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(54) **Antibacterial element and household dishwasher featuring such an element**

(57) A household dishwasher (1) having a wash chamber (2a), in which the dishes are washed; a wash water sump (12) located at the bottom of the wash chamber (2a) and for temporarily receiving the water used in the wash cycle; a wash water drain circuit (13) for draining the water in the sump (12) out of the dishwasher (1); and a bactericide element (20) for preventing the formation

of bacteria and mould caused by decomposition of organic waste in the stagnant wash water in the sump (12) and the drain circuit (13); the bactericide element (20) being defined by a supporting body (21) of plastic material, and by a predetermined amount of grains (22) of antibacterial powder, which are embedded in the outer surface (21a) of the supporting body (21) so as to project partly outwards of the supporting body.

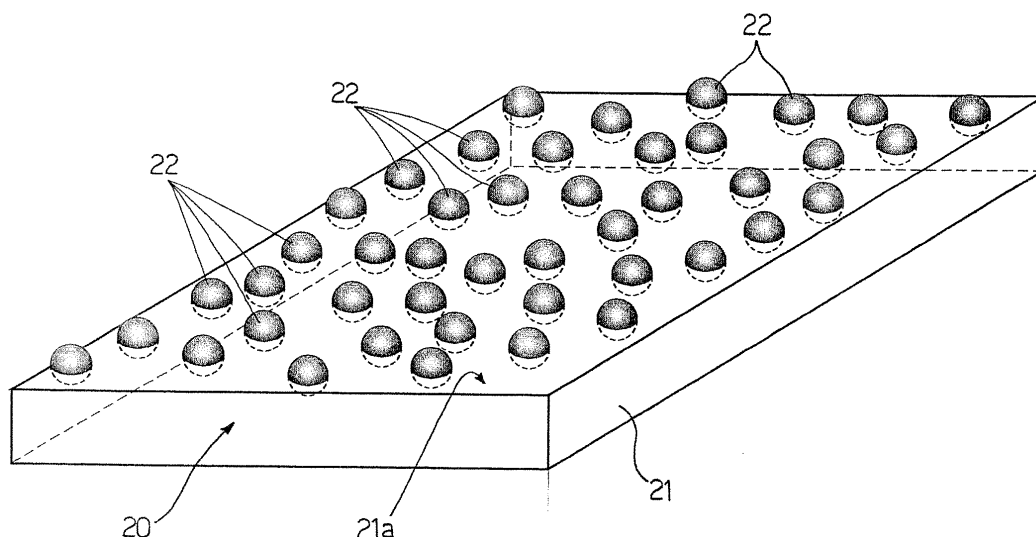


Fig. 2

Description

[0001] The present invention relates to an antibacterial element.

[0002] More specifically, the present invention relates to an antibacterial element particularly suitable for use in the manufacture of certain component parts of the wash water drain circuit of a household dishwasher, to which the following description refers purely by way of example.

[0003] As is known, household dishwashers normally comprise a wash water sump located at the bottom of the wash chamber of the dishwasher to temporarily receive the water used in the wash cycle; and a wash water drain circuit substantially comprising an electrically powered fluid pump, the intake of which communicates directly with the bottom of the sump, and which, at the end of each wash cycle, pumps the dirty water in the sump out of the dishwasher.

[0004] Unfortunately, in most currently marketed household dishwashers, the wash water drain circuit is so designed that, at the end of each wash cycle, the wash water drain pump is unable to drain the sump completely, so that a certain amount of wash water always remains trapped inside the sump pending the start of the next wash cycle.

[0005] If the dishwasher is only used occasionally, the impossibility of draining all the wash water from the sump obviously poses serious hygiene problems, which can only be solved preventively using a fairly high-cost antibacterial detergent. As is known, in fact, in addition to detergent, the stagnant wash water in the sump also contains in suspension a certain amount of waste food which, in the absence of antibacterial detergent, decomposes inside the sump after a few days, thus resulting in odour and other unpleasant consequences.

[0006] It is an object of the present invention to provide a dishwasher designed to eliminate the aforementioned drawbacks.

[0007] According to the present invention, there is provided an antibacterial element as claimed in Claim 1 and, preferably, though not necessarily, in any one of the dependent Claims, and which is particularly suitable for manufacturing one or more component parts of the wash water drain circuit of a household dishwasher.

[0008] According to the present invention, there is also provided a household dishwasher as claimed in Claim 5 and, preferably, though not necessarily, in any one of the Claims depending directly or indirectly on Claim 5.

