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- (54) Title:** DISHWASHING MACHINE WITH WASHING CYCLES AND HYGIENISATION METHOD THEREOF

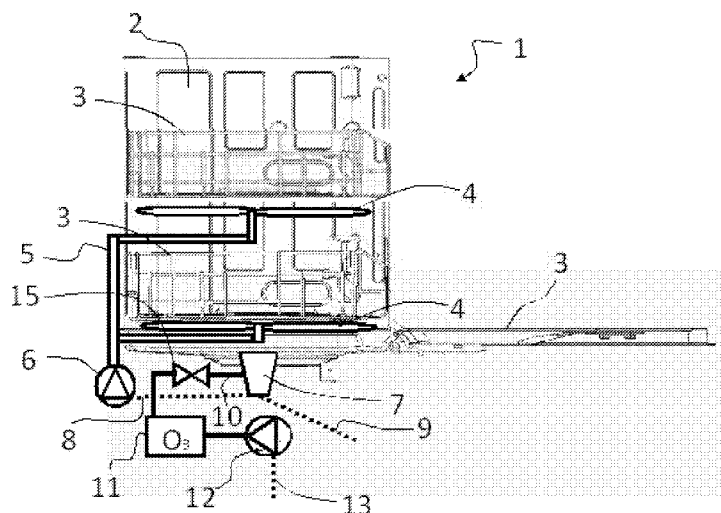


Fig. 1

- (57) Abstract:** A method of hygienization of a dishwashing machine, wherein said machine carries out at least one wash cycle in which a wash liquid is dispensed into a tub of said machine, comprising a hygienization program that comprises a hygienization cycle wherein on oxidizing fluid is dispensed into said tub, said wash cycle and said hygienization cycle being distinct from each other.



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## **DISHWASHING MACHINE WITH WASHING CYCLES AND HYGIENISATION METHOD THEREOF**

### **DESCRIPTION**

The present invention relates to a dishwashing machine with cleaning cycles according to the preamble of claim 1 and to a method of hygienization of said machine.

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).

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.

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.

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.

The present invention aims at overcoming these drawbacks.

One object of the present invention is a dishwashing machine according to the appended claim 1.

Another object of the present invention is a method of hygienization of a dishwashing machine according to claim 6.

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

The 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.

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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.

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 approximately equal to that in the outside environment.

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

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;

Referring now to Fig. 1, there is shown a schematic view of a dishwashing machine according to the present invention.

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

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.

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.

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.

In this description, the term "wash cycle" refers to any operating step of the machine 1

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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.

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.

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

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.

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

The pump may likewise be a fan or the like.

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.

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.

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.

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.

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 approximately equal to the degree of humidity in the environment outside the tub.

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

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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.

- 5 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.

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  
10 cycle according to the present invention, so that any bad smells caused by the crockery in the tub can be reduced or eliminated.

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 approximately equal to that in the environment outside the tub.

- 15 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.

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

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.

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

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.

- 30 In this case, the operating program includes an initial step wherein, with the crockery

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loaded in the racks 3, water taken from the water mains (not shown) is supplied into the tub.

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

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

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

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

10 Subsequently, the water is drained from the tub through the drain duct 9.

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.

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

15 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.

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  
20 operating condition contains no liquids.

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

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  
25 departing from the teachings of the present invention.

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.

30 Of course, ozone may be replaced with another gas or, more in general, with a fluid

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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.

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

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

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 machine carries out at least one wash cycle in which a wash liquid is dispensed into a tub of said machine,

**characterized in that**

5 it comprises a hygienization program comprising a hygienization cycle wherein an oxidizing fluid is dispensed into said tub, said wash cycle and said hygienization cycle being distinct from each other.

2. A method according to claim 1, wherein at least said hygienization program is carried out prior to said wash cycle.

10 3. A method according to claim 1 or 2, wherein said hygienization program is carried out in a condition wherein the degree of humidity in the tub is approximately equal to a degree of humidity in an environment outside the tub.

4. A method according to any one of the preceding claims, wherein said hygienization program comprises the step of dispensing ozone-containing gas into said tub.

15 5. A method according to any one of the preceding claims, wherein a medium of diffusion of ozone in said tub is air.

6. A method according to one or more of the preceding claims, comprising at least two wash cycles with one hygienization cycle in between.

