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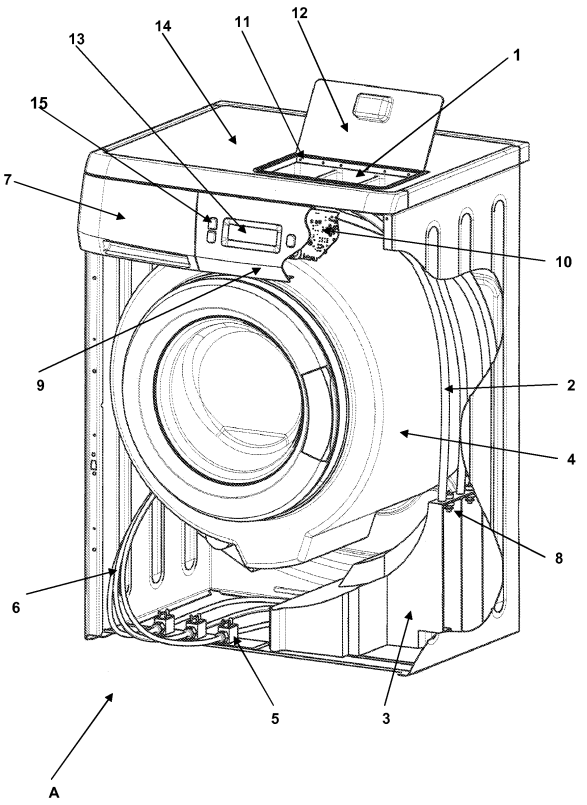
(54) A washing machine

(57) The washing machine (A) according to the present invention comprises a washing tub (4); a filling reservoir (1) used to fill-in detergent into the machine; a storage reservoir (3) wherein the detergent supplied from the filling reservoir (1) is accumulated; and a dosing unit (5) used to deliver the detergent in the storage reservoir (3) to the tub (4). The machine (A) further includes a control unit (10) by which all controls are conducted and the operation functions of machine (A) are regulated. Additionally a display unit (13) in connection with said control unit (10) is employed to indicate the current status of the machine (A) to the user.



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Description

Technical Field

[0001] The present invention relates to a system which adjusts automatically the amount of detergent to be used during operation and stores the detergent for multiple uses in washing machines.

Background Art

[0002] In the prior art of washing machines, either a drawer on the machine, or a washing ball put between the laundries are used as the detergent reservoir. The amount of detergent placed in both such circumstances resembles an amount that suffices only to a single washing program. What's aimed in the present invention is, however, to provide the washing machine with an amount of detergent (in powder and/or liquid form) in a detergent storage reservoir that would suffice to more than one washing programs and to enable the use of an determined amount of detergent for each individual washing program.

[0003] With respect to the prior art, the patent application EP0379950 discloses a system by which liquid detergents are used and in which such detergents are stored. In this system, however, there is not provided any configuration in which detergents of different types are stored separately without becoming mixed. Another patent application, i.e. EP1215329, discloses a storage reservoir of liquid detergents provided out of the machine, appearing not so practical with respect to use. This latter system does not provide a configuration either, in which detergents of different types are stored separately without becoming mixed.

Brief Description of Invention

[0004] Within the present invention, however, the required detergent (powder and/or liquid) is put to the washing machine in an amount that would suffice for longer periods of time, such that the user is freed from the burden of providing detergent during each washing program. Thanks to the configuration formed according to the present invention, the detergent storage reservoir is maintained within the washing machine so that extra space is saved. Since this system is also applicable to widely-used washing machines with detergent drawers, it becomes possible to make use both of the aforesaid storage reservoir, and of the detergent drawer already present in such machines. The system according to the present invention further provides different detergent compartments and storage reservoirs for different type of detergents (detergents for white clothing, colored clothing, softeners). Thanks to this system, the necessity of adjusting distinct types and amounts of detergents according to each washing program is eliminated for the user. Additionally, the filling operation is conducted from the upper part of the machine, ensuring an ergonomic convenience for the user.

Objective of Invention

[0005] The objective of the present invention is to provide the storage of different type of detergents in an amount sufficing to more than one washing program in a washing machine and to release the user of said machine from the burden of supplying detergent for each washing program.

[0006] Another objective of the present invention is to enable the washing machine to automatically adjust the use of detergent in accordance with the washing program or need.

[0007] A further objective of the present invention is to maintain the detergent storage reservoir within the washing machine so as to save space.

