(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 774 230 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
21.05.1997 Bulletin 1997/21

(51) Int. Cl.[6]: **A47L 15/42**, A47L 15/00

(21) Application number: **96203119.1**

(22) Date of filing: **07.11.1996**

(84) Designated Contracting States:
DE FR IT

(30) Priority: **14.11.1995 IT MI952329**

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(54) A washing cycle for a washing machine

(57) A washing cycle for a washing machine comprises a step of cleaning (PF) of filtering means (5) provided for filtering the washing water during said cycle (A, B), said step of cleaning (PF) being executed at the end of said washing cycle (A, B) and comprising at least one substep (CS) during which both a discharge pump (13) and valve means (8) for supplying clean water are activated simultaneously. The step of cleaning (PF) ends with said substep (CS), and at the end of said substep (CS) of the step of cleaning (PF) both the discharge pump (13) and said means (8) for supplying clean water are disactivated, so that part of the clean water loaded up during said substep (CS) of the step of cleaning (PF) is not discharged and remains in the washing tank (2) of the washing machine to be reused in a subsequent washing cycle.

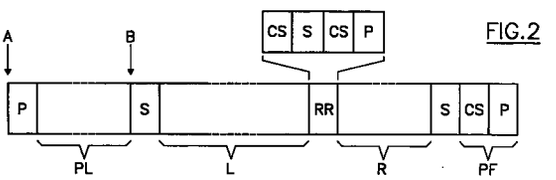

FIG.2

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Description

The present invention relates to a washing cycle for a washing machine, in particular for a dishwashing machine.

The washing cycles of current dishwashing machines comprise several steps executed in succession; more accurately, a washing cycle can comprise one or more steps of prewashing, followed by a plurality of steps of washing, followed in turn by a plurality of steps of rinsing.

With the object of reducing the quantity of water used as a whole by the dishwasher in a washing cycle, that currently is on average 25 litres (but some regulations are being studied on the basis of which such quantity should not be greater than 22 litres), the technique is now common of performing the washing cycle with water that is suitably filtered during the different step of washings. For filtering the washing water, necessary if good washing results are to be obtained, a filter is generally used that is installed at the mouth of an inlet conduit connected to the washing pump.

Said filter has to have meshes that are increasingly smaller the more the washing water is subjected to recycling, in order to trap the greatest amount of dirt that is in suspension in the water itself, avoiding that such dirt, being less diluted, obstruct either the inlet or the outlet conduit of the washing pump. It is thus indispensable to clean the filter periodically.

In the Italian patent application No. 22327 A/86 filed on 13 November 1986 by the same applicant a washing cycle for dishwashers is proposed comprising a step of automatic cleaning of the filter by means of a jet of water that is projected on said filter at the end of a step of discharge of the washing water. More accurately, at the end of said step of discharge of the washing water, while keeping the discharge pump of the dishwasher in operation, clean water is admitted that is projected in a jet, by means of a nozzle, toward the filter, so that the residues of dirt become detached from the walls of the filter and drop off, to be then discharged.

The need to reduce the quantity of water used overall in the dishwasher in the execution of a washing cycle, that translates into a saving of electrical heating energy, has in addition imposed the adoption of devices that allow a precise control of the quantity of water used by the dishwasher. This type of precise control is in fact not assured by the traditional systems of direct in-tank control, using pressure-control chambers in direct communication with the washing tank wherein the loading of water is interrupted when the water in the tank has reached the maximum surface extension. Devices that control the quantity of water in the tank that, on the other hand, allow a precise control of such quantity are for example described in the Italian invention patent applications MI92A000957, MI94A000353, MI94A001078, MI94A002144 and in the utility model application MI94U0000285, all in the name of the same applicant.

The abovementioned precise control devices thus allow a precise control of the quantity of water loaded by the dishwasher, but they are not, however, in a position to detect whether, during the execution of the washing cycle, the level of the water in the washing tank drops below a minimum pre-established level to avoid the washing pump from entering into cavitation. This is a situation that tends to take place especially at every start of a new washing cycle, when the load to be washed is still dry and thus traps a considerable quantity of water, that is subtracted from that in the bottom of the washing tank. It has been found experimentally that a dry load traps about half a litre of water, a quantity that, given the accuracy with which the water is loaded into the washing tank, is sufficient to determine the cavitation of the washing pump. The cavitation of the washing pump translates into a lower effectiveness of the flow of water urged by the distribution rotors toward the dishes to be washed, something that has a negative influence on the washing performances especially in washing cycles that do not provide for steps of prewashing.

A possible solution consists in restoring the ideal level of water in the washing tank by the action on the supply solenoid valve with a timed opening: in this case an additional quantity of water is loaded into the tank, which causes an increase in the total consumption of clean water.

