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(54) Dishwasher with steam generator

(57) A dishwasher comprises a steam generation circuit (7) and a wash tank (1) with an underlying collecting sump (2), that has a maximum filling level (3), from where the water is drawn off by a wash pump (4) and sent to at least one sprinkler (5), which makes up with the sump

(2) and the pump (4) the wash circuit of the dishwasher, the steam generation circuit (7) consisting of a duct (8) extending between the wash circuit and the tank (1) where it ends with a nozzle (9), and of a steam generator (10) arranged in the duct (8) at a height lower than the maximum filling level (3) of the sump (2).

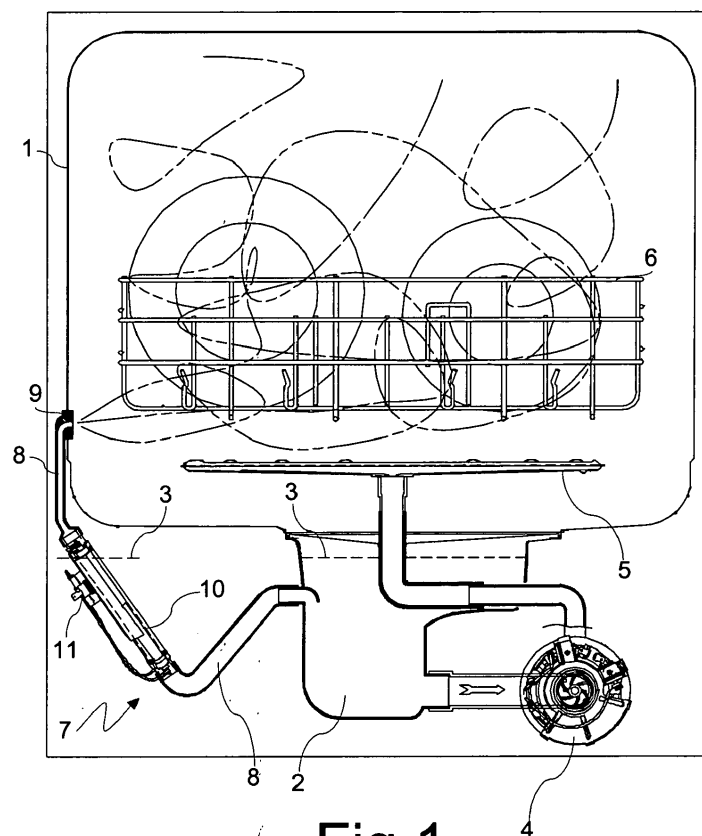


Fig.1

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Description

[0001] The present invention relates to dishwashers, and in particular to a dishwasher provided with a steam generator.

[0002] It is known that in a dishwasher one of the main factors in achieving an effective cleaning is the removal of the food residues from the dishes and this is usually obtained by spraying washing liquid at a pressure sufficiently high to mechanically perform said removal. However, a high pressure of the liquid implies the use of a greater amount of water as well as risks of damaging the dishes.

[0003] In order to facilitate the removal of the residues even with a not too high pressure of the liquid, some dishwashers include a steam generator that introduces hot steam in the wash tank so as to soften the residues that are thus easier to remove, in particular in the initial pre-wash step. Examples of dishwashers with a steam generator are disclosed in WO 2009/028786A1, EP 2039278A1 and EP 2193739A1.

[0004] These prior art dishwashers include a steam generator with its own water reservoir that is filled through a specific supply duct controlled by a dedicated valve. The steam is then introduced in the wash tank through a delivery duct extending between the reservoir and the tank. Such a structure has drawbacks both in manufacturing, due to the cost and bulkiness of the additional components, and in use for the risk of failures caused by the rapid buildup of limescale in the steam generation circuit.

[0005] This latter problem has been dealt with in different ways in the above-mentioned documents:

- in WO 2009/028786A1 network water is used to flush the steam generator after use, said flushing water being then discharged to the wash tank or directly to the drain pipe;
- in EP 2039278A1 the steam generator includes temperature and pressure sensors suitable to detect the clogging of the steam delivery duct and thus command the stop of the steam generator or the opening of a second delivery duct;
- in EP 2193739A1 the steam generator is provided with its own drain pump to remove the residual water after use, said residual water being discharged to the wash tank or directly to the drain pipe.

[0006] It is clear that the above-described arrangements imply an increase in water consumption and/or the addition of further components, thus enhancing the cost and bulkiness problems.

