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(71) Applicant:
**Merloni Elettrodomestici S.p.A.
60044 Fabriano (AN) (IT)**

(72) Inventor: **Marchitto, Giuseppe
Pinerolo (TO) (IT)**

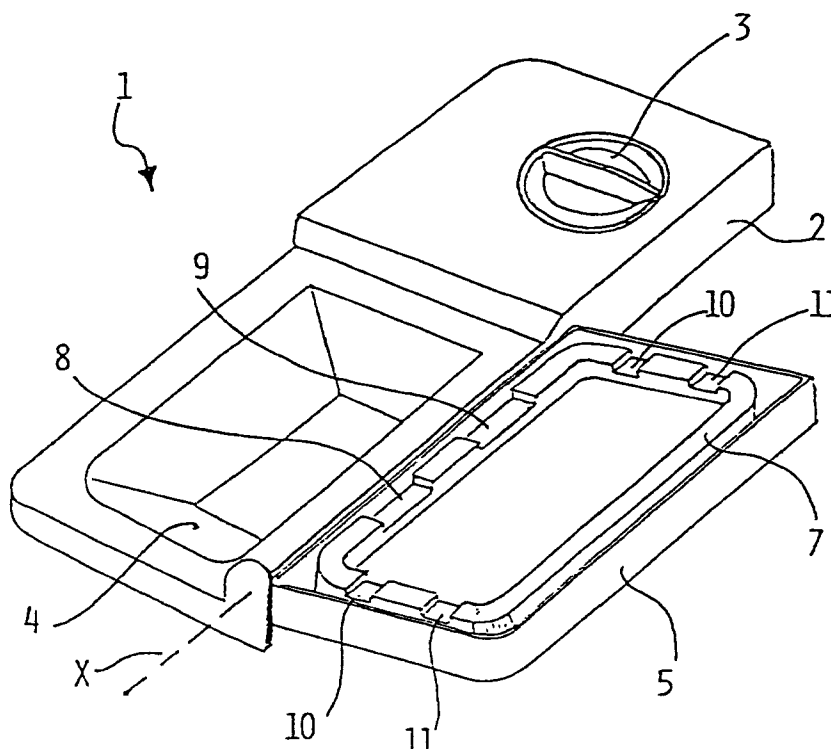
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(54) **Dishwashing machine with washing agents dispenser device and washong method thereof**

(57) A dishwashing machine is described, of the type capable of executing a plurality of different wash programs (standard wash cycle, intensive wash cycle, economy wash cycle, etc.) selectively selectable by the user, said programs comprising a plurality of sequential phases (prewash, main wash, rinses, etc.), among which at least a main wash phase during which a detergent distribution is provided in the machine wash tub (C), wherein said distribution is obtained through a washing agents dispenser (1) comprising at least a recess (4) equipped with a small closing lid (5) to con-

tain said detergent required for said wash phase. According to the invention, said dispenser (1) comprises means (8-11; 5A,5B,5C) for determining the introduction in said tub (C) of a portion of said detergent contained in said recess (4) during at least an operative phase, of the wash program selected among the available ones, temporally preceding said main wash phase, said operative phase being in particular the initial phase provided by the selected wash program.

FIG. 2



Description

The present invention relates to a dishwashing machine comprising a washing agents dispenser device, and a washing method thereof.

It is well known that washing machines usually provide a plurality of different operating cycles or programs; such cycles have different features and can either be selected by the machine user according to washing requirements, or they may even be selected by the machine itself based on the data related to the type of crockery load to be washed.

For instance, dishwashing machines presently available in trade are usually equipped with the following wash programs:

- a standard program for the washing of crockery having a certain degree of dried soil; such a program usually comprises an initial cold prewash, a hot wash, two cold rinses, a hot rinse and a final drying step;
- an intensive program for the washing of heavily soiled crockery or for those instances where food residues are specifically difficult to remove (e.g. hard dried or burnt rests); such a program usually comprises an initial hot prewash, a hot wash, a first cold rinse, a second cold rinse, a third hot rinse and a final drying step;
- an economy program for the washing of slightly soiled crockery or partial loads of crockery; such a program usually comprises a first cold prewash, a hot wash, a first cold rinse, a second hot rinse and a final drying step;
- a fast program for a washing for instances being similar to the previous cycle, but for the case where a faster washing of partial loads; such a program usually comprises an initial hot wash, only one cold or hot rinse, and a likely final drying step;
- a soak program, which cannot be defined as a real wash program as it is simply used as a crockery soaking cycle to hinder most consistent food leftovers to become hard dry by removing them and enable a complete crockery wash at a later time.

