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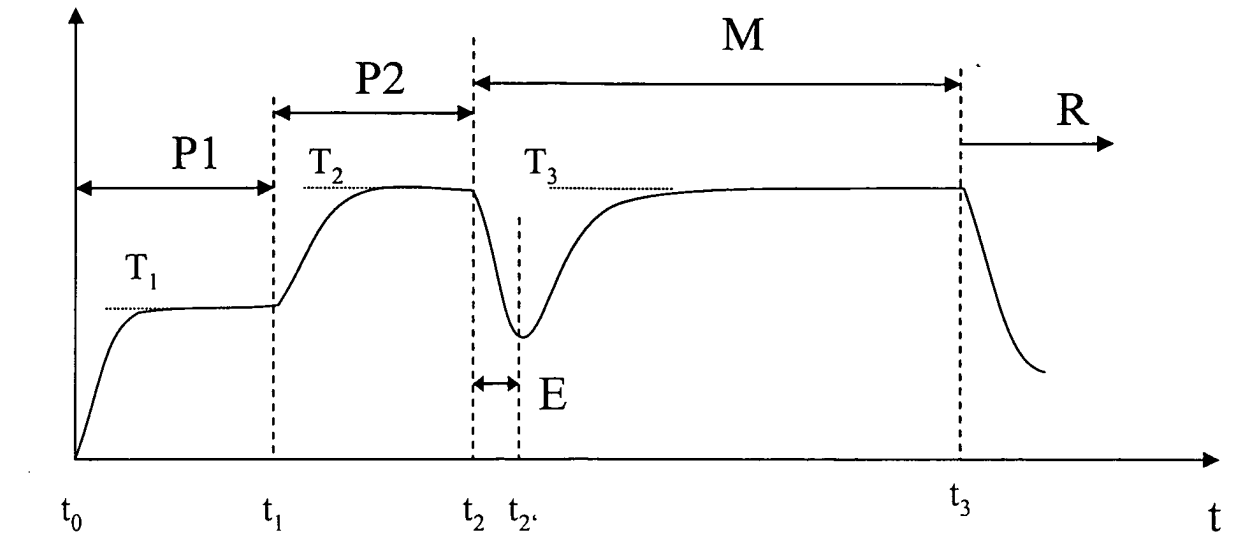
(54) Dishwasher having a program option and dishwashing cycle

(57) The invention relates to a dishwashing cycle for washing articles in a dishwasher, the cycle including performing a pre-treatment wash or phase using a pre-treatment detergent under washing conditions optimized for said pre-treatment detergent, and performing a main wash. A dishwasher comprising an input unit to set a pre-treatment option is also provided.

Fig. 2



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Description

[0001] The invention relates to a dishwashing machine having a program option to modify the washing cycle, and to a dishwashing cycle which provides an optimized dishwashing procedure, in particular for heavily soiled articles to be washed in the dishwasher.

[0002] DE 199 57 243 A1 discloses a dishwasher having an option button for the use of a three-in-one combi-detergent tablet and a washing cycle specifically adapted to optimize the washing result using a three-in-one combi-detergent tablet. When selecting the option button for the three-in-one tablet, the control unit modifies a standard dishwashing cycle including a pre-wash and a main wash in that an optimum time and temperature profile is used during the washing cycle. A first component of the three-in-one tablet is dissolved during a cold pre-wash. A second component is dissolved during a first portion of the main wash using a washing temperature of 40°C. A third component is dissolved during a second portion of the main wash heating the washing liquid to a temperature of 60°C. By running such a temperature profile the dissolving of the components of the three-in-one tablet is optimized on the one side and on the other side the respective component is used at its optimum activation temperature such that the washing result on the articles placed in the dishwasher is also optimized. The composition of such a tablet (amount of the detergent component and the resolving time of the three-in-one tablet) is selected for an average load of the dishwasher and an average soiling of the articles.

[0003] It is an object of the invention to provide a dishwasher and a dishwashing cycle which provide a further optimized washing result for soiled articles to be washed.

[0004] The invention is defined in claims 1, 2 and 14, respectively. Particular embodiments are set out in the dependent claims.

[0005] In the dishwashing cycle according to claims 1 or 2 a pre-treatment detergent is added to a washing compartment of a dishwasher, which is particularly useful to clean heavily soiled articles to be washed, for example pots and pans where food remainders are partially burned in. Using the pre-treatment wash or phase may be designated as 'power-booster phase' which provides a period of intense washing to remove soiling which in conventional dishwashing cycles is normally not completely removed. The pre-treatment phase may be an introductory period during the main wash (claim 2) which provides optimum conditions for the pre-treatment detergent.