In view of the described state of the art, the object of the present invention is that of providing a washing cycle for a washing machine, and in particular for dishwashers, that, even if implemented in a dishwasher equipped with a system of precise control of the quantity of water loaded into the washing tank, overcomes the abovementioned problems of cavitation of the washing pump, without naturally having to supply an increased amount of water.

According to the present invention, such object is attained thanks to a washing cycle for a washing machine, comprising a step of cleaning the filtering means provided for filtering the washing water during said cycle, said step of cleaning being executed at the end of said washing cycle and comprising at least one substep during which both a discharge pump and valve means for supplying clean water are activated simultaneously, characterized in that said step of cleaning ends with said substep, and at the end of said substep of the step of cleaning both the discharge pump and said means for supplying clean water are disactivated, so that part of the clean water loaded up during said substep of the step of cleaning is not discharged and remains in the washing tank of the washing machine to be reused in a subsequent washing cycle.

Thanks to the present invention, a washing cycle for a washing machine is provided that, as opposed to the known cycles, allows part of the clean water loaded during the step of cleaning the filter to be recovered; in a subsequent washing cycle, this quantity of recovered water is added to the volume of water loaded during the first steps of said subsequent cycle, thus compensating for the reduction of the level of water in the tank caused

by the water trapped by the dry dishes; it is thus possible to avoid problems of cavitation of the washing pump without having to provide increased loads of water during the first steps of the washing cycle, but exploiting part of the water used for cleaning the filter. The automatic washing of the filter, in combination with the partial recovery of the water used for the automatic cleaning of the filter, allows a considerable saving of water with respect to for example the case wherein the filter is cleaned normally at the end of each washing cycle under a jet of water by means of brushing.

These and other features of the present invention will be made more evident by the following detailed description of an embodiment thereof, illustrated as a non-limiting example in the enclosed drawings, wherein:

Fig. 1 shows diagrammatically the succession of steps of two washing cycles according to the known art;

Fig. 2 shows diagrammatically the succession of steps of two washing cycles according to the present invention;

Fig. 3 shows a cross-sectional view taken along a vertical plane of the bottom of a washing tank of a dishwasher;

Fig. 4 is a cross-sectional view taken along the line IV-IV of Fig. 3.

With reference to Fig. 1, there are shown therein two traditional washing cycles of a dishwasher.

A first washing cycle is indicated with A, and comprises a step of prewashing PL, a step of washing L, a step of rinsing R and a step PF of automatic cleaning of a filter provided in a manner known in itself at the inlet of a washing pump that urges the water present in the washing tank of the dishwasher to a pair of distribution rotors. The step of prewashing, the step of washing and the step of rinsing comprise in a manner known in itself several substeps, that will not be described in their details as they are known in themselves; for the purposes of the description of the present invention it will be sufficient to remember that the step of prewashing, the step of washing and the step of rinsing each comprise one or more steps of loading of clean water. Before the step of prewashing PL, and before the steps of washing L and of cleaning the filter PF there is a step of complete discharge S of the washing water contained in the tank of the dishwasher, a step during which a discharge pump of the dishwasher is activated.

Between the step of washing L and the step of rinsing R there is a step RR of rinsing with decalcifying resins normally used in dishwashers for decalcifying the clean water loaded from the external water circuit. The resins are first regenerated by causing water containing regenerating salts to flow through them; such water used for regenerating the resins is accumulated in a special tank with a capacity of about 300 cc during the steps wherein clean water is loaded. The step of rinsing the resins RR comprises a first substep CS during which there are activated simultaneously both the discharge pump and the solenoid valve for supplying clean water, connected to a water circuit external to the dishwasher; a second substep S of complete discharge of the water contained in the washing tank; a third substep CS identical with the first substep CS; and a fourth substep S of complete discharge.

The step of cleaning the filter PF comprises, as described in the already mentioned Italian patent application No.22327 A/86, a first substep CS of simultaneous charge and discharge. During the substep CS, with a duration of approximately fifteen seconds, there are activated simultaneously both the discharge pump and the solenoid valve for supplying clean water, connected to a water circuit external to the dishwasher; considering the normal rating of the supply solenoid valve and of the water supply circuit of the dishwasher, the quantity of water loaded in the approximately fifteen seconds of duration of the substep CS is about one litre. During the substep CS the clean water loaded is atomized and sprayed, through a nozzle, on the filter to be cleaned; the particles of dirt are thus detached from the walls of the filter, they drop to the bottom of the washing tank and are discharged by the discharge pump. The step of cleaning the filter PF comprises a second substep of discharge S (substantially identical with the steps of discharge S that precede the steps of prewashing, washing, rinsing and cleaning of the filter) during which the discharge pump remains in operation, while the supply solenoid valve is disactivated; in this second substep S, the water atomized in the preceding substep CS drops to the bottom of the washing tank, and is completely discharged by the discharge pump. It is appropriate to point out that, at the end of the substep of discharge S of the step of cleaning the filter PF, that is, when the discharge pump is disactivated, in the washing tank there still remains a certain quantity of water, because by reason of the effects of cavitation the discharge pump is not in a position to discharge all the water present in the washing tank; such quantity of residual water is approximately equal to 0,5 l. The same thing takes place in all the steps of discharge S of the washing cycle: in other words, at the end of a step of complete discharge S the washing tank of the dishwasher is never completely empty, there being always present in it about half a litre of water.

