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(54) Household dishwashing machine with dispensing device of washing agents and wash program thereof

(57) A household dishwashing machine is described, comprising: a programmer, being apt to control execution of a plurality of various wash programs (basic cycle, intensive cycle, economy cycle, etc.), at least one of these programs comprising a plurality of sequential steps (prewash, main wash, rinses, etc.); a washing agents dispenser (1), comprising at least a compartment (3) for containing a single dose of washing agent, required for performing a single wash program.

According to the invention, said dispenser (1) comprises means (7) for dividing said single dose of washing agent in a plurality of sub-doses of a predefined volume, and said programmer is set for controlling said means (7), in order to dispense at least a relevant sub-dose of washing agent during at least two different steps, or dispensing a plurality of said sub-doses at least within one same step.

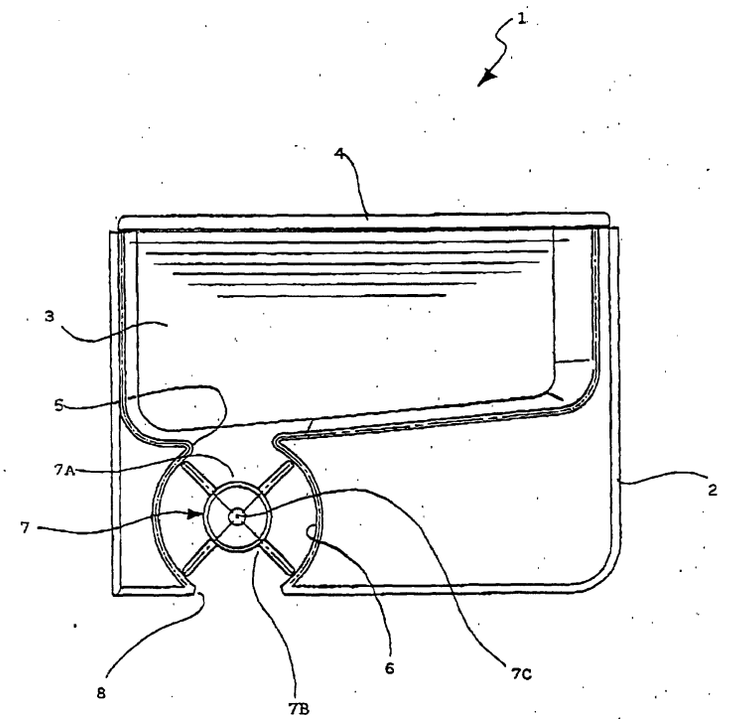

FIG. 1

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Description

[0001] The present invention concerns a household dishwashing machine comprising a dispensing device of washing agents and a wash program thereof.

[0002] As known, household dishwashing machines usually perform a plurality of different operation cycles or programs, which can be selected by the user according to washing requirements.

[0003] For instance, dishwashing machines presently on the market usually perform the following wash programs:

- a basic wash program, for washing normally dirty crockery dried up to a certain extent; this program usually comprises one or two initial cold prewash steps, a hot wash, at least a cold rinse, a hot rinse and a final drying step;
- an intensive wash program, for washing very dirty crockery, or in case of food rests particularly difficult to remove (very dry or burnt spots); this program usually comprises one or two initial hot prewash steps, a hot wash, a first cold rinse, a second cold rinse, a third hot rinse and a final drying step;
- an economy wash program, for washing lightly dirty crockery or partial loads of crockery; this program usually comprises an initial cold prewash, a hot wash, a first cold rinse, a second hot rinse and a final drying step;
- a fast wash program, for a washing like the previous cycle, should a faster washing of partial crockery loadings be wished; this program usually comprises an initial hot wash, only one cold or hot rinse, and a likely final drying step;
- a soaking program, which cannot be defined as a real wash program, since it simply performs a watering of the crockery; this program is used to prevent consistent dirt particles from getting too hard when a complete washing of the crockery has to be postponed to a later time.

[0004] All these programs (save for the soaking program) provide a normally hot main wash, which is the greater responsible for the quality of the whole wash program selected on the machine.

[0005] In main terms, the so-called "washing" and "hot rinse" steps are always performed adding proper washing agents and rinse aids, which are filled by the user in a suitable dispensing device; in some instance, at least one of the so-called "prewash" steps can also be performed adding a detergent.

[0006] To this purpose, appropriate dispensing devices can be provided in the dishwasher, which comprise separate compartments or tanks for containing specific washing agents for the above steps provided by a wash program; typically, these washing agents are provided in solid form, i.e. either powder or a tablet, being dispensed during the washing step, and a liquid additive, e.g. a rinse aid being dispensed during the hot rinse step.

