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(54) A SENSING MULTI-MATERIAL DETERGENT DISPENSING SYSTEM

(57) A washing machine (10) has a reservoir (12) configured to hold materials to be washed, the reservoir (12) positioned to receive water from a water source, a drain pipe (14) connected to the reservoir (12), at least two cleaning agent dispensers (20), a controller (18) connected to the cleaning agent dispensers (20), the controller (18) arranged to control water flow into and out of the reservoir (12), and dispensing of agents from the cleaning agent dispenser (20), and at least one sensor (16) arranged to sense contents of one of either the water or materials to be washed and communicate the contents to the controller (18), the controller (18) to dispense cleaning agents based upon the contents. A method of dispensing cleaning agents includes receiving signals from at least one sensor, wherein the signals provide information about soil in a reservoir, using the information to select appropriate cleaning agents from a set of cleaning agents, and dispensing selected cleaning agents into the reservoir.

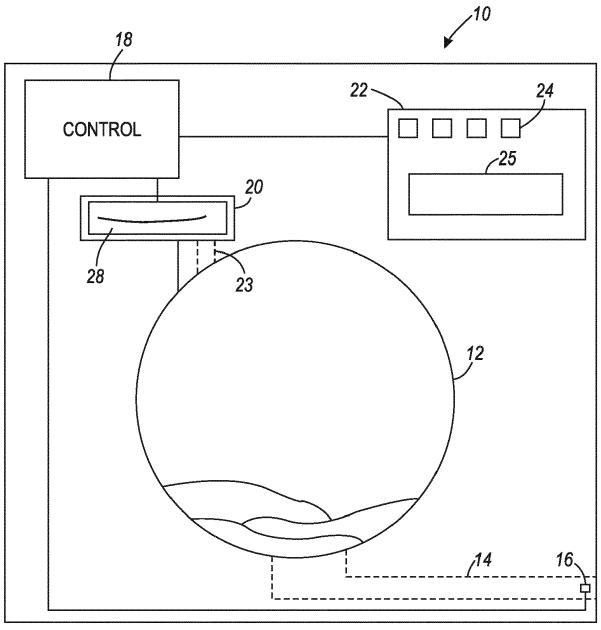

FIG. 1

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Description

FIELD OF THE INVENTION

[0001] This disclosure relates to detergent dispensing systems, more particularly to detergent dispensing systems using a learning system.

BACKGROUND

[0002] Clothing or other washable items get dirty from a wide variety of materials, making consumers decide which products to use, how much of each product to use, and when to apply it. The availability of so many products and conflicting instructions leads to guesswork, detergent overuse and consumer frustration. Some effective cleaning products are too expensive to distribute in large quantities so they are not used. Consumers have to decide for themselves which cleaning products will work for them and manually add them.

[0003] Consumers find cleaning clothes confusing. They have to decide how to pre-treat, how to treat, and how to set the washing machine, potentially thousands of configurations exist. In the end, the selected configuration may or may not clean clothes as expected.

[0004] Detergent overuse in turn leads to that detergent being in the waste water. Detergent manufacturers estimate that the equivalent of 1100 wash loads are started every second of every day. So many people over pour detergent that some washing machines have sensors that add extra rinse cycles just to wash off the extra detergent. This also wastes enormous quantities of water.

[0005] Some machines have bulk chemical dispensers that pre-measure detergent. However, they typically dispense a single detergent and only vary the quantity. In addition, these machines may cost more.

SUMMARY

[0006] One embodiment is a washing machine having a reservoir configured to hold materials to be washed, the reservoir positioned to receive water from a water source, a drain pipe connected to the reservoir, at least two cleaning agent dispensers, a controller connected to the cleaning agent dispensers, the controller arranged to control water flow into and out of the reservoir, and dispensing of agents from the cleaning/conditioning agent dispenser, and at least one sensor arranged to sense contents of one of either the water or materials to be washed and communicate the contents to the controller, the controller to dispense agents based upon the contents.

