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(54) **Method for operating a dishwasher**

(57) A method for operating a dishwasher comprising a washing tub for accommodating articles to be cleaned and a circulation pump for circulating a cleaning liquid within the washing tub, and wherein there is provided for a plurality of washing programs selectable by the user, said washing programs comprising a series of consecutive steps selected from filling, pre-washing, washing, rinsing, soaking, draining and drying steps. In the method

suggested herein, the washing programs comprise:
(a) a first washing program in which the circulation pump is operated at a nominal speed, and
(b) a second washing program in which, for at least part of the program, the circulation pump is operated at a speed which is reduced with respect to the nominal speed, and in which there is provided at least one soaking step during which the circulation pump is inactive.

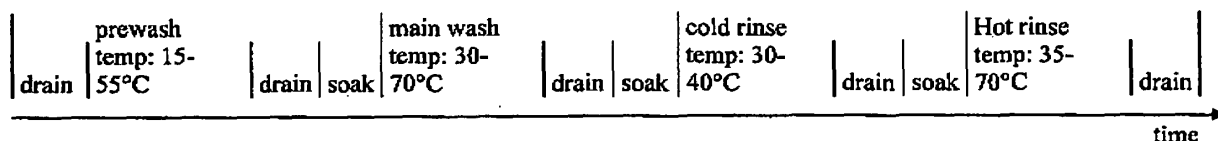


Fig. 2

Description

[0001] The present invention relates to a method for operating a dishwasher comprising a washing tub for accommodating articles to be cleaned and a circulation pump for circulating a cleaning liquid within the washing tub, and wherein there is provided for a plurality of washing programs selectable by the user, said washing programs comprising a series of consecutive steps selected from water intake, pre-washing, washing, rinsing, soaking, draining and drying steps.

[0002] In modern dishwashers the user usually can select from a plurality of washing programs which differ from each other by their operation temperature, duration, amount of water used and selection and sequence of consecutive steps.

[0003] Thus, a typical selection of washing programs in a dishwasher comprises a standard program carried-out at a washing temperature of for example 65 °C, an energy saving program in which the washing step is carried-out at a lower temperature of for example 50°C, an intensive washing program in which the washing step is carried out at a higher temperature of for example 70°C, and a quick cycle as it particularly can be used for cleaning glasses in which a shorter washing cycle is used and which is carried out at for example 40 °C. In each of such washing programs the individual operation parameters such as the amount of water fed into the dishwasher and the duration of the individual steps can be fixed. Furthermore, the dishwasher may comprise an automatic mode wherein a washing program is automatically selected based on certain parameters which are detected by sensors provided in the dishwasher, such as the washing load (i.e. the amount and type of articles to be cleaned) and the amount of soiling.

[0004] While the washing programs in today's dishwashers were more and more optimized in terms of water and energy consumption, there is a permanent desire in the art to provide for further improvements as regards the performance and ease of use of the dishwasher.

[0005] The present invention aims at providing a method for operating a dishwasher, by which the generation of noise during operation of the dishwasher is reduced. In particular, whereas in modern dishwashers the noise level during operation as it is caused by the cleaning fluid circulated through the machine and by the operation of the circulation pump has been reduced by means of acoustic insulation to a level which is below the regular noise level experienced in a domestic household, it would be desirable to be able to operate the dishwasher, particularly during night time, in a silent mode in which the noise level created by the operation of the dishwasher is further reduced. Thus, whereas in a domestic household at daytime typically a sound pressure level of 40 to 41 dB is measured, conventional dishwashers typically operate at a sound pressure level of 39 to 40 dB. While for daytime operation this may be sufficient because the operational noise of the dishwasher blends into the back-

ground noise and hence is not noticed, at night when there is less house and street noise the noise caused by the operation of the dishwasher often is found to be disturbing.

[0006] Therefore it is an object of the present invention to devise a method for operating a dishwasher which provides for a reduction in operational noise.

[0007] In a method for operating a dishwasher comprising a washing tub for accommodating articles to be cleaned and a circulation pump for circulating a cleaning liquid within the washing tub, and wherein there is provided for a plurality of washing programs selectable by the user, said washing programs comprising a series of consecutive steps selected from filling, pre-washing, washing, rinsing, soaking, draining and drying steps, this object is solved by the present invention in that the washing program further comprises a first washing program in which the circulation pump is operated at a nominal speed, and a second washing program in which, for at least part of the program, the circulation pump is operated at a speed which is reduced with respect to the nominal speed, and in which there is provided at least one soaking step during which the circulation pump is inactive.

