



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
30.03.2016 Bulletin 2016/13

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

(21) Application number: **15192928.8**

(22) Date of filing: **07.10.2011**

(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 RS SE SI SK SM TR

(30) Priority: **07.10.2010 IT TO20100825**

(62) Document number(s) of the earlier application(s) in accordance with Art. 76 EPC:
11804790.1 / 2 624 739

(71) Applicant: **Indesit Company S.p.A.**
60044 Fabriano (AN) (IT)

(72) Inventors:
• **BOSSI, Luca**
I-61040 Serra Sant'Abbondio (PU) (IT)

- **ARTECONI, Leonardo**
I-60044 Fabriano (AN) (IT)
- **CIARLETTA, Annalisa**
I-67035 Pratola Peligna (AQ) (IT)
- **FARALDI, Paolo**
I-18038 Sanremo (IM) (IT)
- **DURI, Sandro**
I-62025 Fiuminata (MC) (IT)

(74) Representative: **Zelioli, Giovanni et al**
Metroconsult S.r.l.
Foro Buonaparte, 51
20121 Milano (IT)

Remarks:

This application was filed on 04.11.2015 as a divisional application to the application mentioned under INID code 62.

(54) **DISHWASHING MACHINE AND HYGIENISATION METHOD THEREOF**

(57) The present invention relates to a method of hygienization of a dishwashing machine, wherein said dishwashing machine (1) carries out at least one wash cycle in which a wash liquid is dispensed into a tub (2) of said dishwashing machine (1), the method comprising a hygienization program comprising a hygienization cycle

wherein an oxidizing fluid is dispensed into said tub (2), said wash cycle and said hygienization cycle being distinct from each other, said hygienization cycle is carried out during at least one interval between one wash cycle and the next wash cycle. The present invention also relates to a dishwashing machine (1).

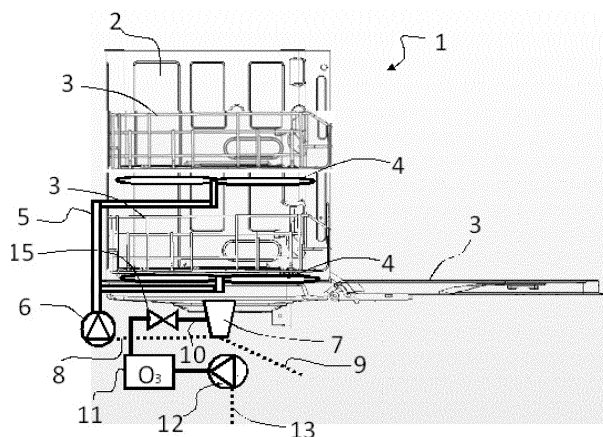


Fig.1

Description

[0001] The present invention relates to a dishwashing machine with cleaning cycles and to a method of hygienization of said machine.

[0002] One problem common to dishwashing machines derives from the fact that users often do not load the machine with a quantity of crockery sufficient to carry out a full-load wash cycle, with the consequence that it is often uneconomical to carry out a wash program in such conditions, in that it would imply a waste of energy, water and washing agents (rinse aid and detergents).

[0003] However, if the user chooses to leave dirty crockery in the tub until the machine is fully loaded, other problems arise which are related to bacteria proliferation and bad smells.

[0004] In this regard, some solutions known in the art provide for carrying out rinse cycles on the crockery accumulated in the tub and staying there until the machine is full.

[0005] The situation can be improved by executing these rinse cycles, but this cannot completely stop the generation of bad smells, since not all microbes are eliminated by a simple water rinse cycle. The execution of such cycles may be uneconomical as well, because they require water and energy consumption without effectively washing the crockery.

[0006] In order to remove bacteria and odors from inside a dishwashing machine, it is known to use Ozone.

[0007] German patent publication DE 10 200S 024322 discloses generating an air/ozone mixture with rinse water, so as to improve the germ-killing effect without need of high temperature water.

[0008] International patent application WO200S/039377 discloses a dishware washing process that is conducted in the presence of a biocide. This process includes the steps of (i) washing ware in a washing cavity of a ware washer with water and a dishware washing detergent; (ii) rinsing the ware in the dish washer with water; and (iii) introducing a biocide into the washing cavity of the ware washer in order to provide a gaseous atmosphere thereof in the washing cavity, the biocide being introduced into the washing cavity prior to or contemporaneously with or subsequently to the washing or rinsing of the ware.