[0007] Another embodiment is method of dispensing agents that includes receiving signals from at least one sensor, wherein the signals provide information about soil in a reservoir, using the information to select appropriate cleaning agents from a set of cleaning agents, and dispensing selected cleaning agents into the reservoir.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008]

Figure 1 shows an embodiment of a washing machine having a sensor and a set of cleaning agents.
Figure 2 shows an embodiment of a cleaning agent dispenser.
Figure 3 shows a flowchart of an embodiment of a method to use sensors to select cleaning agents.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0009] Figure 1 shows an embodiment of a washing machine 10. The term washing machine as used here means any machine that can apply water and cleaners to items undergoing cleaning. Washing machines typically have a reservoir such as 12, also referred to as a drum, into which the items to be washed are placed. In addition, typical washing machines have a drain pipe or hose such as 14 that drains the water from the reservoir during various stages of the wash cycle. The filling of the reservoir from one or more water pipes or hoses generally occurs under control of a controller such as 18. User inputs from a control panel such as 22 determine the cycles of filling and draining. The control panel will typically have a display 25 and users can provide inputs to the control panel about water temperature, material types such as delicates, permanent press, heavy duty, etc. through buttons such as 24.

[0010] In current washing machines, the user puts the detergent as well as any secondary cleaning agents, such as bleaches and extra cleaning agents in a dispenser similar to the dispenser 20 shown. This process results from a lot of guesswork by the user, and considerable amounts of wasted detergent due to wrong guesses.

[0011] However, unlike the typical washing machine, the controller 18 receives inputs from a sensor 16 that resides in one of several places, all referenced as 16, allowing it to sense materials in the 'greywater.' Greywater generally means household waste water, in this case the drain water from the washing machine. The washing machine may perform a pre-rinse cycle that wets the items being washed, or it may use other methods (optical analysis, gas sensing, etc.) to identify the contents of undesirable elements in the laundry. One should note that the term "items" refers to the items in the reservoir being washed, and "materials" refer to the materials in the dirt or soil on the items.

[0012] The sensor 16 may consist of a spectrographic, turbidity, chemical, light, or electrical sensor. As the rinse water passes by the sensor, or comes into contact with the sensor, it analyzes the water to determine the materials in the dirt on the items. This information allows the controller 18 to determine which cleaning agents to apply. The cleaning agents may include, but are not limited to, detergents, soaps, bleaches including color-safe bleaches, and pre-treatments, either oxygen-based or other.

Some cleaning agents would typically cost too much to exist in typical washing machines, but with the limited size and accuracy of the dispenser, may be available in this format.

[0013] In another embodiment, the sensor may reside on the items being washed, similar to a radio frequency ID (RFID) tag. The user may purchase the sensors and attach them to their clothes prior to putting them in the reservoir, or may have one or more included with the washing machine that the user can attach to a single item being washed, as well as many other possibilities. Regardless of the location or disposition of the sensors, they provide valuable information to the controller. As will be discussed in more detail further, the information allows the controller to select the proper cleaning agents based on the materials sensed in the greywater. The three possible positions shown as dashed lines are in the drain pipe 14, in the reservoir 12 near the drain pipe, or on the materials being washed 26. The sensor may detect the presence of materials in the soil or dirt without requiring greywater. The sensor may detect it just from the materials' presence in the drum.

[0014] The controller electrically couples to cartridges in the dispenser 20, shown in more detail in Figure 2. The cartridges may consist of user-replaceable cartridges similar to those used in ink-jet printers. The electrical signals from the controller cause the selected cartridge or cartridges to dispense a measured amount of cleaning agent. The amount may result from the signal being applied to the cartridge for a pre-determined time, or may be applied in multiple pulses, where each pulse dispenses a set amount. In the latter embodiment, the amount dispensed results from the number of pulses applied.

[0015] Figure 2 shows an embodiment of the cartridges from which the agents are dispensed. The dispenser 28 may pull out from the slot 20 similar to dispensers in current washing machines. However, this dispenser contains multiple cartridges similar to ink-jet printers. Referring now to Figure 2, each cartridge 30 contains one of many different cleaning agents. As will be discussed in more detail with regard to Figure 3, the controller will select which agents the machine will dispense into the reservoir.

[0016] Each cartridge 30 has a dispensing portion 32 that allows the cleaning agent to exit the cartridge into the reservoir 12 through the pipe 23 of Figure 1. Multiple dispensers, such as 30 and 34, may reside in the holder. The user should be able to easily remove and replace cartridges as needed. The controller 18 sends a signal or signals through an electrical connection 37 to a contact pad 36. When mounted in the dispenser tray, a matching pad 38 on the dispenser 30 makes contact with the contact pad 36 that receives the signal. When the controller sends a signal to the contact pad such as 36 corresponding to a particular dispenser, the dispenser drops an amount of the agent contained in the dispenser. Each dispenser may be of a different size, depending upon the likelihood of the agent being used, or its potency, cost, etc. The communication may be two-way with a feedback from the dispenser that identifies when the agent level drops below a certain level to allow the controller to notify the user for replacement.

