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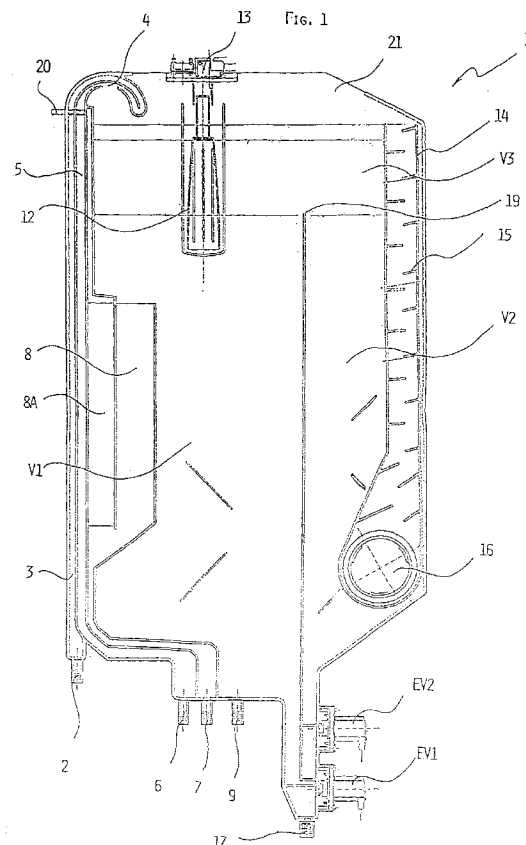
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**AL LT LV MK RO SI**(30) Priority: **18.02.1997 IT TO970134**(71) Applicant: **T & P S.p.A.****21049 Tradate (Varese) (IT)**(72) Inventor: **Carli, Carlo****21100 Varese (IT)**(74) Representative: **Dini, Roberto, Dr. Ing. et al****Via Castagnole, 59****10060 None (Torino) (IT)****(54) System for the supply and the dosage of the washing liquid in a dishwasher**

(57) A system for the supply and the dosage of water in a dishwashing machine comprising a washing tub, a water decalcifier device and a metering container to which water required for machine operation is supplied, by means of a supply tube and a supply valve, at least two metering chambers being present in said container, having two outlets, the first outlet allowing the discharge of at least a first water volume contained in the first metering chamber, and the second outlet allowing the discharge of at least a second water volume from the second metering chamber. According to the invention, the container (1;101) has a section (V3;V103), which communicates through proper hydraulic means (19;119) with the first metering chamber (V1;V101) and the second metering chamber (V2;V102), and that in said section (V3;V103) a level sensor is arranged, in particular of the float type (12;112), in order to detect the performed water discharge at least from the section (V3;V103), and that the first metering chamber (V1;V101) and the second metering chamber (V2;V102) can be discharged into the tub independently from each other.



## Description

The present invention refers to a system for the supply and the dosage of water in a dishwashing machine comprising a washing tub, a water decalcifier device and a metering container to which water required for machine operation is supplied, by means of a supply tube and a supply valve, at least two metering chambers being present in said container, having two outlets, the first outlet allowing the discharge of at least a first water volume contained in the first metering chamber, and the second outlet allowing the discharge of at least a second water volume from the second metering chamber.

It is known that dishwashing machines comprise a washing tub, on the bottom of which the water from the mains required to wash the crockery is collected; to this purpose, the machine is equipped with a recycle pump, for feeding one or more spraying elements with the washing liquid collected on the tub bottom.

The metering of water being required for washing performance can be made in various manners. The simplest solution is that of providing for a time-controlled opening of a supply solenoid valve to let water in the washing tub; however, this procedure may not prove very precise as it does not consider possible pressure and flow rate changes in the water mains.

In other widely adopted solutions, the water metering is obtained through an electropneumatic pressure switch, which detects the water level directly within the washing tub and controls accordingly the supply valve for the water from the mains.

However, this system requires a very precise calibration of the pressure switch: in fact, considering that the washing tub has a rather extended section, even a change of a few millimeters of the water level inside the tub may cause a metering error amounting to several liters of water.

Considering that the supply of a higher water quantity than that actually needed does not agree with the requirements of lower consumption (water has also to be heated), such a system based on pressure switch is gradually leaving the place to other solutions, where water metering occurs from outside the washing tub.

According to more recent solutions, it is known to provide the dishwashing machine with a metering tank, connected through a by-pass line to the water supply conduit to the washing tub, so that a portion of the water from the water mains will reach the tub directly and another portion said tank.

