

(19)



(11)

EP 2 292 139 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:
11.11.2015 Bulletin 2015/46

(51) Int Cl.:
A47L 15/42 ^(2006.01) **A47L 15/46** ^(2006.01)

(21) Application number: **10175422.4**

(22) Date of filing: **06.09.2010**

(54) Process for controlling the operation of a dishwashing machine

Steuerungsverfahren einer Geschirrspülmaschine

Procédé de contrôle d'une machine lave-vaisselle

(84) Designated Contracting States:
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
PL PT RO SE SI SK SM TR**

(30) Priority: **07.09.2009 IT TO20090684**

(43) Date of publication of application:
09.03.2011 Bulletin 2011/10

(73) Proprietor: **BITRON S.p.A.
10122 Torino (IT)**

(72) Inventor: **Brignone, Enzo
12025 Fraz. Monastero Dronero (Cuneo) (IT)**

(74) Representative: **Gerbino, Angelo et al
Jacobacci & Partners S.p.A.
Corso Emilia 8
10152 Torino (IT)**

(56) References cited:
**EP-A1- 1 277 431 DE-A1- 19 828 768
DE-A1-102004 050 396 FR-A1- 2 589 057
JP-A- 7 059 709 JP-A- 2001 198 071**

EP 2 292 139 B1

Note: Within nine months of the publication of the mention of the grant of the European patent in the European Patent Bulletin, any person may give notice to the European Patent Office of opposition to that patent, in accordance with the Implementing Regulations. Notice of opposition shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

Description

[0001] The present invention refers to a process for controlling the operation of a dishwashing machine.

[0002] More specifically, the latter comprises a washing tank closed at the bottom by a sump wherein a level sensor is present, a washing pump actuated by an electric motor which makes water circulate in the aforesaid tank and a control unit.

[0003] A dishwashing machine of this kind is disclosed by JP 2001 198 071 A.

[0004] It is known to control the actuation motor of a washing pump starting from the measurement of its rotation speed, which is carried out by a suitable instrument, or by varying its power supply frequency by means of an inverter device. Such control systems are reliable, but require the presence of dedicated components - such as a rotation speed measurer or an inverter - which cause the complexity and cost of the dishwashing machine to increase.

[0005] It is also further known a process for controlling the operation of the actuation motor of the washing pump of a dishwashing machine which employs components that are in any case already present for performing other functions.

[0006] For instance, DE 198 28 768 A1 discloses a process according to the preamble of claim 1 of the present application. According to this process:

- a reference value of the level of the water in the sump is pre-established for the washing step and the rinsing step, respectively,
- the level sensor measures continuously the actual value of the level of the water in the sump during said steps, and
- said control unit compares in each step the reference value and the actual value of the level of the water in the sump and adjusts the rotation speed of said motor in dependence on the difference existing between said values.

[0007] The present objection has the objective of increasing the reliability of this known process.

[0008] This is achieved by providing a further step in which the control unit further checks the operation capability of said sensor by ascertaining that, during the water loading step, the measured value of the level of the water in the sump continuously increases.

[0009] The control process of the invention is based on the use by a control unit of signals generated by a component which is in any case present, such as the level sensor, and that hence does not lead to additional costs. Consequently, the production of a dishwashing machine adapted to operate according to the process of the invention results more economical. In particular, being certain of the correct functioning of the level sensor, the latter can also be used for monitoring the attainment of a watch level which causes the immediate shutdown

of the dishwashing machine, without requiring dedicated anti-overflow devices, and with consequent further cost savings.

[0010] Further advantages and characteristics of the present invention will be clearer from the following detailed description, carried out with reference to the enclosed drawings provided as a non-limiting example, in which:

the single figure is a schematic representation of the main components of a dishwashing machine in which the control process of the invention is implemented.

[0011] A dishwashing machine comprises a washing tank 10 closed at the bottom by a sump 12 in which a level sensor 14 is mounted. A washing pump 16 driven by an asynchronous electric motor 18 causes the circulation of the water in the tank 10, while a further pump 20 allows its external discharge.

[0012] The operation of the dishwashing machine is governed by a control unit 22. In particular, the level sensor 14 continuously measures the actual value of the water level in the sump 12 during the washing and rinsing steps, and transmits it to the control unit 22 which compares it with a reference value of the level of the water in the sump which is pre-established for each of such steps.

[0013] The control unit 22 can thus adjust the rotation speed of the motor 18 during the washing and rinsing steps in dependence on the difference existing between the actual value of the level of the water in the sump 12 and the pre-established reference value. In particular, the adjustment of the rotation speed of the motor 18 can be carried out by changing the power absorbed through the phase shutting method. For example, the maximum power supplied by the phase shutter and absorbed by the motor 18 can be established by the control unit 22 in dependence on the requirements of the washing step, and in particular it can be greater the more intense the washing action must be.