[0008] The term "nominal speed" of the circulation pump, as used herein, denotes the speed at which the circulation pump is operated during regular operation of the dishwasher, i.e. during standard washing programs as they are known as such in the art and in which the speed of the circulation pump is selected primarily based on the amount and pressure of cleaning liquid as required to achieve a satisfactory cleaning result. In dishwashers in which during all the regular washing programs the circulation pump is operated at a single speed, the term "nominal speed" thus denotes such single standard speed. Should the circulation pump be designed to operate, during at least some of the regular washing programs, at more than one speed, for example at a first speed which corresponds to the aforementioned standard single speed and a second higher speed that is used for intensive washing programs in which cleaning liquid is passed at a higher rate onto the goods to be cleaned, the term "nominal speed" denotes any one of such standard speeds which, as was the case for a single speed pump, likewise are selected primarily based on the amount and pressure of cleaning liquid required to achieve a desired cleaning result.

[0009] Whereas in conventional dishwashers noise reduction was achieved exclusively by mechanical means, such as providing for better acoustic insulation, the present invention is based on the concept of actually lowering the speed of the circulation pump, which in conventional dishwashers is operated at a single speed and hence is subject to an on/off-control only. Since the reduction in operational speed of the circulation pump necessarily results in a decrease in cleaning efficiency, measures have to be taken to compensate for such decrease in cleaning efficiency. In accordance with the present invention, the reduction in operational speed of

the circulation pump is made possible by including in the program sequence at least one soaking step, i.e. a step during which the articles to be cleaned within the dishwasher are first wetted with cleaning liquid, whereupon operation of the dishwasher is paused, i.e. the circulation pump is turned off for a certain period of time and the washing liquid is allowed to soak into the soiling that shall be removed from the articles to be cleaned.

[0010] Whereas in the prior art it was suggested to lower the sound level of a dishwasher by prolonging the washing program, thus making use of the fact that the sound level is measured based on sound power, i.e. sonic energy per time, the present invention provides for an operation mode for a dishwasher in which the peak noise level experienced during operation of the dishwasher is lowered. The present invention thus provides for a true "silent mode" in which not only the sound level but also the sound pressure created by the dishwasher is reduced. Measurements have shown that by using the method suggested herein the operational noise of the dishwasher could be reduced by about 2 to 3 dB. Thus, using the method suggested herein dishwashers can be operated at noise levels of about 36 to 38 dB.

[0011] Preferred embodiments of the present invention are defined in the dependent claims.

[0012] In particular, in the said second washing program the circulation pump can be operated at a speed, which is the range of from 85 to 95 percent of the nominal speed and preferably at a speed which is less than 90 percent of the nominal speed. Thus, if during the first washing program, which can be any one of the regular washing programs, the circulation pump is operated at a speed of for example 1800 rpm, in the said second washing program the speed of the circulation pump can be reduced to 1600 rpm without deteriorating the washing result. Similarly, if the dishwasher during a first washing program that is designed as an intensive care program in which the circulation pump is operated at a speed of for example 2400 rpm, it was found that by providing for soaking steps in the second washing program the speed of the circulation pump can be reduced to 2200 rpm without deteriorating the washing result.

[0013] In order to be able to reduce the speed of the circulation pump without deteriorating the cleaning performance of the dishwasher, periods of the washing cycle were identified, during which a soaking step or soaking pause effectively improves the washing result and which thus enables to achieve at least similar, if not even better washing results at a reduced speed of the circulation pump.

[0014] It was found that in a washing cycle wherein there is provided for a pre-washing step, in which non-heated water is circulated within the washing tub, particularly good results are obtained if there is provided for a soaking step following the pre-washing step, during which soaking step the circulation pump is inactive. Advantageously the soaking step which follows the pre-washing step has a duration of at least 15 minutes, pref-

erably of at least 20 minutes, wherein the pre-washing step as such preferably has a duration of at least 10 minutes, and more preferred, of at least 15 minutes.

