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⑤④ **Dishwashing machine having liquid level control means of the overflow type.**

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| ⑤⑥ References cited:<br><b>DE-A-2 439 400</b><br><b>US-A-3 294 110</b>       |   |

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## Description

The present invention relates to a dishwashing machine having liquid level control means of the overflow type, as set forth in the preamble of claim 1.

A dishwashing machine having liquid level control means of this type is described in FR—A—1,385,971, wherein a first chamber adapted to be supplied with means water communicates via an overflow partition with a second chamber associated with a pressostat adapted to control a solenoid valve itself controlling the mains water supply. In addition the first chamber communicates, through the intake duct of a discharge pump, with the washing tub of a washing machine. In operation the mains water is supplied to the tub under the control of the first chamber. As the water level reaches the level of the overflow partition, the water overflows into the second chamber, resulting in actuation of the pressostat for closing the water supply solenoid valve. The second chamber is connected to the intake side of the discharge pump through a siphon-type conduit, so that both chambers of the level control means are effectively emptied as the water is discharged from the tub.

This control device is of simple construction and reliable and accurate operation, since, in contrast to other known devices of this type, the pressostat is not actuated by a gradually rising pressure, but by a sudden pressure variation occurring as the water overflows from the first to the second chamber, so as to ensure accurately timed operation.

The described level control device presents certain drawbacks, however, when employed in a dishwashing machine as in the preferred embodiment.

This is because during certain phases of the operating cycle of a dishwashing machine (for instance a water supply phase following a soiled water discharge phase, or during temporary stoppage of the water circulation pump in the presence of water in the tub), particulate impurities suspended in the water contained in the discharge circuit of the machine may enter the first chamber. Although the first chamber is normally supplied with clean mains water, these impurities may be carried up to the overflow level so as to enter the second chamber to form a deposit therein which may, in the course of time, solidify and thus hamper the proper operation of the pressostat and/or prevent the second chamber from being completely emptied through the siphon-type conduit.

A substantially similar shortcoming affects a dishwashing machine of the type described in German patent application 2 439 400, wherein the intake duct of a discharge pump is connected to the tub of the machine and to a level control device including a first and a second chamber intercommunicating by means of an overflow device. In particular, said overflow device comprises a siphon device through which the second chamber

can be emptied by the discharge pump when this latter is in operation. However, even in this case, impurities suspended in the water can easily enter the second chamber and solidify therein, with the result that the proper operation of the whole level control device can be hampered in the long run.

It is therefore a main object of the present invention to provide a dishwashing machine of the type set forth in aforementioned FR—A—1 385 971, in which the problems arising from the formation of impurity deposits are substantially eliminated. A further object of the invention is the provision of a dishwashing machine of the type defined above having liquid level control means of the overflow type, which is of compact construction and may be integrated into the liquid collecting well of the dishwasher.

According to the invention, these objects are attained by the characterizing features of claim 1. A preferred embodiment of the invention is subject matter of claim 2.

The characteristics and advantages of the invention will become more clearly evident from the following description, given by way of example with reference to the accompanying drawing, the only figure of which shows a diagrammatical representation of a preferred embodiment of a dishwashing machine according to the invention.

With reference to the drawing, a dishwashing machine comprises a washing tub 4 (only partially shown) having at its bottom portion a well 5 for collecting the liquid the level of which is to be controlled. Tub 4 is adapted to be filled with mains water up to a predetermined level 1 through a supply tube 6 provided with an actuable supply valve 13 of a per se known type. Tub 4 may be emptied in a conventional manner through a discharge pump 7 connected to a discharge conduit 17 down to a residual liquid level 3. To this purpose the bottom of well 5 is connected to pump 7 through an intake duct 8. A circulation pump 9 is provided for spraying dishes and the like (not shown) with the water collected in well 5. During this phase the liquid in tub 4 drops to a dynamic level 2 in a known manner.

The dishwashing machine is also provided with liquid level control means comprising at least one first chamber 10 having a calibrated inlet 11 for mains water connected to a branch duct 12 of supply tube 6. First chamber 10 is provided with at least one overflow arrangement 14 disposed at the predetermined level 1, by way of which it communicates with at least one second chamber 15 or overflow chamber. Associated to the latter is a pressostat 16 or the like adapted to be actuated when the liquid overflows from first chamber 10 into second chamber 15 for closing supply valve 13 in a per se known manner. A connecting conduit 19 connects the bottom portion of first chamber 10 to intake duct 8, and through the latter, to tub 4. Conduit 19 connects intake duct 8 also to second chamber 15 through a conventional siphon device 18 and a branch portion of first chamber 10.