[0009] US patent application US200S/0011329 having title "Dish washing machine equipped with an ozone storage device" discloses a dishwashing machine provided with an ozone generator and with a storage device for storing ozone and/or hydroxyl radicals. Ozone is dispensed either during a washing cycle in order to increase the cleaning action or during a "drying" phase at the end of the washing cycle, or during a non-operating phase in order to remove odors. Dispensing of ozone during non-operating phase is made automatically in response to opening/closing of the door or periodically. International patent application WO02007/099113 discloses a washing machine comprising a washing program having

ozone wash and detergent wash cycles, a tub, a drum. An ozone generator provides to produce the ozone gas mixed into the water delivered by the main water supply.

[0010] US patent 5,524,358 discloses a ventilation filtration kit for use with dishwashers. The kit may comprise a germicidal lamp to disinfect air being drawn and provide residual ozone to disinfect the dishes and eating utensils within the dishwasher.

[0011] US patent application US2010/0000577 further discloses use of a gaseous disinfectant, such as ozone, to be fed into a liquid circulating in a conduit to be disinfected.

[0012] The present invention aims at solving the problem of how to make the operation of sanitizing of the tub of the dishwasher more reliable, flexible and efficient.

[0013] One object of the present invention is a method of hygienization of a dishwashing machine according to the appended claim 1.

[0014] A further object of the present invention is a dishwashing machine according to the appended claim 11.

[0015] Further advantageous features will be set out in the appended claims.

[0016] An idea at the basis of the present invention is to diffuse an oxidizing gas, such as ozone, only during operating cycles wherein no liquid is dispensed into the tub; said operating cycles, having a hygienization function, can be carried out, for example, when dirty crockery is placed into the tub awaiting the start of a wash program.

[0017] This gas is, in fact, a strong oxidizing agent, and as such, when used in a dishwashing machine, it sterilizes and oxidizes organic substances, thereby eliminating the bad smells originating from the proliferation of bacteria inside the tub of the machine.

[0018] Other known properties of ozone in this field relate to its whitening action, which can easily eliminate any tea or coffee stains from white cups or dishes. In this regard, it is also conceivable to carry out an operating program of the dishwashing machine consisting of one or more hygienization cycles, without any liquid being dispensed into the tub during said operating program and/or in a condition wherein the degree of humidity in the tub is substantially equal to that in the outside environment.

[0019] In this way it is advantageously possible to obtain a simpler machine construction while effectively cleaning the tub and any crockery contained therein.

[0020] These features as well as further advantages of the present invention will become more apparent from the following description of an embodiment thereof as shown in the annexed drawings, which are supplied by way of non-limiting example, wherein:

Fig. 1 is a schematic view of a dishwashing machine according to the present invention, in which a method according to the present invention can be carried out. Referring now to Fig. 1, there is shown a schematic view of a dishwashing machine according to the

present invention.

[0021] It comprises a tub 2 in which crockery to be subjected to the machine's washing action is placed.

[0022] Usually the crockery is arranged in sliding racks 3 that can be extracted through the opening the tub 2, which is closed by the horizontally-pivoted door 3.

[0023] Below the racks, rotary sprayers 4 are installed which spray wash liquid (water, water and detergents and/or rinse aids or the like) onto the crockery during the wash cycles. The wash liquid is supplied to the sprayers 4 through the hydraulic circuit 5, which connects them to the pump 6.

[0024] During a wash cycle, after having lapped the crockery the wash liquid collects into the sump 7 at the bottom of the tub 2, from which it returns to the pump 6 through the duct 8 or is drained through the duct 9.

[0025] In this description, the term "wash cycle" refers to any operating step of the machine 1 wherein water or wash liquid is dispensed by the sprayers 4 or wherein, likewise, the pump 6 is on; during the wash cycles, the degree of humidity in the air inside the tub is normally higher than the degree of humidity in the air in the outside environment.

[0026] The machine 1 also comprises a cleaning circuit which comprises a duct 10 in fluidic communication with the sump 7, an ozone generator 11, an air pump 12 and an intake duct 13 that opens into the outside and takes in environmental air.

[0027] The duct 10 puts the sump (and therefore the inside of the tub 2) in fluidic communication with the ozone generator 11.