[0015] In order to facilitate the release of dirt particles from the washing goods, a detergent can be dissolved in the water which is circulated within the washing tub during the pre-washing step. By providing for a soaking step with non-heated water after conclusion of the pre-washing step, dirt particles are effectively removed from the washing goods in a very energy-effective and hence cost-effective manner.

[0016] In determining an optimum timing for the provision of soaking steps it further was found that soaking step(s) can also very effectively be included in the washing step, during which heated cleaning liquid is sprayed onto the articles to be cleaned. In such washing step usually heat is provided to the cleaning liquid during a first part of the washing step, which warmed cleaning liquid then is circulated within the washing tub without providing additional heat to the cleaning liquid. It should be understood that the washing step is not restricted to such temperature profile but may comprises further parts before, after or in between the said first and second part during which heated or non-heated cleaning liquid is circulated within the washing tub.

[0017] A very effective timing for a soaking step was found to be in the last part of the washing step or after the washing step. During the washing step usually most of the soil particles, which during the pre-washing step were wetted and soaked, are dissolved and removed from the washing goods. Some soiling types, such as starch-containing soils or baked soil particles, require more time for their removal in addition to the chemical and mechanical cleaning effected during the washing step. Such additional time for dissolving persistent soiling and thus achieve satisfactory washing results can be provided for in a second soaking step following one of the washing steps. Such soaking step following the washing step preferably has a duration of at least 15 minutes, and more preferred has a duration of at least 20 minutes. While such soaking step following the washing step is referred to herein as "second soaking step", it should be understood that such optional soaking step can be employed either in addition or alternatively to the soaking step following the pre-washing step.

[0018] Instead of a single soaking step following one of the washing steps, the said second soaking step also can comprise a first soaking pause which is provided during said first part of the washing step, i.e. during warming of the cleaning liquid, as well as a second soaking pause that is provided during the second part of the washing step in which the cleaning liquid is circulated within the washing tub without providing additional heat to the cleaning liquid. In case that the soaking pause provided for in the washing steps is split into a first and second soaking pause, such soaking pauses preferably have a duration of 5 to 15 minutes, and most preferred of at about 10 min.

[0019] Particularly when using in the washing liquid a cleaning agent containing enzymes, it was found that a soaking pause following the washing step or conducted following during the washing step is most efficient if carried out at a temperature of 40 to 45 °C and most preferably of about 42 °C.

[0020] Particularly, when using enzyme containing detergents In the cleaning liquid, the cleaning action can be further improved, if the washing step, in addition to a first part during which heat is provided to the cleaning liquid and a second part during which the cleaning liquid is circulated within the washing tub without providing additional heat, i.e. during which the cleaning liquid is circulated while cooling, comprises a third part during which the temperature of the cleaning liquid is kept constant, preferably at the enzyme temperature, which in most cases will be between 40 and 45°C and preferably is about 42°C. Whereas during the soaking pauses the circulation pump and hence the spray arms within the dishwasher are inactive, during such heating pause in which the temperature of the cleaning liquid is kept constant, the circulation pump and hence the spraying arms may be active.

[0021] A third preferred time interval for providing for a soaking pause is prior to the rinsing step, which usually constitutes the last step in the washing cycle. During the rinsing step fresh water is sprayed onto the washing goods so as to wash off loosened soil particles and any remaining detergent. During the rinsing step the washing goods furthermore are heated to a higher temperature, for example, to 70°C, so as to provide for a self drying effect when the circulation of the cleaning liquid is terminated and the washing tub is drained.

[0022] In a washing cycle wherein there is provided for an intermediate rinsing step between the washing step and the final rinsing step, the said soaking step can be effected during or at the conclusion of the intermediate rinsing step. This final soaking step also could be provided for after conclusion of an intermediate rinsing step, i.e. after water, preferably cold fresh water, that has been sprayed onto the washing goods has been drained from the washing tub.

[0023] While said soaking step preceding the rinsing step preferably has a duration of at least 20 minutes, best results were achieved when such soaking step had a duration of about 30 minutes.

[0024] Whereas the above soaking steps could be used alternatively, the best washing results were achieved when all three kinds of soaking steps were employed, i.e. a soaking step during the pre-washing step, a second soaking step during the washing step and a third soaking step prior to the rinsing step.