[0007] The dispensing device usually consists of a body housed in the inner door of the front loading door of the dishwashing machine; this body comprises at least a compartment for containing a single dose of washing agent required for executing the washing step; this compartment has a small cover, which is opened at the appropriate time of the wash cycle by the programming device of the machine; thus, the entire single dose of washing agent in solid form is discharged in the washing tub substantially at the beginning of the hot wash step.

[0008] Inside the body of the dispensing device, in addition to the above compartment containing a single dose of washing powder, a dispenser is also usually provided for the liquid rinse aid to be dispensed during the hot rinsing step.

[0009] With regard to a possible use of the washing agent also during prewash, some dispensing devices can be fitted with an additional compartment, which is separated from the compartment containing the dose of washing agent for the wash step. In this instance, the small cover closing the compartment for the washing agent extends farther to cover this additional compartment as well, but the latter has some outlets either on its front side or lower side: therefore, when the door of the dishwasher is closed (i.e. moving from its horizontal position to a vertical position), most of the washing agent contained in said additional compartment will fall down by gravity into the washing tub to be used during the first prewash step.

[0010] According to the present state of art, the use of this additional compartment is specifically provided for containing the washing agent required for the first prewash step; therefore, the user has to fill both the compartment for the wash step and the compartment for the prewash step with the washing agent.

[0011] In those cases where the dispensing device of the dishwasher is not fitted with this additional compartment, the user wishing to use a washing agent for the first prewash step will necessarily have to introduce a little amount of washing powder (which is the same powder used for the wash steps) directly in the machine washing tub before closing the machine door and starting machine operation.

[0012] Other dispensing devices are also known, wherein the compartment for the single dose of washing agent has some passages, being apt for a calibrated water inlet during the initial time of the wash cycle.

[0013] Thus, a small volume of water can flow through these passages into the compartment of the washing agent and to bring a certain portion of it into the washing tub during the prewash step; thereafter, when starting the hot wash step, the machine programmer will open the small cover of the compartment of the washing agent, and let its residual portion fall by gravity into the washing tub.

[0014] The dishwashing machines and dispensing devices described above, as well as their operating and use procedures are commonly known, so they are not further detailed here.

[0015] Following exhaustive practical tests, the present invention is based on the acknowledgement that the technique previously mentioned does not ensure adequate utilization of the single dose of washing agent introduced in the machine, i.e. to obtain an optimal utilization of its capability for improving the quality of washing.

[0016] From a first viewpoint, the solutions presently known do not ensure an efficient dosage of the washing agent for performing one or more prewash steps.

[0017] On the other hand, a nearly complete dispensing in one time of the single dose of solid washing agent at the beginning of the main wash step entails a fast exhaustion of the chemical-physical action of the washing agent during only the first part of the step.

[0018] Accordingly, it is the object of the present invention to provide a dishwashing machine and a wash program thereof, where a single dose of washing agent can be utilized at its best, in order to improve the quality of washing.

[0019] According to the present invention, these and other aims to be further cleared are obtained by means of a household dishwashing machine and a crockery wash program incorporating the features of the annexed claims, which form an integral part of the present description.

[0020] Further objects, features and advantages of the present invention will become apparent from the following detailed description and annexed drawings, which are supplied by way of non limiting example, wherein:

- Fig. 1 shows schematically a section of a dispensing device of washing agents for a household dishwashing machine, according to a first possible embodiment of the present invention;
- Fig. 2 shows schematically a section of a dispensing device of washing agents for a household dishwashing machine, according to a second possible embodiment of the present invention, in a first operating condition;
- Fig. 3 shows schematically a section of the dispensing device of washing agents of Fig. 2, in a second operating condition;
- Fig. 4 shows schematically a section of the dispensing device of washing agents of Fig. 2, in a third operating condition.

[0021] The household dishwashing machine object of the present invention has a known manufacture and operation, save for the special form of its dispensing device of washing agents, as further described. Therefore, this dishwasher will not be further described and illustrated in the following. It will be enough to remember here that such a dishwashing machine has at least:

- a control system, being apt to control execution of a plurality of various wash programs, such as a basic cycle, an intensive cycle, an economy cycle, etc.; according to the known art, each one of these programs comprises a plurality of sequential steps, such as a likely prewash, a main wash, a rinse step, etc. ;
- a washing tub, wherein one or more baskets are located for containing the crockery to be washed;
- water intake and dosing means inside the tub, comprising e.g. an inlet hose, a solenoid valve and a pressure meter;
- heating means for the water supplied to the tub, comprising e.g. an electric heater;
- means for spraying the crockery with the water taken into the tub, its filtering and recycling; comprising e.g. a wash pump, a filter system and rotary sprayers;
- discharging means for the water used during the various wash cycle steps, comprising e.g. a duct and a discharge pump;
- at least a washing powder dispenser.

[0022] In Fig. 1 reference 1 indicates in its whole the above dispensing device of the dishwashing machine object of the present invention; to this purpose the dispenser 1 is fastened preferably movable with common hooking means to the inner door of the machine.

