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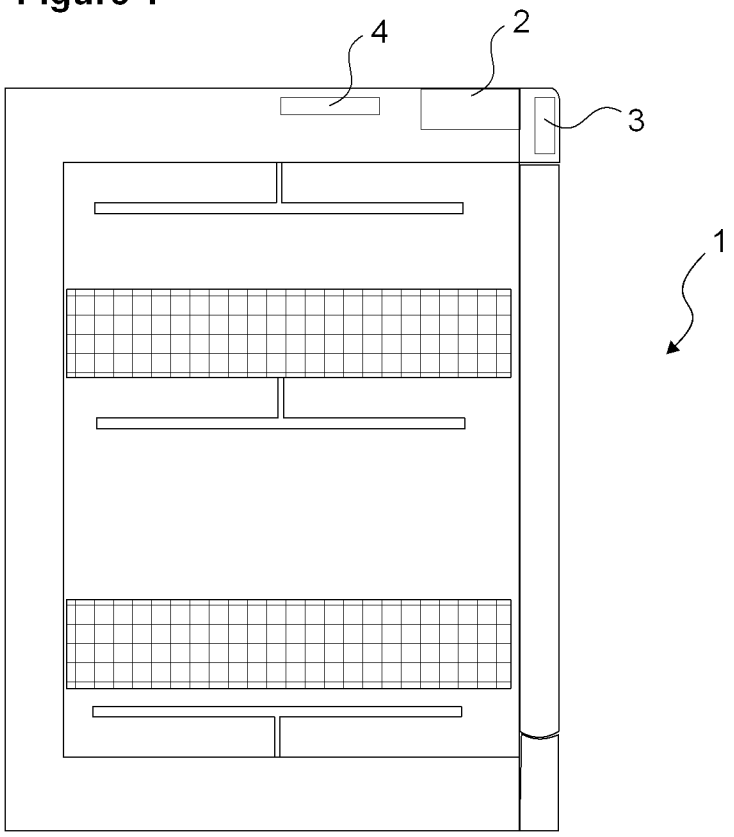
(54) **Title:** A DISWASHER

(57) **Abstract:** The present invention relates to a dishwasher (1) comprising a control unit (2) which operates a washing program comprising various cycles like pre-wash, main-wash, rinsing, and regeneration, the latter carried out when necessary, and a display means (3) which indicates the remaining time to the user.

Figure 1



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Description

A DISHWASHER

[0001] The present invention relates to a dishwasher wherein the remaining time is calculated and displayed to the user.

[0002] In a dishwasher, a washing program comprising various cycles like pre-wash, main-wash, and rinsing, is performed. In said dishwashers, washing and/or drying performance is inversely proportional to the hardness of water. As is known, water hardness depends on the positive calcium and magnesium ions (Ca++ and Mg++) present in water in dissolved form. In order to reduce water hardness, water used for washing is passed through an ion exchanger, for example through resin. An ion exchanger absorbs these ions from water and emits sodium ions (Na+) instead. Therefore, water hardness is reduced. However, in the course of time, an ion exchanger becomes exhausted to absorb calcium and magnesium ions. Thus, the said ion exchanger is left inside a salt solution (for example, NaCl) in order to remove the absorbed calcium and magnesium ions and regenerate anew sodium ions at times. This procedure is called regeneration. The regeneration process lasts 13 minutes on average and is not performed in every washing program.

[0003] As is also known, each washing program is selected considering the condition of items to be washed. The duration of a selected washing program and/or time left before completion thereof is calculated in terms of remaining time and displayed to the user over a display means.

[0004] Factors like ambient temperature, water supply temperature, quantity of items to be cleaned loaded into the dishwasher, etc. can change the remaining time, but these changes do not create great differences. Yet, the situation is different in washing programs wherein a regeneration cycle is carried out. Approximately a 13-minute extra time is added to remaining time in washing programs performing a regeneration cycle. For example, when the user starts running a 20-minute short program that does not include a drying cycle, remaining time decreases backwards starting from 20 minutes. If regeneration process is to be carried out during the washing program, for instance 5 minutes before completion of the program, the

extra period due to the said regeneration step is instantly added to the remaining time, and the user is displayed a remaining time of 18 minutes. Tracking the remaining time but not knowing whether or not a regeneration cycle is to be carried out, the user perceives the change in remaining time as failure and calls a service man.

[0005] In the state of the art, International Patent Application No WO02062195, a method for estimating, computing and displaying the remaining program duration in a dishwasher is explained.

[0006] The aim of the present invention is the realization of a dishwasher comprising a display means that accurately indicates remaining time at the start of a washing program.