All these wash programs (apart the soak cycle) provide a main wash step, usually a hot washing, which is mainly responsible for the quality results of the selected whole wash program.

In the above programs, the so-called "wash" and "hot rinse" phases are obtained by adding special washing agents and rinse aids, which have to be introduced by the user in a proper dispenser device. Also in the instance of an intensive wash program, the so-called "hot prewash" phase can be executed with the introduction of washing agents.

Therefore, dishwashers are provided with proper dispenser devices comprising separated recesses or compartments to contain specific washing agents for

the above phases covered by a wash program; typically, such washing agents consist of powder detergent delivered during the wash step and of a liquid additive, e.g. a rinse aid delivered during the hot rinse phase. In those instances where introduction of detergent is suggested also for the prewash phase, the same detergent introduced for the wash phase will be used, introducing it in the tub before starting washing operation.

The dispenser device generally consists of a body housed in the inner door panel of the front loading door of the dishwashing machine; such a body comprises at least a recess to contain the required detergent dose for the execution of the washing phase; such a recess is provided with a small lid that is opened by the machine programmer at a given time during the washing program (i.e. at the beginning of the hot wash phase).

Besides the above single-dose recess containing the powder detergent, usually the body of the dispenser device also has a distributor containing the liquid additive to be delivered during the hot rinse phase.

As to a likely use of washing agent also during the prewash phase, some dispenser devices may be equipped with an additional recess, which is separated from the compartment containing the detergent for the wash phase. In this instance, the small lid closing the recess for the wash detergent is extending to cover also said additional recess; however, the latter has an opening in its lower section, so that when the door of the dishwashing machine is closed (i.e. going from a horizontal position to an upright position), the main quantity of detergent contained in such an additional recess can fall down in the wash tub and be used during the initial prewash.

It should be noticed that, according to the present state of the art, such an additional recess is meant to contain the detergent required to execute the hot prewash phase provided by the so-called intensive wash program; should the user wish to execute such a cycle, then both the recesses for the wash phase and for the prewash phase need to be filled with washing agents.

In those instances where the dishwasher dispenser device does not include said additional recess, should the user wish to use some washing agents also for the prewash phase, it will be necessary to introduce a small quantity of powder detergent (as said, this is the same as used for the wash phases) directly in the machine wash tub, before closing the door and start machine operation.

Since dishwashing machines and dispenser devices as described above, as well as their operating and usage modes, are already well known, no further detailed description is required about them.

The present invention is based on the acknowledgment of the fact that, following the execution of exhaustive practical tests, a considerable advantage has been noticed in using washing agents already during the initial phase of any wash program, even if it is not a hot phase. Specifically, it was noted by the inventor that dur-

ing the initial phase of a wash program, washing agents tend to exert on the crockery, besides their own chemical-physical action, a considerable mechanical action in removing the soil from them.

Due to such a mechanical action, which develops during the initial phase of the program, a substantial soil removal can be obtained, which allows to optimize and make the subsequent cycle phases more efficient, for instance in view of reducing the water consumption.

Moreover, the present invention is also based on the acknowledgment that users are mainly interested to have dishwashing machines being of simple and fast use, so that it might be difficult to "educate" such users to always proceed to a specific introduction of washing agents to be used during the initial phase of a wash program.

For instance, as a matter of fact, in the daily practice a user does not introduce the prewash detergent in the machine, due to either a likely laziness or forgetfulness, even if this is explicitly suggested in the instructions for use booklet delivered with the dishwasher.

Therefore, on the basis of the above considerations, the aim of the present invention is to provide a dishwashing machine wherein, during the first phase of any selectable wash cycle, an automatic introduction of detergent in the wash tub is carried out, but without requiring a specific decision by the user or any operations differing from the simple introduction of the detergent for the wash phase in the machine dispenser device.