[0023] The device 1 comprises a boxed body 2 made from plastic material, with a compartment 3 delimited in its upper section for containing a single dose of washing powder, i.e. an amount of washing agent as required for executing one wash cycle; the amount of washing agent that can be contained in the compartment 3 is substantially similar to the amount that can be contained in the known single-dose dispensers with a movable cover as mentioned at the beginning of the present description.

[0024] The compartment 3 in the form of a hopper, comprises an upper cover 4, eventually fitted with a suitable sealing gasket (not visible in the figure) and a lower port, indicated with 5.

[0025] Below the port 5, an area or dosing chamber 6 in communication with it is delimited in the body 2, housing a dosing and dispensing element 7; on its lower section, the dosing chamber 6 has a discharge outlet 8 in communication with the inside of the washing tub of the machine.

[0026] In the above example, the element 7 comprises a rotary element delimiting a couple of radial recesses 7A and 7B opposite to each other; each recess 7A and 7B being apt to contain a volumetric defined amount of washing agent, i.e. equalling a part or fraction of the single dose contained in the compartment 3.

[0027] The element 7 comprises a main shaft 7C with appropriate sealing means and coupling means to a suitable actuator, solidly fastened inside the dishwasher

door; these means are not represented in the figure, since they are commonly known as such.

[0028] In main terms, operation of the dispenser 1 is very simple.

[0029] Before starting a wash cycle, the user of the dishwasher opens the upper cover 4 to fill the compartment 3 with the single dose of washing agent required for cycle execution; then the cover 4 is closed again (it should be noticed how filling the compartment 3 with the washing agent can be performed also with the machine door half open).

[0030] Now the user can close the dishwasher door and start the wash cycle.

[0031] While filling the washing agent, a portion of it will reach by gravity through the port 5 the recess 7A of the element 7 in line with the port 5; thus, the recess 7A is filled with a defined dose of washing agent.

[0032] As to dispensing the washing agent, the control system of the machine will instruct the device 1 at the appropriate time.

[0033] Thus, the actuator previously mentioned causes rotation of the shaft 7C and consequently of the element 7, which is caused to move angularly by about 180°.

[0034] As a result, the recess 7A is brought in line with the discharge outlet 8, and the amount of washing agent contained in the same recess can freely fall into the machine tub for the washing of the crockery.

[0035] This actuation will obviously bring the recess 7B in line with the port 5; thus, a new portion or fraction of the amount of washing agent originally contained in the compartment 3 can fill the same recess 7B by gravity through the port 5.

[0036] At a later time of the wash cycle, the control system will instruct again the actuator of the device 1 for dispensing a new portion of washing agent; as it can be guessed, this is obtained exactly as described above, i. e. causing the element 7 to start rotation until the recess 7B is brought in line with the discharge outlet 8; moreover, a new filling of the recess 7A is obtained performing the same movement.

[0037] From the above description it is clear how the dispenser 1 will ensure:

- "fractioning" of the single dose of washing agent introduced in a plurality of sub-doses of predefined volume,
- dispensing at least a respective sub-dose of washing agent at least during two different steps of a wash cycle, or dispensing a plurality of said sub-doses, at least within one same cycle step.

[0038] In this frame, according to an advantageous embodiment of the present invention, the dishwasher control system is programmed for controlling a first dispensing of washing agent already during a prewash step provided by the cycle, even if cold performed, in order to utilize the mechanical/abrasive properties of the washing agent itself; actually, a substantial dirt removal is already obtained with the first wash step, independently from water temperature. Obviously, analogous considerations also apply for a likely second prewash step, also a cold one, provided by the chosen cycle.

[0039] Additionally, according to a significant feature of the present invention, the machine control system can be programmed for several actuations of the device 1 in the subsequent main wash step, to obtain dispensing washing agent portions or fractions at separate times.

[0040] Thus, two or more separate dispensing of washing agent can be obtained within one same main wash step; for instance, a first dispensing conveniently can be performed at the beginning of that step, when the wash liquid has not yet reached a stable temperature, and a second dispensing can be performed after a certain time has elapsed since the starting of that step, when the temperature is assumed to have been reached (on the other hand, temperature value may also be detected through appropriate sensing means); thus, during the first part of the wash step (i.e. after the first dispensing), the mechanical/abrasive properties of the washing agent can be fully utilized, whereas the physical/chemical properties of the washing agent will be fully utilized during the second part of the wash step (i.e. after the second dispensing).

[0041] Obviously, the steps for obtaining at least one dispensing of washing agents and the steps for dispensing the washing agent several times are established during the design stage of the machine control system, dependently on the wash cycle the user is going to choose and on the capacity of the compartment 3.

