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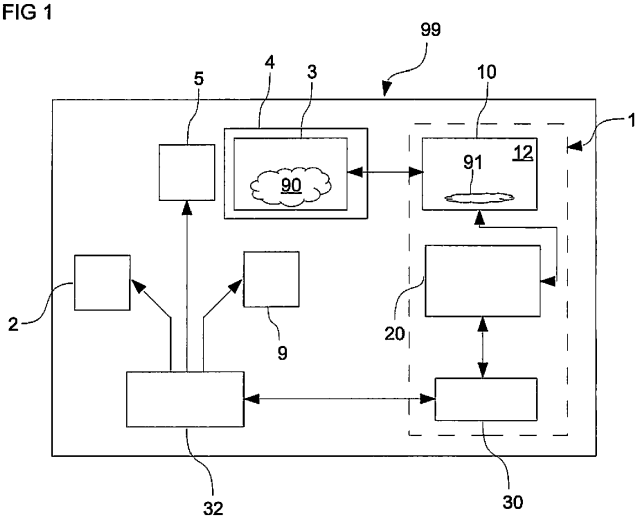
(54) ARRANGEMENT FOR DETERMINING OPTIMAL WASH SCHEME FOR A LOAD IN A WASHING MACHINE

(57) An arrangement (1) in a washing machine (99) for determining optimal wash scheme for a load (90) received into a drum (3) of the washing machine (99) is presented. The arrangement (1) includes a micromachine (10), one or more sensors (20), and a microcontroller (30). The micromachine (10) has a hearth (12) for receiving a part (91) of the load (90) from the drum (3) and is configured to wash the part (91) prior to washing of the load (90) present in the drum (3). The sensors (20) are positioned around the hearth (12) and are configured to determine one or more parameters relating to characteristics of water used in the washing machine (99), characteristics of detergent solution formed in the washing machine (99), and/or characteristics of the part (91) of the load (90). The microcontroller (30) receives, from the sensors (20), one or more signals indicative of the parameters so determined by the sensors (20), and subsequently determines a wash scheme for the load (90) based on the parameters so determined by the sensors (20).

FIG 1



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Description

[0001] The invention refers to an arrangement in a washing machine for determining optimal wash scheme for a load received into the washing machine according to claim 1, and a washing machine according to claim 11.

Background of the invention

[0002] A inserts the laundry into the washing machine, particularly into a drum of the washing machine. Washing detergents, and other similar products such as fabric softeners etc are used in washing laundry in the washing machine. The user adds the detergents and other optional washing or laundry treatment agents, such as fabric softeners, to the washing machine in particular the load and then generally selects a desired wash program from a set of pre-provided wash programs or selects a combination of program parameters such as using extra water, soaking before washing etc, before starting the washing operation of the washing machine. Although such pre-provided wash programs or the user selected program parameters for the washing are generally aimed at getting an optimal washing operation of the load to be carried out by the washing machine, most such pre-provided wash programs or the user selected program parameters fail to precisely take into account or factor in the effects of real time parameters, factors or conditions such as characteristics of the detergent being used for washing of that load, characteristic of the water being used for washing of that load, and also characteristics of the load itself, for example how dirty the laundry is. Even when the user, during selection of the washing program or setting of the program parameters of the washing, aims to take into account or factor in the effects of real time parameters, factors or conditions as aforementioned, the user has to rely on experience, his intuition and expertise, which are prone to human error. There is no way for the user to find out the optimal wash scheme that takes into account or factors in the effects of the aforementioned real-time parameters, factors or conditions.

[0003] The aforementioned real-time parameters have a significant effect on the washing of the laundry. For example, an amount of water to be used differs for different loads for example color of the laundry and degree of dirtiness of the laundry i.e. how dirty or clean the clothes are when inserted into the washing machine drum. Furthermore, different washing operations are required for example washing using hot water at 60°C or washing using non-heated water or washing using water at 45°C, and so on and so forth, depending on characteristics of the load. Furthermore, even if the same amount of detergent is added in different runs of the washing machine, the action and consumption of the detergent may be different owing to different modes/operations performed for the washing, and other factors such as water hardness, or interplay between different agents added, for example between the detergent and the fabric softener, and so on and so forth.

[0004] Thus, there exists a need for a technique for determining optimal wash scheme for washing a load received into the washing machine that takes into consideration the aforementioned real-time factors during determination of the optimal wash scheme or washing program for washing the load that is received into the washing machine for washing.

Object of the Invention

[0005] It is therefore an object of the present invention to provide a technique for determination of optimal wash scheme for washing a load received into the washing machine that takes into consideration the aforementioned real-time factors during determination of the optimal wash scheme or washing program for washing the load.