20 7. A method according to one or more of the preceding claims, wherein said machine comprises a pump (6) for dispensing said wash liquid and a pump (12) for directing air taken from the environment outside said machine to an ozone generator (11) and from there to said tub, and wherein during said hygienization cycle said pump (6) for dispensing said wash liquid is off and said pump (12) for air taken from the outside environment is on.

25 8. A dishwashing machine (1) comprising:  
a tub (2) into which crockery to be subjected to the cleaning action of said machine (1) is placed  
at least one rotary sprayer (4) for spraying a wash liquid onto said crockery during a wash cycle

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at least one pump (6) for said wash liquid

at least one sump (7) housed at the bottom of said tub (2) for collecting said wash liquid

characterized in that

5 it further comprises

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), and an intake duct (13) which connects the environment outside said tub (1) to said air pump (12).

9. A dishwashing machine (1) according to claim 9, wherein said duct (10) ends into  
10 said sump (7).

10. A dishwashing machine (1) according to claim 9 or 10, 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.

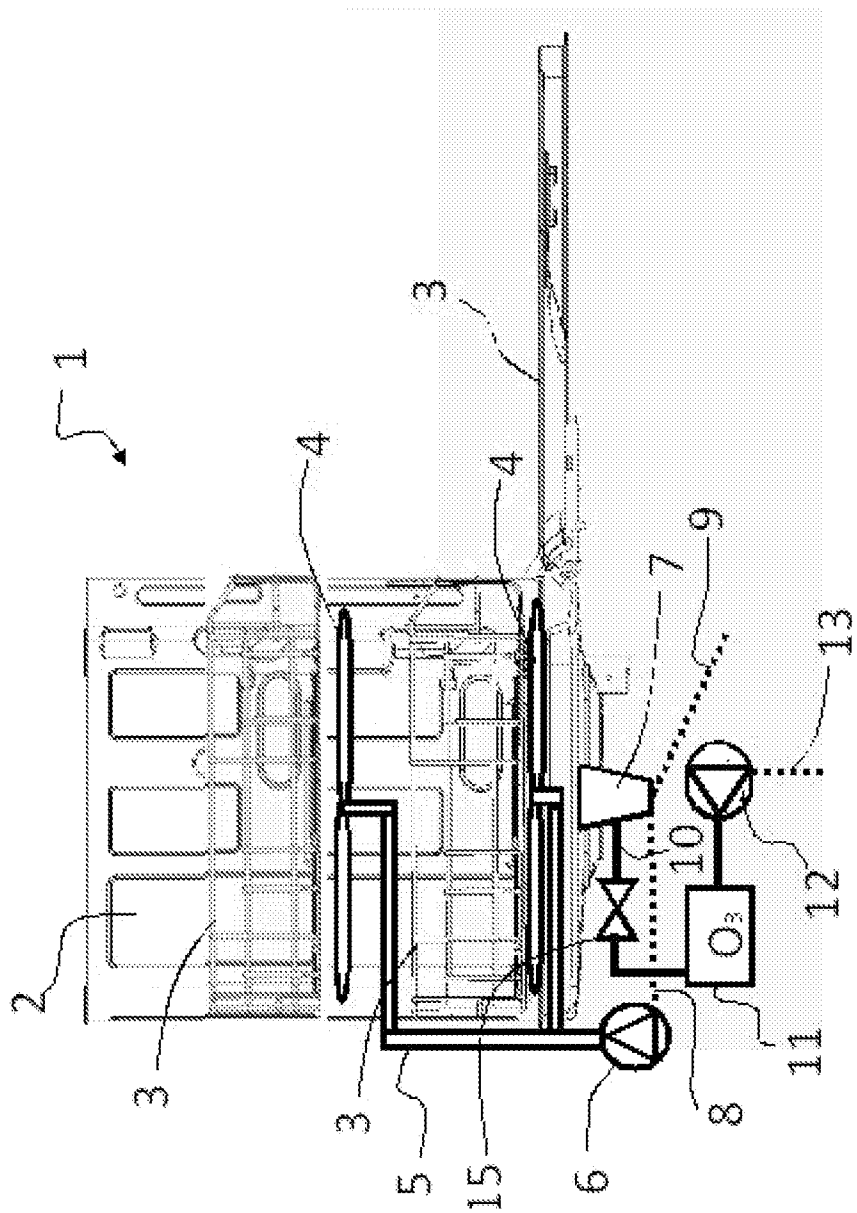


Fig.1