To reach said purposes, it is the object of the present invention a dishwashing machine and a crockery wash method having the features of the annexed claims, which are an integral part of this description.

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

- Fig. 1 shows schematically a dishwashing machine according to the present invention;
- Fig. 2 shows schematically a washing agents dispenser device of the dishwashing machine of Fig. 1;
- Fig. 3 shows schematically a section of a washing agents dispenser device of the dishwashing machine according to the present invention, in an embodiment similar to the one of Fig. 2;
- Fig. 4 shows schematically a part of a washing agents dispenser device in a second possible embodiment of the dishwashing machine according to the present invention;
- Fig. 5 shows schematically a front view of a detergent tablet, whose use is particularly beneficial to the purposes of the present invention.

The dishwashing machine according to the present

invention is intended to provide operation as usually known, save for the special embodiment of its washing agents dispenser device.

Therefore, the dishwasher shall not be further described and detailed in its whole. It will be enough to mention that the dishwashing machine according to the present invention, indicated as a whole with A in Fig. 1, is equipped with a washing agents dispenser device 1, being housed in the inner door panel B of the dishwashing machine, i.e. on the door surface directed to the inside of the machine wash tub C.

As it can be seen in Fig. 2, said dispenser device 1 comprises a box-like body 2 containing a distributor 3 for liquid additive; since said distributor 3 is known as such, no detailed description of it will follow.

Reference number 4 indicates a recess defined in the body 2 to contain powder detergent; number 5 indicates a small lid hinged on its upper section to the body 2.

Thus, the small lid 5 can rotate around an axis indicated with X.

The small lid 5, represented in Fig. 2 in its open position, is apt to close the recess 4 against the action of a spring (not shown in the figure) reacting between the body 2 and the small lid 5 itself. In order to keep the small lid 5 closed against the action of said spring, a proper locking system controlled by the dishwasher programmer is provided on the body 2; also this system is not shown in the figures for simplicity's sake, as its type and operation are known.

Fig. 3 shows the internal surface of a small lid 5 substantially similar to the one shown in Fig. 2.

As it can be seen in Figs. 2 and 3, the internal section of the small lid 5 has a gasket 7, in rubber or similar material; when the small lid 5 is closed, said gasket 7 is substantially pressed along the perimeter defined by the walls of the recess 4.

However, according to the invention, a plurality of properly located gaps or thickness reductions are defined along the gasket 7, determining some openings or ports, which put the internal side of the recess 4 in communication with the external environment; in particular, said ports are so calibrated and located along the gasket 7 to allow for a given throughflow of the washing liquid inside the recess 4, even with the small lid 5 closed. For instance, in the embodiment shown in Figs. 2 and 3, numbers 8 and 9 indicate some ports to allow a liquid inflow inside the recess 4, whereas numbers 10 and 11 indicate some ports for the outflow from the recess 4 of that same liquid carrying detergent with it. As it can be seen, inlet ports 8-9 are located along the upper side of the perimeter defined by the gasket 7, whereas outlet ports 10-11 are located on the right and left sides of the same perimeter.

According to the invention, following a proper location and dimensioning of said inlet ports 8-9 and outlet ports 10-11, a delivery of a given quantity of washing agents can be obtained, already during the initial phase

of a wash cycle. To this regard, operation of the dishwashing machine according to the present invention is as follows.

The user of the machine A loads the crockery to be washed inside the wash tub C, the detergent in the recess 4 and closes the small lid 5; if required, the user may also load the rinse aid in the distributor 3.

Then the user can close the machine door, select a desired wash cycle (e.g. the standard cycle) and start the machine operation.

In this way, the wash tub C is filled in a known manner with a certain quantity of water, that will be sprayed on the crockery through a well known recirculation pump and well known sprinkler elements. Some of the water sprayed in the tub by the sprinklers reaches the dishwasher inner door panel B and the dispenser 1, and a tiny part of it enters the recess 4 through ports 8-9 (located on the upper section of the dispenser 1 with the door closed). Then the inflow of the same water flows out of the recess 4 through ports 10-11, carrying some detergent towards the bottom of the wash tub.

Such part of detergent, which is mixed with the water being present on the bottom of the wash tub, is then circulated by the above pump and sprinklers, and be sprayed on the crockery.