[0006] Preferentially, the main wash detergent is added with a delay from the start of the pre-treatment phase and it is best added when the pre-treatment phase has been finished and the main wash is resuming its normal conditions.

[0007] In a preferred embodiment the pre-treatment wash or phase is only activated when an option for the dishwashing cycle has been selected, for example by the user pressing a corresponding pre-treatment option button at the console of the dishwasher.

[0008] In a further embodiment, the main wash detergent for the main wash or the master phase of the main wash is added to a washing compartment of the dishwasher as soon as the pre-treatment wash or phase is finished. Thereby, optimum washing conditions can also be set for the main wash detergent and there is no interference between the pre-treatment detergent and the main wash detergent, or the interference is, at least minimized.

[0009] In one embodiment the temperature of the washing liquid is set in the range of 30°C-65°C, preferably in the range of 40°C-55°C, which is an optimum activity range, if for example the pre-treatment detergent comprises enzymes or a bleaching component. In a preferred embodiment the washing liquid temperature in a first time period during the pre-treatment wash is in the range of 30°C-50°C, in which for example enzymes have their optimum activity. Then in a second time period the temperature is set in the range of 40°C-80°C, in which for example the bleaching component has its optimum activity. So two components of the pre-treatment detergent are activated separately and the mutual interferences, for example by destroying the enzymes at higher washing liquid temperatures, are avoided. In a further embodiment, instead of two time periods having different average temperatures, the washing liquid temperature is successively raised in distinct temperature steps or continuously raised.

[0010] A pre-wash phase of a conventional dishwashing cycle is preferably replaced by said pre-treatment wash when an option selection is made for pre-treatment. Thereby, the pre-wash time and liquid amount is saved, as they do not have much effect for the cleaning result when heavily soiled articles have been loaded into the dishwasher.

[0011] In a preferred embodiment the pre-treatment wash or phase is finished by completely or partially replacing the soiled washing liquid. The degree of soiling of the washing liquid is preferably determined by a soiling detector so that the need and extent of replacing soiled washing liquid by fresh water is determined in dependence of the soiling degree.

[0012] In the dishwasher according to claim 14 an input unit includes a pre-treatment option, for example a pre-treatment button or a pre-treatment menu option by which the pre-treatment wash is activated. Thereupon, a control unit of the dishwasher modifies the washing cycle to include a pre-treatment wash or a pre-treatment phase which optimizes the washing result when using a pre-treatment detergent.

[0013] Reference is made in detail to a preferred embodiment of the invention, an example of which is illustrated in the accompanying drawings. The drawings show:

Fig. 1 a block diagram of the control section and basic

units of a dishwasher, and

Fig. 2 an exemplary temperature/time diagram of a washing cycle.

[0014] Fig. 1 illustrates a block diagram of a control section and functional components of the dishwasher. A control unit 1 controls the operation of the dishwasher by sending control signals to the functional components of the dishwasher and by receiving detection signals from sensors of the dishwasher. A draining pump 2 is activated by the control unit 1 to completely or partially drain the washing liquid out of the washing compartment (not shown) of the dishwasher. A water inlet valve 3 is opened and closed under the control of the control unit to fill fresh water into the washing compartment. A heater 4 heats the washing liquid to a temperature set by the control unit 1 and as detected by a temperature sensor 7 which sends the temperature signal to the control unit.

[0015] A detergent for the main wash is supplied into the washing compartment by a first dispenser 5 and a pre-treatment detergent is supplied into the washing compartment by a second dispenser 6. Both.dispensers 5, 6 can have spring-biased lids which are released by a solenoid activated by the control unit 1. The degree of soiling or the contamination of the washing liquid is detected by a turbidity sensor 8 which sends a respective turbidity signal to the control unit. A conductivity sensor for detecting the degree of soiling of the washing liquid could be used instead.

[0016] Program options for the dishwashing cycle are set at an operation panel 9 which supplies the option selection signal(s) to the control unit and in turn shows the selected option or specific states of the dishwashing machine and the washing cycle state at a display (not shown) of the operation panel 9. If for example in addition to a standard washing cycle including a pre-wash, the pre-treatment option button has been pressed at the operation panel 9, the pre-wash is skipped from the washing cycle and instead of it a pre-treatment phase is performed prior to starting the main wash phase.