Description of the Invention

[0006] The aforementioned object is achieved by an arrangement in a washing machine for determining optimal wash scheme for washing a load received into the washing machine according to claim 1 of the present technique, which presents a first aspect of the present technique. The arrangement is for determining the optimal wash scheme for a load that is put into the washing machine by a user, particularly into a drum of the washing machine. In the washing machine, the drum is rotatably mounted in a detergent solution tub of the washing machine. The drum is configured to be rotated by a drive motor of the washing machine that is arranged outside of the detergent solution tub, and generally connected to the drum via a rotatable shaft. The arrangement includes a micromachine, one or more sensors, and a microcontroller. The micromachine has a hearth, i.e. similar to the drum of a conventional washing machine. The hearth of the micromachine may be attached to the drum of the washing machine, i.e. the drum and the hearth may form a continuous volume such that a physical entity like a small piece of clothing from the load can move from the drum of the washing machine and into the hearth of the micromachine. The hearth receives a part of the load from the drum of the washing machine, for example by suction generated within the hearth, which pulls in or suck in a small piece of clothing from the load or a part of larger piece of clothing. The micromachine is configured to wash the part of the load so received into the hearth before the washing machine performs washing of the load present in the drum of the washing machine. The required configuring i.e. the requirement of micromachine washing the part of the load prior to the washing machine performing washing of the load present in the drum of the washing machine, is achieved by programming the microcontroller of the arrangement and a controller of the washing machine to coordinate with each other as desired. The controller of the washing machine is the proc-

essor or control module present in the washing machine that accepts user programs and executes different stages of the washing and drying cycle of the washing machine.

[0007] The one or more sensors are positioned around the hearth of the micromachine and are configured to determine one or more parameters relating to characteristics of water used in the washing machine, characteristics of detergent solution formed in the washing machine, and/or characteristics of the part of the load present in the hearth.

[0008] The microcontroller then receives, from the one or more sensors, one or more signals indicative of the one or more parameters so determined by the one or more sensors, and subsequently determines a wash scheme for the load in the washing machine based on the one or more parameters so determined by the one or more sensors. The wash scheme is a suggested washing and drying program of the washing machine, and may include, but not limited to, occurrences of different stages in the washing machine such as soaking, washing, rinsing, spinning and different combinations thereof, order and repetitions of the aforementioned different stages, parameters of the different stages such as duration of any particular stage and/or speed of rotation of the drum of the washing machine in the that stage, and so on and so forth.

[0009] Thus, as a result of the arrangement of the present technique, optimum washing scheme or program of the washing machine for the load inserted into the washing machine by the user is determined, and subsequently suggested to the user or decided for operation of the washing machine, automatically. The washing of the part of the load by the micromachine generates results that are sensed by the sensors of the arrangement and subsequently communicated to the microcontroller thus allowing the microcontroller to interpolate the results and obtain a suitable optimal wash program i.e. the wash scheme for the entire load. The benefit of the arrangement of the present technique is that the optimal program for the washing of the load is selected in real time basis and depending on the parameters or factors that exist during the operation of the washing machine, for example the water that is being used for that washing of the load, the characteristics of the load such as color and degree of dirtiness, the detergent being used for that washing of the load, and so on and so forth. This is unlike conventionally known washing machines which are based on operations that do not take into account real time factors, and are mostly based on algorithms that use predetermined parameters.

[0010] In one embodiment of the arrangement, the micromachine is attached to the drum of the washing machine, i.e. is positioned within the detergent solution tub. This makes it easier to transfer the part of the load from the drum to the hearth of the micromachine.

[0011] In another embodiment of the arrangement, the microcontroller is a part of a control module of the washing machine, i.e. is a part of the controller of the washing machine. Such controllers are present in modern day washing machines and generally function to start and stop many different processes within the washing machine including pumps and valves to fill and empty the drum with water, control heating of the detergent solution in the drum, control rotating of the drum at different speeds, and so on and so forth.

[0012] In a further embodiment of the arrangement, the one or more sensors are configured to determine the one or more parameters before, during and/or after the washing of the part of the load so received into the hearth, i.e. the sensors may determine the different parameters for example turbidity of the detergent solution, i.e. of the detergent mixed with the water used for washing, before the micromachine washes the part of the load, and/or after the micromachine washes the part of the load. When the parameters are determined both before and after the micromachine washes the part of the load, the two different determinations i.e. the values of the parameters may be compared with each other to determine or analyze the effect of the washing of the part of the load by the micromachine. The micromachine may be programmed to wash the part of the load for a predetermined time period or may be programmed to wash the part of the load until the part of the load is cleaned to a desired degree, which may be sensed by one of the sensors of the arrangement.