[0009] A non-limiting embodiment of the present invention will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 shows a side view of a household dishwasher in accordance with the teachings of the present invention;

Figure 2 shows a larger-scale view in perspective of a detail of the antibacterial element in accordance with the teachings of the present invention.

[0010] With reference to Figure 1, number 1 indicates as a whole a pull-out-basket dishwasher which substantially comprises a preferably, though not necessarily, parallelepiped-shaped outer casing 2 enclosing a wash chamber 2a communicating with the outside through an opening formed in one of the vertical lateral walls of casing 2; a door 3 hinged to casing 2, alongside the access opening to wash chamber 2a, to rotate, about a preferably, though not necessarily, horizontal axis of rotation, to and from a closed position resting against the lateral wall of casing 2 to hermetically close the access opening to wash chamber 2a; and one or more baskets housed one over the other inside wash chamber 2a and resting on known runners (not shown) by which to slide the baskets out through the access opening to wash chamber 2a.

[0011] More specifically, in the example shown, dishwasher 1 comprises two baskets 4 and 5 housed one over the other inside wash chamber 2a; and at least one rotary spray wash member, which is housed inside wash chamber 2a, is connected to and supplied with pressurized water by the dishwasher hydraulic circuit (not shown), and has a number of spray nozzles designed to direct pressurized-water jets onto baskets 4 and 5 inside wash chamber 2a, so as to wash the dishes inside the baskets.

[0012] More specifically, in the example shown, dishwasher 1 comprises two rotary spray wash members, a first of which - hereinafter indicated 6 - is located at the bottom of wash chamber 2a, and comprises a hub 7 projecting from the bottom of wash chamber 2a, and an impeller 8 fitted to hub 7 to rotate freely about a vertical axis of rotation, and having a number of spray nozzles designed to direct pressurized-water jets onto baskets 4 and 5 inside wash chamber 2a. Pressurized water is supplied to impeller 8 along a feed conduit formed inside hub 7.

[0013] A second rotary spray wash member - hereinafter indicated 9 - is integrated in the top basket 5, and comprises a hub 10 projecting from the bottom of basket 5 and facing the bottom of wash chamber 2a (and therefore the bottom basket 4); and an impeller 11 fitted to hub 10 to rotate freely about a vertical axis of rotation which is locally perpendicular to the plane of the bottom of basket 5, and is preferably, though not necessarily, aligned with the axis of rotation of impeller 8 of rotary spray wash member 6.

[0014] Like impeller 8 of rotary spray wash member 6, impeller 11 has a number of spray nozzles designed to direct pressurized-water jets onto top basket 5 and possibly onto bottom basket 4, and hub 10 has an inner conduit for feeding pressurized water to impeller 11.

[0015] With reference to Figure 1, dishwasher 1 also comprises a wash water sump 12 located at the bottom of wash chamber 2a and for temporarily receiving the water used in the wash cycle; and a wash water drain circuit 13 which, on command, drains the dirty water in sump 12 out of dishwasher 1.

[0016] In the example shown, the bottom of wash

chamber 2a is defined by a complex-shaped tank 14 made of pressed metal or moulded plastic, and sump 12 is substantially defined by a complex-shaped, cup-shaped container 15 made of metal or plastic material, and which is fitted in fluidtight manner to a projecting sleeve formed on the bottom of tank 14, at a through hole 14a, and communicates at the bottom with wash water drain circuit 13.

[0017] Cup-shaped container 15 may obviously be pressed or moulded, from metal or plastic, in one piece with tank 14.

[0018] Sump 12 preferably, though not necessarily, also comprises a filter cover 16 closing the top opening of cup-shaped container 15 and designed to prevent large pieces of waste food, removed from the dishes in baskets 4 and 5 during the wash cycle, from reaching the bottom of cup-shaped container 15 and clogging the inlet of wash water drain circuit 13.

[0019] More specifically, in the example shown, filter cover 16 is defined by a cup-shaped body 16 with perforated metal or plastic walls and sized to fit inside through hole 14a at the bottom of tank 14, so that its top peripheral edge 16a rests on the bottom of tank 14, on the opposite side to cup-shaped container 15, and the rest of its body projects inside cup-shaped container 15. The perforated walls of cup-shaped body 16 are obviously sized to let water and suspended particles through, but to retain inside cup-shaped body 16 large pieces of waste food capable of clogging the inlet of wash water drain circuit 13.

[0020] Wash water drain circuit 13 substantially comprises an electrically powered pump 17, the intake of which communicates directly with the bottom of sump 12, or rather with the bottom of cup-shaped container 15, and which, on command, drains the wash water in sump 12 out of dishwasher 1.