[0028] The latter is preferably of the so-called "corona discharge" type, such as those of the TCB-66, TCB-56 e TCB-115 series available from Trump Electronics.

[0029] The ozone generator 11 is supplied by the pump 12 with air taken from the environment through the intake duct 13.

[0030] The pump may likewise be a fan or the like.

[0031] On the duct 10 that connects the generator 11 and the sump 7 there is optionally a valve 15, e.g. a non-return valve for liquids, which prevents the wash liquid from reaching the generator 11.

[0032] As an alternative, a solenoid valve or even a simple gate valve may be used, which is kept closed as the sump 7 is filling with liquid or during a wash cycle.

[0033] The method of operation according to the present invention provides for the execution of a hygienization program comprising at least one hygienization cycle wherein ozone is dispensed into the tub prior to one or more wash cycles.

[0034] Thus, when the quantity of dirty crockery is not enough to justify the execution of a wash program or one or more wash cycles, the user can carry out the hygienization cycle to remove any bacteria, microbes and bad smells, and then wait until the machine can be completely filled.

[0035] The hygienization program is preferably distinct

from the wash cycles: preferably, it is carried out prior to the latter, i.e. when the degree of humidity in the tub is substantially equal to the degree of humidity in the environment outside the tub.

[0036] Such a hygienization program, therefore, dispenses no wash liquid or water, and the ozone diffusion medium is air.

[0037] This improves the hygienic conditions of the crockery inside the tub; in fact, sometimes the presence of water in the tub (due, for example, to the execution of separate rinse cycles) might increase the diffusion of some types of bacteria or microbes, promoting the proliferation thereof and hence the onset of bad smells.

[0038] In this manner, a user having not enough dirty crockery to justify the start of a wash cycle can wait for other dirt crockery to fully load the dishwasher before executing a wash program.

[0039] It follows that any problems related to the presence of dirty crockery in the tub, which stays there until the machine can be fully loaded, are solved by starting a hygienization cycle according to the present invention, so that any bad smells caused by the crockery in the tub can be reduced or eliminated.

[0040] In this case, the hygienization cycle takes place before the execution of the wash cycles, in a condition wherein the degree of humidity in the air inside the tub is substantially equal to that in the environment outside the tub.

[0041] In this description and in the appended claims, the term "hygienization cycle" refers to an operating step of the machine 1 wherein the pump 12 and the generator 11 are on. According to a variant of this method of operation, the hygienization cycle is carried out between two successive wash cycles.

[0042] In yet another variant, a hygienization cycle is carried out during every interval between one wash cycle and the next.

[0043] This advantageously allows for the execution of a plurality of hygienization micro-cycles which do not extend the duration of the normal wash cycles, while frequently hygienizing the tub and the crockery.

[0044] It should be noted that in all these variants the ozone diffusion medium is environmental air, not a liquid, and this allows to overcome the above-described drawbacks.

[0045] The following will describe an exemplificative program according to this latter machine operation variant, with the corresponding commands to be given to the above-described water pump 6 and air pump 12.

[0046] In this case, the operating program includes an initial step wherein, with the crockery loaded in the racks 3, water taken from the water mains (not shown) is supplied into the tub.

[0047] The water pump 6 is then turned on, while the air pump 12 remains off.

[0048] In this manner, the water collected in the sump 7 inside the tub is delivered to the sprayers 4, to be sprayed onto the crockery.

[0049] Both the pump 12 and the generator 11 are kept off, and the selected wash cycle (in this case a prewash cycle) is started.

[0050] If present, the valve 15 is kept closed to prevent any water from reaching the ozone generator.

[0051] Subsequently, the water is drained from the tub through the drain duct 9.

[0052] A hygienization cycle is then carried out, during which, with no liquid in the tub, the water pump 6 is kept off and the air pump 12 is turned on.

[0053] At the same time, the ozone generator 11 is turned on as well and, if present, the valve 15 is opened.

[0054] The air taken in from the outside environment through the duct 13 flows past the pump 12 and reaches the ozone generator 11, where it is charged with ozone in accordance with a per se known method, which will not be described any further herein.

[0055] The air thus charged is the medium used for diffusing ozone in the tub: in fact, it is delivered into the latter through the duct 8 and through the sump 7, which in this operating condition contains no liquids.

