



(12) **EUROPEAN PATENT APPLICATION**

(21) Application number : **94300979.5**

(51) Int. Cl.⁵ : **D06F 39/02, A47L 15/44**

(22) Date of filing : **10.02.94**

(30) Priority : **11.02.93 GB 9302722**

(43) Date of publication of application :
17.08.94 Bulletin 94/33

(84) Designated Contracting States :
**AT BE CH DE DK ES FR GB GR IE IT LI LU MC
NL PT SE**

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(54) **Improvements in dosing systems.**

(57) A dosing system which can be simply and rapidly fitted to an existing laundry or dishwashing machine includes means to supply detergent, rinse agents, fabric conditioners or the like to a working area of the machine from respective bulk containers, and means to provide control signals to the supply means at appropriate times for the dispensing of detergents, rinse agents, fabric conditioners and the like.

There is also disclosed a washing machine having a working area in which a predetermined cycle of operations including filling, washing, draining, refilling and rinsing operations takes place under the control of a sequence controller, and wherein a dosing system includes at least one sensor (14,15) associated with the working area of the machine to provide output signals to a control device (13) dependant on the presence or absence of water at the sensor location, the control device including circuitry to determine the requirement for a washing agent from said output signals of said sensor, and to provide output signals to control the operation of at least one pump (10) whose inlet is connected to a bulk supply (11) of the liquid washing agent and whose outlet is lead to the working area of the machine.

A method of converting a semi-automatic laundry or dishwashing machine, wherein a washing cycle is controlled by a sequence controller which initiates pre-wash, wash and rinse operations, to fully automatic operation by fitting the dosing system is also disclosed.

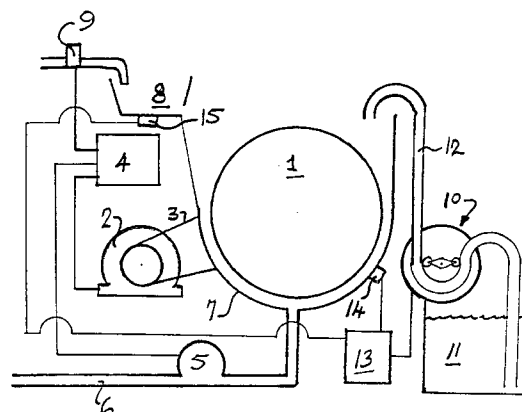


FIG 1

The present invention relates to dosing systems, and is particularly concerned with the controlled dosing of detergents, rinse agents, fabric conditioners and the like in industrial and domestic laundry and dishwashing equipment.

In conventional laundry equipment, a powdered detergent is dispensed at the appropriate stage of the wash cycle by placing the detergent in a compartment separate from the washing compartment, and at the appropriate time flushing the detergent into the washing compartment with water. A similar approach is adopted to dispense liquid fabric conditioners, generally utilising a syphon type device to ensure complete delivery of the fabric conditioner.

In order to simplify such equipment, and to remove the need to charge the detergent and fabric conditioner compartments of the machine before each wash cycle, it is proposed to use a liquid detergent and a liquid fabric conditioner, dispensed by means of a dosing pump operated at the appropriate times in the wash cycle. While such equipment can be easily designed into new machines, the conversion of existing laundry equipment is problematical and time consuming in that each individual machine or machine type will have a different set of electrical connections to be tapped in order to provide appropriate input signals for a dosing pump controller.

An objective of the present invention is to provide a dosing system which can be simply and rapidly fitted to an existing laundry or dishwashing machine, requiring no connections to the machine's control circuitry, but including means to provide control signals at appropriate times for the dispensing of detergents, rinse agents, fabric conditioners and the like. Preferably the dosing system is supplied with detergent, rinse agents, fabric conditioners or the like from bulk containers, with the various materials to be dosed in liquid form. Most preferably, the materials to be delivered to the machine are pumped by means of a peristaltic pump, controlled by circuitry responsive to input signals from sensors placed at predetermined locations in the washing machine.

According to a first aspect of the invention, there is provided a dosing system which can be simply and rapidly fitted to an existing laundry or dishwashing machine, the dosing system including means to supply detergent, rinse agents, fabric conditioners or the like to a working area of the machine from respective bulk containers, and means to provide control signals to the supply means at appropriate times for the dispensing of detergents, rinse agents, fabric conditioners and the like.