[0021] In the example shown, pump 17 is located beneath tank 14, adjacent to sump 12, and drain circuit 13 also comprises two connecting conduits, a first of which - hereinafter indicated 18 - connects the intake of pump 17 directly to the bottom of sump 12, or rather to the bottom of cup-shaped container 15, and a second of which - hereinafter indicated 19 - connects the delivery of pump 17 directly to the drain pipe (not shown) outside dishwasher 1.

[0022] Optionally, cup-shaped container 15, the outer casing of pump 17, and connecting conduit 18 may be pressed or molded in one piece.

[0023] With reference to Figures 1 and 2, dishwasher 1 also comprises a bactericide element 20 for preventing the formation of bacteria and mould caused by decomposition of organic waste in the stagnant wash water inside sump 12 and drain circuit 13.

[0024] Bactericide element 20 is positioned inside sump 12 and/or wash water drain circuit 13 so as to be wet by the stagnant wash water inside sump 12 and drain circuit 13, and is defined by a supporting body 21 of plastic material, and by a predetermined amount of monolithic grains 22 of antibacterial powder, which are embedded

irremovably in at least a portion of the outer surface 21a of supporting body 21, and project partly outwards of supporting body 21 so as to come into direct contact with the stagnant wash water inside sump 12 and drain circuit 13.

[0025] More specifically, grains 22 comprise antibacterial powder with a base preferably, though not necessarily, of silica and silver and/or titanium oxides or similar.

[0026] In the example shown, bactericide element 20 is fixed to filter cover 16, or rather to the bottom of cup-shaped body 16, so as to be located adjacent to the bottom of cup-shaped container 15 and hence immersed completely in the stagnant wash water in sump 12 and drain circuit 13, and is defined by a supporting disk or pad 21 made of nylon or other plastic material, and which comprises, on both faces, a predetermined amount of grains 22 of silica and silver oxide based antibacterial powder, which are partly embedded in the outer surface 21a of supporting disk or pad 21 so as to come into direct contact with the stagnant wash water in sump 12 and drain circuit 13.

[0027] Operation of dishwasher 1 and bactericide element 20 can be deduced from the foregoing description with no further explanation required, except to state that, on coming into contact with the stagnant wash water in sump 12 and drain circuit 13, grains 22 of antibacterial powder gradually release highly antibacterial silver ions capable of effectively preventing the formation of bacteria and mould caused by decomposition of organic waste in the water.

[0028] The advantages of dishwasher 1 as described above are obvious : bactericide element 20 prevents the formation of mould and bacteria in sump 12 and drain circuit 13, even when the sump and drain circuit contain, for a prolonged period of time, a certain amount of stagnant water containing decomposable organic waste (i.e. food particles removed from the dishes during the wash cycle and reaching the bottom of sump 12).

[0029] Unlike known plastic bactericide materials, bactericide element 20 is so designed to prevent the formation of mould and bacteria for relatively prolonged periods of time with no noticeable fall-off in efficiency.

[0030] In known plastic bactericide materials, in fact, the antibacterial additive is completely dissolved and evenly incorporated in the plastic polymer, so that its antibacterial effect soon ceases, when the additive molecules on the surface of the plastic polymer stop releasing silver ions. In these materials, in fact, the silver ions released by the additive molecules trapped in the plastic polymer cannot migrate towards the surface of the plastic material.

[0031] In the case of bactericide element 20, on the other hand, all the grains 22 of antibacterial powder are already concentrated on the surface of the plastic polymer where the silver ions can easily spread into the stagnant water, and each grain 22 contains a quantity of active principle (silver ions) several times greater than the active principle surface density of known plastic bactericide materials, with all the advantages this affords in

terms of constant, long-lasting antibacterial action of the material.

[0032] Clearly, changes may be made to dishwasher 1 as described herein without, however, departing from the scope of the present invention.

[0033] For example, bactericide element 20 may be defined by any other part of sump 12 and/or wash water drain circuit 13 wet by the stagnant wash water inside the sump and drain circuit, on condition, obviously, that the part is defined by a supporting body 21 of plastic material, and by a predetermined amount of grains 22 of antibacterial powder embedded irremovably in and projecting partly outwards of the outer surface 21a of supporting body 21, so as to come into contact with the stagnant wash water in sump 12 and drain circuit 13.

[0034] More specifically bactericide element 20 may advantageously be defined by part of the bottom or of the lateral wall of cup-shaped container 15, by part of the bottom or of the lateral wall of filter cover 16, by part of connecting conduit 18, and/or by part of the outer casing or of the impeller of pump 17.

6. A dishwasher as claimed in Claim 5, **characterized in that** said bactericidal element (20) is as claimed in any one of Claims 1 to 4.