[0017] An example of a washing cycle including a pre-treatment wash (P1+P2) and a main wash (M) which is succeeded by a rinsing (R) is depicted in Fig. 2.

[0018] At a time $t=t_0$ fresh water is filled into the washing compartment by opening the water inlet 3 as long as the predetermined water amount has been filled in. At the same time the heater is activated to heat the temperature of the washing liquid up to a first temperature T_1 in a first phase P1 of the pre-treatment period (P1+P2). At the time to the second dispenser 6 is also activated to supply the pre-treatment detergent into the washing compartment.

[0019] In an alternative embodiment, if no separate second dispenser 6 for the pre-treatment detergent is available, the pre-treatment detergent can be directly poured into the washing compartment, e.g. to the bottom of the washing compartment.

[0020] The first phase P1 of the pre-treatment period is continued from time to to t_1, while the liquid temperature is heated to and held at temperature T_1. In a second phase P2 of the pre-treatment period lasting from time t_1 to t_2 the washing liquid is heated from temperature T_1 to temperature T_2 by the heater 4.

[0021] At the time t_2 the pre-treatment period is finished and depending on the signal of the turbidity sensor 8 washing liquid from the dishwasher is drained or not. For example, if there is no or only a low level of detected turbidity, no liquid is drained (saving liquid) and the main wash period M is continued with the washing liquid of the pre-treatment period, possibly by adding additional fresh water. If a medium level of soiling of the washing liquid is detected, only a part of the washing liquid is drained and replaced by fresh water. This case is depicted in Fig. 2 where in the time period t_2 to t_2'(phase E) washing liquid is drained and fresh water (from time t2') is successively refilled to the washing compartment. If the turbidity sensor 8 detects a heavily soiled washing liquid, the washing liquid is completely drained out of the washing compartment and fresh water is filled in up to a predetermined level. The washing liquid during the main wash period M is heated to a third temperature T_3 and the articles placed in the washing compartment are conventionally cleaned.

[0022] After the draining of the washing liquid (time t_2) or, if no draining is necessary at time t_2, the control unit 1 activates the first dispenser 5 to supply the main wash detergent into the washing compartment. The main wash period M lasts from time t_2 to t_3. Beginning at time t_3 the rinsing period R starts by completely draining the washing liquid. The rinsing period R is only shown in the starting phase and is performed in a conventional way.

REFERENCE NUMERAL LIST

[0023]

1	control unit
2	draining pump
3	water inlet valve
4	heater
5	first dispenser (main wash detergent)
6	second dispenser (pre-treatment detergent)
7	temperature sensor
8	turbidity sensor
9	operation panel

Claims

1. Dishwashing cycle for washing articles in a dishwasher, including:

   performing a pre-treatment wash using a pre-treatment detergent under washing conditions optimized for said pre-treatment detergent; and performing a main wash.

2. Dishwashing cycle for washing articles in a dishwasher, including:

performing a main wash, the main wash starting with a pre-treatment phase using a pre-treatment detergent under washing conditions optimized for said pre-treatment detergent.

3. Dishwashing cycle according to claim 1 or 2, wherein the pre-treatment detergent comprises at least an enzyme component and/or a bleaching component.

4. Dishwashing cycle according to claim 3, wherein the pre-treatment detergent is substantially or exclusively composed of an enzyme component and/or a bleaching component.

5. Dishwashing cycle according to any of the previous claims, wherein a dishwashing cycle including said pre-treatment wash or phase is activated upon an option selection.

6. Dishwashing cycle according to any of the preceding claims, wherein a main wash detergent is supplied to the washing compartment after the pre-treatment wash or phase is finished.

7. Dishwashing cycle according to any of the preceding claims, wherein the washing liquid temperature during the pre-treatment wash or phase is set to a temperature in the range of 30°C to 65°C, preferably in the range of 40°C to 55°C, particularly to about 50°C.

8. Dishwashing cycle according to any of the preceding claims 1 to 6, wherein
in a first time period during the pre-treatment wash or phase the washing liquid temperature is set to a temperature in the range of 30°C to 50°C, preferably in the range of 35°C to 45°C; and
in a second time period during the pre-treatment wash or phase the washing liquid temperature is set to a temperature in the range of 40°C to 80°C, preferably in the range of 50°C to 70°C.

9. Dishwashing cycle according to any of the preceding claims 1 to 6, wherein during the pre-treatment wash the washing liquid temperature is successively or continuously raised by a temperature in the range of 20°C to 40°C starting from a temperature in the range of 30°C to 40°C.