[0014] It is therefore critical, for the purpose of performing the adjustment process, that the pressure sensor 14 functions correctly. Consequently, the operation of the latter is previously advantageously verified by the control unit, by ascertaining that, in the water loading step, the value measured by the sensor 14 of the level of the water in the sump 12 continuously increases. In addition, in order to ensure the correct functioning of the sensor 14, the latter can be advantageously used also for monitoring the possibly rising of the water up to a watch level which causes the employment of emergency measures, such as the immediate shutdown of the dishwashing machine.

[0015] Naturally, without detriment to the principle of the invention, the embodiment details and embodiments can be widely varied with respect to that described as a mere example above, without departing from the claimed scope.

Claims

1. Process for controlling the operation of a dishwashing machine comprising a washing tank (10) closed at the bottom by a sump (12) wherein a level sensor (14) is mounted, a washing pump (16) operated by an asynchronous electric motor (18) which circulates water in said tank (10), and a control unit (22), according to which:

- a reference value of the level of the water in the sump (12) is pre-established for the washing step and the rinsing step, respectively,
- the level sensor (14) measures continuously the actual value of the level of the water in the sump (12) during said steps, and
- said control unit (22) compares in each step the reference value and the actual value of the level of the water in the sump (12) and adjusts the rotation speed of said motor (18) in dependence on the difference existing between said values,

said process being **characterized in that** it as well checks the operation capability of said sensor (14) by ascertaining that, during the water loading step, the measured value of the level of the water in the sump (12) increases continuously.

2. Process according to claim 1, wherein the rotation speed of the motor (18) is adjusted by changing the power absorbed through the phase shutting method.
3. Process according to claim 2, wherein the maximum power absorbed is established by the control unit (22) in dependence on the requirements of the washing step.

Patentansprüche

1. Prozess eines Steuerns des Betriebs einer Geschirrspülmaschine mit einem Waschbehälter (10), der am Boden mittels eines Sumpfes (12), in dem ein Pegelsensor (14) montiert ist, verschlossen ist, einer Waschpumpe (16), die mittels eines Asynchron-elektromotors (18) betrieben ist, der Wasser in dem Behälter (10) zirkuliert, und einer Steuereinheit (22), gemäß der ein Referenzwert des Pegels des Wassers in dem Sumpf (12) jeweils für den Waschschrift und den Spülschrift vorbestimmt ist, der Pegelsensor (14) während der Schritte kontinuierlich den gegenwärtigen Wert des Pegels des Wassers in dem Sumpf (12) misst, und die Steuereinheit (22) in jedem Schritt den Referenzwert und den gegenwärtigen Wert des Pegels des Wassers in dem Sumpf (12) vergleicht und die Dreh-

geschwindigkeit des Motors (18) in Abhängigkeit von der zwischen den Werten bestehenden Differenz anpasst,

wobei der Prozess **dadurch gekennzeichnet ist, dass**

ferner die Betriebsfähigkeit des Sensors (14) überprüft wird durch Ermitteln, dass während des Was-serladeschritts der gemessene Wert des Pegels des Wassers in dem Sumpf (12) kontinuierlich steigt.

2. Prozess nach Anspruch 1, wobei die Drehgeschwindigkeit des Motors (18) durch Ändern der mittels des Phasenschließverfahrens aufgenommenen Energie angepasst wird.

3. Prozess nach Anspruch 2, wobei die aufgenommene Maximalenergie mittels der Steuereinheit (22) in Abhängigkeit von den Anforderungen des Waschschritts bestimmt wird.

Revendications

1. Processus de contrôle du fonctionnement d'un lave-vaisselle comprenant un bac de lavage (10) fermé à la base par un bac de décantation (12) dans lequel est monté un capteur de niveau (14), une pompe de lavage (16) entraînée par un moteur électrique asynchrone (18) qui fait circuler l'eau dans ledit bac (10) et un module de commande (22), selon lequel :

- une valeur de référence du niveau d'eau dans le bac de décantation (12) est prédéfinie pour, respectivement, la phase de lavage et la phase de rinçage,

- le capteur de niveau (14) mesure en continu la valeur effective du niveau d'eau dans le bac de décantation (12) pendant lesdites phases et
- ledit module de commande (22) compare dans chaque phase la valeur de référence et la valeur effective du niveau d'eau dans le bac de décantation (12) et adapte la vitesse de rotation dudit moteur (18) en fonction de la différence entre lesdites valeurs,

ledit processus étant **caractérisé en ce qu'il** contrôle également la capacité opérationnelle dudit capteur (14) en vérifiant que, pendant la phase de chargement en eau, la valeur mesurée du niveau d'eau dans le bac de décantation (12) augmente en continu.

