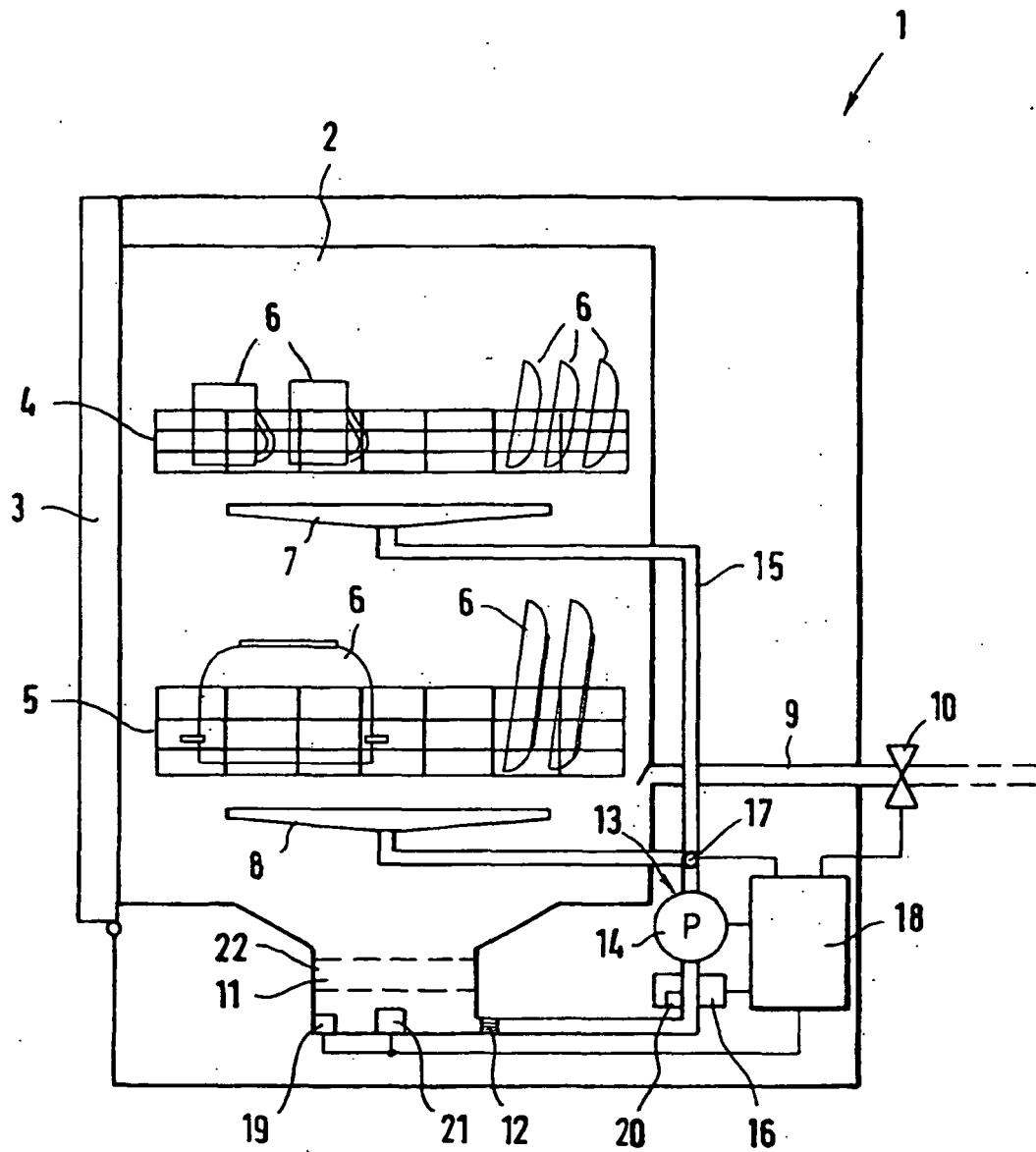


FIG. 1

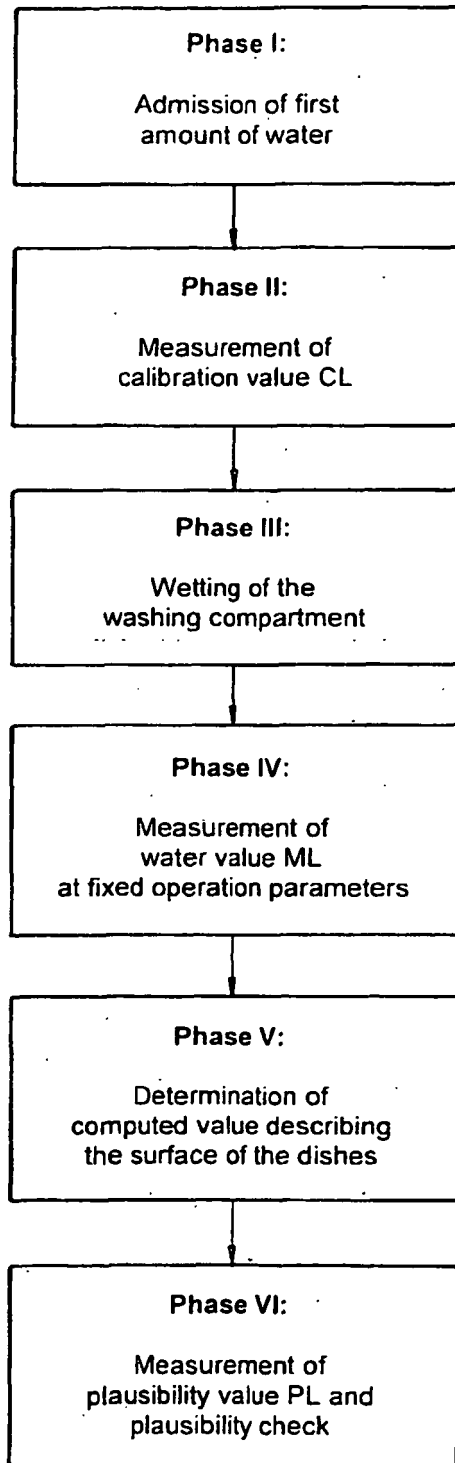


FIG. 2