10. Dishwashing cycle according to any of the preceding claims 5 to 9, wherein a pre-wash of a dishwashing cycle is replaced by said pre-treatment wash upon said option selection.

11. Dishwashing cycle according to any of the preceding claims, wherein the washing liquid is completely or partially drained out of the dishwasher during and/or at the end of the pre-treatment wash or phase.

12. Dishwashing cycle according to claim 11, wherein the draining of the washing liquid depends on the contamination load of the washing liquid, particularly on the turbidity or conductivity of the washing liquid.

13. Dishwashing cycle according to any of the preceding claims, wherein the pre-treatment detergent is supplied from a pre-wash or pre-treatment detergent dispenser to the washing compartment of the dishwasher.

14. Dishwasher comprising:

a washing compartment,
a control unit (1) adapted to control a washing cycle including at least a main wash,
a heater device (4) adapted to heat a washing liquid under the control of the control unit (1), and an input unit (9) adapted to set at least one program option to modify a washing cycle controlled by the control unit (1),
characterized in that
the input unit (9) includes a pre-treatment option for a pre-treatment wash, and
the control unit (1) is adapted to provide a pre-treatment wash or a pre-treatment phase in said main wash during the washing cycle, when said pre-treatment option is set.

15. Dishwasher according to claim 14, wherein said control unit (1) is adapted to provide said pre-treatment wash prior to said main wash.

16. Dishwasher according to claim 14 or 15, wherein said control unit (1) is adapted to skip a pre-wash of the washing cycle, when said pre-treatment option is set.

17. Dishwasher according to claim 14, 15 or 16, comprising a first detergent dispenser (6) adapted to dispense a pre-treatment detergent, particularly under the control of the control unit (1).

18. Dishwasher according to any of the preceding claims 14 to 17, comprising a second detergent dispenser (5) adapted to dispense a main wash detergent under the control of the control unit (1).

19. Dishwasher according to any of the preceding claims 14 to 18, wherein the control unit (1) is adapted to control the heater device (4) to heat the washing liquid during the pre-treatment wash or phase to a temperature in the range of 30°C to 65°C, preferably in the range of 40°C to 55°C, particularly to about 50°C.

20. Dishwasher according to any of the preceding claims 14 to 18, wherein the control unit (1) is adapted to control the heater device (4) to heat the washing liquid during the pre-treatment wash or phase
in a first time period to a temperature in the range of 30°C to 50°C, preferably in the range of 35°C to 45°C; and
in a second time period to a temperature in the range of 40°C to 80°C, preferably in the range of 50°C to 70°C.

21. Dishwasher according to any of the preceding claims 14 to 18, wherein the control unit (1) is adapted to control the heater device (4) to heat the washing liquid during the pre-treatment wash or phase by successively or continuously raising the washing liquid temperature by a temperature in the range of 20°C to 40°C starting from a temperature in the range of 30°C to 40°C.

22. Dishwasher according to any of the preceding claims 14 to 21, comprising a sensor (8) adapted to detect the contamination load of the washing liquid and providing a contamination load signal to the control unit, particularly a turbidity or conductivity sensor.

23. Dishwasher according to any of the preceding claims 14 to 22, wherein the control unit (1) is adapted to completely or partially drain the washing liquid during or at the end of the pre-treatment wash or phase, in particular in dependence of the contamination load signal of a contamination load sensor (8).