[0007] Therefore the object of the present invention is to provide a dishwasher provided with a simplified and preferably self-cleaning steam generation circuit so as to overcome the above-mentioned drawbacks. This object is achieved by means of a dishwasher provided with a steam generation circuit extending between the wash

circuit and the wash tank, the steam generator being arranged at a height lower than the maximum filling level of the collecting sump located at the bottom of the wash tank. Other advantageous features of the present dishwasher are disclosed in the dependent claims.

[0008] The main advantage of this dishwasher resides in using the collecting sump as a reservoir for the steam generator, thus greatly simplifying the structure of the steam generation circuit. In this way, in fact, it is possible to dispense with a specific reservoir for the steam generator and with the relevant valved supply duct with clear advantages in terms of cost and bulkiness.

[0009] A further advantage of the present dishwasher stems from the fact that, in a preferred embodiment, the cleaning of the steam generator is performed automatically at the beginning of the wash cycle without requiring additional components or a greater water consumption.

[0010] These and other advantages and characteristics of the dishwasher according to the present invention will be clear to those skilled in the art from the following detailed description of two embodiments thereof, with reference to the annexed drawings wherein:

Fig.1 is a diagrammatic front view of a first embodiment of the dishwasher;

Fig.2 is a diagrammatic front view of a second embodiment of the dishwasher, with the steam generation circuit configured for the steam generation and self-cleaning function; and

Fig.3 is a view similar to Fig.2 that shows the steam generation circuit configured for the normal operation of the dishwasher.

[0011] With reference to Fig.1, there is seen that a dishwasher according to the present invention is conventionally provided with a wash tank 1 having an underlying collecting sump 2, that has a maximum filling level 3, from where the water is drawn off by a wash pump 4 and sent to a sprinkler 5 for washing the dishes housed in a rack 6 (just one sprinkler 5 and one rack 6 are shown for the sake of simplicity, but the dishwasher will usually have two of each).

[0012] The novel aspect of the present invention resides in the fact that between tank 1 and the underlying wash circuit made up of sump 2, wash pump 4 and sprinkler(s) 5 there is arranged a steam generation circuit 7. Said circuit 7 consists of a duct 8 branching out of sump 2 and ending with a nozzle 9 that projects into wash tank 1, preferably from a side wall at a position higher than sprinkler 5, as well as a steam generator 10 arranged in duct 8 at a height lower than the maximum filling level 3 of sump 2, the operation of the steam generator 10 being controlled by a thermostat 11 located thereon.

[0013] The simple and effective operation of the present dishwasher is therefore readily understood in the light of the description given above.

[0014] At the beginning of the operating cycle sump 2 is filled with water, usually coming from a decalcifier (not

shown), up to level 3 such that due to the communicating vessels principle also duct 8 is filled with water up to level 3 and the steam generator 10 is submersed. Then the steam generator 10, which is a resistor in practice, is activated to heat the water therein until it is turned into steam that through duct 8 and nozzle 9 reaches tank 1 where it expands and invests all the dishes.

[0015] The continuous generation of steam causes the water level to decrease until it arrives below thermostat 11 that, being no longer cooled by water, due to the heat coming from the steam generator 10 reaches its intervention temperature and thus opens the circuit stopping the operation of the steam generator 10.

[0016] The switching of thermostat 11 is detected by the control unit of the dishwasher that opens the electrovalve for loading the water and keeps it open until level 3 is restored, as detected by the cooling and new switching of thermostat 11. As an alternative, it is even possible to bypass the control unit by connecting thermostat 11 directly to the load electrovalve according to a scheme well known in the field.

[0017] In the simple embodiment illustrated above the risks of clogging of the steam generation circuit 7 are already significantly lower than in prior art dishwashers, but to further minimize said risks it is possible to adopt the configuration of the second embodiment illustrated in figures 2 and 3.

[0018] In this second embodiment duct 8 does not branch out from sump 2 but rather from the delivery duct 12 connecting the wash pump 4 to sprinkler 5, and is also preferably provided with a valve 13 located upstream from the steam generator 10. In this way, the operation of the steam generator 10 is the same as illustrated above but when the wash pump 4 is activated after the steam generation step, valve 13 being open, duct 8 is flushed with pressurized water that cleans it from possible limescale.

[0019] In order to prevent a slight increase in water consumption during the wash due to the additional recirculation consisting in the steam generation circuit 7, valve 13 is then closed so as to cut off said circuit 7 and proceed with the normal operation of the dishwasher (Fig.3). It should be noted, however, that this slight increase in water consumption could be offset by the saving in not installing valve 13 whereby said second embodiment could even do without said valve 13.