[0056] Through the effect of the ozone, the crockery and the tub itself are thus hygienized.

[0057] Although in this example the hygienization cycles have been carried out every two wash cycles, it can be easily understood that the number of the former and their distribution within the program of the machine 1 may be varied at will without departing from the teachings of the present invention.

[0058] Similar considerations apply to the case wherein only one hygienization cycle is carried out before starting the wash cycles: in this latter case, it should be noted that this phase can be identified by measuring the degree of humidity in the air inside the tub, which is substantially equal to the degree of humidity in the outside environment. Of course, ozone may be replaced with another gas or, more in general, with a fluid having the same effect, in particular an oxidizing gas, which will only require that the ozone generator 11 be replaced with a suitable generator of said gas or fluid.

[0059] A fan may also be used for improving ozone distribution in the tub.

[0060] Advantageously, in the case of a dishwashing machine equipped with a tub-mounted drying fan, said fan can be turned on to evenly distribute the ozone during the hygienization cycle.

[0061] Said fan is included in a closed circuit that takes air from the tub and recirculates it into the tub; it may be positioned, for example, in a duct external to the tub, so as to prevent any contact with the wash liquid.

Claims

1. A method of hygienization of a dishwashing machine, wherein said dishwashing machine (1) carries out at least one wash cycle in which a wash liquid is dispensed into a tub (2) of said dishwashing machine

(1), the method comprising a hygienization program comprising a hygienization cycle wherein an oxidizing fluid is dispensed into said tub (2), said wash cycle and said hygienization cycle being distinct from each other,

characterized in that

said hygienization cycle is carried out during at least one interval between one wash cycle and the next wash cycle.

2. A method according to claim 1, wherein said hygienization program is carried out every interval between one wash cycle and the next.

3. A method according to claim 1 or 2, comprising:

starting an initial wash cycle, preferably a prewash cycle, to spray wash liquid on crockery loaded in the dishwashing machine (1);
draining said wash liquid;
carrying out said hygienization cycle, wherein no wash liquid is in said tub during said hygienization cycle;
after the end of said hygienization cycle, carrying out a further wash cycle.

4. A method according to any one of claims 1 to 3, wherein said dishwashing machine (1) comprises a sump (7) for collecting said wash liquid to be sprayed on said crockery, and wherein said oxidizing fluid is dispensed into said tub through said sump (7) which in said hygienization cycle contains no wash liquid.

5. A method according to claim 4, wherein draining said wash liquid comprises draining said wash liquid from said sump (7) through a drain duct (9).

6. A method according to any one of claims 1 to 5, wherein said hygienization program comprises the step of dispensing ozone-containing gas into said tub (2).

7. A method according to any one of claims 1 to 6, wherein a medium of diffusion of ozone in said tub (2) is air.

8. A method according to any one of claims 1 to 7, comprising at least two wash cycles with one hygienization cycle in between.

9. A method according to any one of claims 1 to 8, wherein said dishwashing machine (1) comprises a first pump (6) for dispensing said wash liquid, and a second pump (12) for directing air taken from the environment outside said dishwashing machine (1) to an ozone generator (11) and from there to said tub (2), and wherein during said hygienization cycle said first pump (6) for dispensing said wash liquid is

off and said second pump (12) for air is on.

10. A method according to claim 9, wherein a valve (15) prevents washing liquid to reach said generator (11), and wherein said valve (15) is kept closed during said wash cycle. 5

11. A dishwashing machine (1) **characterized in that** it is adapted to perform a method of hygienization according to any one of claims 1 to 10. 10

12. A dishwashing machine (1) comprising:

a tub (2) for placing crockery to be subjected to the cleaning action of said dishwashing machine (1); 15
 at least one rotary sprayer (4) for spraying a wash liquid onto said crockery during a wash cycle;
 at least one pump (6) for said wash liquid; 20
 at least one sump (7) housed at the bottom of said tub (2) for collecting said wash liquid;
 a duct (10) in fluidic communication with said tub (2);
 an ozone generator (11) in fluidic communication with said duct (10) and with an air pump (12); 25
 an intake duct (13) which connects the environment outside said tub (1) to said air pump (12);
characterized in that said dishwashing machine (1) further comprises a tub-mounted drying fan, said fan being configured to be turned on so as to evenly distribute the ozone generated by said ozone generator (11) during an hygienization cycle. 30
 35