Thus, according to the present invention, the mechanical/abrasive properties of the detergent can be used during the first phase of the machine wash cycle, as described at the beginning of this description.

As said, this fact allows for obtaining a substantial removal of soil during the first wash phase alone, independently from the water temperature.

It has to be noticed that the prewash phase comprised in the various selectable wash cycles of dishwashers has, on average, a duration of a few minutes; consequently, since during such a short period of time only a restricted quantity of water can flow through the recess 4, only a portion of the washing agents contained in it will be removed. Moreover, due to the short time interval lasting between the prewash phase and the subsequent real wash phase, it is not possible for the detergent to clot and get stuck inside the small lid door 5, and be no more removable.

In the subsequent hot wash phase, the machine programmer will control the opening of the cited locking system of the small lid 5. In this way, the small lid 5 can open up and let the detergent still available in the recess 4 fall down into the wash tub.

Thus, removal of said detergent is practically sure, due to the upright position of the dispenser, to a portion of the water sprays produced by the sprinklers now capable of flooding directly the recess 4, and to the usual vibrations caused by the machine operation.

Considering that the dispenser device 1 comprises only one recess 4 to contain the powder detergent, the user is practically compelled to use such a recess to introduce the detergent required for the execution of the wash cycle. As said, a part of said detergent is used

during the first phase of the cycle, but without requiring specific decisions by the user, who does not need to execute any additional operations with respect to the ones normally required on any dishwashing machines of known type.

It should also be noticed that the function of automatic delivery of a portion of detergent during the initial phase of the cycle is anyway and always obtained independently from the program the user has selected.

Obviously, the ports provided for the water inflow to the recess 4 do not necessarily need to be made on the gasket 7, as they may even consist of proper openings or ports obtained directly on the small lid 5, or along the edges of recess 4. Similarly, the gasket 7 could be housed in a proper seat on the body 2 of the dispenser 1 instead of being associated with the small lid 5.

Fig. 4 shows another possible embodiment of a part of the washing agents dispenser device of the dishwashing machine according to the present invention; in this figure showing a recess 4 with a relevant small lid 5, the same reference numbers of the previous figures are used for indicating technically equivalent elements.

In said Fig. 4, number 5A indicates a septum or wall, departing at right angle from the internal surface of the small lid 5; such a septum 5A can be inserted in the recess 4 when the small lid 5 is closed and divide the detergent contained in the recess 4 in two portions.

Moreover, on the part of the small lid 5 extending to the right with respect to the septum 5A, at least a lower port is present, indicated with 5B (with reference to Fig. 4), and one or more openings on its surface, indicated with 5C.

As it can be noticed, the gasket 7 has a gap in line with the port 5B. On the contrary, the recess 4 and the left part of the small door 5 are of a classic concept; when the small lid 5 is closed, in fact, the gasket 7 is able to ensure a nearly hermetic seal inside of the part of the recess 4 extending to the left with respect to the septum 5A.

As to the embodiment shown in Fig. 4, the dishwashing machine operates as follows. After introducing the detergent in the recess 4, the user closes the small lid 5; this will cause the septum 5A to divide the detergent contained inside the recess 4 in two portions.

The subsequent closure of the dishwasher door will cause the portion of detergent contained in the section of the recess 4 being at the right of the septum 5A to fall down to the bottom of the wash tub C; this fall is ensured by the port 5B and the corresponding gap of the gasket 7. Thus, said detergent can mix with the water filling the tub during the first phase of the wash cycle and be used for a substantial initial soil removal, through a combined chemical-mechanical action as described above.

On the other hand, during such an initial phase, the removal of the detergent contained on the right side of the recess 4 is warranted anyway through the openings 5C on the small lid 5. In fact, a part of the sprays developing inside the tub C will also reach the dispenser 1, so

that a certain amount of water can enter the recess 4 through said openings 5C and then flow out through the lower port 5B along with likely detergent residues.

Obviously, during such a phase, the septum 5A will warrant a satisfactory seal on the left side of the recess 4, where is contained the portion of detergent to be used for the subsequent wash phase.

Also in this instance, the machine programmer will control the opening of the locking system of the small lid 5 during the subsequent hot wash phase. Thus, the small lid 5 can open and let the detergent still contained on the left side of the recess 4 fall into the wash tub.