[0008] Yet a further objective of the present invention is leaned on its applicability to widely-used washing machines with detergent drawers, so that either the storage reservoir or such existing detergent drawers are benefited.

Description of Figures

[0009] An illustrative embodiment of the subject washing machine is illustrated in the annexed figure briefly described hereunder.

Figure 1 is a perspective view of an illustrative washing machine.

[0010] The parts in said figure are individually enumerated as following:

Washing machine (A)
Filling reservoir (1)
Hose (2)
Storage reservoir (3)
Tub (4)
Dosing unit (5)
Hose (6)
Detergent drawer (7)
Level sensor (8)
Front panel (9)
Control unit (10)
Lamp (11)
Filling reservoir cover (12)
Display unit (13)
Upper panel (14)
Selection switch (15)

Description of Invention

[0011] Figure 1 illustrates an exemplary washing machine (A) (this example illustrates the present invention by means of a washing machine, but it can nevertheless

be applied to other washing machines). The subject washing machine (A) comprises a washing tub (4); a filling reservoir (1) used to fill-in detergent into the machine; a storage reservoir (3), wherein the detergent supplied from the filling reservoir (1) is accumulated; and a dosing unit (5) used to deliver the detergent within the storage reservoir (3) to the tub (4). The machine (A) further includes a control unit (10) by which all controls are conducted and the operation functions of machine (A) are regulated. Additionally a display unit (13) in connection with said control unit (10) is employed to indicate the current status of the machine (A) (program phases, operation conditions, warnings, etc.) to the user.

[0012] Said filling reservoir (1) is preferably be provided at the upper panel (or at an easily-accessible location) of the washing machine (A) concerning the user's ergonomic convenience. On the top of the filling reservoir (1) is provided an open-/closable cover (12). Said cover (12) both protects the filling reservoir's (1) interior from foreign material and provides an aesthetical integrity on the upper panel. Said filling reservoir (1) comprises a plurality of compartments allowing the individual storage of distinct detergents (e.g. detergents for white, colored, woolen clothing, softeners etc.). It can also be removed for cleaning purposes. The storage reservoir (3) is similarly comprised of a plurality of compartments and any detergent put into the respective compartment of the filling reservoir (1) is accumulated within a compartment of said storage reservoir (3) that is in communication with such respective compartment. The communication between said filling reservoir (1) and the storage reservoir (3) can be realized directly or by means of elements such as tubes, hoses (2), etc.

[0013] A level sensor (8) is provided in each compartment of the storage reservoir (3). The extent to which the compartments of said storage reservoir (3) are full is measured by means of said level sensors (8). The level sensors (8) are in communication with the control unit (10) of the machine (A). The control unit (10) indicates the data of the amount of detergent delivered by said level sensors (8) on the display unit (13) located at the machine's (A) front panel (9) to the user in a visual and/or audible manner. Additionally, the maximum and minimum levels of detergent within the storage reservoir (3) compartments can also be seen from the lamps provided at the compartments of the filling reservoir (1) that are in communication with the respective compartments of the storage reservoir (3). Thanks to the warning signal of each lamp (11) provided at each compartment of the filling reservoir (1), the upper and lower detergent levels in the relevant compartment of the storage reservoir (3) are indicated.

[0014] The control unit (10) of the machine (A) determines the amount of detergent and the time such detergent is to be used in line with the washing program selected by the user. It accordingly controls the dosing unit (5) employed in delivering detergent into the tub (4). A pump and/or valve is used as said dosing unit (5). If, for instance, the storage reservoir (3) is positioned in the lower part of the tub (4), a pump is used in the role of said dosing unit, but if said storage reservoir (3) is positioned in the upper part of the tub (4), an on-off valve is employed as said dosing unit (if necessary, a pump can be used in this case as well). Each dosing unit (5) is in connection with a respective compartment of the storage reservoir (3). Thus, detergents of distinct characteristics within the storage reservoir (3) are transferred into the tub (4) by means of separate units (5). The communication of said units (5) with the tub (4) and the storage reservoir (3) can be realized directly or by means of elements such as tubes, hoses (6), etc. The amount of detergent to be transferred by the dosing unit (5) into the tub (4) varies depending on factors such as the amount of detergent, washing program, amount of water in the tub (4), and the material to be washed (e.g. type of laundry). The control unit (10) determines the type, amount, and supply-timing of detergent in line with these factors and activates the pumps and/or valves accordingly.