[0042] As it can be noticed, the invention has been described with reference to a washing powder dispenser comprising an angular rotary dosing/dispensing element type; however it is clear for the man skilled in the art that the dispenser may have a different concept, though maintaining the idea of providing such means capable of "fractioning" the initial single dose of washing agent in several sub-doses of defined quantity, and means capable of dispensing these sub-doses at separate times; in this frame, the dosing element 7 may have for instance a different form than the one described and also comprise, for instance, one sole dosing recess for the washing agent or be structured like a sliding drawer.

[0043] In Fig. 2 is illustrated a possible embodiment of the invention, which provides a linear movable dosing element instead of an angular moving one; it should be noticed how in this figure the same reference numbers of Fig. 1 are used for technical equivalent elements.

[0044] The dispensing device of Fig. 2, indicated with 1' in its whole, comprises a boxed body 2 made from plastic material, with a compartment 3 delimited in its upper section for containing a single dose of washing powder.

[0045] The compartment 3 in the form of a hopper, comprises an upper cover 4, eventually fitted with a suit-

able sealing gasket (not visible in the Figure), and a lower port 5.

[0046] Below the port 5, and in communication with it, a sliding seat 6 is delimited in the body 2, which houses a dosing and dispensing element 7'; the body 2 has a lower discharge outlet 8 communicating upwards inside the seat 6 and downwards inside the machine washing tub; as it can be noticed, the discharge outlet 8 is shifted with respect to the port 5.

[0047] In the above example, the element 7' comprises a linear sliding element, in which a through-cavity 7A' is delimited; this through-cavity 7A' is apt to contain a volumetric defined amount of washing agent equalling to a part or fraction of the single dose contained in the compartment 3. The linear movement of the element 7' in its relevant seat 6 is obtained by means of an appropriate common actuator, such as a thermal actuator 9, fitted with a shaft or piston 9A.

[0048] Operation of the device 1' in Fig. 2 for dispensing the washing agent, is described below; to this purpose, the device 1' assumed in its rest position, is as illustrated in Fig. 2.

[0049] Before starting a wash cycle, the user of the dishwasher opens the top cover 4 to fill the compartment 3 with the single dose of washing agent required for executing the cycle; the cover 4 can be closed again (it should be noticed that filling the washing agent in the compartment 3 can also be performed with the machine door half open). The user can then close the dishwasher door and start the wash cycle.

[0050] While filling the washing agent, a portion of it will reach by gravity through the port 5 the cavity 7A' of the element 7' in line with the port 5; in this operating condition, the cavity 7A' is closed on its lower side by the surface of the seat 6; thus, the cavity 7A' is filled with a defined dose of washing agent.

[0051] The control system of the machine will instruct the device 1' at the appropriate time for dispensing the washing agent.

[0052] In particular, the actuator 9 is power supplied to let its piston 9A cause translation of the element 7', which will move linearly to the right (with reference to Fig. 2). Thus, the cavity 7A' is brought in line with the discharge outlet 8 and the amount of washing agent contained in the same cavity is now free to fall down in the machine washing tub for the washing of the crockery.

[0053] This condition is visible in Fig. 3.

[0054] Once dispensing has been performed, power supply to the actuator 9 is cut to let the element 7' go back to the original position of Fig. 2, wherein the cavity 7A' can be filled again with washing agent through the port 5; it should be noticed how the return of the element 7' to its original position can be obtained or favoured by the use of common elastic means (e.g. integrated in the actuator 9).

[0055] At a later time of the wash cycle, the control system will be able to instruct the actuator 9 of the device 1' again for dispensing a new portion of washing agent; as it can be guessed, this is obtained exactly as described above, i.e. moving the element 7' linearly, until the cavity 7A' is brought in line with the discharge outlet 8; moreover, a new filling of the cavity 7A' is eventually obtained once more with the subsequent return of the element 7'.

[0056] According to another significant feature of the invention, the embodiment of the device 1' illustrated in Fig. 2 further comprises a second compartment indicated with 3A, being apt to receive a common detergent tablet, indicated with PD.

[0057] This compartment 3A has a lower port 5A communicating with the seat 6; the seat 6 has an end outlet 8A, in communication with the inside of the machine washing tub.

[0058] Operation of the device 1', concerning a likely use of the detergent tablet PD is described below; in this connection, the device 1' assumed in its rest position also in this event, is as illustrated in Fig. 2.

[0059] Before starting a wash cycle, the user of the dishwasher opens the upper cover 4 to insert the detergent tablet PD in the compartment 3A, required for performing the cycle; following the closure of the cover 4, the user can close the door of the dishwasher and get the wash cycle started.

[0060] When introducing the tablet PD in the compartment 3A, the former will reach the seat 6 and rest on its bottom; thus, as it can be seen, a portion of the tablet PD is positioned inside the seat 6, whereas the remaining portion of the tablet PD remains inside the compartment 3A.