As it can be seen, operation of the dishwashing machine described according to the embodiment of Fig. 4 leads to the same results as previously pointed out with reference to Fig. 1.

It is obvious that according to the embodiment of Fig. 4, the outlet port 5B may be obtained on the body 2 rather than on the small door 5; similarly, the openings 5C of the small lid 5 may be replaced by one or more openings defined in the upper section of the recess 4 (e.g. thickness reductions of the gasket 7).

From the above description the features and advantages of the dishwashing machine according to the present invention are clear.

Independently from the selected embodiment, it is clear how according to the present invention an initial introduction of detergent is possible since the first phase of a wash cycle, which occurs automatically and independently from the choice or decision by the machine's user; the only condition is that the user introduces some detergent in the recess 4, but this is obviously an essential requisite for performing the washing. i.e. an operation the user has to execute under all circumstances.

The new operative mode according to the present invention is therefore implemented in the initial phase of all wash cycles provided by the dishwasher.

It is obvious that many changes are possible for the man skilled in the art to the dishwashing machine according to the present invention, without departing from the novelty spirit of the inventive solution, and it is also clear that in the practical actuation of the invention the components described may differ in form and size from the ones described, and be replaced by technically equivalent elements.

For instance, in the embodiment of Fig. 4, the septum 5A may operate as a blade for breaking up a known detergent tablet in two pieces.

To this purpose, for an advantageous implementation of the present invention, detergent tablets could be manufactured with an intermediate restriction or thickness reduction, right with the purpose of favoring an automatic separation by the septum 5A when closing the small lid 5.

Fig. 5 shows schematically by way of example such an innovative detergent tablet, indicated as a whole with 20. As it can be seen, such a tablet 20 has two portions

20A and 20B, separated by a thickness reduction 21; in the given example, the portion 20B represents a fraction (half) of the portion 20A. For the purpose of the present invention it is obvious that the separation by the septum 5A of the two portions 20A and 20B will be favored by the thickness reduction 21.

It is clear that in the case of use of detergent tablets, the lower port 5B of the small lid 5 shall be sufficiently dimensioned to let the tablet portion 20B fall in the wash tub, when closing the dishwasher door.

At any rate, provision of detergent tablets presenting a restriction 21 may have a useful and beneficial result, independently from the use of a dispenser of the kind described and represented in Fig. 4.

Thus, in fact, manufacturers of detergent tablets have the opportunity of producing only one tablet identifying two different amounts of detergent, i.e. one for use in the prewash step and the other for the execution of the wash step, or for indicating possible different doses of detergent for different wash phases.

Therefore, in the instance of machines according to the present state of the art, the user will only be required to manually separate the two portions of a tablet, insert the largest portion in the dispenser recess destined to contain the washing detergent, the other portion in the additional recess destined to contain the prewash detergent or, should the latter not be provided, directly in the wash tub.

Claims

1. A dishwashing machine, of the type capable of executing a plurality of different wash programs (standard wash cycle, intensive wash cycle, economy wash cycle, etc.) selectively selectable by the user, said programs comprising a plurality of sequential phases (prewash, main wash, rinses, etc.), among which at least a main wash phase during which a detergent distribution is provided in the machine wash tub (C), wherein said distribution is obtained through a washing agents dispenser (1) comprising at least a recess (4) equipped with a small closing lid (5) to contain said detergent required for said wash phase, characterized in that said dispenser (1) comprises means (8-11; 5A,5B,5C) for determining the introduction in said tub (C) of a portion of said detergent contained in said recess (4) during at least an operative phase, of the wash program selected among the available ones, temporally preceding said main wash phase, said operative phase being in particular the initial phase provided by the selected wash program.
2. A dishwashing machine according to claim 1, characterized in that said operative phase is a prewash phase.
3. A dishwashing machine according to claim 1, char-

acterized in that said means comprise ports (8-11; 5B,5C) putting the inside of said recess (4) in communication with the environment outside it, even when the small lid (5) is closed.