According to a second aspect of the invention, there is provided a laundry or dishwashing machine having a working area in which a predetermined cycle of operations including filling, washing, draining, re-filling and rinsing operations takes place under the control of a sequence controller, and wherein a dos-

ing system includes at least one sensor associated with the working area of the machine to provide output signals to a control device dependant on the presence or absence of water at the sensor location, the control device including circuitry to determine the requirement for a washing agent from said output signals of said sensor, and to provide output signals to control the operation of at least one pump whose inlet is connected to a bulk supply of the liquid washing agent and whose outlet is lead to the working area of the machine.

According to a third aspect of the invention, there is provided a method of converting a semi-automatic laundry or dishwashing machine, wherein a washing cycle is controlled by a sequence controller which initiates pre-wash, wash and rinse operations, to fully automatic operation, comprising the steps of:

- a) fitting to a working area of the machine at least one sensor which detects the presence or absence of water at the sensor location and provides output signals in dependance thereon,
- b) connecting the sensor or sensors to a control device including circuitry to determine the requirement for a washing agent from said output signals of said sensor, and
- c) providing at least one pump whose inlet is connected to a bulk supply of the liquid washing agent and whose outlet is lead to the working area of the machine,

the arrangement being such that the sensor provides output signals to the control device to cause operation of the pump independently of the sequence controller and its associated circuitry.

An embodiment of the present invention will now be described in detail with reference to the accompanying drawings, in which:

Figure 1 is a schematic diagram showing the principal parts of a washing machine fitted with the device of the present invention.

Referring now to Figure 1, there is seen a laundry apparatus comprising a rotating drum 1 driven by a motor 2 via a belt drive 3. The operation of the motor 2 is controlled by a control device 4, which is also linked to a pump 5 connected to an exit duct 6 for the washing and rise water. A water inlet (not shown) to admit water to the tank 7 containing the washing drum 1 is also provided, the water inlet to the tank 7 being controlled by the control device 4, which is responsive to a float switch (not shown) or other level detecting arrangement to stop the ingress of water when the tank 7 is filled to the desired level.

To dispense a detergent to the tank, powdered detergent is placed in the hopper 8 before the washing cycle begins. At the appropriate time for dispensing the detergent to the tank 7, the control device 4 opens an electromagnetic valve 9 which admits water to the hopper 8 and flushes and powdered detergent therein into the tank 7. The control device 4 opens and

closes the valve 9 for a sufficient interval to flush all the detergent into the tank 7. At the end of the wash cycle, which is typically a predetermined sequence of timed operations of the motor 2, the valve 9, and the pump 5, the tank 7 is drained by the operation of the pump 5 and the clean clothes can be removed from the drum 1.

The apparatus shown schematically in Figure 1 is fitted with the dosing device of the present invention, which comprises four main components. These are a peristaltic pump 10 which can deliver a liquid detergent from a detergent bulk storage tank 11 to the washing tank 7 via a duct 12, a control device 13, and sensors 14 and 15 linked to the control device 13.

The sensors 14 and 15 detect the presence of water respectively in the tank 7 and in the hopper 8, and advantageously are temperature sensors. As an alternative to temperature sensing, the presence of water may be detected by other means, such as capacitive detectors, conduction between contacts immersed in the water when present, or any other suitable means.

If more than one detergent hopper 8 is provided, for example for dosing detergent to a pre-wash part of the operating cycle, then a further sensor 15 will be provided so that there is a respective sensor 15 for each of the hoppers 8, and also a further sensor 15 for any fabric conditioning dispenser compartments.

In operation, the desired wash programme is selected using the machine's own program controller and the clothes are loaded into the drum 1. The control device 13 will then monitor the progress of the wash cycle, by sensing, via sensor 14, the repeated filling and emptying of the tank 7. At the appropriate times, as detected by the sensors 15 associated with detergent feed hoppers 8, the control device 13 will cause the pump 10 to operate, thus dosing detergent from the detergent bulk storage tank 11 into the washing tank 7. It is envisaged that the control device 13 will include means by which an operator can select the amount of detergent to be dispensed at each stage of the cycle, dependent on the type and concentration of detergent held in tank 11. If a fabric conditioner is also to be dispensed to the washing tank 7, then a further bulk storage tank (not shown) for fabric conditioner must be provided, and a further duct and pump. This fabric conditioner pump will also be controlled by the control device 13, as the presence of inflowing water into the fabric conditioner dispensing hopper is detected by its respective sensor.