[0013] In another embodiment of the arrangement, the micromachine is configured to receive the water from a water inlet of the washing machine and/or from the drum of the washing machine, for example by fluidly connecting the water inlet and/or the drum of the washing machine to the hearth of the micromachine. Thus, the sensors of the arrangement are able to determine the parameters of the water that is being used or will be used for the washing of the load. The characteristics of the water is one of a degree of hardness of the water, a degree of turbidity of the water, a temperature of the water, a pH of the water, and a combination thereof.

[0014] In a further embodiment of the arrangement, the micromachine is configured to receive the detergent solution from a detergent delivery system of the washing machine and/or from the drum of the washing machine, for example by fluidly connecting the detergent delivery system and/or the drum of the washing machine to the hearth of the micromachine. The characteristic of the detergent solution is one of a degree of turbidity of the detergent solution, a temperature of the detergent solution, a pH of the detergent solution, and a combination thereof.

[0015] As aforementioned, the arrangement may include one or more sensors that determine the parameters relating to the characteristics of the part of the load in the hearth. The characteristics of the part of the load is one of a color of the part of the load i.e. of the laundry, a degree of dirtiness of the part of the load, and a combination thereof.

[0016] In another embodiment of the arrangement, the

micromachine is driven by the drive motor of the washing machine. Thus, a separate driving mechanism is obviated for the micromachine.

[0017] The aforementioned object is also achieved by a washing machine having an arrangement for determining optimal wash scheme for a load received into a drum of the washing machine, according to claim 11 which presents a second aspect of the present technique. The drum within the washing machine is rotatably mounted in a detergent solution tub of the washing machine and is configured to be rotated by a drive motor of the washing machine. The arrangement of the washing machine is according to the aforementioned first aspect of the washing machine.

[0018] Further benefits, goals and features of the present invention will be described by the following specification of the attached figures, in which components of the invention are exemplarily illustrated. Components of the devices and method according to the inventions, which match at least essentially with respect to their function can be marked with the same reference sign, wherein such components do not have to be marked or described in all figures.

[0019] The invention is just exemplarily described with respect to the attached figures in the following.

Brief Description of the Drawings

[0020]

Fig. 1 schematically shows an arrangement for determining optimal scheme for washing a load received into a drum of a washing machine according to the present invention;

Fig. 2 schematically shows an exemplary embodiment of a drum-type washing machine in which an exemplary embodiment of the arrangement of Fig. 1 is incorporated;

Fig. 3 schematically shows an exemplary embodiment of a micromachine of Fig. 2 with sensors arranged around a hearth of the micromachine; and

Fig. 4 schematically shows another exemplary embodiment of the drum-type washing machine in which another exemplary embodiment of the arrangement of Fig. 1 is incorporated; in accordance with aspects of the present technique.

Detailed Description of the Drawings

[0021] Fig. 1 schematically shows a drum-type washing machine 99, hereinafter also referred to as washing machine 99. Figs. 2 and 4 also schematically shows the washing machine 99. The washing machine 99 includes a detergent solution tub 4, also referred to as an external tub or suds container, a drum 3 for accommodating laundry 90 or load 90 through an opening 8 (shown in Figs. 2 and 4) of the drum 3. The drum 3 is rotatably mounted within the detergent solution tub 4, hereinafter also referred to as the tub 4. The washing machine 99 also includes a drive motor 5. From the drive motor 5 extends a drive shaft 6 (shown in Figs. 2 and 4). The drive shaft 6 passes though the tub 4 and connects to the drum 3. The drive shaft 6 rotationally couples the drum 3 with the drive motor 5. The washing machine 99 has a wash solution discharge system 7 through which wash liquor is drained out of the washing machine 99. The washing machine 99 also comprises other parts (not shown) that are required for functioning of such washing machines 99, such as foam detection mechanism, water heating elements, control buttons to program the washing machine, etc.

[0022] As shown in Fig. 4 in combination with Fig. 1, the washing machine 99 also includes a water inlet 2 and a detergent delivery system 9. A user, i.e., a person intending to use the washing machine 99 to clean or wash laundry i.e. the load 90, inserts or inputs the load 90 into the drum 3 of the washing machine 99 through a front opening 8 of the drum 3. The user also places detergent, and any other washing aids such as fabric softeners into the detergent delivery system 9. The user then starts the washing machine 99, i.e. instructs the washing operation to begin. The washing machine 99 includes a control module 32, also referred to as a controller 32 or a main processor 32, often built into a control console having a user interface to accept user inputs, if any. The control module 32 controls the operation of different components of the washing machine 99, for example starting and stopping of different processes within the washing machine 99 including pumps and valves to fill and empty the drum 3 with water, heating of the detergent solution in the drum 3, rotating of the drum 3 at different speeds, and so on and so forth. The controller 32 also controls the water inlet 2 and thus decides when and how much water enters the washing machine 99. The controller 32 further controls the detergent delivery system 9 and decides when the detergent or other washing aids such as fabric softeners resting in the detergent delivery system 9 are added to the drum 3 of the washing machine 99.