5 7. A dishwasher as claimed in Claim 6, **characterized in that** said antibacterial element (20) is defined by a component or part of a component of said sump (12) and/or of said wash water drain circuit (13).

Claims

1. An antibacterial element (20), **characterized by** comprising a supporting body (21) of plastic material, and a predetermined amount of grains (22) of antibacterial powder, which are embedded in at least part of the outer surface (21a) of said supporting body (21) and project partly outwards of the supporting body. 25
2. An antibacterial element as claimed in Claim 1, **characterized in that** said antibacterial powder comprises silver oxides. 30
3. An antibacterial element as claimed in Claim 1, **characterized in that** said antibacterial powder comprises titanium oxides. 35
4. An antibacterial element as claimed in Claim 2 or 3, **characterized in that** said antibacterial powder comprises silica. 40
5. A household dishwasher (1) comprising a wash chamber (2a), in which the dishes are washed; a wash water sump (12) located at the bottom of said wash chamber (2a) and for temporarily receiving the water used in the wash cycle; and a wash water drain circuit (13) for draining the water in the sump (12) out of the dishwasher (1); said dishwasher (1) being **characterized by** comprising at least one bactericidal element (20) for preventing the formation of bacteria and mould caused by decomposition of organic waste in the stagnant wash water in said sump (12) and said drain circuit (13). 45 50 55