[0061] As to a dispensing of the washing agent, the machine control system will instruct the device 1' at the appropriate time, as for the procedures previously described.

[0062] Therefore, the actuator 9 is power supplied to let its piston 9A cause a movement of the element 7', which will move linearly to the right, with reference to Fig. 2. Thus, the front surface of the element 7 will press the portion of the tablet PD in the seat 6 and break it; the portion removed from the tablet, indicates with PD1 in Fig. 4, is pushed by the element 7' outside the discharge outlet 8A to fall into the machine tub for the washing of the crockery. The remaining portion of the tablet, indicates with PD2 in Fig. 2, remains inside the compartment 3A.

[0063] Once dispensing has been performed, power supply to the actuator 9 is cut to bring the element 7' back to the original position of Fig. 2; thus, when the front end of the element 7' in its backward movement exceeds the port 5A, the remaining portion PD2 of the detergent tablet can go down to the seat 6; as a result, a part of that same portion PD2 will be contained in the seat 6 and the remaining part in the compartment 3A.

[0064] At a later time of the wash cycle, the control system will instruct the actuator 9 of the device 1' again for dispensing a new portion of the tablet; as it can be

guessed, this is obtained exactly as described above, i. e. moving the element 7' linearly until the front end of the latter breaks the portion PD2 of the tablet in two parts, of which the lower one is expelled through the discharge outlet 8A; moreover, a subsequent return of the element 7' will cause the remaining part of the detergent tablet to reach its position inside the seat 6, as previously described.

[0065] From the above description it is obvious how also the dispenser 1' of the Figures 2-4 ensures:

- a "fractioning" of the charged single dose of washing agent in a plurality of sub-doses of predefined volume, also when this single dose is a detergent tablet;
- dispensing at least a respective sub-dose of washing-agent during at least two different wash cycle steps or a plurality of said sub-doses within at least one same cycle step.

[0066] Advantageously, the front part of the dosing element 7' may have a form favouring the breakage of the detergent tablet; this front part could be e.g. in the form of a blade.

[0067] Moreover, special detergent tablets may be provided with appropriate precut lines during their manufacturing stage, or with thinner areas for easier division of the tablet in several parts; also, the single dose of washing agent for executing a wash cycle may consists of a plurality of detergent tablets of smaller size; in this instance, the various tablets would be placed in the compartment 3A one on top of the other, with the movement of the element 7' simply causing the expulsion of one of them during each dispensing operation.

[0068] It is also clear that the dishwasher according to the invention will be preferably fitted with a common rinse aid dispenser, which can be provided as a separate component for the dispenser 1 or 1', or be either associated or integrated to it.

[0069] The invention also ensures practical advantages in view of an easy use of the dishwasher.

[0070] Considering, in fact, that the dispensing device 1 comprises only one dedicated compartment 3 and/or 3A for containing the dose of washing agent, the user is actually compelled to use this compartment for the entire dose of washing agent required for performing the wash cycle, either powder or in the form of a tablet.

[0071] As mentioned above, a portion of this washing agent can be used during the first cycle step (first and/or second prewash), without requiring any specific decisions by the user, who has no additional operations to perform besides the ones normally required for common dishwashing machines.

[0072] In addition, since the part of the dispenser 1 or 1' facing inside the washing tub can be removed from the machine door, it can be completely washed manually any time it is necessary.

[0073] From the above description the features of the dishwashing machine and of the program thereof object of the present invention are clear, and also its advantages are clear.

[0074] Independently from the embodiment being chosen for the dispenser, it is obvious how according to the present invention the use of a single dose of washing agent can be improved by dividing it in several volumetric defined doses, which are then dispensed at the more appropriate times during one same wash cycle.

[0075] In this frame, a first fraction of the single dose of washing agent can be used during a prewash step of the cycle being executed; the device 1 or 1' also ensures dispensing of a second portion of the single dose of washing agent within a second prewash step of the cycle, should this step be provided in the program.

[0076] The device 1 or 1' also ensures a plurality of dispensing operations within one same step of the wash cycle; in this frame, the machine control system will instruct dispensing of a third and fourth portion of the single dose of washing agent at separate times during the main hot wash step provided by the cycle.

[0077] According to the above procedure, the use of a single dose of washing agent introduced in the machine can be optimised for an increased quality of the washing.

[0078] All this is obtained automatically and independently from the choice or decision operated by the machine user, since the sole condition for the user is to introduce the washing agent in the compartment 3 or 3A; however, this is an essential condition for the washing, i.e. an operation the user should perform anyway.

[0079] It is obvious that many other changes are possible for the man skilled in the art to the dishwashing machine and program thereof object of the present invention, without departing from the novelty principles of the inventive idea, and it is clear that in practical actuation of the invention the various components described may be replaced with technical equivalent elements.