[0007] The dishwasher realized in order attain the aims of the present invention, explicated in the first claim and the respective claims thereof, comprises a control unit that calculates the remaining time at the start of a program by adding the duration of the regeneration cycle to the duration of the washing program if a regeneration cycle is determined to be carried out during the selected washing program, and a display means that indicates the remaining time calculated by the control unit to the user as soon as the selected washing program starts running.

[0008] Thus, avoiding the abrupt increase in the remaining time resulting from the regeneration cycle during a washing program, user's misinterpretation of the operation of dishwasher and calling a service man is prevented.

[0009] In one other embodiment of the invention, remaining time for a washing program, wherein a regeneration cycle is to be performed, is displayed on the display means with additional notice which warns that a regeneration cycle is to be performed. Thus, the user is continually kept informed that there is an increase in the duration of the washing program resulting from carrying out a regeneration cycle.

[0010] By means of the present invention, informing the user with updates about the remaining time of a washing program from the start onwards wherein a regeneration cycle is to be performed is provided.

[0011] A dishwasher realized in order to attain the aim of the present invention is illustrated in the attached figures, where:

[0012] Figure 1 – is a schematic view of a dishwasher.

[0013] The elements illustrated in the figures are numbered as follows:

1. Dishwasher
2. Control unit
3. Display means
4. Memory

[0014] The dishwasher (1) of the present invention comprises a control unit (2) that operates a washing program having various cycles like pre-wash, main-wash, rinsing, and regeneration, the latter carried out when necessary, and a display means (3) that indicates the remaining time of the washing program to the user.

[0015] The control unit (2) determines whether or not a regeneration cycle is to be performed during a washing program, and calculates the remaining time (K=tw+tr) if a regeneration cycle is to be performed, by adding the necessary time of regeneration cycle (tr) to the time of washing (tw) before the start of washing program.

[0016] The display means (3) enables the display of the remaining time (K) calculated by the control unit (2) before the start or at the beginning of a washing program (Figure 1).

[0017] Hence, remaining time (K) is calculated by adding the time of washing program (tw) to the time of regeneration cycle (tr) and displayed to the user not at the start of the regeneration cycle but at the start of the washing program wherein a regeneration cycle is to be performed. Consequently, by preventing abrupt alterations in the remaining time (K) during the flow of a washing program, misinterpretation of the user is avoided.

[0018] The dishwasher (1) also comprises a memory (4) storing the information which is related as to how many litres a regeneration cycle is to be performed, how many litres of water shall be used for each washing program, and the amount of water used after the last regeneration cycle which is reset following each regeneration cycle.

[0019] A service man, while installing the dishwasher (1), measures the hardness of water supply that is connected to the dishwasher (1), and adjusts the

regeneration cycle of the dishwasher (1) accordingly. During this regeneration adjustment, information as to the total amount of water that the dishwasher (1) is required to have consumed before the performance of a regeneration cycle is recorded into the memory (4). For example, a regeneration cycle is performed at every 105 litres if water hardness is between 6 to 11 dh. or every 12 litres if water hardness is between 23 to 24 dh. The quantity of water that shall be consumed at each washing program and the level of water consumption at which a regeneration cycle shall start as per adjusted water hardness are both stored in the memory (4) by the producer.

[0020] When the user selects a washing program, the number of litres of water that shall be consumed during the selected program is indicated, together with information whether that quantity of water is reached for the performance of a regeneration cycle during the washing program. If a regeneration cycle is to be performed during the selected washing program, the remaining time (K) is not calculated during the regeneration cycle after the start of said washing program, but at the very beginning of that washing program, by adding the time of washing program (tw) to the time of regeneration cycle (tr). The remaining time (K) calculated by the control unit (2) is displayed on the display means (3).

[0021] An embodiment related to the performance of the invention is described hereunder as an example.

[0022] At first, a service man installs the dishwasher (1) with regeneration cycles set to be performed at every 45 litres. After installation, the dishwasher (1) is operated for a period of time, and, for instance, the total amount of used water recorded by the memory (4) reaches 42 litres. In this example, if a 20-minute washing program consuming 7.5 litres of water is selected, the user is aware from the selection moment onwards that there will be a regeneration cycle during the flow of this program. In the present invention, the control unit (2) calculates the remaining time (K) by adding the time of selected washing program (tw=20 minutes) to the time of regeneration cycle (tr=13 minutes). When the user starts running the selected washing program, the remaining time (K), which has been

calculated by the control unit (2), is transmitted to the display means (3). Accordingly, at the beginning of the program the remaining time (K) that corresponds to 20+13=33 minutes and not to 20 minutes is displayed.