[0020] It is clear that the above-described and illustrated embodiments of the dishwasher according to the invention are just examples susceptible of various modifications. In particular, the exact structure and position of circuit 7 can change somewhat according to specific manufacturing needs, as long as it is in communication with the wash circuit and the steam generator 10 is located below level 3. For example, nozzle 9 could be located on the ceiling or the bottom of the wash tank and the operation of the steam generator 10 could be controlled directly by the control unit rather than by thermostat 11.

Claims

1. Dishwasher comprising a steam generation circuit (7) and a wash tank (1) with an underlying collecting sump (2), that has a maximum filling level (3), from where the water is drawn off by a wash pump (4) and sent to at least one sprinkler (5), which makes up with said sump (2) and said pump (4) the wash circuit of the dishwasher, **characterized in that** said steam generation circuit (7) consists of a duct (8) extending between said wash circuit and said wash tank (1) where it ends with a nozzle (9), and of a steam generator (10) arranged in said duct (8) at a height lower than said maximum filling level (3) of the sump (2).
2. Dishwasher according to claim 1, **characterized in that** the duct (8) branches out from the collecting sump (2).
3. Dishwasher according to claim 1, **characterized in that** the duct (8) branches out from the delivery duct (12) connecting the wash pump (4) to the sprinkler (5).
4. Dishwasher according to claim 3, **characterized in that** the duct (8) is provided with a valve (13) located upstream from the steam generator (10).
5. Dishwasher according to any of the preceding claims, **characterized in that** the nozzle (9) projects from a side wall of the wash tank (1) at a position higher than the sprinkler (5).
6. Dishwasher according to any of the preceding claims, **characterized in that** it further includes a thermostat (11) arranged on the steam generator (10) and suitable to control the operation thereof.
7. Dishwasher according to claim 6, **characterized in that** the thermostat (11) is operatively connected to a control unit of the dishwasher.
8. Dishwasher according to claim 6, **characterized in that** the thermostat (11) is operatively connected to an electrovalve for loading network water.