The device of the present invention is therefore ideal for the conversion of laundry equipment to complete the automatic operation, i.e. operation wherein it is unnecessary for an operative to charge detergent hoppers of the laundry device prior to each wash cycle. It is further envisaged that, in installations where a multiplicity of laundry devices are installed, a single detergent bulk storage tank 11 may be connected to

respective individual dosing pumps 10 for each laundry device, so that the routine replenishment of detergent can be done at a single station for all machines at the site. Likewise, a single bulk storage tank for fabric conditioner may be provided, to be drawn on by a plurality of laundry machines via individual dosing pumps.

When temperature sensing is used to detect the presence of water in the washing tank 7, the temperature sensor 14 may provide differing output signals to the control device 13 dependent on the temperature of the water. Utilising this feature, the control device 13 may be programmed to dose a pre-wash amount of detergent when the temperature sensor 14 detects the presence of cold water in the tank 7. When the temperature detector 14 senses the presence of water in the tank 7 at 40°C, the control device 13 may be arranged to trigger the dosing of a 'main wash' amount of detergent, and possibly also the addition of alkali reagents to the wash.

When the temperature sensor 14 detects the presence of water at 60°C, then the control device 13 may be programmed to deliver either bleach, or a combination of the detergent and bleach. It is therefore advantageous for the sensors 14 and 15 to be sensitive to the presence of water at differing temperatures, rather than simply to detect the presence or absence of water. However, if the sensors 14 and 15 are simple devices such as float switches, then the detection of temperature is not possible. Likewise, if the sensors 14 and 15 merely comprise pairs of electrical contacts between which and electrical connection is made by the presence of water, the sensing of the temperature of the water is not possible and the dosing of the detergent, bleach, alkali, etc is controlled by the control device 13 on the basis simply of the number of times the tank 7 has been filled and emptied, and the presence or absence of water in the hopper 8.

The control device 13 is preferably a programmed microprocessor circuit, including a memory device and comparison means to enable the outputs of sensors 14, 15, etc to be compared with predefined programmes so that the control device 13 may identify the particular wash cycle being used by the machine, and make the appropriate dosage of detergent, fabric conditioner or other reagents at the correct times.

While the device has been described in relation to laundry machinery, it is equally applicable to commercial or domestic dishwashing equipment where instead of the operator having to charge detergent hoppers in the equipment before each cycle, a central supply of liquid detergent may be used, and may be dosed to the dishwashing apparatus as required.

The present invention thus provides a laundry or dishwashing machine wherein the dosing of detergent is controlled by means of a control device re-

sponsive to sensors detecting the presence of water in various parts of the machine. It is foreseen that the sensors, control device and dosing pump may form a dosing system capable of being fitted to an existing laundry machine with the minimum of labour, in that the existing wiring loom of the laundry machine does not need to be modified to accept the dosing system.

Claims

1. A dosing system which can be simply and rapidly fitted to an existing laundry or dishwashing machine, the dosing system including means to supply detergent, rinse agents, fabric conditioners or the like to a working area of the machine from respective bulk containers, and means to provide control signals to the supply means at appropriate times for the dispensing of detergents, rinse agents, fabric conditioners and the like.
2. The dosing system of claim 1, wherein the machine is supplied with detergent, rinse agents, fabric conditioners or the like in liquid form, the materials being delivered to the machine being pumped by means of respective motorised pumps controlled by output signals from control circuitry responsive to input signals from sensors placed at predetermined locations in the laundry or dishwashing machine.
3. The dosing system of claim 2, comprising a plurality of sensors, a control circuit, and a pump for delivering liquid additives to the working area of a washing machine, the sensors being mountable to the washing machine so as to detect the presence or absence of water in predetermined areas of the machine.
4. The dosing system of claim 2, comprising a plurality of sensors, a control circuit, and a pump for delivering liquid additives to the working area of a washing machine, the sensors being mountable to the washing machine so as to detect the temperature in predetermined areas of the machine.
5. A laundry or dishwashing machine having a working area in which a predetermined cycle of operations including filling, washing, draining, refilling and rinsing operations takes place under the control of a sequence controller, and wherein a dosing system includes at least one sensor associated with the working area of the machine to provide output signals to a control device dependant on the presence or absence of water at the sensor location, the control device including circuitry to determine the requirement for a wash-

ing agent from said output signals of said sensor, and to provide output signals to control the operation of at least one pump whose inlet is connected to a bulk supply of the liquid washing agent and whose outlet is lead to the working area of the machine.