4. A dishwashing machine according to claim 3, characterized in that said ports (8-11; 5B,5C) are obtained in said small lid (5) and/or in the walls or edges of said recess (4) and/or in a gasket operating between said recess (4) and said small lid (5). 5
10
5. A dishwashing machine according to claim 4, characterized in that said ports consist of thickness reductions or gaps (8-11) of said gasket (7). 15
6. A dishwashing machine according to at least one of the previous claims, characterized in that said ports (8-11) are so calibrated and positioned for allowing a given passage of liquid through said recess (4) with said small lid (5) closed, with the consequent removal of a part of the detergent contained within said recess (4), said liquid coming from a spraying element operating within said wash tub (C). 20
7. A dishwashing machine according to claim 1, characterized in that said means comprise at least a septum (5A) of said small lid (5), which is able to be inserted in said recess (4) when closing the small lid, so as to divide the detergent contained in said recess (4) in two portions, said recess (4) and/or said small lid (5) presenting at least an opening (5B,5C) to let one of said two detergent portions fall towards the wash tub. 25
30
8. A dishwashing machine according to claim 7, characterized in that said recess (4) and/or said small lid (5) has at least an opening (5C) to let liquid flow into said recess (4) also with the small lid (5) closed, said liquid coming from a spraying element operating within said wash tub (C). 35
40
9. A dishwashing machine according to claim 7, characterized in that said recess (4) is able to contain a detergent tablet (20), and that said septum (5A) is able to divide said tablet (20) in two portions (20A,20B) when said small lid (5) is closed. 45
10. A detergent tablet for use in the dishwashing machine according to at least one of the claims from 7 to 9, characterized in that it has an intermediate restriction or thickness reduction (21) to favor a division of said tablet (20) in two portions (20A,20B). 50
11. A method for the washing of crockery in a washing machine comprising a number of possible wash programs, said wash programs including a plurality of operative phases, characterized in that by the 55

imposition, during the first operative phase of any selectable wash program, of an introduction of detergent in the machine wash tub, but without implying a specific decision by the user.

12. A detergent tablet for the use in a washing machine, in particular a dishwashing machine, characterized in that it has an intermediate restriction or thickness reduction (21) to favor its separation in two portions (20A,20B), said two portions having in particular different dimensions.