In Fig. 1 there is also shown a second washing cycle, indicated with B; such cycle is substantially identical with the cycle A described previously, except for the fact that it does not provide for a step of prewashing. The cycle B starts at the discharge step S that precedes the step of washing L, and ends with the step of cleaning of the filter PF.

In Fig. 2 there are shown diagrammatically the two washing cycles A and B, modified with respect to Fig. 1 according to the present invention.

The steps of prewashing PF, of washing L and of rinsing R of the washing cycle A are substantially identical with the corresponding steps of the cycle A of Fig.

1. Moreover, before the step of washing L and the step of cleaning the filter PF there are also steps of complete discharge S of the water, and between the step of washing L and the step of rinsing R there is also a step of rinsing RR of the decalcifying resins.

As opposed to traditional washing cycles, however, before the step of prewashing PL there is no discharge step S, but there is a pause step P during which the dishwasher does not substantially perform any function (such pause step could in fact not be provided for, but it is inserted in order to avoid changing the timers existing commercially, so that the washing cycles according to the present invention can be implemented even with a traditional timer).

The step of cleaning the filter PF comprises also a first substep CS of simultaneous charge and discharge of water, according to the methods described previously. But as opposed to traditional washing cycles, the second substep of the step of cleaning the filter PF is not a step of discharge S, but a step of pause P (again, this step of pause is inserted to avoid changing the timers existing commercially, but it could be eliminated).

At the end of the washing cycle A the step of cleaning the filter PF is executed and, in the substep CS with a duration of approximately fifteen seconds, the dishwasher loads up with a quantity of clean water equal to about one litre, water that is atomized and sprayed on the filter in order to detach the residues of dirt. Part of the litre of clean water loaded up is simultaneously discharged by the discharge pump (substep S of the step PF) in order to eliminate the residues of dirt. After the approximately fifteen seconds have elapsed, the supply solenoid valve is disactivated, and the atomized water is deposited on the bottom of the washing tank; the discharge pump is also disactivated, so that only part (about half) of the litre of clean water loaded up in the substep CS is actually discharged. In this way, at the end of the washing cycle A in the tank of the dishwasher there remains a quantity of water equal to about one litre: 0.5 l are constituted by the residue of water that remains in the tank at the end of the step of discharge S preceding the step of cleaning the filter PF, and 0.5 l are constituted by part of the clean water loaded up for cleaning the filter and not completely discharged.

When the washing cycle A is next set up, thanks to the fact that the first step of the cycle is not a step of discharge but a step of pause P, the entire litre of water present in the washing tank is conserved, and is in addition to the (precise) quantity of clean water loaded up during the step of prewashing. It is therefore understood that, with respect to known washing cycles, the cycle according to the present invention allows the recovery of a quantity of (substantially clean) water equal to about 0.5 l, enough to avoid that, in the first steps of the washing cycle, when the load of dishes is still dry, phenomena of cavitation of the washing pump may be triggered, with the consequent limited efficiency of the washing action.

In Fig. 2 it is also possible to see how the washing cycle B of Fig. 1 has been changed so as not to start during the step of discharge S preceding the step of washing L, but only after such step of discharge; in this way, even in the case that the washing cycle B is set up, in the washing tank of the dishwasher the half litre of water recovered during the step of cleaning the microfilter at the end of the previous washing cycle is always conserved.

As also shown in Fig. 2, as opposed to the traditional washing cycles the last substep of the step of rinsing RR of the decalcifying resins does not provide for the complete discharge of the water in the tank, but for a pause P (provided as already said in order to avoid changing the existing timers); in this way it is possible to recover part of the water used in rinsing the decalcifying resins (more accurately, the water contained in the tank containing the water for rinsing the resins, that is about 300 cc, is recovered), so that the quantity of water available for the first step of rinsing is increased; this contributes in avoiding cavitation of the washing pump even in the presence of critical conditions.