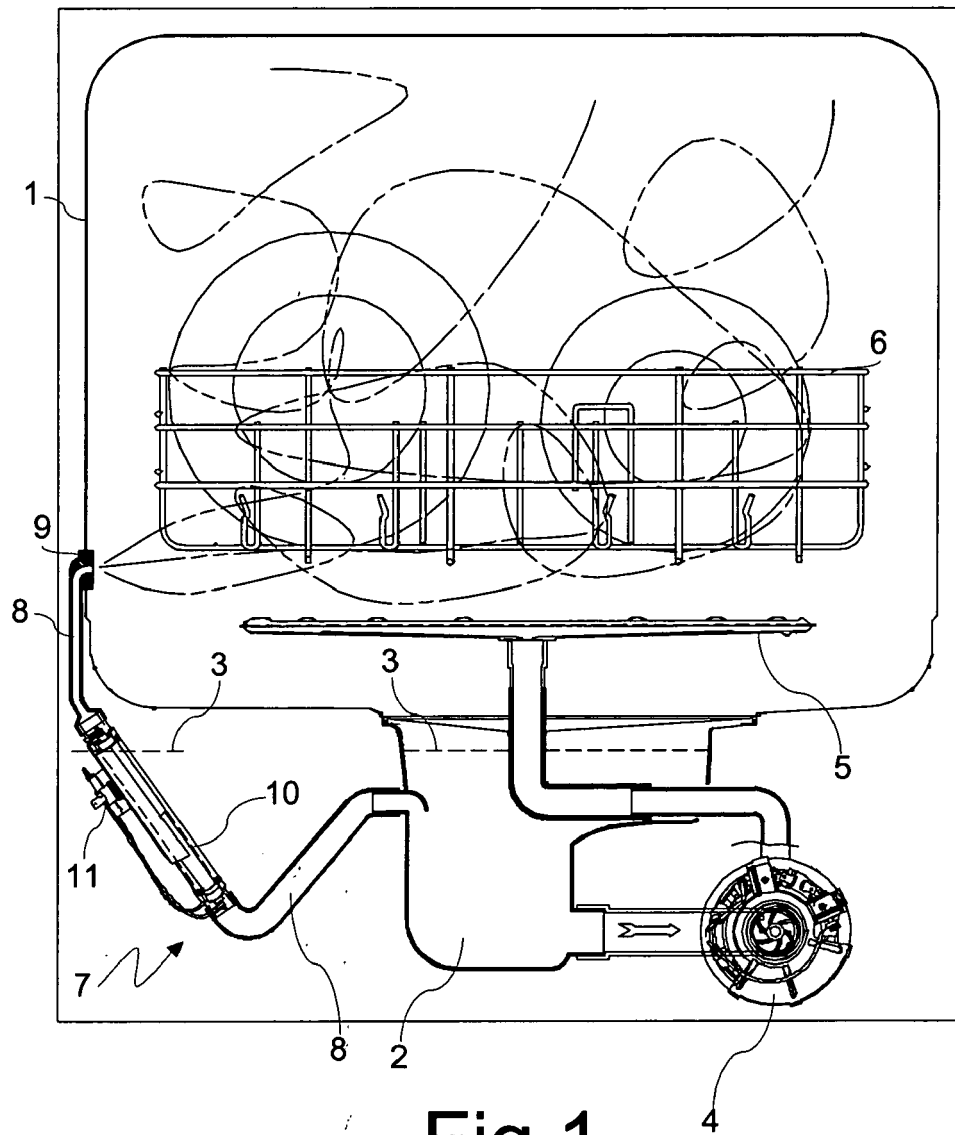


Fig.1

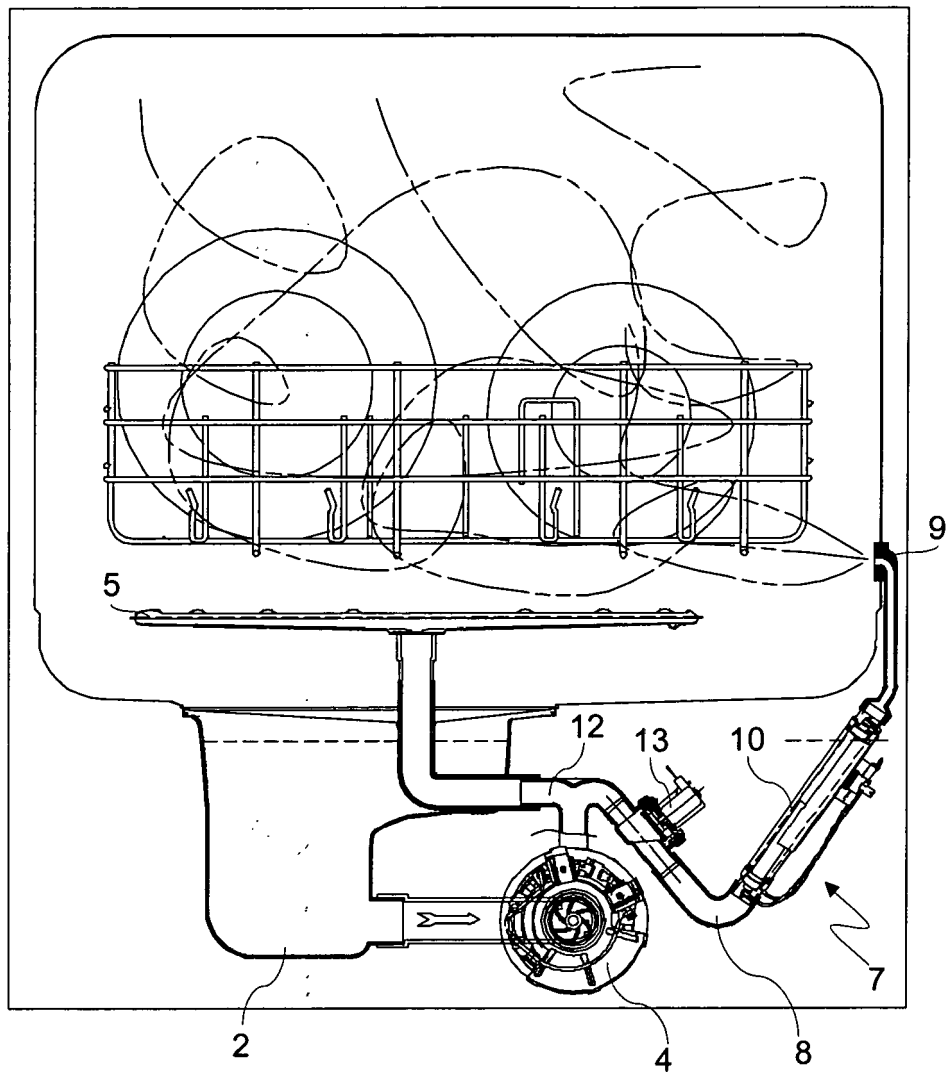


Fig.2

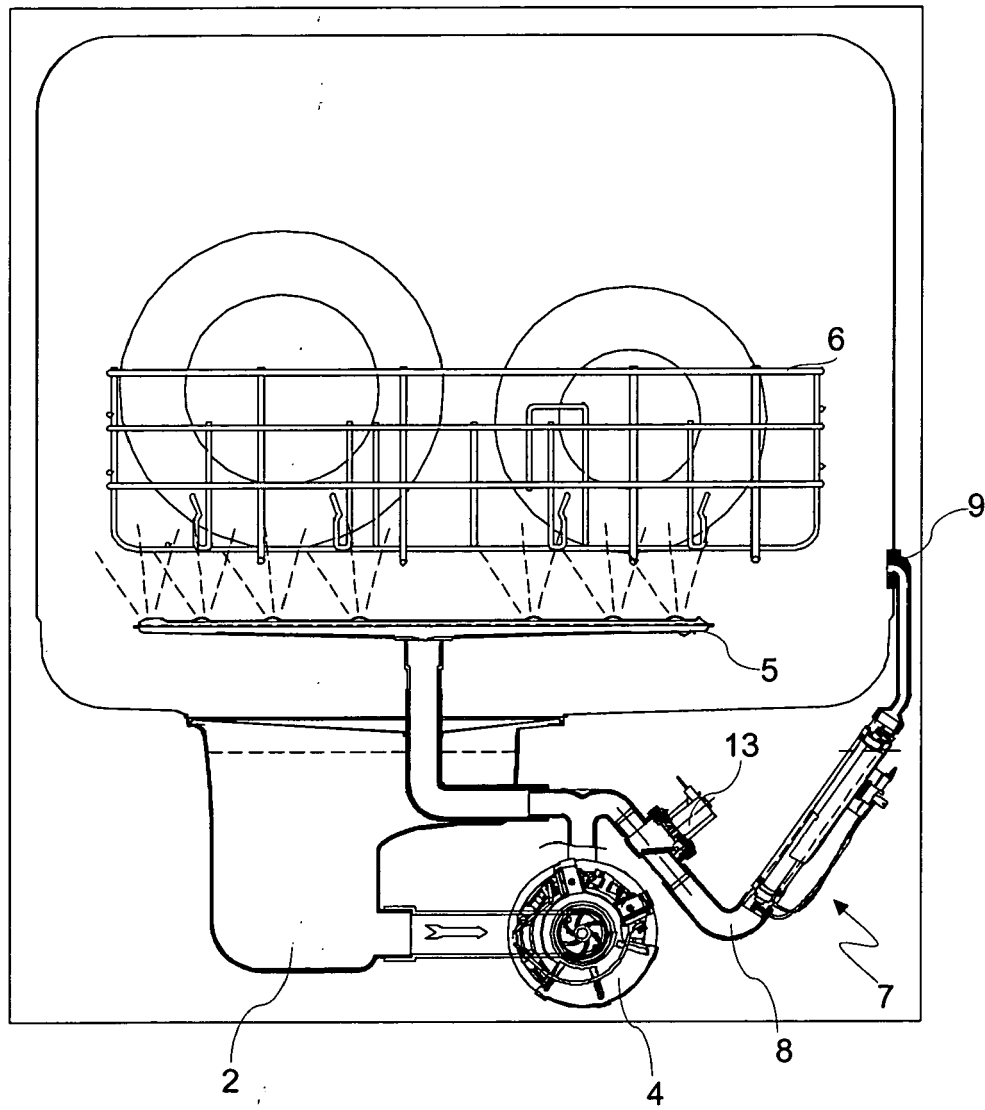


Fig.3



EUROPEAN SEARCH REPORT

Application Number
EP 11 42 5196

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	DE 203 05 082 U1 (CHEN CHUNG MING [TW]) 5 June 2003 (2003-06-05) * page 4, line 13 - page 5, line 27; figure 2 *	1-8	INV. A47L15/42
X	US 2008/236625 A1 (KIM SEONG HO [KR] ET AL) 2 October 2008 (2008-10-02) * paragraph [0050] - paragraph [0053]; figure 1 *	1-8	
			TECHNICAL FIELDS SEARCHED (IPC)
			A47L
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 12 January 2012	Examiner Hannam, Martin
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 11 42 5196

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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12-01-2012

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REFERENCES CITED IN THE DESCRIPTION

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- WO 2009028786 A1 [0003] [0005]
- EP 2039278 A1 [0003] [0005]
- EP 2193739 A1 [0003] [0005]