FIG. 1

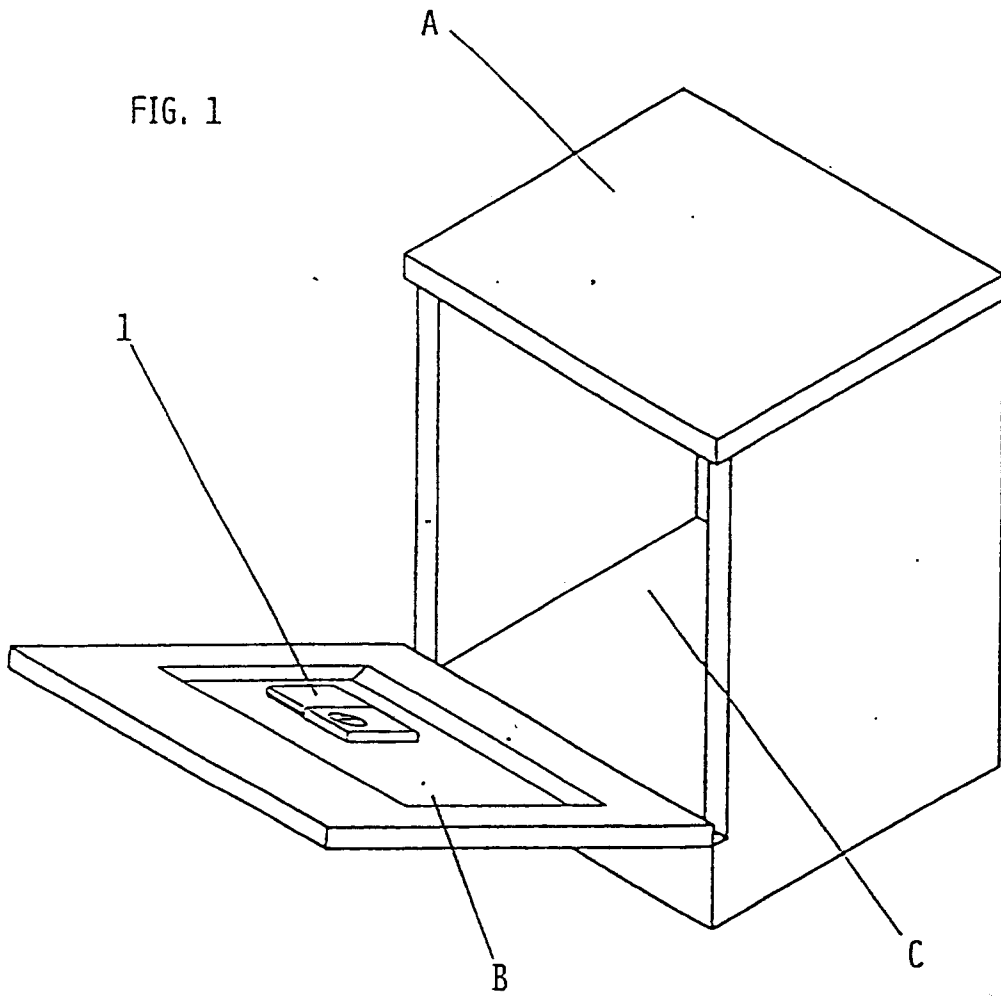


FIG. 2

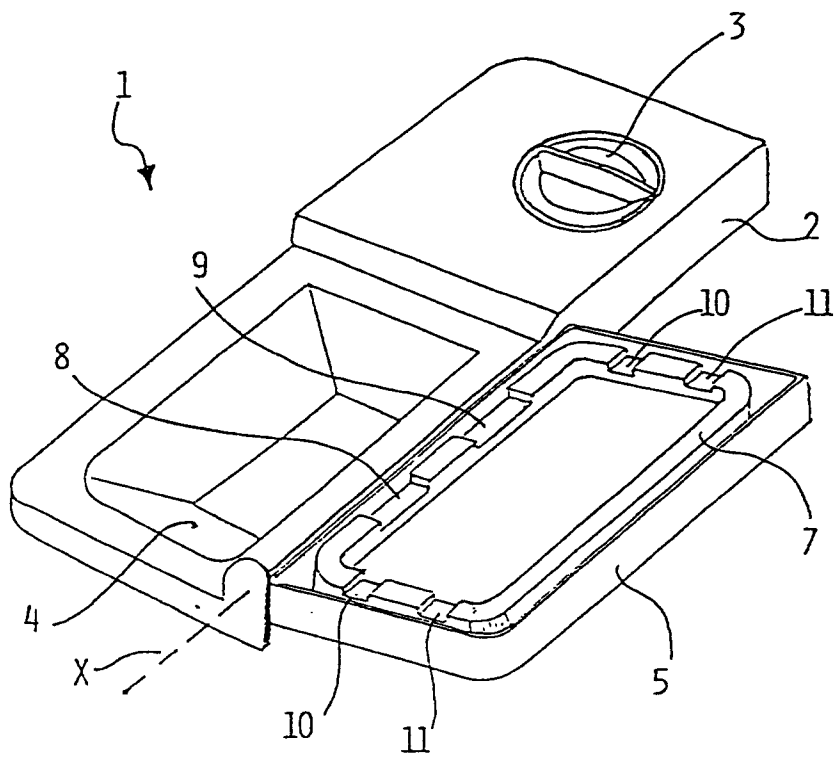


FIG. 4