[0015] Standard detergent drawers (7) can also be used in the washing machine (A) according to the present invention. By means of a selection switch (15) provided on the machine (A) [this switch (15) is in communication with the control unit (10) and is illustrated on the front panel (9) in the figure], the system involving the delivery of detergent from the storage reservoir (3) is deactivated and the delivery of detergent from the drawer (7) is activated. Likewise, the same selection switch (15) functions to activate back the supply of detergent from the storage reservoir (3), and deactivates the detergent drawer (7).

[0016] In another illustrative embodiment of the present invention, the color of laundry is determined and the type of detergent is selected accordingly by means of an optical sensor in communication with the control unit (10) and provided in the tub (4).

[0017] In a further illustrative embodiment of the present invention, thanks to a weight sensor, which is connected to the control unit (10) and measures the weight of the tub (4) or washing drum (the rotating washing unit in the tub), the weight of the laundry and water taken in is determined so that the amount of detergent to be supplied to the tub (4) is increased or decreased. Similarly, the weight of laundry and water taken in shall cause the tub (4) or drum to displace downward to some extent, so that a position sensor in connection with the control unit (10) can be used to measure the amount of displacement and to calculate the weight of laundry. Accordingly, the amount of detergent to be supplied into the tub (4) is increased or decreased. One way of measuring the weight of laundry that is soaked with water is to measure the revolution of drum by means of a torque meter (which is in communication with the control unit (10)). The drum load can be calculated according to the measured torque value so that the weight of laundry can be determined. This data can also be used in increasing or decreasing the amount of detergent to be supplied into the tub (4). If the net weight of laundry is to be measured,

it can also be done by means of the tub load weight sensor, position sensor, and torque meter without taking in water. Additionally, the amount of water fed into the tub can be measured by means of a flow meter positioned on the tub's inlet line and the tub load can be determined accordingly.

[0018] In a further illustrative embodiment of the present invention, thanks to an optical sensor (e.g. photocell, photocoupler, etc.) provided in the standard detergent drawer (7) and communicated with the control unit (10), the presence of detergent in said drawer (7) can be sensed and be taken from said drawer (7) accordingly. In this case, the necessity towards using the aforementioned selection switch (15) is eliminated.

[0019] Yet in a further illustrative embodiment of the present invention, thanks to a dirtiness sensor communicated with the control unit (10) and provided in the tub (4) or on the machine's cover, it becomes possible to determine the dirtiness of laundry and to correspondingly adjust the amount of detergent to be employed.

[0020] Still in a further illustrative embodiment of the present invention, the extent to which the laundry soaks water determines the water level in the tub (4). By measuring the time-dependent change of this level by means of elements such as pressure sensor, presostate, level sensor, flow meter provided in the tub (4) and in communication with the control unit (10), it becomes possible to determine the type and weight of laundry, and the detergent supply into the tub (4) is adjusted correspondingly.

[0021] In another illustrative embodiment of the present invention, when the detergent is to be changed, a separate cleaning program is activated for cleaning the detergent remaining between the tub (4) and dosing unit (5) so that such waste detergent is consumed and discarded from the machine (A).

[0022] Still in another embodiment of the present invention, a peristaltic pump is employed as the dosing unit (5). As known, avoiding the contact of movable elements of peristaltic pumps with the fluid passing through the pump keeps such elements unaffected from such fluid.

[0023] Thus the potential problem, that the detergent may cause the pump to get obstructed in time, is eliminated.

Claims

1. A washing machine (A), **characterized by** comprising

- a washing tub (4);
- a filling reservoir (1) containing a plurality of compartments to fill in distinct detergents separately into the machine;
- a storage reservoir (3), wherein the detergent supplied from the filling reservoir (1) is accumulated and which contains separate compartments each in communication with the respective compartment of said filling reservoir (1);
- at least one dosing unit (5) used to deliver the detergents within the storage reservoir (3) to the tub (4); and
- a control unit (10) by which all controls of the machine (A) are conducted and the operation functions of machine (A) are regulated.

2. A washing machine (A) according to Claim 1, **characterized by** comprising a display unit (13) used to inform the user about the current status of machine (A).

3. A washing machine (A) according to Claim 1, **characterized in that** said filling reservoir (1) is a removable reservoir.

4. A washing machine (A) according to Claim 1, **characterized in that** an open/closable cover (12) is provided on said filling reservoir (1).