Said metering tank has a lower capacity with respect to the water volume required for the washing and has a level sensor fitted in it, which works on a small amount of water quantity, being proportional to the amount of water delivered to the tub, said level sensor closing the water supply solenoid valve upon reaching the preset level for the tank. In other words, the level sensor works on a fraction of the water fed to the tub, which fills a small compartment, thus reducing detection

errors.

However, also this system is subject to detection errors due to likely differences in the flow rate distribution in the by-pass line feeding the metering tank.

Other water supply and metering systems are also known, where a repeated water supply is made of a tank having a capacity equal to a fraction of the quantity of water required for the washing. In this case, the tank has a level sensor controlling the supply solenoid valve as usual, and the water supply to the washing tub occurs by subsequent transfers of the tank contents into the tub itself.

However these systems are rather complex and crucial during the manufacturing stage, due for instance to the presence of siphons, and may also request long times for realizing the supply of the water being required for the washing. Moreover, since the tank has a predetermined volume, the amount of water delivered to the tub can only be an integer multiple of the tank capacity. As a result, the machine may have a low performing flexibility.

Finally, other water supply and metering systems are also known, which represent a summation of elements being common to the above cited solutions. Such water supply systems are objectively complex and bulky, typically due to the presence of several siphon connecting the different tanks.

The present invention has the aim of solving the above drawbacks and providing an improved water supply and metering system in a dishwashing machine, which is more efficient with respect to the solutions already known.

In this frame, it is the main object of the present invention to provide a supply and metering system in a dishwashing machine, which ensures full flexibility in the selection of the water volumes to be delivered to the tub and in the emptying sequence.

To reach these purposes, it is the object of the present invention to provide a water supply and metering system in a dishwashing machine, which incorporates the characteristics of the annexed claims, which form an integral part of the present description.

Further purposes, characteristics and advantages of the present invention will become apparent from the following detailed description and annexed drawings, which are only supplied by way of a non limiting example, wherein:

- Fig. 1 shows a diagram outline of the device according to the present invention;
- Fig. 2 shows a sectional view of the device represented in Fig. 1;
- Fig. 3 shows a preferred embodiment of the present invention.

Figure 1 shows a sectional view of a tank 1 for the metering of the washing water. Said tank 1 has an hydraulic connector 2 for realizing the connection to the

water mains, through a proper pipe not shown here. A conduit 3 leads to an air-break 4, which is provided for the aim of avoiding backflows. Then, water can reach through a conduit 5 an hydraulic connector 6, which is connected with a water softening device, not shown here. The duly softened water is then reintroduced in the tank 1, through an hydraulic connector 9.

The tank 1 has a first compartment V1, a second compartment V2, two compartments 8 and 8A for the water to be used for resins regeneration. The tank 1 also has an opening 21 in its upper section, to let airflow through.

Water flows in from the bottom, through the hydraulic connector 9, to fill the first compartment V1, filling at the same time the compartment for resin regeneration 8 by overflow. The compartment for resin regeneration 8A is only filled when a valve 20 allows air breathing on the top. Said valve 20 is actuated when a larger water volume is needed for resins regeneration, such as when water hardness is extremely high. Resin regeneration compartments 8 and 8A have an hydraulic conduit 7, to discharge their water contents in the softening device, not shown here.

An overflow 19 connects the first compartment V1 with the second compartment V2. When water reaches the overflow level 19, it can flow through it into the second compartment V2.

When also the second compartment V2 is filled up, the water level can rise and fill a section V3, located on top of both the first compartment V1 and second compartment V2. The second compartment V2 also has a vent pipe 14, going to a breather hole 16, with barriers 15 to hinder steam backflow from a washing tub, not shown here. Said breather hole 16 connects the tank 1 with the washing tub and works as a safety drain, in case of a failed or wrong operation of the water supply valve or a microswitch.

A float 12 is arranged in the section V3, for actuating a microswitch 13. Said microswitch 13 controls both the opening and closing of a supply valve of water from the water, not shown here, which will let water in through the hydraulic connector 2 and consequent filling of the tank 1.

As it can be clearly seen in Fig. 1, the float 12 is located in correspondence with the section V3, so as to actuate the microswitch 13 only when the section V3 is filled up. Since the section V3 is the last one in the filling sequence of the various compartments, this warrants a complete filling of the tank 1 in all its compartments V1, V2, 8, V3, as well as optionally 8A.

The first compartment V1 and the second compartment V2 have two solenoid valves, EV1 and EV2, which allow to discharge the first compartment V1 and the second compartment V2, either independently or jointly through a proper outlet conduit 17.