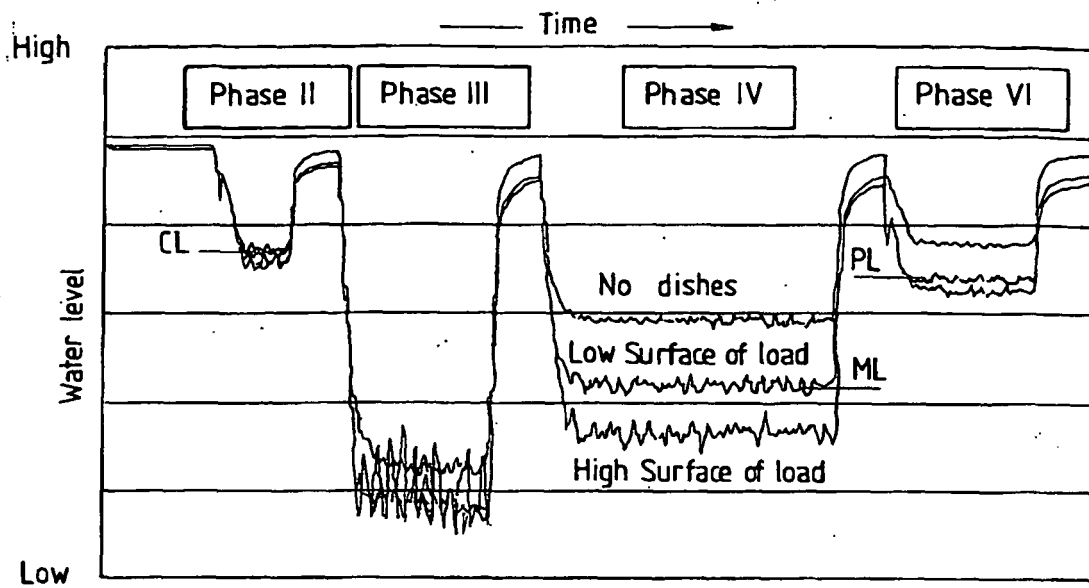


FIG. 3

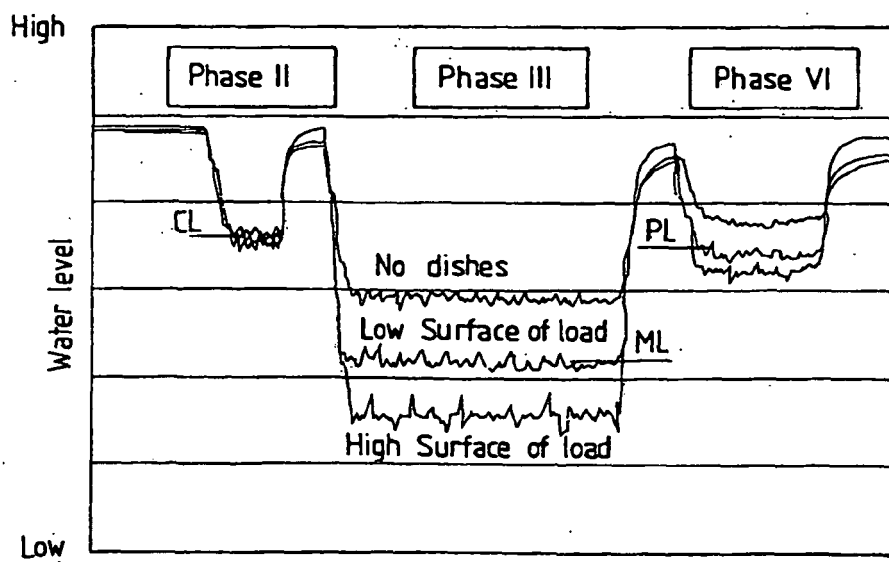


FIG. 5