5. A washing machine (A) according to Claim 1, **characterized by** comprising a detergent drawer (7) as well.

6. A washing machine (A) according to Claim 1, **characterized by** comprising at least one level sensor (8) in at least one compartment of the storage reservoir (3) to measure the extent to which such compartment is full.

7. A washing machine (A) according to Claim 6, **characterized in that** the data on the amount of detergent provided from the level sensor (8) is indicated to the user by the control unit (10) via the display unit (13) in a visual and/or audible manner.

8. A washing machine (A) according to Claim 6, **characterized in that** at least one warning lamp (11) is provided at the relevant compartment of the filling reservoir (1) to indicate the detergent level in each compartment of the storage reservoir (3) that corresponds to said relevant compartment of the filling reservoir (1).

9. A washing machine (A) according to Claim 1, **characterized in that** an individual dosing unit (5) is in connection with each compartment of the storage reservoir (3).

10. A washing machine (A) according to Claim 1, **characterized in that** said dosing unit (5) is a pump.

11. A washing machine (A) according to Claim 1, **characterized in that** said dosing unit (5) is a valve.

12. A washing machine (A) according to Claim 6, **characterized by** comprising a selection switch (15) in

order to select the detergent of use either from the storage reservoir (3) or from the detergent drawer (7).

13. A washing machine (A) according to Claim 1, **characterized by** comprising at least one optical sensor in communication with the control unit (10) and provided in the tub (4) or on the machine's cover in order to determine the color of laundry and accordingly the type of detergent to be used.

14. A washing machine (A) according to Claim 1, **characterized by** comprising at least one weight sensor in communication with the control unit (10) in order to determine the weight of laundry and of water taken in and accordingly the amount of detergent to be delivered into the tub (4).

15. A washing machine (A) according to Claim 1, **characterized by** comprising at least one position sensor in communication with the control unit (10) in order to determine the weight of laundry and of water taken and accordingly the amount of detergent to be delivered into the tub (4).

16. A washing machine (A) according to Claim 1, **characterized by** comprising at least one torque meter in communication with the control unit (10) in order to determine the weight of laundry and of water taken in and accordingly the amount of detergent to be delivered into the tub (4).

17. A washing machine (A) according to any of the claims 14 to 16, **characterized by** comprising at least one flow meter in communication with the control unit (10) and positioned at the inlet line of the tub in order to determine the weight of water taken in.

18. A washing machine (A) according to Claim 1, **characterized by** comprising at least one optical sensor in communication with the control unit (10) and provided in the drawer (7) in order to sense the presence of detergent therein (7).

19. A washing machine (A) according to Claim 1, **characterized by** comprising at least one dirtiness sensor in communication with the control unit (10) and provided in the tub (4) in order to determine the dirtiness of laundry and accordingly to adjust the amount of detergent to be used.

20. A washing machine (A) according to Claim 1, **characterized by** comprising at least one pressure sensor in communication with the control unit (10) and provided in the tub (4) in order to determine the extent to which the laundry soaks water.