As a result, through a proper sizing of the first compartment V1, second compartment V2 and section V3, according to the washing program requirements the in-

dependent water discharge into the washing tub is possible, either by opening the solenoid valve EV1 or the solenoid valve EV2. In fact, when the valve EV1 is opened, water flows through the drain conduit 17, so that section V3 is firstly emptied. Similarly, when the solenoid valve EV2 is opened, the second compartment V2 will be emptied, which implies a prior emptying of the section V3. Also in this event, the float 12 goes down and actuates the microswitch 13, that arrange for a new filling of the tank 1. Obviously, when both solenoid valves EV1 and EV2 are opened simultaneously to discharge into the tub the whole water volume contained in the tank 1, the section V3 will always be the one to be firstly emptied. Emptying of one or more compartments is controlled by the dishwasher programmer. At the end of the emptying phase, the programmer allows for the opening of the water supply valve. The emptying time has to make sure that the first compartment V1 or second compartment V2, or both, are also completely emptied.

Therefore, in this way, the following water volumes can be introduced into the washing tub:

- 1) V1+V3
- 2) V2+V3
- 3) V1+V2+V3

during various repeated or combined sequences according to the washing program requirements.

It can be assumed, for instance, that the compartment V1 has a volume of 1400 cc, compartment V2 a volume of 700 cc, section V3 of 500 cc, whereas the summed up volume of the resins regeneration compartments 8 and 8A is 400 cc. This means that 1900 cc, 1200 cc or 2600 cc water, respectively can be introduced independently in the tub.

Specifically, during the execution of a standard washing program with a full load of crockery, it is possible for instance to discharge the whole tank content, or V1+V2+V3, whereas when the washing of a smaller crockery load is done, requiring less water, either V1+V3 or V2+V3 can be discharged into the tub.

In general, a large number of volume combinations can be obtained, through more complex controls and different volumes of the first compartment V1, second compartment V2 and section V3, or changing the overflow height 19, but always with the safety that water discharge into the tub has been performed.

Alternatively, if necessary, due to different program requirements, repeated water supply and discharge cycles can be repeated, using only the first compartment V1 or only the second compartment V2.

Figure 2 shows a side section of the tank 1 of Fig. 1, from which the reduced thickness of the tank can be seen, which is fixed on the washing tub in line with an opening, not shown here, matching with the breather hole 16.

Figure 3 shows a preferred embodiment of the in-

vention, where a tank 101 has a first compartment V101 and a second compartment V102, communicating by means of a conduit 119, which connects the upper section of the first compartment V101 to the lower section of the second compartment V102. A vent conduit 114, also with barriers 115 and extending to a breather hole 116, is interposed between the first compartment V101 and second compartment V102. A section V103, starting from the height of the inlet of conduit 119, is thus defined above the first compartment V101 and second compartment V102; in correspondence with said section V103 a float 112 actuating a microswitch 113 is arranged, above the first compartment V101.

As a result the following filling sequence of the tank 1 is obtained:

- when the water supply valve opens, the first compartment V101 will be first filled;
- when the water reaches the inlet level of conduit 119 in the first compartment V101, then the second compartment V102 will be filled;
- when the water reaches the inlet level of conduit 119 in the first compartment V101 and second compartment V102, both the section V103 above the first compartment V101 and section V103 above the second compartment V102 will be simultaneously filled, according to the principle of the communicating vessels;
- when the water in the section V103 reaches such a level to have the microswitch 113 actuated by the float 112, then the microswitch 113 will indicate that the water supply valve has to be closed.

Should the inlet valve fail, water can be evacuated through the vent conduit 114 from both the first compartment V101 and second compartment V102, using a passage 123.

The machine control device will then control solenoid valves EV101 and EV102, according to the washing requirements, to introduce the required water volumes in the tub, which are obtained through the various combinations of the first compartment V101, second compartment V102 and section V103.

The characteristics of the present invention are clear from the above description, and also its advantages are clear.

Availability of a water volume being common to both compartments, but placed above them, so that the discharge of any one of the two compartment causes also the discharge of the common volume, and a consequent float movement related to this volume, allow to indicate to the control system in any configuration that a discharge into the tub is performed. This eliminates the need of actuating a preset discharge sequence into the tub, to restore the float and, specifically, to perform a partial discharge using only the compartment where the float is arranged.

Advantageously, moreover, since the compart-

ments are independent from the discharge sequence, it is possible to locate wherever desired the compartment containing the water volume for resin regeneration of the softening device, as it will anyway always be filled. Obviously, many modifications will be possible for the man skilled in the art to the water supply and metering system in a dishwashing machine described by way of example, without departing from the spirit of novelty of the innovative idea, and it is also clear that in its practical actuation the forms and size of the components shown may differ and be replaced with technical equivalent elements.