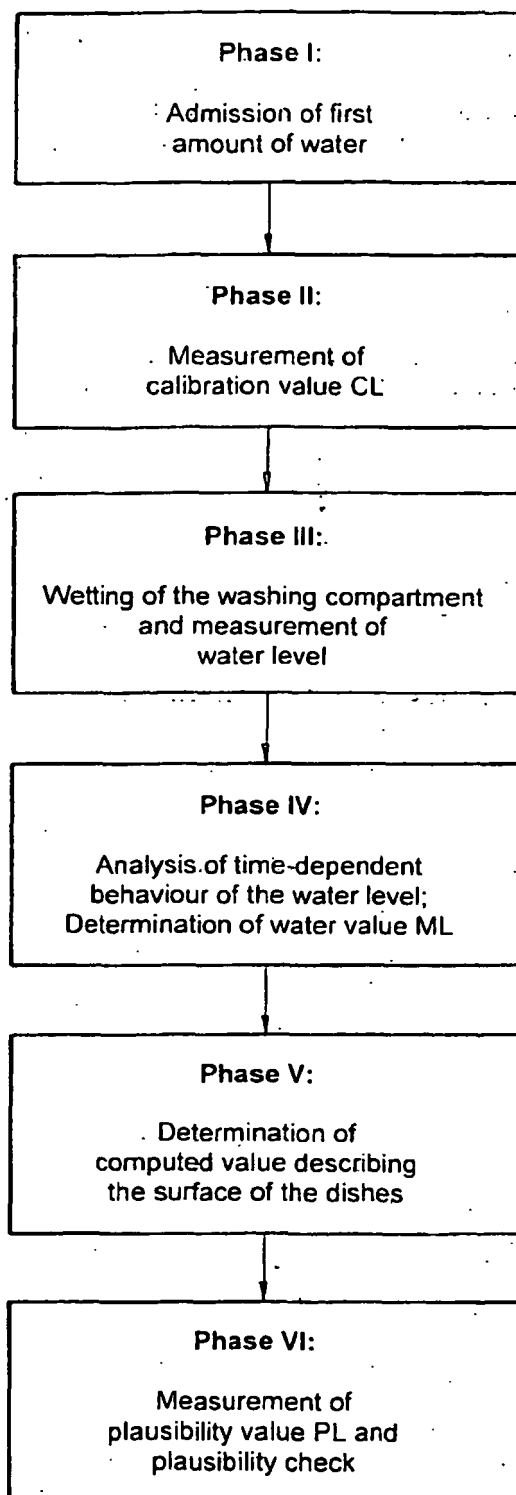


FIG. 4

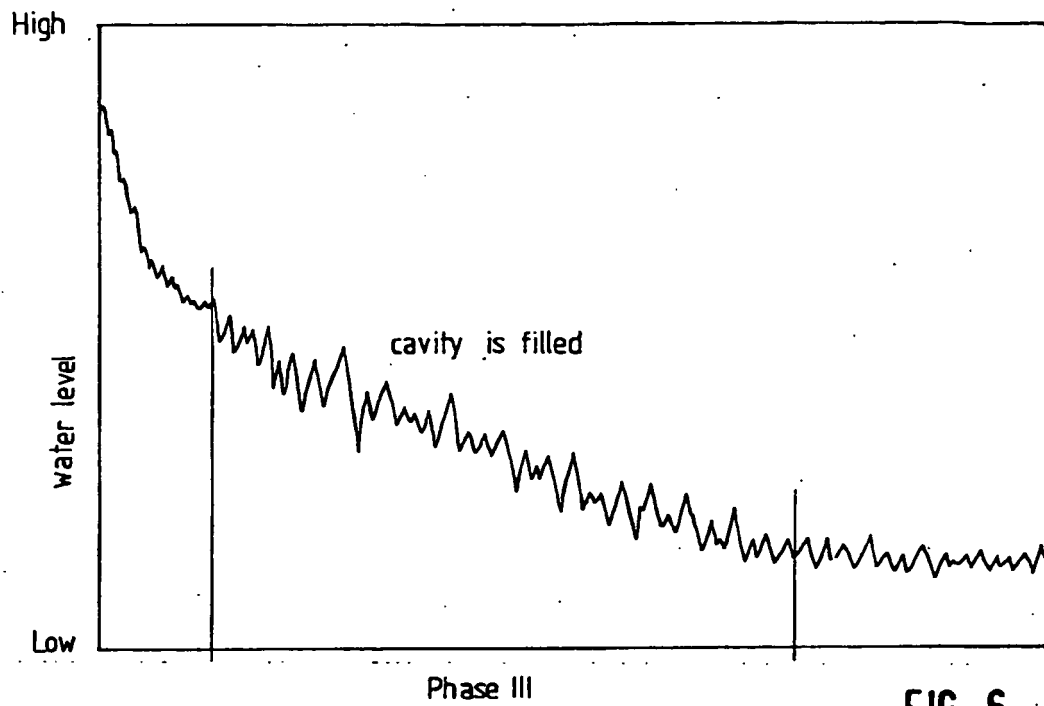


FIG. 6