[0017] The controller selects the appropriate dispenser based upon the identification of the dirt identified by the sensor. Figure 3 shows a flowchart of one embodiment of a method of dispensing agents based upon the information obtained from the sensor. At 40, the items being washed are pre-rinsed. The controller causes water to be run through the reservoir and then drained by the controller. At 42, the sensor senses the contents of the water and identifies the composition at 44. The identification may occur in several different ways. For example, the sensor may just provide sensor data, such as spectrographic, weight, viscosity, etc., depending upon the type of sensor. The controller may then access a look-up table or other type of memory to match the data to the composition of the dirt.

[0018] The controller then injects the appropriate agent or agents into the reservoir. This may involve determining which agent or agents will best clean the materials contained in the dirt from the items being washed. The determination may include how much of a particular agent is needed. The control of the amount may involve activating the dispenser for a pre-determined time based upon the drop rate of the agent from the dispenser. The drop rate may depend upon the viscosity of the agent and therefore the time needed to drop a predetermined amount depends upon the drop rate.

[0019] The process may run in an open-loop fashion, where the controller injects the agent at 46 and the process ends. Alternatively, the controller may receive feedback from the sensor from monitoring the sensor at 48. For example, assume the agent dispensed is supposed to remove a particular material from the items being washed, and the sensor only detects trace amounts of the material that was supposed to be removed. The controller would then update the storage to reflect that the agent is not to be used for that particular material in the dirt and stored it at 50.

[0020] In this manner, the washing machine can provide better control over the user and dispensing of cleaning agents. This eliminates much of the over use of cleaning agents, and would lead to use of less water to clean the materials being washed, but still getting them cleaner.

[0021] It will be appreciated that variants of the above-disclosed and other features and functions, or alternatives thereof, may be combined into many other different systems or applications. Various presently unforeseen or unanticipated alternatives, modifications, variations, or improvements therein may be subsequently made by those skilled in the art which are also intended to be encompassed by the following claims.

Claims

1. A washing machine, comprising:

   a reservoir configured to hold materials to be washed, the reservoir positioned to receive water from a water source;
   a drain pipe connected to the reservoir;
   at least two cleaning agent dispensers;
   a controller connected to the cleaning agent dispensers, the controller arranged to control water flow into and out of the reservoir, and dispensing of agents from the cleaning agent dispenser; and
   at least one sensor arranged to sense contents of one of either the water or materials to be washed and communicate the contents to the controller, the controller to dispense cleaning agents based upon the contents.

2. The washing machine of claim 1, wherein the cleaning agent dispenser comprises multiple cleaning agent dispensers.

3. The washing machine of claim 1, wherein the sensor comprises one of spectrographic, turbidity, chemical, light, and electrical.

4. The washing machine of claim 1, wherein the controller comprises a processor, the processor to execute instructions, the instructions to cause the controller to:

   turn on the water flow into the reservoir;
   agitate the reservoir;
   drain water from the reservoir past the sensor;
   receive the contents from the sensor; and
   dispense at least one selected cleaning agent into the reservoir based upon the contents.

5. The washing machine of claim 1, wherein the cleaning agent dispensers comprise ink-jet printer injectors.

6. A method of dispensing cleaning agents, comprising:

   receiving signals from at least one sensor, wherein the signals provide information about soil in a reservoir;
   using the information to select appropriate cleaning agents from a set of cleaning agents; and
   dispensing selected cleaning agents into the reservoir.

7. The method of claim 6, wherein receiving signals comprises receiving signals from a sensor located in the reservoir.

8. The method of claim 6, wherein receiving signals comprises receiving signals from a sensor located on items to be washed.

9. The method of claim 6, wherein the information comprises materials contained in the soil.

10. The method of claim 6, wherein dispensing selected cleaning agents comprises activating an ink-jet injector to inject a selected cleaning agent into the reservoir.