For instance, the number of compartments in the tank may be higher than two, should a higher number of configurations be required to comply with the requirements of the different washing programs.

## Claims

1. System for the supply and the dosage of water in a dishwashing machine comprising a washing tub, a water decalcifier device and a metering container to which water required for machine operation is supplied, by means of a supply tube and a supply valve, at least two metering chambers being present in said container, having two outlets, the first outlet allowing the discharge of at least a first water volume contained in the first metering chamber, and the second outlet allowing the discharge of at least a second water volume from the second metering chamber, characterized in that the container (1;101) has a section (V3;V103), which communicates through proper hydraulic means (19;119) with the first metering chamber (V1;V101) and the second metering chamber (V2;V102), and that in said section (V3;V103) a level sensor is arranged, in particular of the float type (12;112), in order to detect the performed water discharge at least from the section (V3;V103), and that the first metering chamber (V1;V101) and the second metering chamber (V2;V102) can be discharged into the tub independently from each other.
2. System for the supply and the dosage of water in a dishwashing machine according to claim 1, characterized in that the section (V3;V103) is located at an height substantially higher than the height of the first metering chamber (V1;V101) and the second metering chamber (V2;V102).
3. System for the supply and the dosage of water in a dishwashing machine according to claim 2, characterized in that the hydraulic means (19;119) consist of an overflow (19) putting the first metering chamber (V1) in communication with the second metering chamber (V2).

4. System for the supply and the dosage of water in a dishwashing machine according to claim 2, characterized in that the hydraulic means (19;119) consist of a conduit (119) putting the first metering chamber (V101) in communication with the second metering chamber (V102). 5
5. System for the supply and the dosage of water in a dishwashing machine according to claim 2, characterized in that the level sensor (12;112) actuates a microswitch (13;113) controlling the water supply valve. 10
6. System for the supply and the dosage of water in a dishwashing machine according to claim 5, characterized in that the microswitch (13;113) sends a signal relating to the filling state of the section (V3; V103) to a control device. 15
7. System for the supply and the dosage of water in a dishwashing machine according to claim 6, characterized in that the control device can the control water discharge through the outlet conduit (17;117) of the first metering chamber (V1;V101) and/or of the second metering chamber (V2;V102), by actuating respective solenoid valves (EV1;EV2). 20 25
8. System for the supply and the dosage of water in a dishwashing machine according to claim 7, characterized in that, upon receipt of the emptying signal of the section (V3;V103) from the microswitch (13; 113), the control device waits for a preset time before closing the outlet conduit (17;117) through the solenoid valves (EV1, EV2; EV101, EV102) and opening the water supply valve to the container (1; 101), to ensure a complete emptying of the metering chambers (V1, V2; V101, V102). 30 35
9. Method for the supply and the dosage of water in a dishwashing machine comprising a washing tub, a water softening device and a metering container to which water required for machine operation is supplied, by means of a supply tube and a supply valve, characterized in that it provides for the filling of at least two chambers (V1, V2; V101, V102) having different capacities between themselves, specifically in cascade and available within said container (1; 101) and that, in order to perform a phase of a washing program, water contained in one or both said chambers (V1, V2; V101, V102) can be independently discharged to said tub. 40 45 50
10. Method according to the previous claim, characterized in that in a first operating mode of the dishwashing machine, such as the execution of a phase of a program for a full load of crockery, the water fed to both said chambers (V1, V2; V101, V102) is discharged into said tub, whereas in a second operating mode of the dishwashing machine, such as the execution of a phase of a program for a reduced load of crockery, only the water contained in one of said chambers (V1 or V2; V101 or V102) is discharged into said tub.
11. Method according to claim 10, characterized in that, for the execution of a phase of a washing program, a repeated filling and a repeated emptying of only one of said chambers (V1 or V2; V101 or V102) is provided.
12. Method according to at least one of the previous claim, characterized in that said chambers (V1, V2; V101, V102) are connected in cascade between themselves and that
  - water is fed to the first chamber (V1; V101) of the cascade, which filled up to reach an overflow level (19;119), so that any further water fed to the container (1;101) will cause a water flow into a next chamber of said cascade (V2; V102);
  - water inlet to the container (1;101) will continue till the water trigs a level sensor (13;113) located in an upper section (V3; V103) of the container (1;101).
13. Method according to at least one of the previous claim, characterized in that said container (1;101) is provided with at least a third chamber (8,8A; 108,108A) for metering a water volume being required for regeneration of the decalcifying resins.
14. Method according to at least one of the previous claim, characterized in that said chambers (V1, V2, 8,8A; V101, V102, 108, 108A) are emptied directly without the use of siphons, i.e. by a simple opening of relevant valves (EV1, EV2; EV101, EV102) located on conduits (7, 17; 107, 117) departing from the lower side of said chambers (V1, V2, 8,8A; V101, V102, 108, 108A).
15. Method according to at least one of the previous claim, characterized in that the water flows through a softening device and becomes soft before filling said chambers (V1, V2, 8,8A; V101, V102, 108, 108A).