[0023] This way, 5 minutes before the end of the washing program, the remaining time is not suddenly displayed as 18 minutes. Therefore, preventing the user's calling a service man on the assumption that the dishwasher (1) is defective is provided.

[0024] In one other embodiment of the invention, remaining time (K) is indicated on the display means (3) with additional notice which warns that a regeneration cycle is to be performed. This helps the user to perceive that a regeneration cycle is to be performed in the selected washing program.

[0025] The present invention enables the notification of the user with updated information about the remaining time (K) of the selected washing program at the start, wherein a regeneration cycle shall be performed.

Claims

1. A dishwasher (1) **comprising** a control unit (2) which operates a washing program that includes various cycles like pre-wash, main-wash, rinsing, and regeneration, the latter carried out only when necessary, and a display means (3) which shows the remaining time of the washing program to the user, and **characterized by** a control unit (2)

   - that determines before the start of a washing program whether or not a regeneration cycle is to be performed,

   - that calculates the remaining time (K), if a regeneration cycle is to be performed, by adding the time of regeneration cycle (tr) to the time of selected washing program (tw),

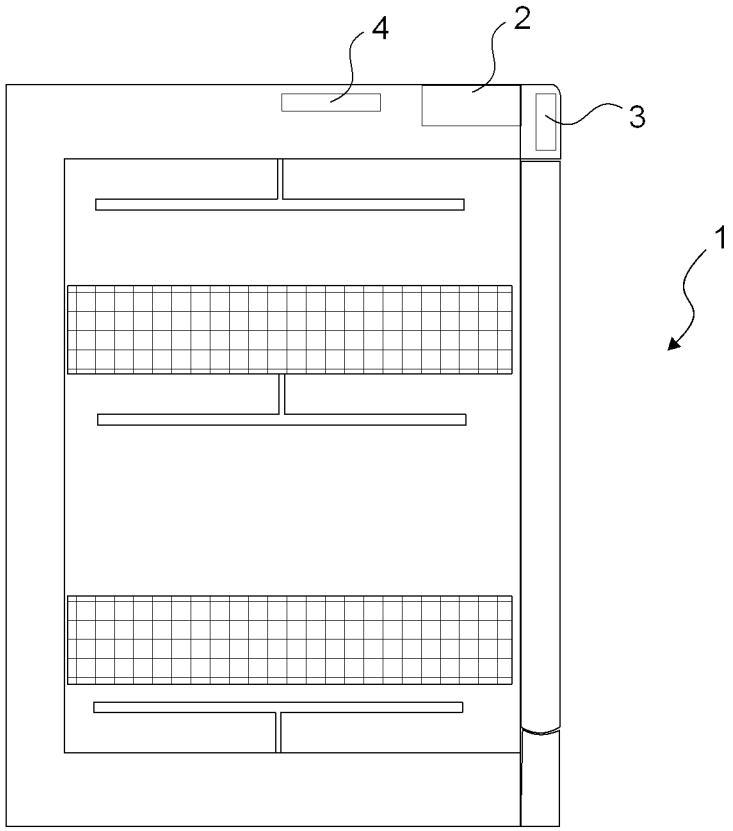
   and

   - a display means (3) that shows the remaining time (K) calculated by the control unit (2) to the user before the start or at the beginning of said washing program.

2. A dishwasher (1) as in Claim 1, **characterized by** a memory (4) storing the information which is related as to how many litres a regeneration cycle shall be performed in accordance with water hardness adjustment, how many litres of water is to be used for each washing program, and the total amount of water used after the final regeneration cycle which is reset following each regeneration cycle.

3. A dishwasher (1) as in Claim 1, **characterized by** a display means (3) that indicates the remaining time (K) together with an additional notice warning that a regeneration cycle is to be performed.

Figure 1



INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2008/068305

A. CLASSIFICATION OF SUBJECT MATTER
INV. A47L15/42

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A47L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 02/062195 A (ARCELIK AS [TR]; BASTUJI CEM [TR]) 15 August 2002 (2002-08-15) cited in the application claims	1
A	US 2004/149314 A1 (CHA KI CHUL [KR] ET AL) 5 August 2004 (2004-08-05) paragraphs [0017] - [0020]	1
A	EP 1 421 893 A (ELECTROLUX HOME PROD CORP [BE]) 26 May 2004 (2004-05-26) paragraph [0008]	1

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
20 March 2009	02/04/2009

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2008/068305

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 02062195 A	15-08-2002	NONE	
US 2004149314 A1	05-08-2004	KR 20040045759 A	02-06-2004
EP 1421893 A	26-05-2004	AT 290812 T	15-04-2005
		DE 10255006 A1	03-06-2004
		ES 2240902 T3	16-10-2005