[0023] The aforementioned washing machine 99 incorporates an arrangement 1 according to the present invention. Referring now to Fig. 1 the arrangement 1 is explained hereinafter. The arrangement 1, when in the washing machine 99, determines optimal wash scheme for washing the load 90 that is received into the washing machine 99. The arrangement 1 includes a micromachine 10, one or more sensors 20, and a microcontroller 30. The micromachine 10 has a hearth 12, i.e. inner space or volume of the micromachine 10 in which a part 91 of the load 90 i.e. a small piece of clothing 91 or a fraction or part 91 of a large piece of clothing 90 can be inserted or received. The hearth 12 may be understood to be similar in construct and function as the drum 3 of the washing machine 99 albeit suitable only for the part

91. The hearth 12 or the drum equivalent 12 of the micromachine 10 may be attached to the drum 3 of the washing machine 99, as shown in Figs. 2 and 4 i.e. the drum 3 and the hearth 12 may form a continuous volume such that a physical entity i.e. for example the part 91 like a small piece of clothing from the load 90 can move from the drum 3 of the washing machine 99 and into the hearth 12 of the micromachine 10. The hearth 12 receives the part 91 of the load 90 from the drum 3 of the washing machine 99, for example by suction generated within the hearth 12 that pulls in or suck in a small piece of clothing 91 from the load 90 or a part 91 of larger piece of clothing of the load 90. To facilitate the transfer of the part 91 of the load 90 from the drum 3 and into the hearth 12, the hearth 12 may be attached to the drum 3 such that an opening 11 (shown in Fig. 3) of the hearth 12 opens into the drum 3. The transfer of the part 91 of the load 90 is preferably performed before the water and the detergent solution have been added to the drum 3, however the transfer of the part 91 of the load 90 may also be performed after the water and the detergent solution have been added to the drum 3 but before the washing of the load 90 is commenced in the drum 3 of the washing machine 99.

[0024] Once the part 91 of the load 90 is received into the hearth 12 of the micromachine 10, the micromachine 10 is configured to wash the part 91 of the load 90 so received into the hearth 12. The washing of the part 91 of the load 90 by the micromachine 10 is performed before the washing machine 99 performs washing of the load 90 present in the drum 3 of the washing machine 99. This may be achieved by programming the microcontroller 30 of the arrangement 1 and the controller 32 of the washing machine 99 accordingly to coordinate with each other. The controller 32 of the washing machine 99 is the processor or control module present in the washing machine 99. The micromachine 10 may have a construct similar to an assembly of the drum 3, the detergent solution tub 4, the drive motor 5 and the shaft 6, i.e. the hearth 12 of the micromachine 10 may be inside of a drum equivalent of the micromachine 10 which in turn is positioned inside a detergent solution tub equivalent of the micromachine 10. The drum equivalent of the micromachine 10 may be driven by a micromachine drive motor and a connecting shaft extending from the micromachine drive motor and connecting to the drum equivalent of the micromachine 10. In another embodiment of the arrangement 1, the micromachine 10 is driven by the drive motor 5 of the washing machine 99. Thus, a separate driving mechanism i.e. need for the micromachine drive motor is obviated. Alternatively, the micromachine 10 may have another construct for example a non-perforated drum having an inlet to receive water and/or detergent solution and an outlet to drain off the wash liquor during and/or after the washing of the part 91 is completed within the hearth 12 of the micromachine 10. The basic idea is that the micromachine 10 is such a component that functions to wash the part 91 present in the hearth 12 for a predetermined period of time or until a desired degree of cleaning of the part 91 is achieved.

[0025] The arrangement 1 also includes the one or more sensors 20. It may be noted that although Figs. 1 and 4 shows only one sensor 20, multiple sensors 20, 21, 22, 23 may be present in the arrangement 1, as shown in Fig. 3. The sensors 20, 21, 22, 23 are positioned around the hearth 12 of the micromachine 10 as shown in Fig. 3. The sensors 20, 21, 22, 23 are configured to determine one or more parameters relating to characteristics of the water used in the washing machine 99, characteristics of the detergent solution formed in the washing machine 99, and/or characteristics of the part 91 of the load 90 in the hearth 12 of the micromachine 10.