[0025] The noise reduction, which can be achieved by being able to operate the circulation pump at least during part of the washing cycle at a lower speed than the nominal speed can be further assisted by operating the circulation pump in a pulsed mode, i.e. by continuously varying the speed of the pump, because it was found that

the operating noise created during operation of the circulation pump in pulse mode creates a less disturbing sound impression with the user. Furthermore, it should be understood that although due to the soaking pauses the overall washing cycle has a longer duration than without soaking pauses, such prolongation of the washing cycle in many cases is not of disadvantage, because dishwashers anyway often are operated at times when there is much more time available than that required for the washing cycle, for example, when the dishwasher is operated night time or at day time when the user has left his home for work and will return long after the washing program is terminated.

[0026] While actual noise reduction is achieved already when the circulation pump only for part of its operation is operated at a reduced speed, the circulation pump preferably is operated in the entire second washing program at a speed which is reduced with respect to the nominal speed.

[0027] Preferred embodiments of the method for operating a dishwasher as suggested herein are described below by reference to the attached drawings, in which:

Fig. 1 is a schematic representation of a washing program for a dishwasher as it is used in prior art dishwashers;

Fig. 2 is a schematic representation similar to that shown in Fig. 1, illustrating a program flow for a dishwasher which is operated in accordance with the present invention; and

Fig. 3 is a schematic representation of an alternative program flow for a dishwasher which is operated in accordance with the present invention.

[0028] Fig. 1 shows an example of a washing program as it may be used also in a conventional dishwasher. Such washing program typically comprises a pre-wash step, in which the articles to be cleaned are subject to an initial cleaning step for removing coarse soil particles as well as dirt which easily can be removed from the washing goods. Following such pre-wash step, a main wash step is conducted, typically at a temperature that is higher than the temperature employed in the pre-wash step, wherein during the main wash step also the more persistent soil particles are loosened and removed from the washing goods. After the main wash step, the washing goods are exposed to a cold rinse step during which the loosened dirt particles and detergent are washed-off from the washing goods. In a final hot rinse step, heated fresh water is sprayed onto the washing goods to fully clean the latter and at the same time supply heat to the washing goods, which serves for drying the washing goods.

[0029] In the illustrative example of such washing program as it is depicted in Fig. 1, the pre-wash step begins with a drain sub-step, during which the drain pump is activated, so as to remove any liquid that has accumu-

lated in the sump of the dishwasher during a previous cleaning cycle. Upon having activated the drain pump for a certain amount of time or until no further liquid is withdrawn from the sump of the dishwasher, fresh water is fed into the dishwasher and a circulation pump is activated so as to feed such water to rotatable spray arms and thus to spray it onto the articles to be cleaned, which typically are arranged on dish racks, such as a lower and an upper dish rack, provided within the washing chamber of the dishwasher. The pre-wash step can be carried out either with cold water, i.e. with water at a temperature as it has when coming from the tap to which the dishwasher is connected, or with heated water, that is with water which during being fed into the washing compartment or during being recycled within the washing compartment is heated, or by using in sequence both cold and heated water. Preferably, the pre-wash step is carried out at a temperature of between 15 and 55 °C.

[0030] During the pre-wash step a detergent can be added to the water circulated within the dishwasher, which detergent can be added to the cleaning liquid either by a detergent dispenser, a detergent compartment that is flushed with cleaning liquid, or by using multi-component detergents which are provided in the form of tablets containing a plurality of active agents that are dissolved into the cleaning liquid at different times during the cleaning cycle. At the end of the pre-wash step the drain pump is activated, so as to remove the cleaning liquid and any dirt particles that were dissolved from the washing goods.

[0031] Following the pre-wash step there is carried-out a main wash step during which warmed cleaning liquid is circulated within the dishwasher, i.e. first fresh water is fed into the washing tub and then the circulation pump is activated, so as to feed water which collects within the sump of the dishwasher to the spray arms that are located below or above the dish racks, on which the articles to be cleaned are arranged, so as to spray the cleaning liquid onto the washing goods. During the main wash step the cleaning liquid typically is heated to a temperature in the range of from 30 to 70 °C.