[0080] By way of example, the dispenser cover 4 may have some apertures in line with the compartment 3A to let in a restricted volume of washing water for a preliminary soaking of the tablet PD, before dispensing is performed as described above.

[0081] According to other possible implementations, the machine control system may be programmed to realize, when approaching the end of the main wash cycle, a fast sequence of several actuations of the device 1 or 1', for emptying the compartment 3 and/or 3A completely.

[0082] Another possible embodiment provides a tilting dispenser cover 4 actuated by means of an elastic element and fitted with an actuation mechanism for opening it automatically. In this frame, by way of example, always approaching the end of the cycle main wash step, the machine control system may control this mechanism for opening the cover 4, so that the water sprayed inside the tub will reach the compartment 3 and/or 3A, at least for its partial washing.

Claims

1. A household dishwashing machine, comprising

   - a control system, being apt to control the execution of a plurality of various wash programs, at least one of said programs comprising a plurality of sequential steps;
   - a washing agents dispenser (1,1'), comprising at least a compartment (3;3A) for containing one single dose of washing agent in solid form, i.e. either powder or in tablet, required for performing a single wash program;

   characterized in that said dispenser (1;1') comprises means (7;7') for dividing said single dose of washing agent in a plurality of sub-doses substantially of a predefined amount, and that said control system is programmed for controlling said means (7;7'), in order to dispense at least a respective sub-dose of washing agent in the course of at least two different steps of a wash program, or a plurality of said sub-doses at separate times within at least one same step of a wash program.

2. A dishwashing machine according to claim 1, **characterized in that** said dispenser (1;1') has a body (2) movably fastened to the inner door of the machine.

3. A dishwashing machine according to claim 1, **characterized in that** said dispenser (1;1') comprises a cover (4) for closing said compartment (3;3A).

4. A dishwashing machine according to claim 1, **characterized in that** said compartment (3) is in the form of a hopper.

5. A dishwashing machine according to claim 1, **characterized in that** said compartment (3;3A) has a discharge port (5;5A).

6. A dishwashing machine according to claim 5, **characterized in that** said dispenser (1) has a seat or dosing area delimited (6) below said port (5;5A).

7. A dishwashing machine according to claim 6, **characterized in that** said means comprise a dosing and dispensing element (7;7'), at least partially movable in said seat or dosing area (6).

8. A dishwashing machine according to claim 6, **characterized in that** said seat or dosing area (6) has at least a discharge outlet (8;8A), communicating with the inside of the machine washing tub.

9. A dishwashing machine according to claim 7, **characterized in that** said element (7;7') comprises at least a recess or cavity (7A,7B;7A'), being apt to contain one of said sub-doses, said element (7;7') being movable for moving said recess or cavity (7A, 7B;7A') at least from a first to a second position, where in said first position said recess or cavity (7A, 7B;7A') is in line with said port (5;5A) and in said second position said recess or cavity (7A,7B;7A') is in line with said outlet (8;8A).

10. A dishwashing machine according to claim 7, **characterized in that** said element (7;7') is movable for displacing one of said sub-doses inside said seat or dosing area (6) to said discharge outlet (8;8A).

11. A dishwashing machine according to claim 7, **characterized in that** said element (7;7') is capable of breaking a detergent tablet (PD) in several parts (PD1,PD2), said tablet (PD) forming said single dose and said parts (PD1,PD2) forming said sub-doses.

12. A dishwashing machine according to at least one of the claims 7 to 11, **characterized in that** said element (7) is a rotary or angular movable element.

13. A dishwashing machine according to at least one of the claims 7 to 11, **characterized in that** said element (7') is a sliding or linear movable element.

14. A dishwashing machine according to at least one of the previous claims, **characterized in that** said dispenser (1;1') comprises an actuator (9) for producing the movement of said element (7;7').

15. A dishwashing machine according to at least one of the previous claims, **characterized in that** said control system is programmed for a fast sequence of several actuations of said dispenser (1;1').

16. A dishwashing machine according to at least one of the previous claims, **characterized in that** said cover (4) is a tilting cover.

17. A dishwashing machine according to the previous claim, **characterized in that** an actuation mechanism is associated to said cover (4) for its automatic opening, said mechanism being controlled by said control system.

18. A dishwashing machine according to at least one of the previous claims, **characterized in that** it provides one or more passages in communication with said compartment (3;3A), to let in a small intake of washing water for a preliminary soaking of the washing agent contained therein.

19. A dishwashing machine according to at least one of the previous claims, **characterized in that** said sin-

gle dose of washing agent in solid form consists of a plurality of detergent tablets, said tablets being arranged in particular in said compartment (3A), one on top of the other.