[0026] An example of the sensor 20 may be a turbidity meter, that uses the scattering effect of suspended particles in the water and/or in the detergent solution i.e. after the detergent provided into the washing machine 99 has been mixed or dissolved in the water received by the washing machine 99. Another example of the sensor 20 may be a total dissolved solids meter (TDS meter) based on electrical conductivity measurement of the water and/or of the detergent solution. The total dissolved solids represent the total amount of mobile charged ions, including minerals, salts or metals dissolved in a given volume of water and/or a given volume of the detergent solution. The measurements from the TDS meter and/or the turbidity meter may be used to determine a measure of hardness of the water being used in the washing machine 99, or to determine characteristics of the detergent solution. Yet another example of the sensor 20 may be a thermometer that measures a temperature of the water and/or of the detergent solution. The thermometer or the temperature sensor may further determine a rate of cooling of the water and/or of the detergent solution that may in-turn be dependent on an ambient temperature in which the washing machine 99 is positioned. A further example of the sensor 20 may be a pH meter that determines a pH of the water and/or of the detergent solution. Furthermore, another example of the sensor 20 may be a photometer that is used for determining a color of the part 91 or a degree of dirtiness of the part 91 of the load 90. As aforementioned the arrangement 1 may have anyone or multiple of the aforementioned sensors 20. For example, in Fig. 3 the arrangement 1 includes four sensors 20,21,22,23 which may, for example, be a TDS meter, a photometer, a pH meter, and a temperature sensor.

[0027] The sensors may determine the different parameters for example turbidity of the detergent solution, the dirtiness of the part 91, the pH of the detergent solution before the micromachine 10 washes the part 91 of the load 90, during the washing of the part 91 of the load 90 and/or after the micromachine 10 has completed the washing of the part 91 of the load 90. The values of the parameters may be compared with each other to determine or analyze the effect of the washing of the part 91 of the load 90 by the micromachine 10. As aforementioned, the micromachine 10 may be programmed to

wash the part 91 of the load 90 for a predetermined time period or may be programmed to wash the part 91 of the load 90 until the part 91 of the load 90 is cleaned to a desired degree which may be sensed by one of the sensors 20, 21, 22, 23 of the arrangement 1 for example by the photometer or turbidity meter.

[0028] The microcontroller 30 then receives, from the one or more sensors 20,21,22,23, one or more signals indicative of the one or more parameters so determined by the sensors 20,21,22,23. The microcontroller 30 then subsequently determines a wash scheme for the load 90 in the washing machine 99 based on the one or more parameters so determined by the sensors 20,21,22,23. The wash scheme is a suggested washing, and optionally additional drying program, of the washing machine 99, and may include, but not limited to, occurrences of different stages in the washing machine 99 such as soaking, washing, rinsing, spinning and different combinations thereof, order and repetitions of the aforementioned different stages, parameters of the different stages such as duration of any particular stage and/or speed of rotation of the drum 3 of the washing machine 99 in the that stage, and so on and so forth. For example, the sensor 20 may be a turbidity meter and may measure the turbidity of the water when first added and mixed with the detergent or of the detergent solution if the detergent solution from the drum 3 is directly inducted into the hearth 12 of the micromachine 10. The turbidity meter 20 then continuously or intermittently measures the turbidity of the solution present in the hearth 12 of the micromachine 10 as the part 91 of the load 90 is washed in the hearth 12 by the micromachine 10. After a few washings, rinsing and draining cycles of the part 91 in the hearth 12, the turbidity meter 20 measures a turbidity measurement of the wash liquor in the hearth 12 that represents that the part 91 has achieved a desired degree of cleaning, thereby indicating that washing of the part 91 is completed to a desired level. The microcontroller 30 analyzes all the sensor measurements for the part 91 and interpolates and adjusts the results to calculate how many washing, rinsing and draining cycles have to applied to the load 90 in the drum 3 of the washing machine 99 for achieving the desired degree of cleaning of the load 90. In another example, the microcontroller 30 may determine how much water is needed for rinsing and/or a temperature to which the water is to be heated and/or the speed and duration of rotation of the drum 3, and so on and so forth. Thus, as a result of the arrangement 1 of the present technique, optimum washing scheme or program of the washing machine 99 for the load 90 inserted into the washing machine 99 by the user is determined based on the washing of the part 91 of the load 90 by the micromachine 10.

[0029] As shown in Fig. 1 the optimal wash scheme as determined by the microcontroller 30, which may for example be a microprocessor or a FPGA, is then communicated to the control module 32 of the washing machine 99 and the control module 32 subsequently controls, i.e. starts, stops and regulates the water inlet 2 to control the water intake into the drum 3, the detergent delivery system 9 to control at what stage of the washing the detergent or other washing aids such as the fabric softeners are added to the drum 3, and/or the drive motor 5 to control when and for how long and at what speed the drum 3 is rotated during different stages of the washing of the load 90.