2. Processus selon la revendication 1, dans lequel la vitesse de rotation du moteur (18) est adaptée par la variation de la puissance absorbée par la méthode de la fermeture de phase.

3. Processus selon la revendication 2, dans lequel la

puissance maximale absorbée est définie par le module de commande (22) en fonction des exigences de la phase de lavage.

5

10

15

20

25

30

35

40

45

50

55

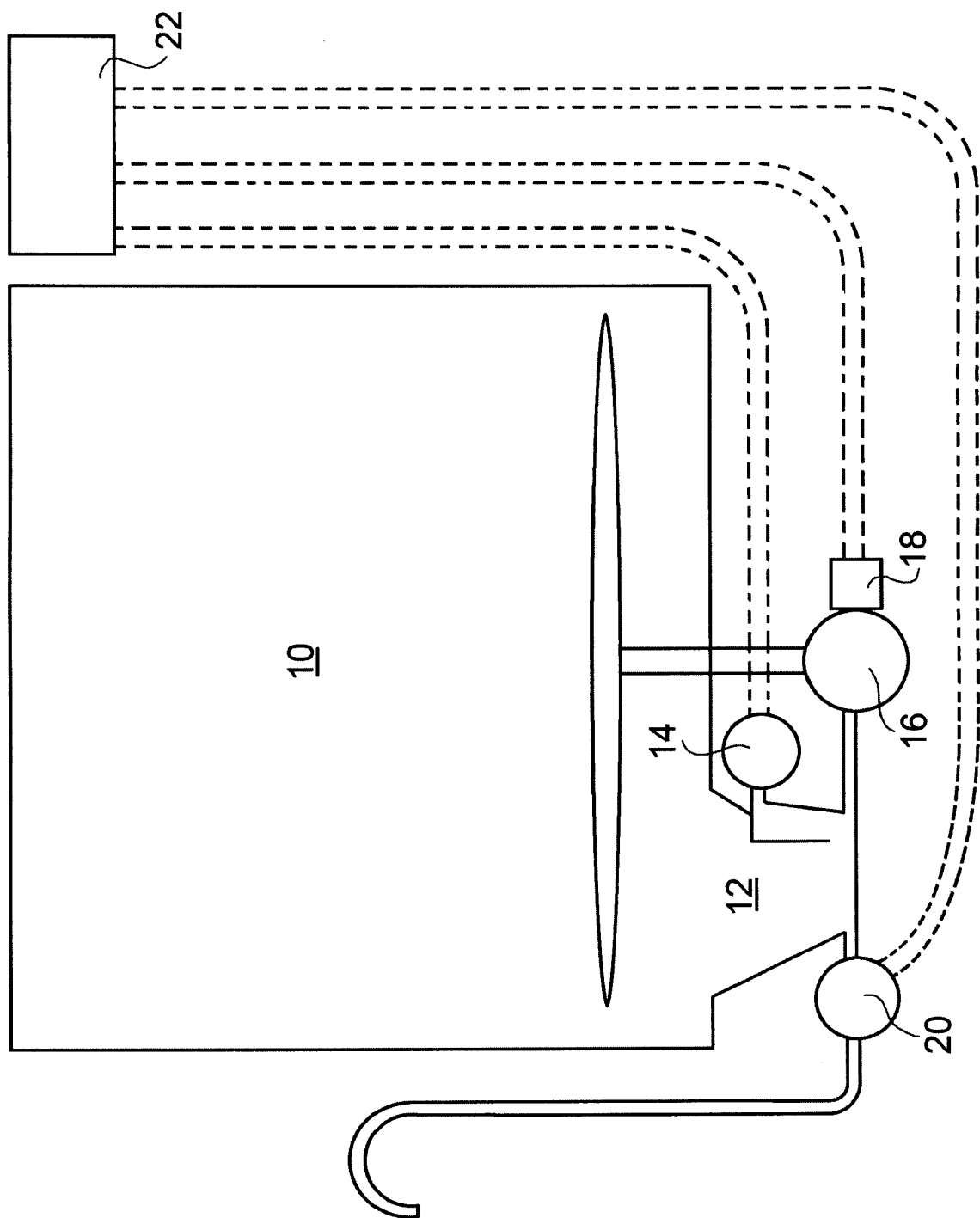


FIG. 1

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- JP 2001198071 A [0003]
- DE 19828768 A1 [0006]