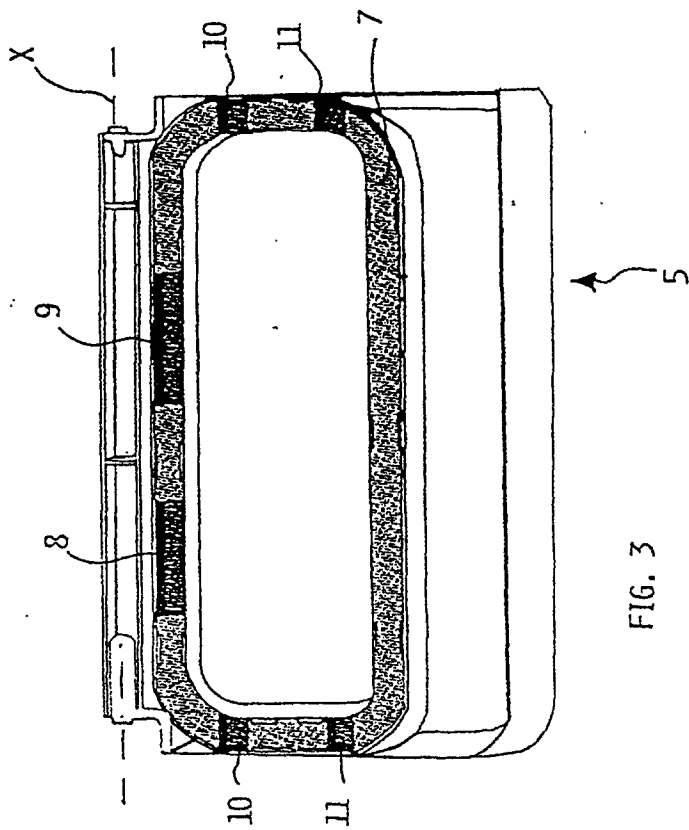
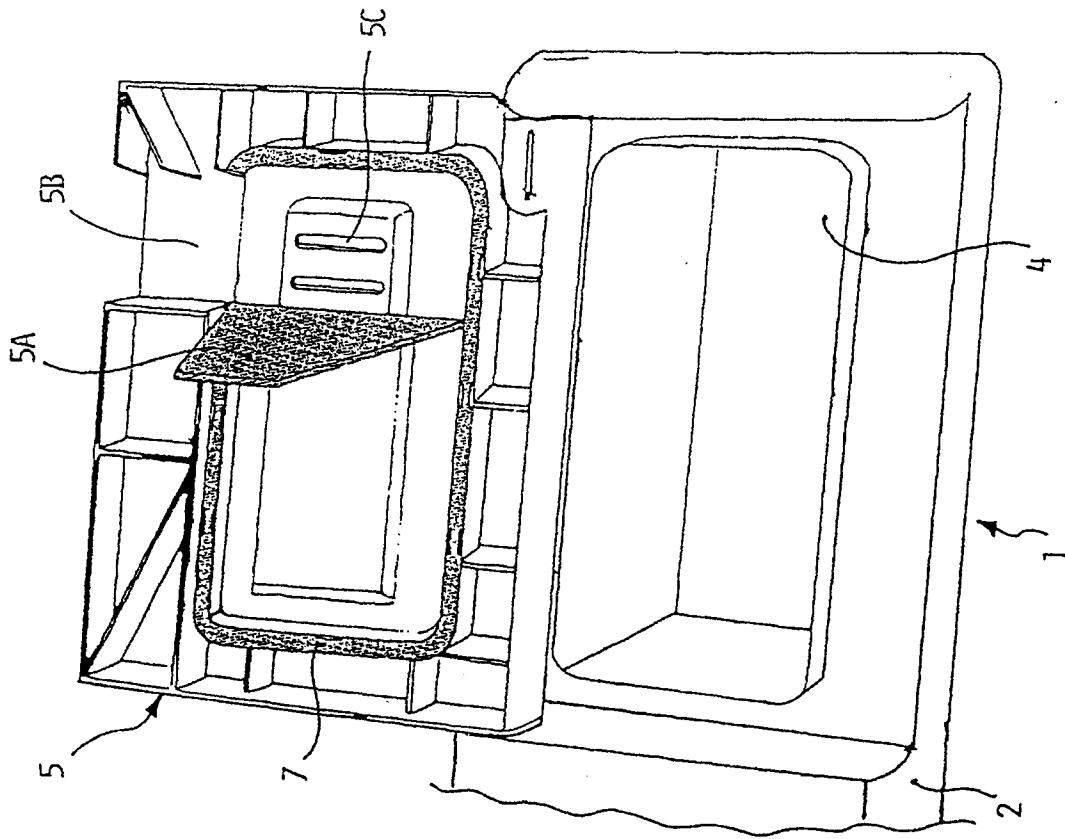


FIG. 3

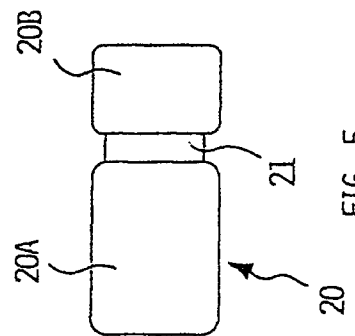


FIG. 5