[0030] As shown in the embodiment of the arrangement 1 in Fig. 2 the microcontroller 30 of the arrangement 1 may be present as separate entity while being in communication with the control module 32 of the washing machine 99, or as shown in Fig. 4, the microcontroller 30 of the arrangement 1 may be present as part of the control module 32 of the washing machine 99.

[0031] As shown in Fig. 4, in an exemplary embodiment of the arrangement 1, the micromachine 10 is fluidly connected to the water inlet 2 and/or the drum 3 of the washing machine 99 and thus the hearth 12 of the micromachine 10 receives the water from the water inlet 2 of the washing machine 99 and/or from the drum 3 of the washing machine 99. When the water is received by the micromachine 10 directly from the water inlet 2, the sensors 20,21,22,23 of the arrangement 1 are enabled to determine the parameters of the water that is being used before the water is added to the drum 3 where the detergent and the laundry i.e. the load 90 are present. When the water is received by the micromachine 10 from the drum 3, the sensors 20,21,22,23 of the arrangement 1 are enabled to determine the parameters of the water that is mixed with the detergent and exposed to the laundry.

[0032] In another embodiment of the arrangement 1 and as depicted in Fig. 4, the micromachine 10 is fluidly connected to the detergent delivery system 9 and/or to the drum 3 of the washing machine 99. The micromachine 10 is thus enabled to receive detergent solution directly from the detergent delivery system 9 and/or from the drum 3 of the washing machine 99. When the detergent solution is received by the micromachine 10 directly from the detergent delivery system 9, the sensors 20,21,22,23 of the arrangement 1 are enabled to determine the parameters of the detergent solution that is going to be used, before the detergent solution is added to the drum 3 where the detergent solution is exposed to the laundry i.e. the load 90 and to excess water that may be present in the drum 3. When the detergent solution is received by the micromachine 10 from the drum 3, the sensors 20,21,22,23 of the arrangement 1 are enabled to determine the parameters of the detergent solution that is exposed to the laundry i.e. to the load 90 for a given period of time.

[0033] Besides the arrangement 1, the present invention also includes the washing machine 99 having the arrangement 1 for determining optimal wash scheme for the load 90 received into the drum 3 of the washing machine 99. The arrangement 1 of the washing machine 99 is as explained hereinabove in relation to Figs. 1 to 4.

[0034] Thus, an arrangement 1 in a washing machine

99 for determining optimal wash scheme for a load 90 received into a drum 3 of the washing machine 99 is presented according to the invention. The arrangement 1 includes a micromachine 10, one or more sensors 20, and a microcontroller 30. The micromachine 10 has a hearth 12 for receiving a part 91 of the load 90 from the drum 3 and is configured to wash the part 91 prior to washing of the load 90 present in the drum 3. The sensors 20 are positioned around the hearth 12 and are configured to determine one or more parameters relating to characteristics of water used in the washing machine 99, characteristics of detergent solution formed in the washing machine 99, and/or characteristics of the part 91 of the load 90. The microcontroller 30 receives, from the sensors 20, one or more signals indicative of the parameters so determined by the sensors 20, and subsequently determines a wash scheme for the load 90 based on the parameters so determined by the sensors 20.

List of reference numbers

[0035]

1	arrangement
2	water inlet of the washing machine
3	drum of the washing machine
4	detergent solution tub of the washing machine
5	drive motor of the washing machine
6	drive shaft of the washing machine
7	wash solution discharge system of the washing machine
8	opening of the drum
9	detergent delivery system of the washing machine
10	micromachine of the arrangement
12	hearth of the micromachine
20,21,22,23	sensors of the arrangement
30	microcontroller of the arrangement
32	control module of the washing machine
90	load
91	part of the load
99	washing machine

Claims

1. An arrangement (1) in a washing machine (99) for determining optimal wash scheme for a load (90) received into a drum (3) of the washing machine (99), the drum (3) rotatably mounted in a detergent solution tub (4) of the washing machine (99) and configured to be rotated by a drive motor (5) of the washing machine (99), the arrangement (1) comprising:

- a micromachine (10) having a hearth (12) configured to receive a part (91) of the load (90) from the drum (3) of the washing machine (99), wherein the micromachine (10) is configured to wash the part (91) of the load (90) so received into the hearth (12) prior to washing of the load (90) present in the drum (3) of the washing machine (99),
- one or more sensors (20) positioned around the hearth (12) of the micromachine (10) and configured to determine one or more parameters relating to characteristics of water used in the washing machine (99), characteristics of detergent solution formed in the washing machine (99), and/or characteristics of the part (91) of the load (90) in the hearth (12), and
- a microcontroller (30) configured

  - to receive, from the one or more sensors (20), one or more signals indicative of the one or more parameters so determined by the one or more sensors (20), and
  - to determine a wash scheme for the load (90) in the washing machine (99) based on the one or more parameters so determined by the one or more sensors (20).