20. A program for washing the crockery in a household dishwashing machine, said program comprising a plurality of sequential steps and providing the use of a single dose of washing agent in solid form, i.e. either powder or in tablet, said single dose being preliminarily introduced in a dispensing device (1; 1'), **characterized in that** it provides a division of said single dose of washing agent in a plurality of sub-doses, in particular of a substantially predefined amount, and dispensing a plurality of said sub-doses at least within one same program step, at separate times.

21. A program according to claim 20, **characterized in that** said same step is the main hot wash provided by said program.

22. A program according to claim 21, **characterized in that** it provides a first dispensing of a sub-dose, performed substantially at the beginning of said main wash, in particular when the washing liquid has not yet reached a stable temperature, and a second dispensing of a sub-dose performed after a certain time has elapsed from starting that same step.

23. A program according to claim 22, **characterized in that** said second dispensing is performed when the washing liquid has reached a stable temperature.

24. A program according to claim 20, **characterized in that** it comprises at least a first prewash step, in the course of which dispensing of at least a sub-dose of washing agent is provided.

25. A program according to claim 24, **characterized in that** it comprises at least a second prewash step, in the course of which dispensing of at least a sub-dose of washing agent is provided.

26. A program according to claim 25, **characterized in that** said second prewash is a cold step.

27. A program according to claim 20, **characterized in that** it provides a preliminary soaking of said single dose of washing agents through the washing water.

28. A program according to claim 20, **characterized in that** said single dose of washing agent in solid form is a detergent tablet.

29. A program according to claim 20, **characterized in that** said single dose of washing agent in solid form consists of a plurality of detergent tablets, each one of said tablets forming one of said sub-doses.

30. A detergent tablet for use in a dishwashing machine according to one or more of the claims 1 to 19 and/or for use in a program according to one or more of the claims 20 to 29, **characterized in that** it has one or more precut lines or thinner areas, which favour a division of said tablet in several parts, said several parts forming said sub-doses.