[0032] Upon having sprayed cleaning liquid onto the washing goods for a certain amount of time, the circulation pump is deactivated and the cleaning liquid, now containing dissolved detergent as well as soil and dirt particles that have been washed-off from the washing goods, is drained from the sump of the dishwasher by activation of the drain pump.

[0033] Following the main wash step, the washing cycle comprises a number of rinsing steps during which water is fed into the dishwasher and the circulation pump is operated so as to rinse remaining dirt particles and detergent from the goods to be cleaned. Although during the rinsing steps typically no detergent is added to the water fed into the dishwasher, particularly in the initial rinsing steps some detergent may be present in the cleaning liquid, for example, when multi-component cleaning tabs are used that may not have fully dissolved during the pre-wash and main wash steps. Furthermore,

certain further treating agents may be added to the cleaning liquid, possibly also by the use of multi-component cleaning tabs, such as specific glass treating agents or the like.

[0034] While the initial rinsing step typically is carried-out at a lower temperature of, for example, 30 to 40 °C, during the terminal rinsing step a higher temperature of, for example, 35 to 70 °C is used, so as to heat the rinsed washing goods to thus facilitate drying of the washing goods. At the end of each rinsing step, the sump may be emptied by activating the drain pump.

[0035] It should be noted that any of the individual steps of the washing program may comprise several sub-steps, such as the main wash step being divided into plural washing phases which are carried-out at different temperatures. In this case the cleaning liquid used within the washing compartment can be exchanged between such sub-phases by activating the drain pump upon termination of the first phase and feeding fresh water into the washing compartment at the beginning of the second phase.

[0036] During all the steps described above, the circulation pump can be operated at a single speed so as to provide for a certain water pressure with which the cleaning liquid is sprayed onto the articles to be cleaned. Should, however, a higher water pressure be desired, as it could be employed for the cleaning of heavily soiled articles such as pans having baked spoils adhering thereon, the dishwasher may be designed to operate the circulation pump at a higher speed. Since, however, a higher water pressure may cause damages of certain articles, such as fine glass ware or the like, the use of a higher speed of the circulation pump and correspondingly of a higher water pressure during any of the washing cycles should be activated only on specific request by the user, such as by selecting an "intensive care" program or the like.

[0037] Fig. 2 shows a washing program, which comprises similar program steps as the ones shown in Fig. 1, but wherein there are provided several soaking pauses, during which the circulation pump is inactive and which serve for providing additional time for the cleaning liquid and any active agents added thereto to soak into the dirt particles adhering to the articles to be cleaned.

[0038] While in the example shown in Fig. 2 soaking pauses are inserted at the end of the pre-wash step, the main wash step and the cold rinse step, In each such step after the sub-step of draining the washing tub, the soaking pauses also could be employed before draining the dishwasher. In any event, the soaking step or soaking pause should have a duration of several minutes, that is preferably of between 5 and 30 minutes, so as to allow for sufficient time to provide for sufficient soaking. By the use of soaking pauses, the cleaning efficiency is improved to such an extent that the circulation pump can be operated at a lower speed, which correspondingly provides for a lower pressure at which the cleaning liquid is sprayed onto the articles arranged within the dishwasher.

In this manner, not only the average noise level, but indeed the actual and instantaneous noise level caused by operation of the dishwasher is lowered. While evidently the use of soaking steps causes a prolongation of the overall washing program, such prolongation is of little or no concern when the dishwasher is operated overnight, i.e. when the dishwasher is filled and started in the evening and is unloaded not until the next morning.

[0039] In a dishwasher as is suggested herein, the user of the dishwasher thus can select between a number or "regular" washing programs, such as an automatic program or standard programs that are carried out at different temperatures, such as at 40 °C, 50 °C or 65 °C, an intensive washing program carried out at a higher temperature of for example 70 °C, or a quick cleaning program having a shortened program duration. Common to all these programs is that the circulation pump is operated at a nominal speed that is optimized in terms of the cleaning efficiency and which may be the same in all washing programs. In addition to the these programs, the user can also select a silent mode, in which, for at least part of the respective program and preferably for the entire program, the circulation pump is operated at a speed which is reduced with respect to said nominal speed, and in which there is provided at least one soaking step during which the circulation pump is inactive.