2. The arrangement (1) according to claim 1, wherein the micromachine (10) is attached to the drum (3) of the washing machine (99).

3. The arrangement (1) according to claim 1 or 2, wherein the microcontroller (30) is a part of a control module (32) of the washing machine (99).

4. The arrangement (1) according to any of claims 1 to 3, wherein the one or more sensors (20) are configured to determine the one or more parameters before, during and/or after the washing of the part (91) of the load (90) so received into the hearth (12).

5. The arrangement (1) according to any of claims 1 to 4, wherein the micromachine (10) is configured to receive the water from a water inlet (2) of the washing machine (99) and/or from the drum (3) of the washing machine (99).

6. The arrangement (1) according to any of claims 1 to 5, wherein the characteristics of water is one of a degree of hardness of the water, a degree of turbidity of the water, a temperature of the water, a pH of the water, and a combination thereof.

7. The arrangement (1) according to any of claims 1 to 6, wherein the micromachine (10) is configured to receive the detergent solution from a detergent delivery system (9) of the washing machine (99) and/or from the drum (3) of the washing machine (99).

8. The arrangement (1) according to any of claims 1 to 7, wherein the characteristics of the detergent solu-

tion is one of a degree of turbidity of the detergent solution, a temperature of the detergent solution, a pH of the detergent solution, and a combination thereof.

9. The arrangement (1) according to any of claims 1 to 8, wherein the characteristics of the part (91) of the load (90) in the hearth (12) is one of a color of the part (91) of the load (90), a degree of dirtiness of the part (91) of the load (90), and a combination thereof.

10. The arrangement (1) according to any of claims 1 to 9, wherein the micromachine (10) is configured to be driven by the drive motor (5) of the washing machine (99).

11. A washing machine (99) having an arrangement (1) for determining optimal wash scheme for a load (90) received into a drum (3) of the washing machine (99), the drum (3) rotatably mounted in a detergent solution tub (4) of the washing machine (99) and configured to be rotated by a drive motor (5) of the washing machine (99), wherein the arrangement (1) is according to any of claims 1 to 10.