13. A dishwashing machine (1) according to claim 12, wherein said drying fan is included in a closed circuit configured for taking air from said tub (2) and recirculating it into said tub (2). 40

14. A dishwashing machine (1) according to claim 12 or 13, wherein said duct (10) ends into said sump (7). 45

15. A dishwashing machine (1) according to any one of claims 12 to 14, wherein during a wash cycle said pump (6) for said wash liquid is on and said air pump (12) is off, and during a hygienization cycle said pump (6) for said wash liquid is off and said air pump (12) is on. 50
 55

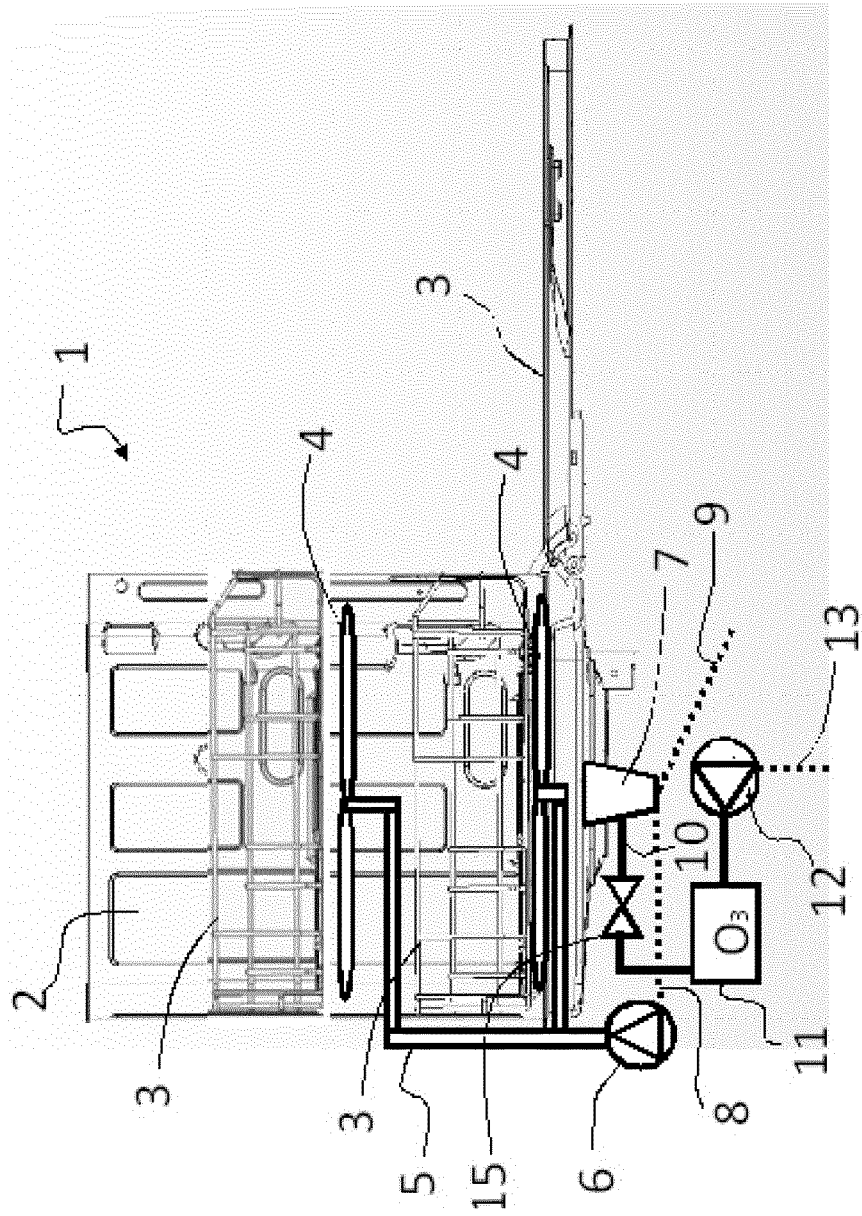


Fig.1

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

- DE 10200S024322 [0007]
- WO 200S039377 A [0008]
- US 200S0011329 A [0009]
- WO 02007099113 A [0009]
- US 5524358 A [0010]
- US 20100000577 A [0011]