[0040] Fig. 3 shows a portion of a modified main wash step as it could be employed in an overall washing program as it is shown in Fig. 2. In particular, Fig. 3 shows a main wash step which comprises several sub-phases, namely a first main wash phase during which a mildly warmed cleaning liquid having a temperature of about 30 to 45 °C is sprayed onto the articles to be cleaned and in which during a second main wash phase the cleaning liquid is warmed to a higher temperature of generally 40 to 70 °C.

[0041] In the example shown in Fig. 3 there are provided two soaking pauses in such main wash step, namely a first soaking step following the first washing phase, and a second soaking pause in the terminal phase of the main wash step. In the embodiment shown, the cleaning liquid is not drained from the washing tub between the first and second main wash phases, but rather upon termination of the lower temperature first main wash phase only the circulation pump is deactivated, and upon termination of the first soaking pause heat is provided to the washing tub and hence to the cleaning liquid present therein when the circulation pump is again activated to carry out the second main wash phase. While Fig. 3 thus shows an embodiment in which the sump of the dishwasher is drained upon deactivation of the circulation pump upon conclusion of the second main wash phase but before the soaking pause of the second main wash phase, if preferred the cleaning liquid could also be partially or fully exchanged during the first and second main wash phases.

[0042] Particularly when using enzymes-containing cleaning agents, it was found that the cleaning result is

most efficient, when the first and or the second soaking pause in the main wash step is carried-out at a temperature of 40 to 45°C and most preferably of about 42°C. In this manner, particularly advantageous conditions are realized in the washing compartment for the cleaning agent to perform its cleaning activity.

Claims

1. A method for operating a dishwasher comprising a washing tub for accommodating articles to be cleaned and a circulation pump for circulating a cleaning liquid within the washing tub, and wherein there is provided for a plurality of washing programs selectable by the user, said washing programs comprising a series of consecutive steps selected from filling, pre-washing, washing, rinsing, soaking, draining and drying steps, **characterized in that** said washing programs comprise:
 - (a) a first washing program in which the circulation pump is operated at a nominal speed, and
 - (b) a second washing program in which, for at least part of the program, the circulation pump is operated at a speed which is reduced with respect to the nominal speed, and in which there is provided at least one soaking step during which the circulation pump is inactive.
2. The method of claim 1, **characterized in that** in said second program the circulation pump is operated at a speed which is in the range of from 85 to 95 percent of the nominal speed.
3. The method of claims 1 or 2, **characterized in that** in said second program the circulation pump is operated at a speed which is less than 90 percent of the nominal speed.
4. The method of any one of the preceding claims, **characterized in that** in said second program there is provided a pre-washing step in which non-heated water is circulated within the washing tub, and wherein there is provided a soaking step following the pre-washing step during which the circulation pump is inactive.
5. The method of claim 4, **characterized in that** said soaking step following the pre-washing step has a duration of at least 15 min, preferably of at least 20 min.
6. The method of claims 4 or 5, **characterized in that** the pre-washing step has a duration of at least 10 min, preferably of at least 15 min.
7. The method of any one of claims 4 to 6, **character-**

ized in that during the pre-washing step a detergent is dissolved in the water circulated within the washing tub.

8. The method of any one of the preceding claims, **characterized in that** in said second program there is provided at least one washing step in which cleaning liquid is circulated within the washing tub, wherein during at least a first part of the washing step heat is provided to the cleaning liquid and wherein during at least a second part of the washing step the heated cleaning liquid is circulated within the washing tub without providing additional heat to the cleaning liquid, wherein the washing step comprises at least one soaking pause during which the circulation pump is inactive. 5
9. The method of claim 8, **characterized in that** said soaking pause has a duration of at least 15 min, preferably of at least 20 min. 10
10. The method of claim 8 or 9, **characterized in that** said soaking pause is provided at the conclusion of the washing step. 15
11. The method of claim 8 or 9, **characterized in that** a first soaking pause is provided during said first part of the washing step and a second soaking pause is provided during said second part of the washing step. 20
12. The method of claim 11, **characterized in that** said first and/or second soaking pause has a duration of 5 to 15 minutes, preferably of at about 10 min. 25
13. The method of any one of claims 8 to 12, **characterized in that** said soaking pause(s) is (are) conducted at a temperature of 40 to 45 °C, preferably of about 42 °C. 30
14. The method of any one of the preceding claims, **characterized in that** in said second program there is provided at least one washing step in which cleaning liquid is circulated within the washing tub, wherein during at least a first part of the washing step heat is provided to the cleaning liquid and wherein during at least a second part of the washing step the heated cleaning liquid is circulated within the washing tub without providing additional heat to the cleaning liquid, wherein during a third part of the washing step the temperature of the cleaning liquid is kept constant. 35
15. The method of claim 14, **characterized in that** during said third part of the washing step the temperature of the cleaning liquid is kept at a temperature of between 40 to 45 °C; preferably of about 42 °C. 40