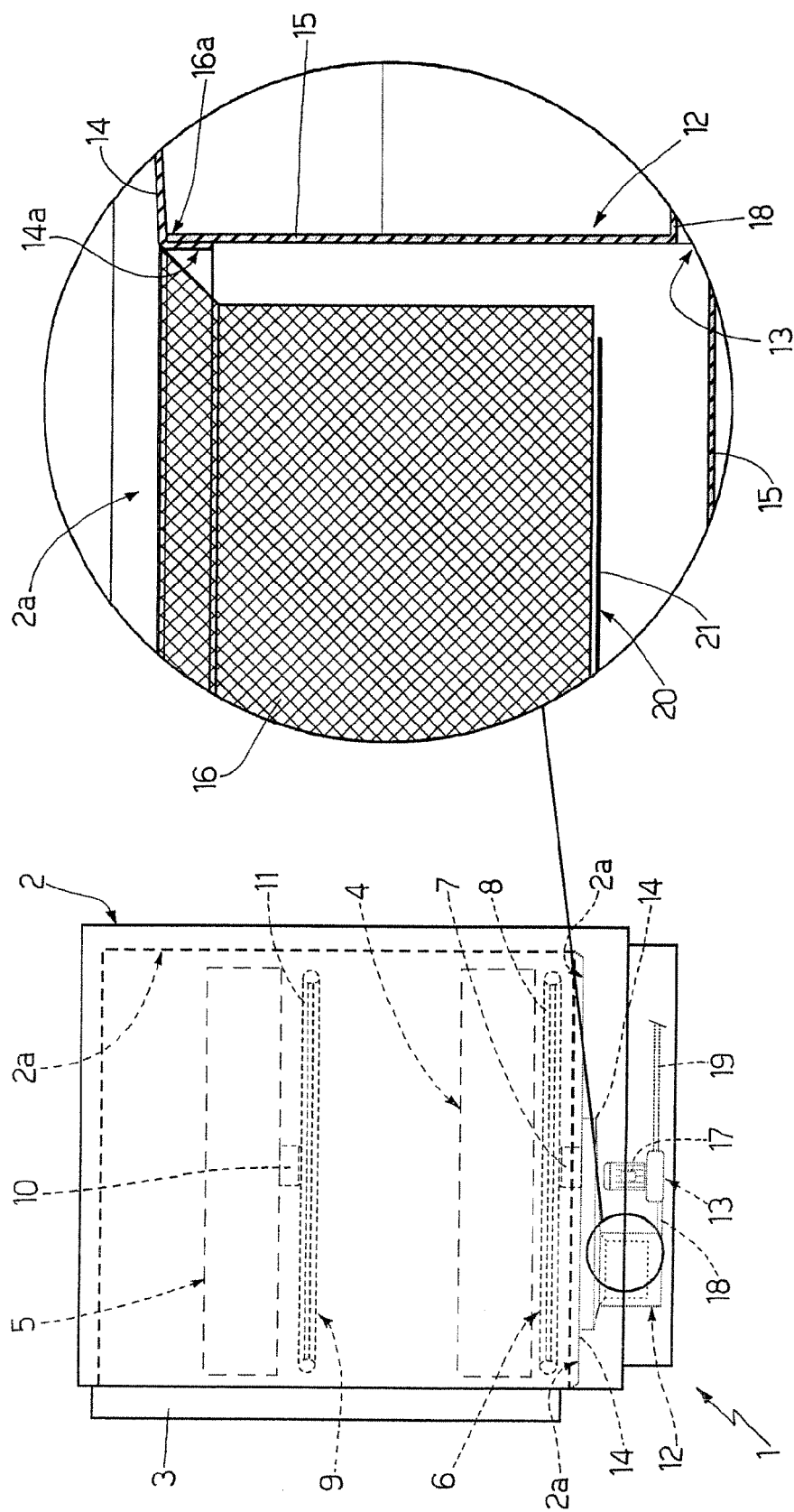


Fig. 1

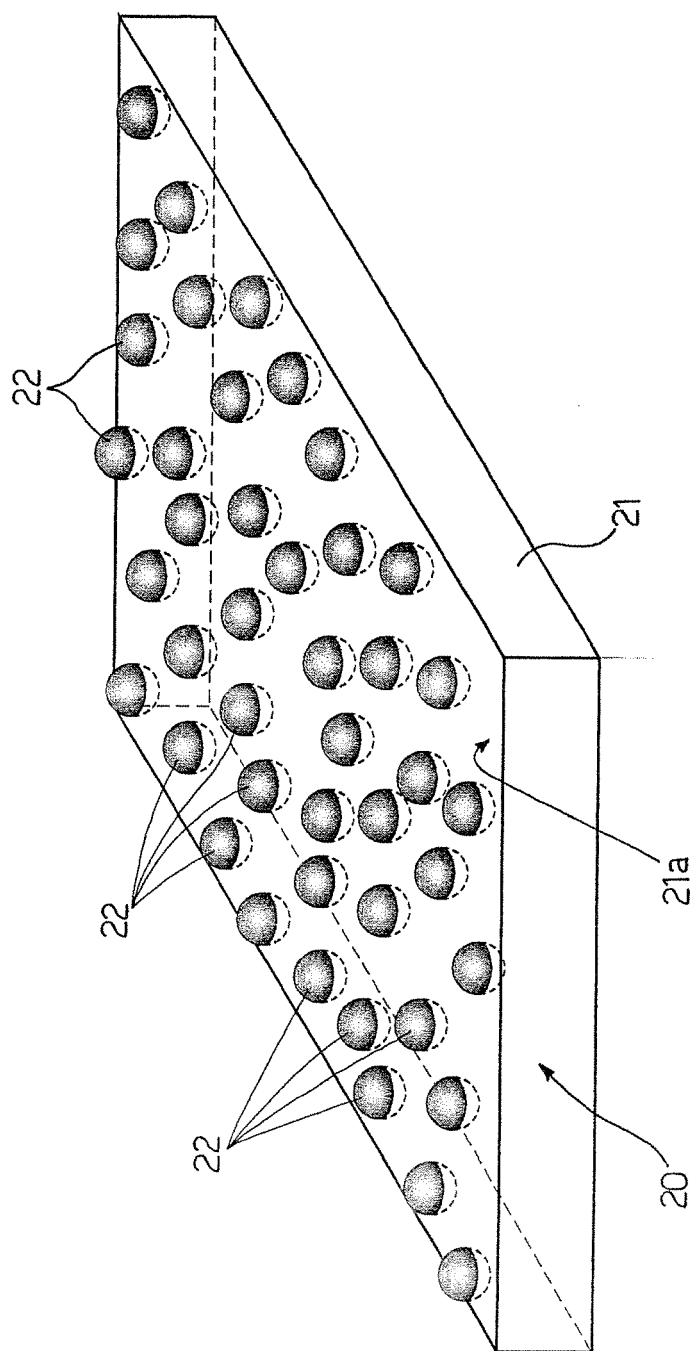


Fig. 2



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 06 12 1585

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	EP 1 550 396 A2 (LG ELECTRONICS INC [KR]) 6 July 2005 (2005-07-06) * paragraph [0033] - paragraph [0064]; figures *	1-7	INV. A47L15/42
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X	US 2005/131100 A1 (HERBST HEINZ [DE] ET AL) 16 June 2005 (2005-06-16) * paragraphs [0002] - [0005], [0037], [0038], [0128], [0129] *	1-4	
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A	US 2005/191355 A1 (FOSS STEPHEN W [US]) 1 September 2005 (2005-09-01) * paragraph [0067] *	1	TECHNICAL FIELDS SEARCHED (IPC)
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 14 February 2007	Examiner Lopez Vega, Javier
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
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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