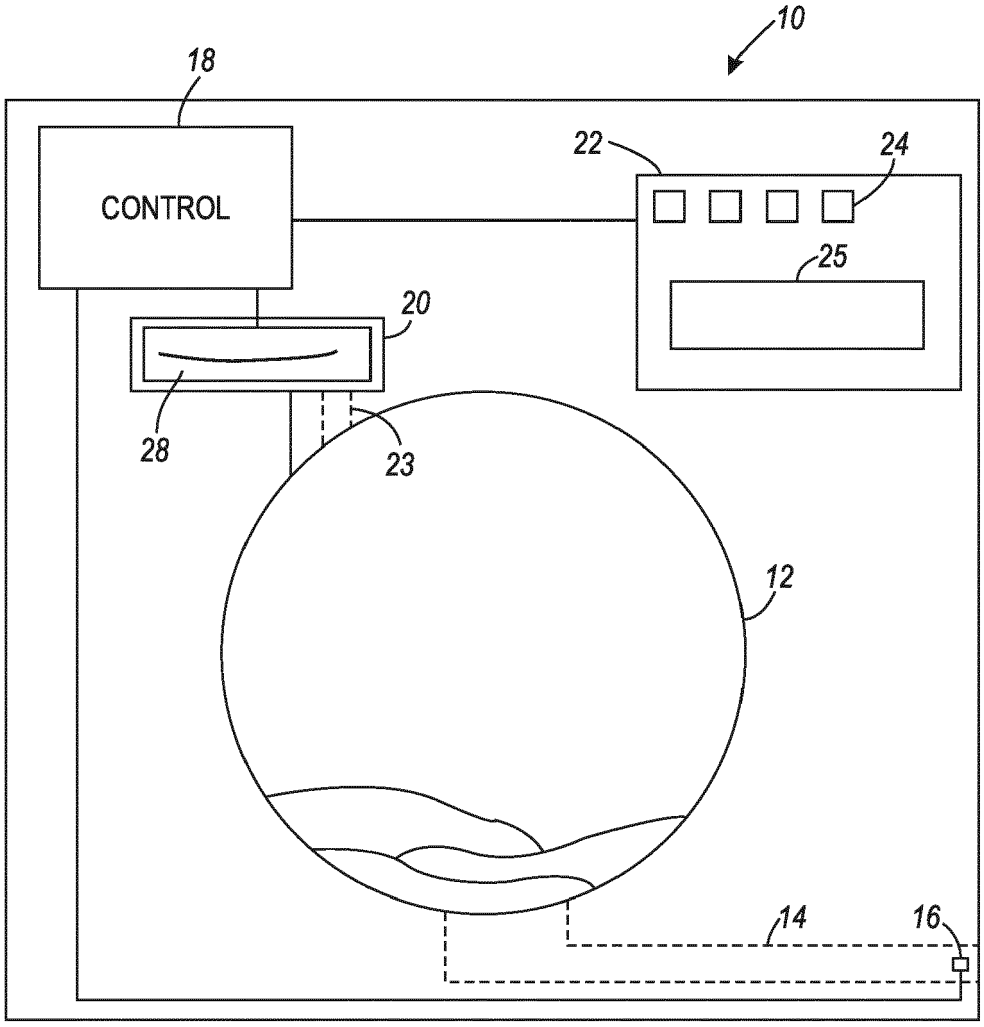

FIG. 1

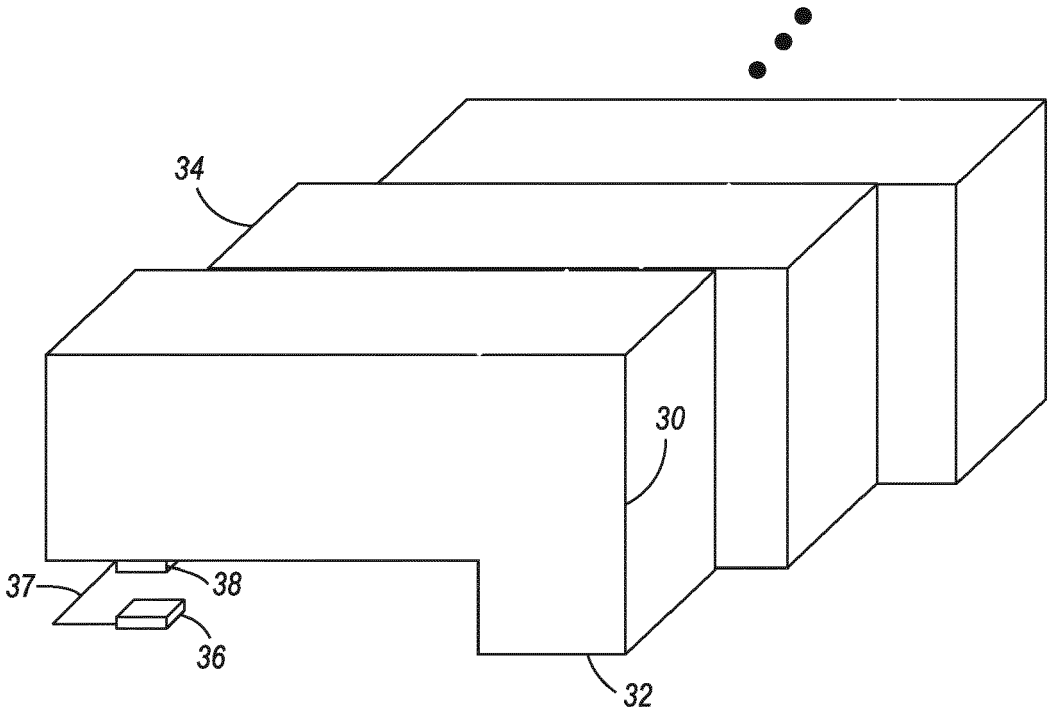

FIG. 2

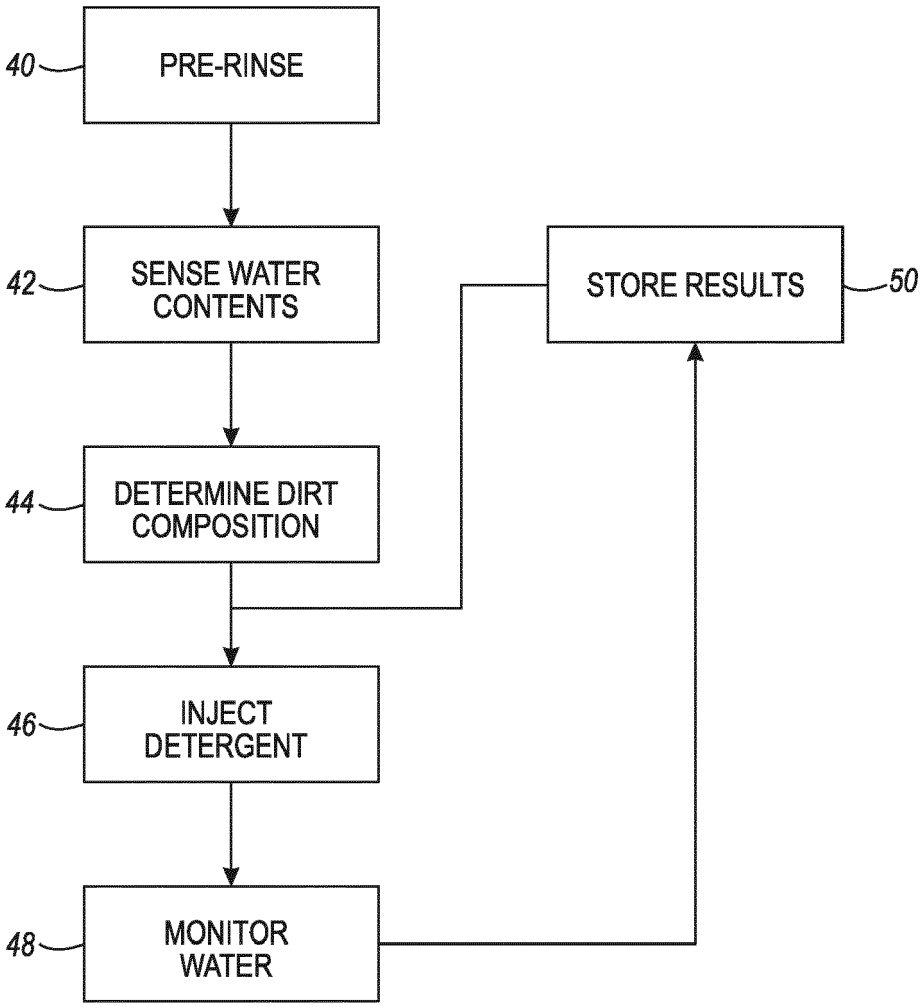
40
PRE-RINSE
42
SENSE WATER CONTENTS
44
DETERMINE DIRT COMPOSITION
46
INJECT DETERGENT
48
MONITOR WATER
STORE RESULTS
50

FIG. 3

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EUROPEAN SEARCH REPORT

Application Number
EP 17 17 2961

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	29 September 2017	Sabatucci, Arianna

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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