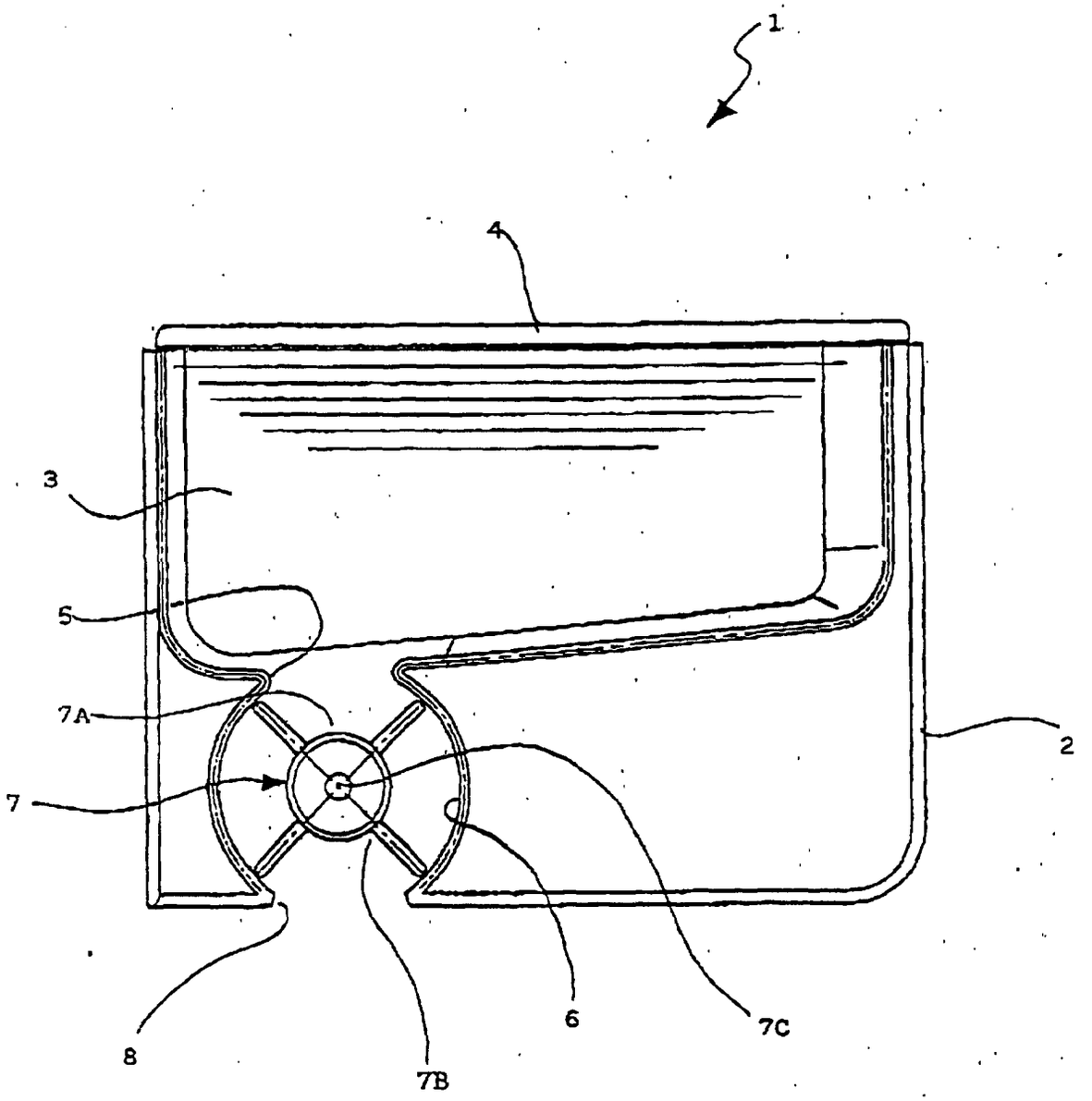

FIG. 1

FIG. 2

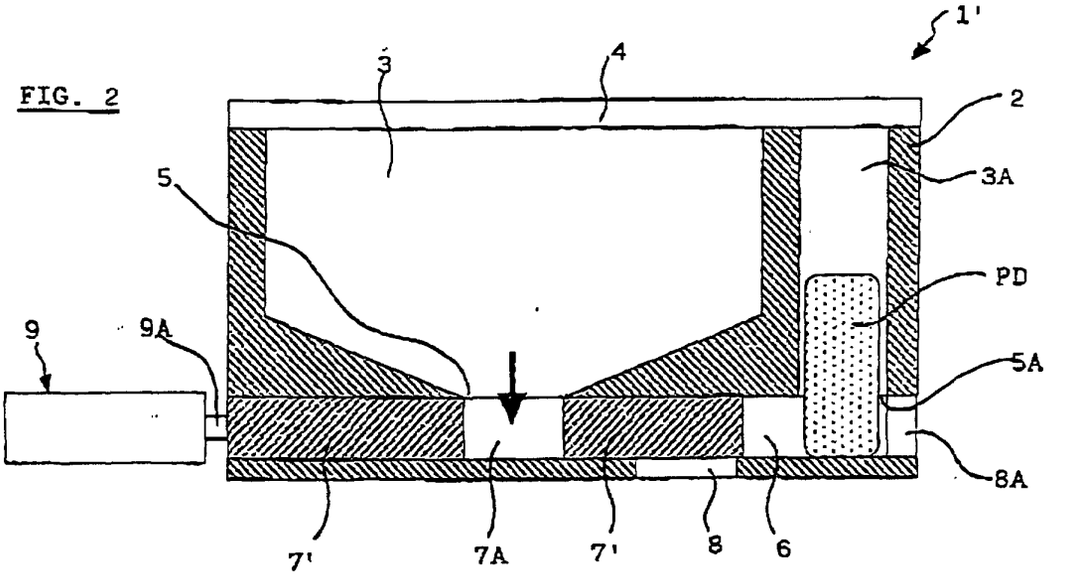

FIG. 3

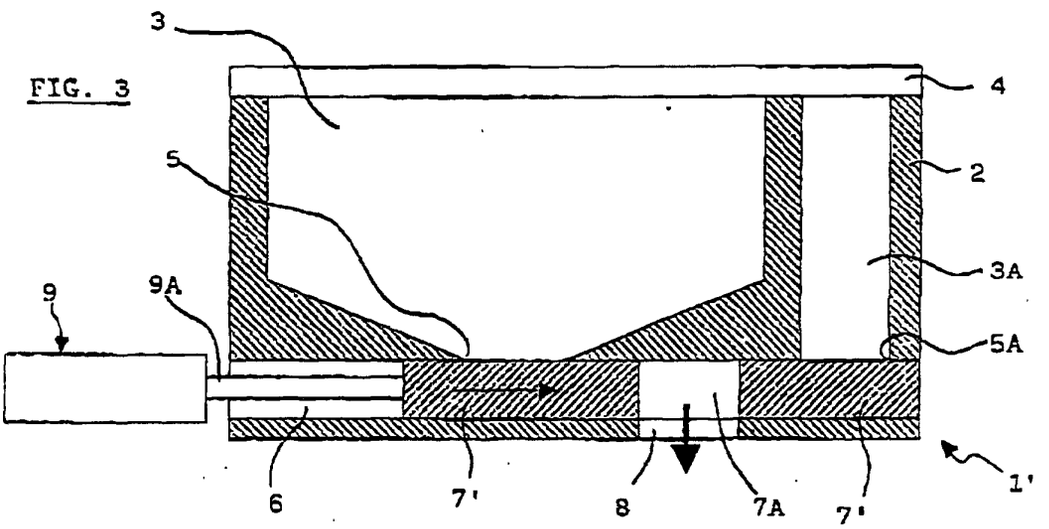

FIG. 4