According to one aspect of the invention the interior volume of connecting conduit 19 is at least

equal to the volume of first chamber 10 between the predetermined overflow level 1 and dynamic level 2.

Connecting conduit 19 preferably offers a greater flow resistance to the flow of liquid than does intake duct 8. This requirement may obviously be met in various manner, for instance by forming conduit 19 with a contorted flowpath or by restricting its cross-sectional area.

In addition, the bottom of first chamber 10 is preferably disposed at a higher level than the maximum residual liquid level 3 which the liquid remaining in tub 4 may attain after the discharge phase. Connecting conduit 19 may not in any case be formed with vertical loops, as such loops would result in the undesirable formation of air locks.

With regard to operation of the described arrangement, the following explanations refer to those phases significant to the purposes of the invention.

At the end of a discharge phase, a certain amount of the soiled water contained in discharge conduit 17 flows by gravity back towards intake duct 8, and from there along a preferential flow-path into tub 4. This is because the relatively high flow resistance offered by connecting conduit 19 and the relatively high level at which this conduit opens into first chamber 10 prevent the soiled water from flowing into first chamber 10. The residual water in tub 4 will then stabilize at level 3, as already indicated.

During a subsequent supply phase (with supply valve 13 open) fresh water flows through supply tube 6 and from there through branch pipe 12 into first chamber 10 so as to fill the latter up to the overflow level 1. First chamber 10 is thus filled only with fresh water, which at the outset flows by gravity from inlet 11 through connecting conduit 19 towards intake duct 8. In this manner connecting conduit 19 is substantially filled with a volume of fresh water effective to displace the soiled water previously contained therein towards intake duct 8. When circulation pump 9 starts its operation, the level of the liquid in tub 4 and first chamber 10 drops to the dynamic level 2, as already stated, while the liquid in connecting conduit 19 remains substantially quiescent.

When circulation pump 9 is temporarily stopped during the diswashing cycle, the liquid in the tub rises again from dynamic level 2 to the overflow level 1. In accordance with the law of communicating tubes, this rising of the level also occurs within first chamber 10. The liquid entering chamber 10 during this phase is the volume of fresh water which had flown into connecting conduit 19 during the preceding supply phase. As stated previously, this volume of fresh water forms an obstruction preventing impurities suspended in the discharge circuit of the dishwashing machine from entering chamber 10. As a result, chamber 10 is kept free of such impurities, as stated as an object of the invention.

During a subsequent discharge phase, pump 7 substantially empties tub 4, first chamber 10 and,

through siphon 18, also the overflow chamber 15. During this phase pump 7 removes any impurities which may have accumulated within connecting conduit 19, so that major accumulations are prevented from forming therein in the course of repeated operating cycles of the machine.

## Claims

1. A dishwashing machine having means for controlling the level of a liquid in a washing tub (4) adapted to be filled with said liquid through a supply tube (6) provided with an actuatable supply valve (13) and to be substantially emptied during a discharge phase, said level control means comprising at least one first chamber (10) connected to said tub (4) at the bottom portion thereof disposed under a residual level (3) through the intake duct (8) of a discharge pump (7) and provided with an inlet (11) for said liquid connected to said supply tube (6), said first chamber (10) communicating with at least one second chamber (15) via at least one overflow arrangement (14) for the overflow of said liquid from said first chamber (10) to said second chamber (15) as the liquid in said tub (4) reaches the overflow level (1) of said overflow arrangement (14), pressure sensitive means (16) being provided for causing said supply valve (13) to close when said liquid overflows into said second chamber (15), said liquid being adapted to drop to a dynamic level (2) during at least one phase of the operation of a circulation pump (9), said second chamber (15) being connected to said first chamber (10) through a siphon device (18) as well as to enable emptying thereof, characterized by comprising a connecting conduit (19) between the bottom of said first chamber (10) and said intake duct (8) of said discharge pump (7) the volume of said connecting conduit (19) being at least equal to the volume of said first chamber (10) between said overflow level (1) and said dynamic level (2), the bottom of said first chamber (10) being disposed at a higher level than a residual liquid level (3) within said tub (4) after said discharge phase.

2. Dishwashing machine according to claim 1, characterized in that said connecting conduit (19) has a higher flow resistance than said intake duct (8) of said discharge pump (7).