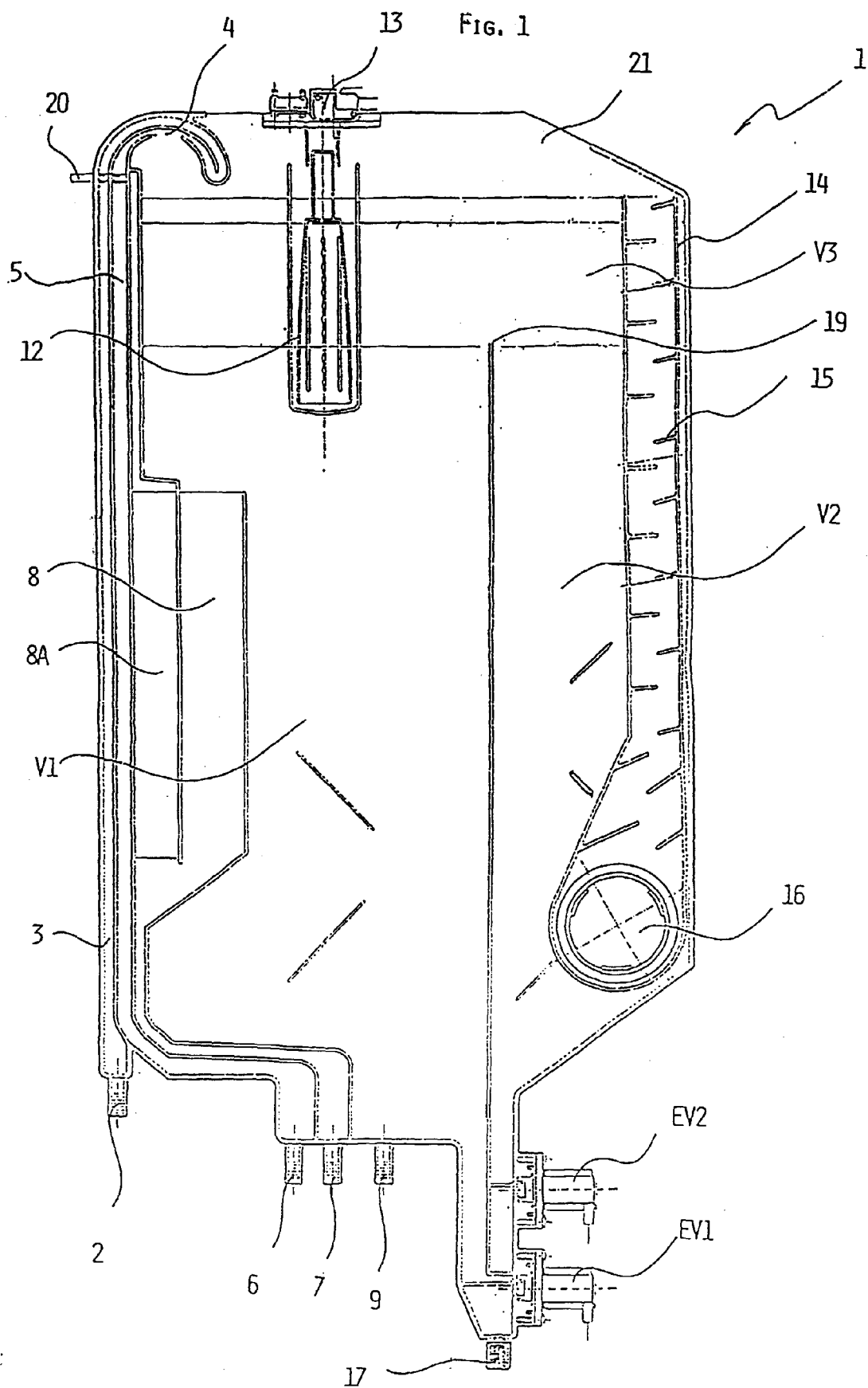


FIG. 2