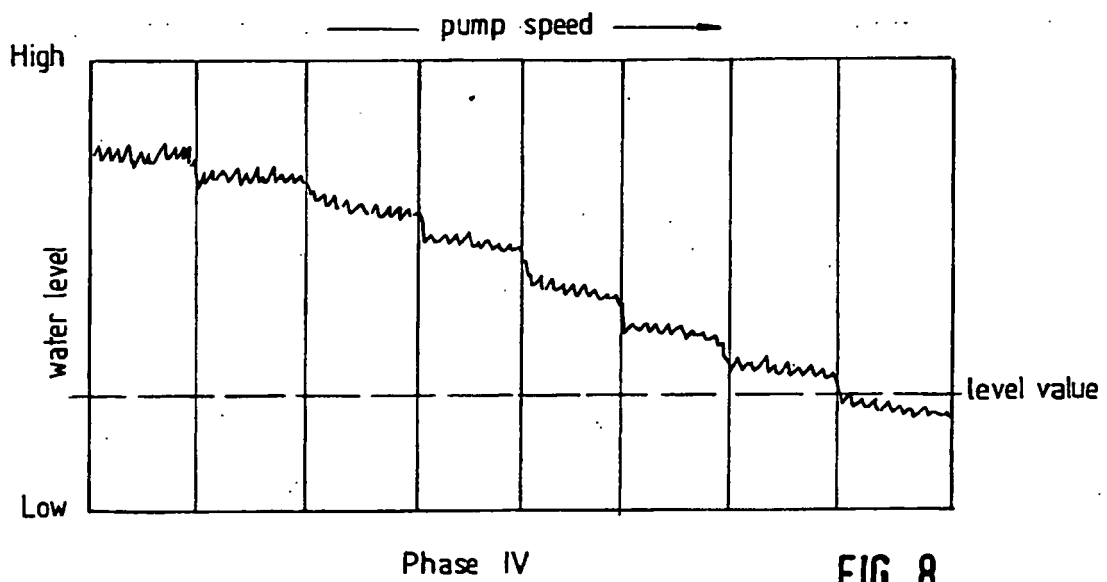


FIG. 8

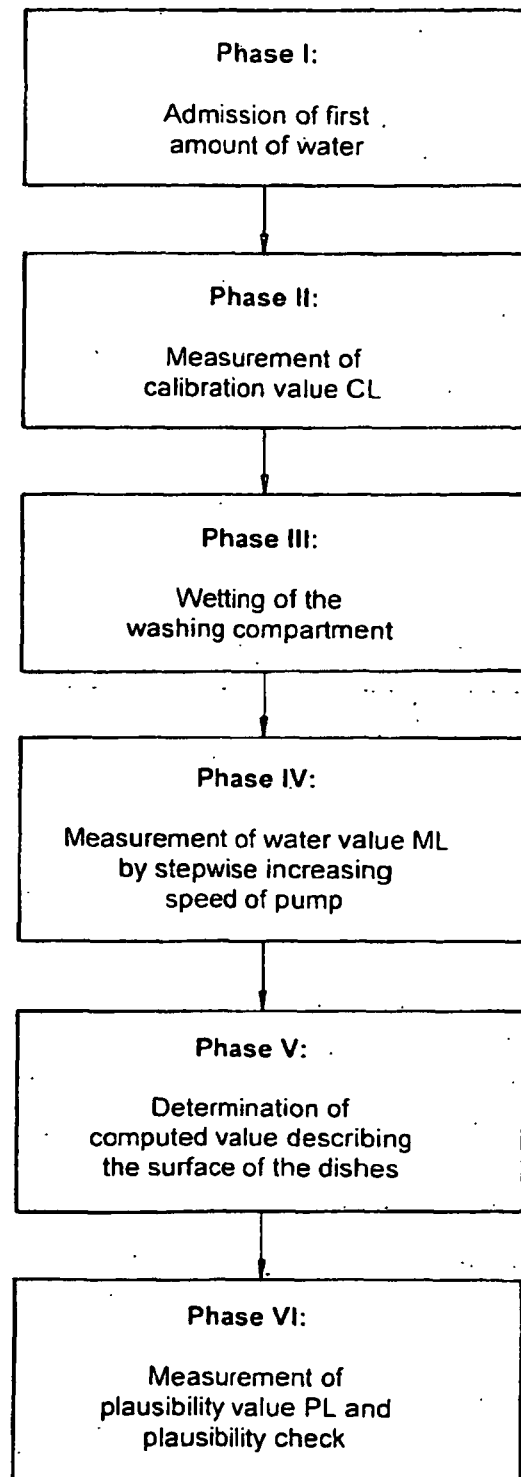


FIG. 7

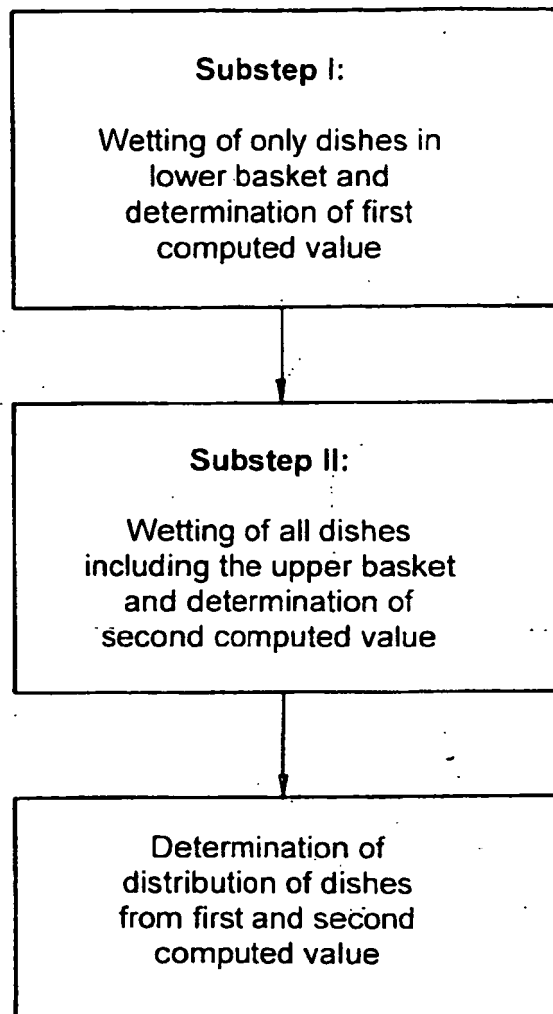


FIG. 9

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- WO 2006011773 A [0005]