16. The method of any one of the preceding claims, **characterized in that** in said second program there is provided at least one rinsing step in which fresh water is fed into and circulated within the washing tub, and wherein there is provided a soaking step which precedes the rinsing step and during which the circulation pump is inactive. 45
17. The method of claim 16, **characterized in that** said soaking step preceding the rinsing step has a duration of at least 20 min, preferably of at least 30 min. 50
18. The method of any one of the preceding claims, **characterized in that** the circulation pump, when active, is operated in a pulsed mode. 55
19. The method of any one of the preceding claims, **characterized in that** in said second washing program the circulation pump, if and when active, is operated at a speed which is reduced with respect to the nominal speed.
20. A dishwasher adapted for carrying out the method of any one of the preceding claims.

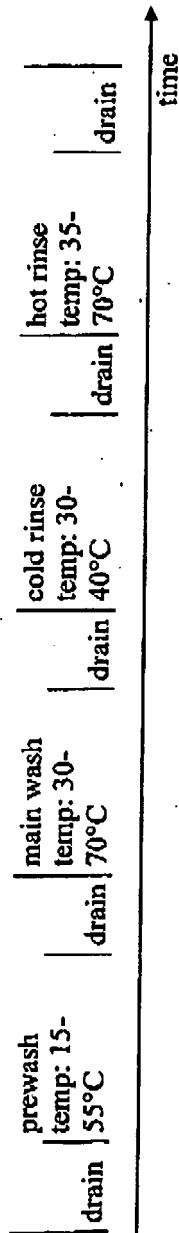


Fig. 1

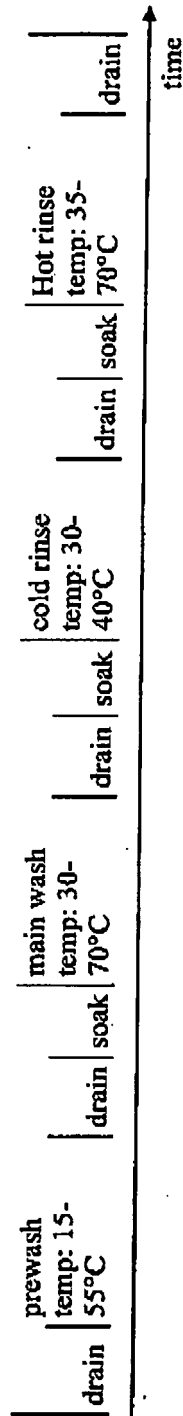


Fig. 2

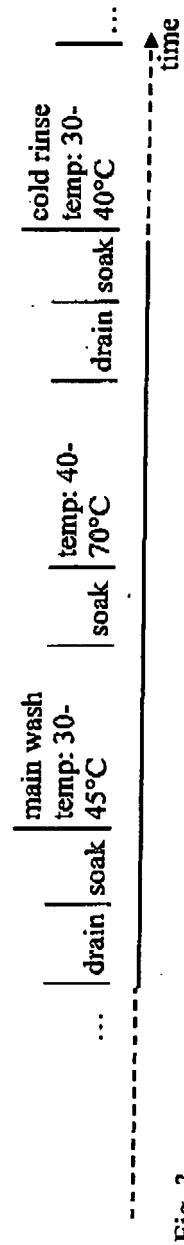


Fig. 3



EUROPEAN SEARCH REPORT

Application Number
EP 08 01 9155

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	DE 40 21 574 A1 (LICENTIA GMBH [DE]) 9 January 1992 (1992-01-09)	1-5,20	INV. A47L15/00
Y	* column 1, line 68 - column 2, line 7 *	6-8, 10-16, 18,19	A47L15/42
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	* column 2, line 61 - column 3, line 3 *		
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