6. A laundry or dishwashing machine according to claim 5, wherein the sensor or sensors can provide different output signals to indicate the presence at the sensor location of water at different temperatures, and the control device causes the pump or pumps to operate in accordance with a predetermined dosing program based on the temperature of water detected at the sensor or sensors.
7. A laundry or dishwashing machine according to claim 5, wherein the sensor or sensors detect the presence or absence of water at the sensor location by detecting conduction or non-conduction of electricity between two contacts exposed to the water, conduction of electricity indicating the presence of water at the sensor location.
8. A laundry or dishwashing machine according to claim 5, wherein the sensor or sensors detect the presence or absence of water at the sensor location by detecting a change in capacitance between two capacitor elements.
9. A method of converting a semi-automatic laundry or dishwashing machine, wherein a washing cycle is controlled by a sequence controller which initiates pre-wash, wash and rinse operations, to fully automatic operation, comprising the steps of:
 - a) fitting to a working area of the machine at least one sensor which detects the presence or absence of water at the sensor location and provides output signals in dependance thereon,
 - b) connecting the sensor or sensors to a control device including circuitry to determine the requirement for a washing agent from said output signals of said sensor, and
 - c) providing at least one pump whose inlet is connected to a bulk supply of the liquid washing agent and whose outlet is lead to the working area of the machine,
 the arrangement being such that the sensor provides output signals to the control device to cause operation of the pump independently of the sequence controller and its associated circuitry.

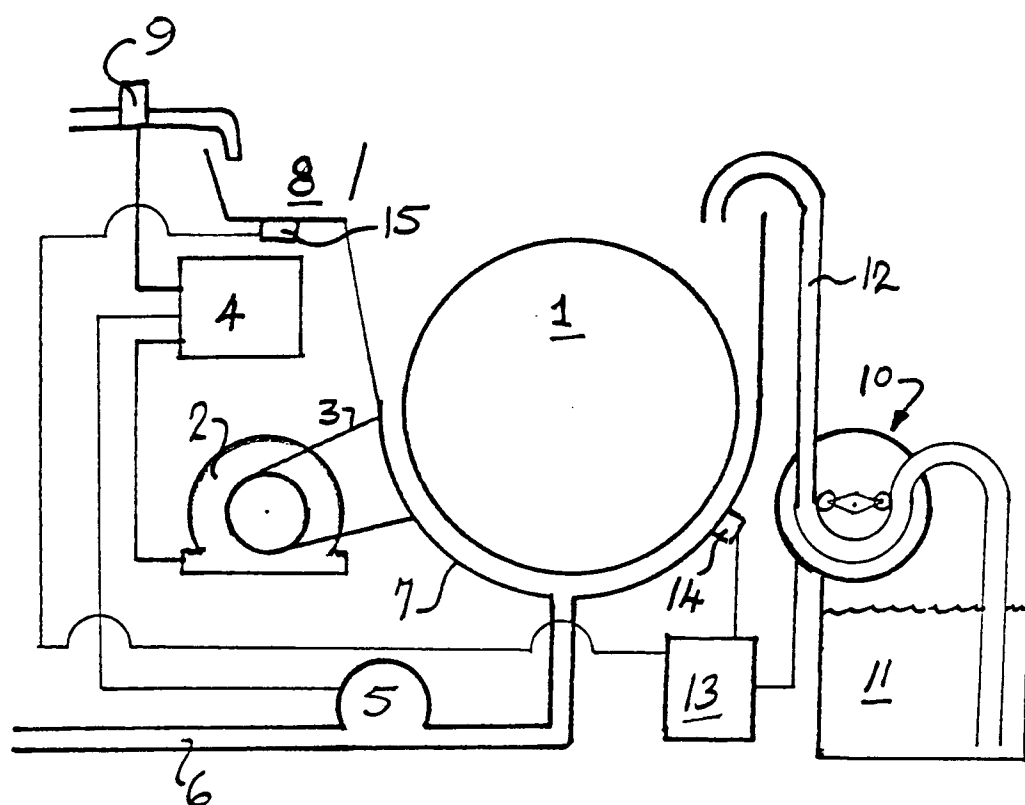


FIG 1



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 94 30 0979

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)
X	US-A-4 932 227 (LEVER BROTHERS COMPANY) * the whole document * ---	1-3,5,9	D06F39/02 A47L15/44
X A	US-A-3 881 328 (ECONOMICS LABORATORY INC.) * the whole document * ---	1 2,5,9	
X	DE-A-26 15 469 (MIELE & CIE. GMBH.) * claims; figures * -----	1,2	
			TECHNICAL FIELDS SEARCHED (Int.Cl.5)
			D06F A47L
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 26 May 1994	Examiner Courrier, G
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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