FIG 1

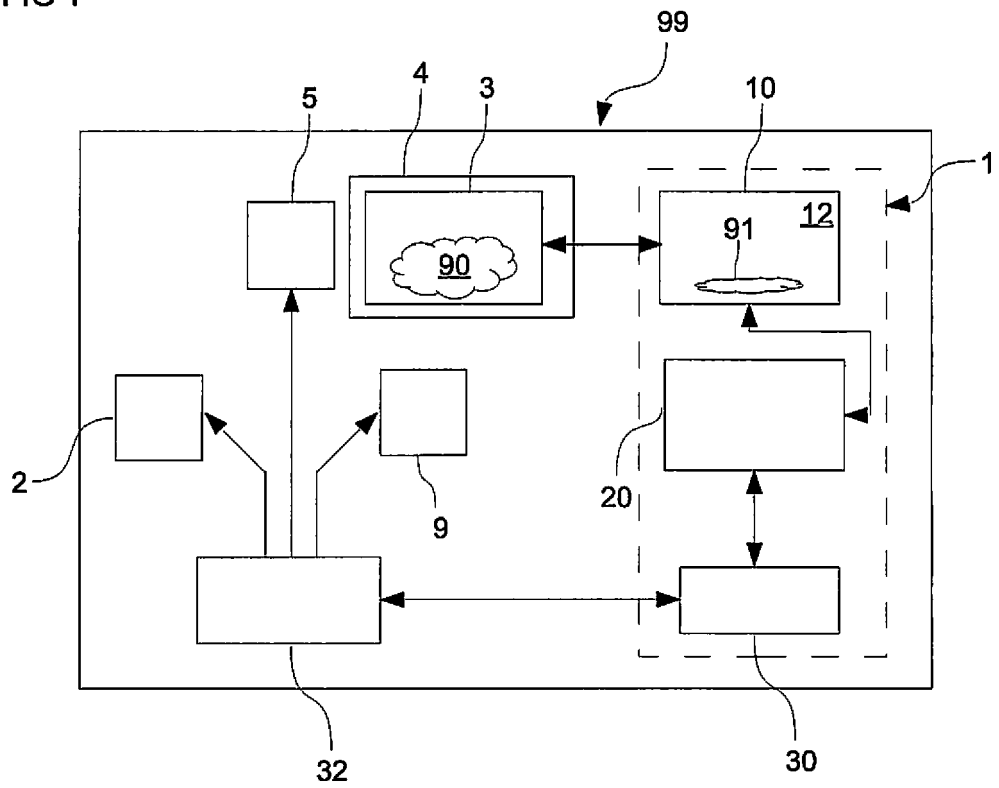


FIG 2

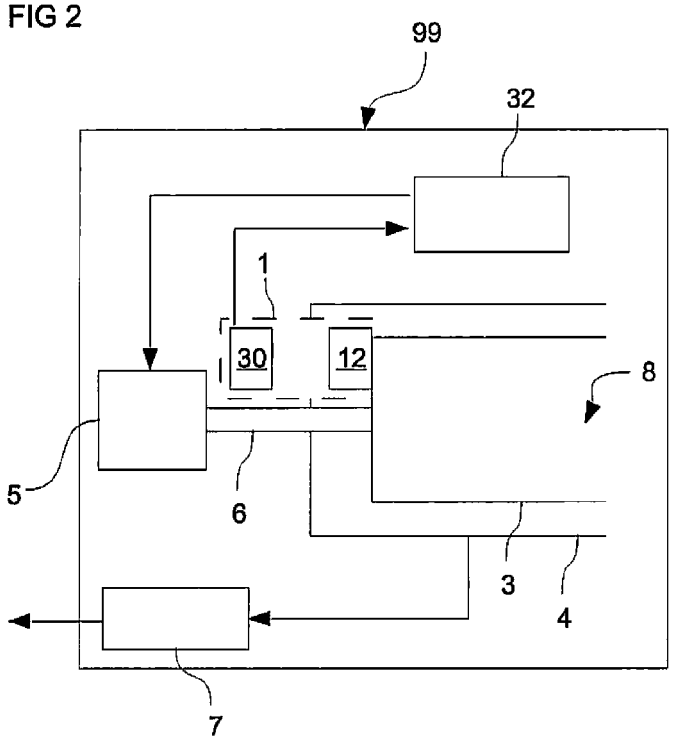


FIG 3

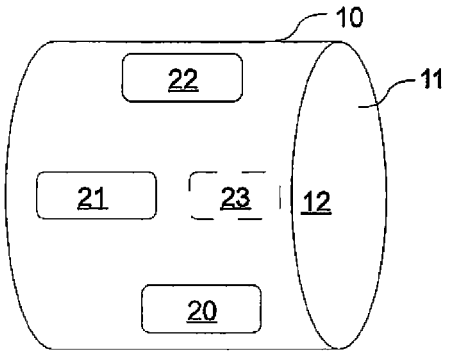
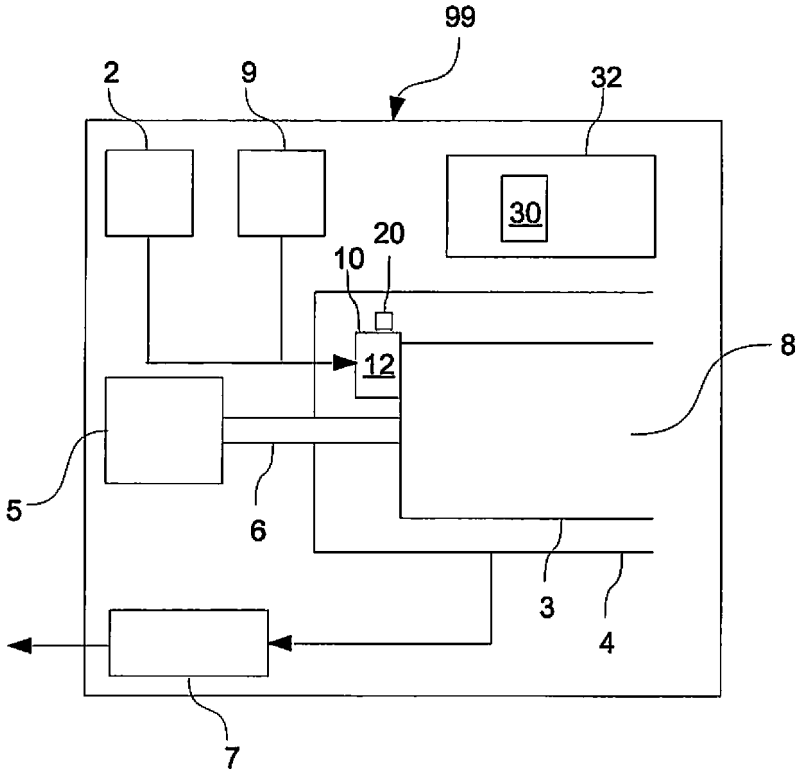


FIG 4



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Application Number
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The present search report has been drawn up for all claims

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