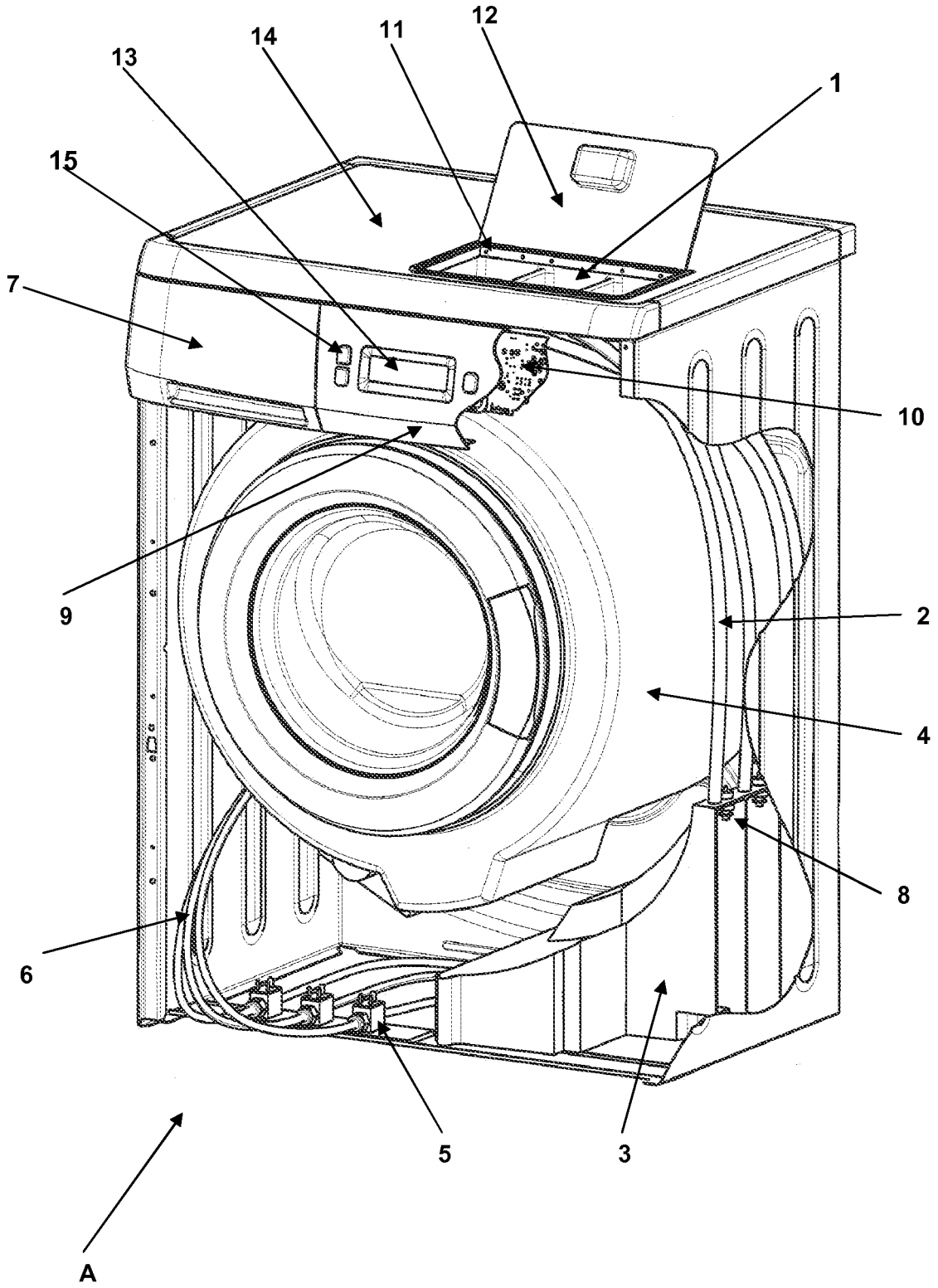
21. A washing machine (A) according to Claim 1, **characterized by** comprising at least one level sensor in communication with the control unit (10) and provided in the tub (4) in order to determine the extent to which the laundry soaks water.

22. A washing machine (A) according to Claim 1, **characterized by** comprising at least one presostate in communication with the control unit (10) and provided in the tub (4) in order to determine the extent to which the laundry soaks water.

23. A washing machine (A) according to Claim 1, **characterized in that** if the detergent is to be changed, a separate cleaning program is activated for cleaning the detergent remaining between the tub (4) and the dosing unit (5) so that such waste detergent is consumed and discarded from the machine (A).

24. A washing machine (A) according to Claim 1, **characterized in that** as the amount of water taken into the tub (4) is increased, more detergent is dosed therein (4).

25. A washing machine (A) according to Claim 1, **characterized by** comprising at least one flow meter in communication with the control unit (10) and provided at the inlet of tub (4) in order to determine the extent to which the laundry soaks water.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EUROPEAN SEARCH REPORT

Application Number
EP 08 10 4036

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	FR 2 606 430 A (BOSCH SIEMENS HAUSGERAETE [DE]) 13 May 1988 (1988-05-13) * figure 1 * -----	1-25	INV. D06F39/02 A47L15/44
A	US 6 401 499 B1 (CLARK BRIAN D [US] ET AL) 11 June 2002 (2002-06-11) * claim 1; figure 1 * -----	1-25	
A	DE 83 01 632 U1 (BOSCH-SIEMENS HAUSGERAETE GMBH, 7000 STUTTGART, DE) 5 January 1984 (1984-01-05) * figure 2 * -----	1-25	

TECHNICAL FIELDS SEARCHED (IPC)

D06F
A47L

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	17 September 2008	Dupuis, Jean-Luc

CATEGORY OF CITED DOCUMENTS

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

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 08 10 4036

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17-09-2008

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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- EP 0379950 A **[0003]**
- EP 1215329 A **[0003]**