Fig. 1

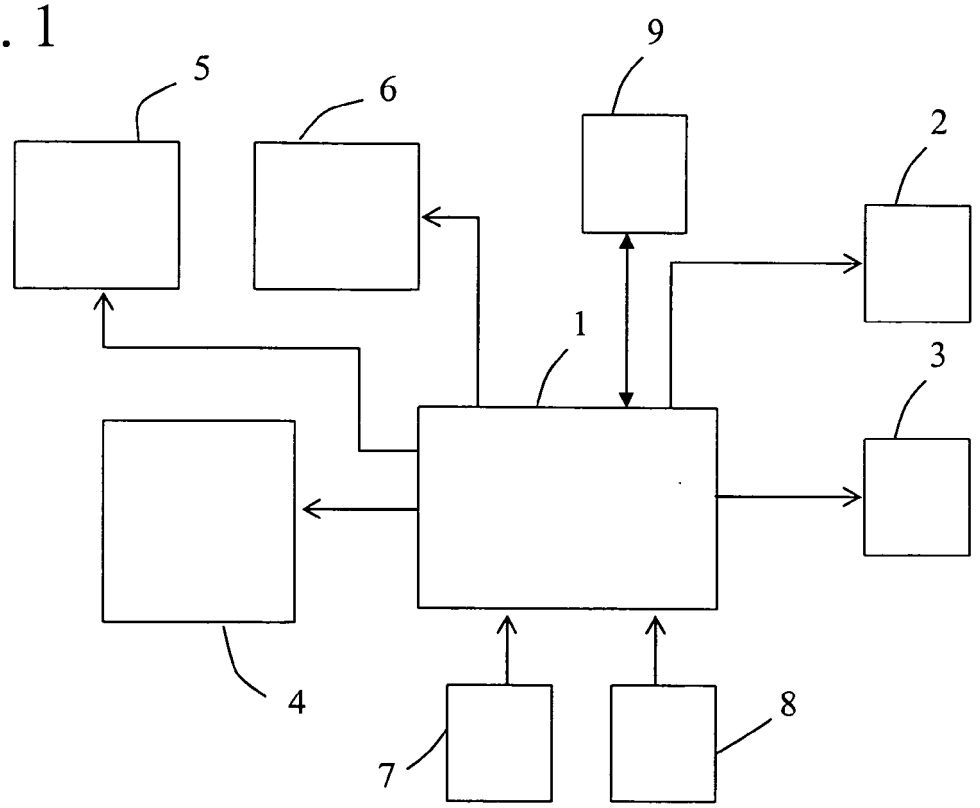
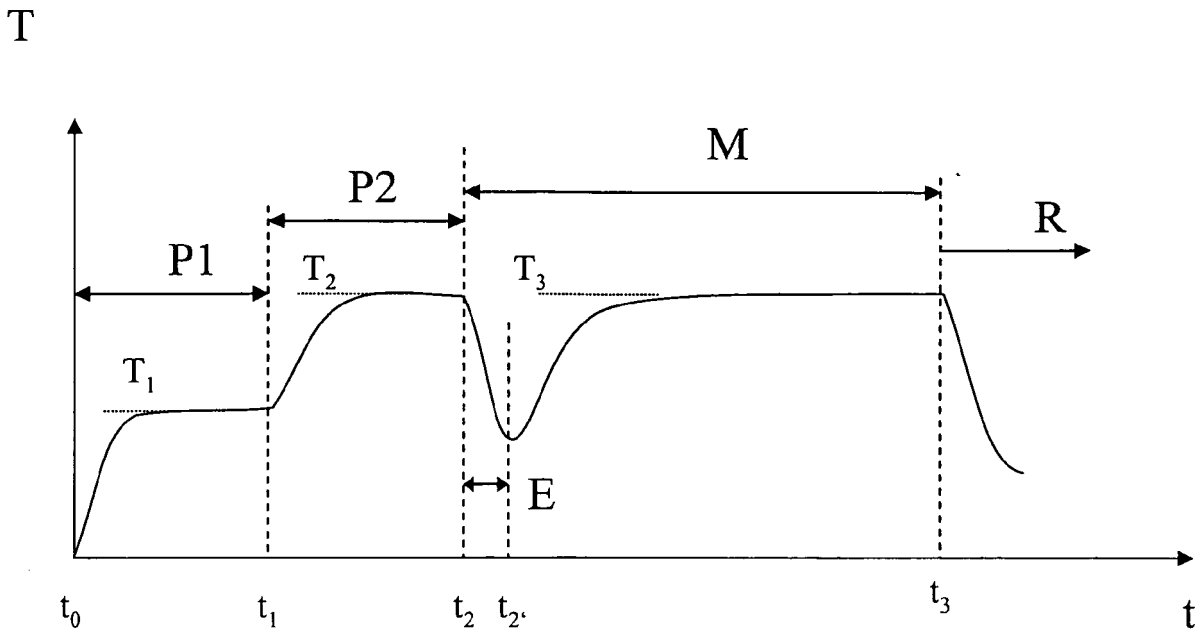


Fig. 2



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EUROPEAN SEARCH REPORT

Application Number
EP 04 02 7623

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Y	* column 3, line 45 - line 64; figures 1,2 * * column 2, line 62 - column 3, line 26 *	3-5,11, 12,19-22	
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Y	* column 1, line 41 - column 2, line 4; claim 1; figure 1 *	3-5, 19-21	
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A	* column 2, line 45 - column 3, line 10; figure 1 *	1-10, 14-22	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	3 May 2005	Clarke, A

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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1 EPO FORM 1503 03.82 (P04C01)

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