## Patentansprüche

1. Geschirrspülmaschine mit einer Einrichtung zur Steuerung des Pegels einer Flüssigkeit in einem Waschbottich (4), der dazu eingerichtet ist, mit der Flüssigkeit über ein Zuführrohr (6) gefüllt zu werden, das mit einem betätigbaren Zuführventil (13) versehen ist, und während einer Auslaßphase im wesentlichen entleert zu werden, wobei die pegelsteuereinrichtung wenigstens eine erste Kammer (10) aufweist, die mit dem Bottich (4) im Bodenbereich desselben unter einem Restpegel (3) über die Einlaßleitung (8) einer Auslaßpumpe (7) verbunden ist, und die mit einem Einlaß (11) für die Flüssigkeit versehen ist,

der mit dem Zuführrohr (6) verbunden ist, wobei die erste Kammer (10) mit wenigstens einer zweiten Kammer (15) über wenigstens eine Überlaufanordnung (14) für den Überlauf von Flüssigkeit von der ersten Kammer (10) in die zweite Kammer (15) verbunden ist, wenn die Flüssigkeit in dem Bottich (4) den Überlaufpegel (1) der Überlaufanordnung (14) erreicht, wobei eine druckempfindliche Einrichtung (16) vorgesehen ist, um das Zuführventil (13) zum Schließen zu veranlassen, wenn die Flüssigkeit in die zweite Kammer (15) überläuft, wobei die Flüssigkeit dazu eingerichtet ist, auf einen dynamischen Pegel (2) während wenigstens einer Betriebsphase einer Umwälzpumpe (9) abzufallen, die zweite Kammer (15) mit der ersten Kammer (10) auch über eine Siphoneinrichtung (18) verbunden ist, um ein Entleeren derselben zu ermöglichen, dadurch gekennzeichnet, daß sie eine Verbindungsleitung (19) zwischen dem Boden der ersten Kammer (10) und der Einlaßleitung (8) der Auslaßpumpe (7) aufweist, wobei das Volumen dieser Verbindungsleitung (19) wenigstens gleich dem Volumen der ersten Kammer (10) zwischen dem Überlaufpegel (1) und dem dynamischen Pegel (2) ist und der Boden der ersten Kammer (10) auf einem höheren Pegel liegt, als ein Restflüssigkeitspegel (3) innerhalb des Bottichs (4) nach der Auslaßphase.

2. Geschirrspülmaschine nach Anspruch 1, dadurch gekennzeichnet, daß die Verbindungsleitung (19) einen höheren Strömungswiderstand als die genannte Einlaßleitung (8) der Auslaßpumpe (7) aufweist.

## Revendications

1. Lave-vaisselle ayant des moyens pour régler le niveau d'un liquide dans une cuve de lavage (4) adaptée pour être remplie de ce liquide par l'intermédiaire d'un tube d'alimentation (6) équipée d'une vanne d'alimentation commandable

(13) et pour être pratiquement vidée lors d'une phase de vidange, ces moyens de réglage du niveau comprenant au moins une première chambre (10) raccordée à la cuve (4) au niveau de la portion inférieure de celle-ci disposée en-dessous d'un niveau résiduel (3) par l'intermédiaire du conduit d'admission (8) d'une pompe de vidange (7) et équipée d'une entrée (11) pour ce liquide raccordée au tube d'alimentation (6), la première chambre (10) communiquant avec au moins une deuxième chambre (15) par l'intermédiaire d'au moins un dispositif de débordement (14) pour permettre au liquide de déborder de la première chambre (10) dans la deuxième chambre (15) lorsque le liquide dans la cuve (4) atteint le niveau de débordement (1) du dispositif de débordement (14), des moyens sensibles à la pression (16) étant prévus pour fermer la vanne d'alimentation (13) lorsque le liquide déborde dans la deuxième chambre (15), ce liquide étant adapté pour tomber à un niveau dynamique (2) pendant au moins une phase du fonctionnement d'une pompe de circulation (9), cette deuxième chambre (15) étant raccordée à la première chambre (10) par l'intermédiaire d'un dispositif de siphon (18) afin de lui permettre de se vider, caractérisé en ce qu'il comporte un conduit de raccordement (19) entre le fond de la première chambre (10) et le conduit d'admission (8) de la pompe de vidange (7), le volume de ce conduit de raccordement (19) étant au moins égal au volume de la première chambre (10) compris entre le niveau de débordement (1) et le niveau dynamique (2), le fond de la première chambre (10) étant disposé à un niveau supérieur à un niveau de liquide résiduel (3) à l'intérieur de la cuve (4) après la phase de vidange.

2. Lave-vaisselle selon la revendication 1, caractérisé en ce que le conduit de raccordement (19) offre à l'écoulement du liquide une résistance plus élevée que le conduit d'admission (8) de la pompe de vidange (7).