Fig. 3 is a cross-sectional view taken along a vertical plane of a bottom part of a washing tank of a dishwasher. In this figure there is indicated with 1 a chassis of the dishwasher and with 2 a washing tank of the dishwasher; the washing tank 2 has a lower opening below which there is mounted a sump 3, in communication with the inside of the washing tank through a filtering plate 4. Inside the sump 3 there is mounted a filter 5 with a substantially cylindrical shape, inside which there extends an atomizing-spraying nozzle 6 connected to a conduit 7 in turn connected to a supply solenoid valve 8; during the step PF of cleaning the filter 5, clean water is supplied to the nozzle 6 through the conduit 7, water that is atomized and sprayed on the walls of the filter 5 to cause the detachment of the residues of dirt. Inside the filter 5 there also extends, starting from the filtering plate 4, a cup 9 for recovering the solid residues with the largest dimensions. Still in Fig. 3 there is diagrammatically indicated with 10 a device for the precise control of the quantity of water loaded into the washing tank 2 during the operation of loading up with clean water. Such device 10 can for example be of the volumetric type, described for example in the already mentioned Italian patent application MI94A002144, but it could also be of a different type. The device 10 executes the measurement of the volume of clean water loaded up through the supply solenoid valve 8, and sends the quantity of clean measured water, through a conduit 11 and a check valve 12, to the sump 5. Lastly, there is visible in Fig. 3 a discharge pump 13, with mouth on the bottom of the sump 5 (Fig. 4) that is activated for discharging the water present in the washing tank 2.

There are shown in Figs. 3 and 4 four different levels of water: a first level, indicated with L1, is the level of the water in the sump 3 at the end of a step of complete discharge S, with the discharge pump still activated. A second level, indicated with L2, is the level of the water in the sump 3 at the end of a step of complete discharge

S, after the discharge pump has been disactivated; the level L2 corresponds to a volume of water substantially equal to 0.5 l, determined by the return into the sump of the water present in the intake conduits of the discharge pump and that cannot be discharged completely due to the appearance of phenomena of cavitation. A third level L3 is the level of the water in the sump 3 during the execution of the substep CS of the step PF of cleaning the filter 5, during which both the discharge pump and the supply solenoid valve are activated. A fourth level L4 is the level of the water that, according to the present invention, remains in the sump 3 at the end of the substep CS of the step PF of cleaning the filter 5 when such substep CS is not followed by a substep of complete discharge S; as described previously, the level L4 corresponding to a volume of water substantially equal to 1 l(0.5 l consisting of the residue of water that remains in the tank at the end of the step of discharge preceding the step of cleaning the filter, plus 0.5 l consisting of the part of clean water loaded up for cleaning the filter and not completely discharged), a volume that is conserved in the sump and that is recovered in a subsequent washing cycle. The recovery of the 0.5 l in the step of cleaning the filter allows the avoidance of problems of cavitation of the washing pump in a subsequent washing cycle.

Even though the washing cycle according to the present invention finds use advantageously in dishwashers equipped with devices for the precise control of the quantity of clean water loaded up into the washing tank, nothing forbids it from being implemented in dishwashers equipped with traditional devices for the direct in-tank control by means of pressure-control chambers connected to the washing tank.

Claims

1. A washing cycle for a washing machine, comprising a step of cleaning (PF) of filtering means (5) provided for filtering the washing water during said cycle (A, B), said step of cleaning (PF) being executed at the end of said washing cycle (A, B) and comprising at least one substep (CS) during which both a discharge pump (13) and valve means (8) for supplying clean water are activated simultaneously, characterized in that said step of cleaning (PF) ends with said substep (CS), and at the end of said substep (CS) of the step of cleaning (PF) both the discharge pump (13) and said means (8) for supplying clean water are disactivated, so that part of the clean water loaded up during said substep (CS) of the step of cleaning (PF) is not discharged and remains in the washing tank (2) of the washing machine to be reused in a subsequent washing cycle.

2. A washing cycle according to claim 1, characterized in that said step of cleaning (PF) provides for sending the clean water loaded up toward said filtering means (5) through atomizing-spraying means (6) to determine the detachment from said filtering means (5) of residues of the filtering action.

3. A washing cycle according to claim 2, characterized in that it also comprises at least one step of washing (L) and, subsequently, at least one step of rinsing (R), said step of washing (L) starting with a load of clean water in the washing tank (2), that is added to the part of the water not discharged during the substep (CS) of the step of cleaning (PF) of a prior cycle (A, B).

4. A washing cycle according to claim 2, characterized in that it also comprises at least one step of prewashing (PL), followed by at least one step of washing (L) and by at least one step of rinsing (R), said step of prewashing (PL) starting with a load of clean water in the washing tank, that is added to the part of the water not discharged during the step (CS) of the step of cleaning (PF) of a prior cycle (A, B).

5. A washing cycle according to claim 3 or 4, characterized in that said substep (CS) of the step of cleaning (PF) has a duration of about 15 seconds, the quantity of clean water loaded up in said substep (CS) being substantially equal to one liter, said part of clean water loaded up during said substep (CS) and that is not discharged being substantially equal to half a liter.

FIG.1

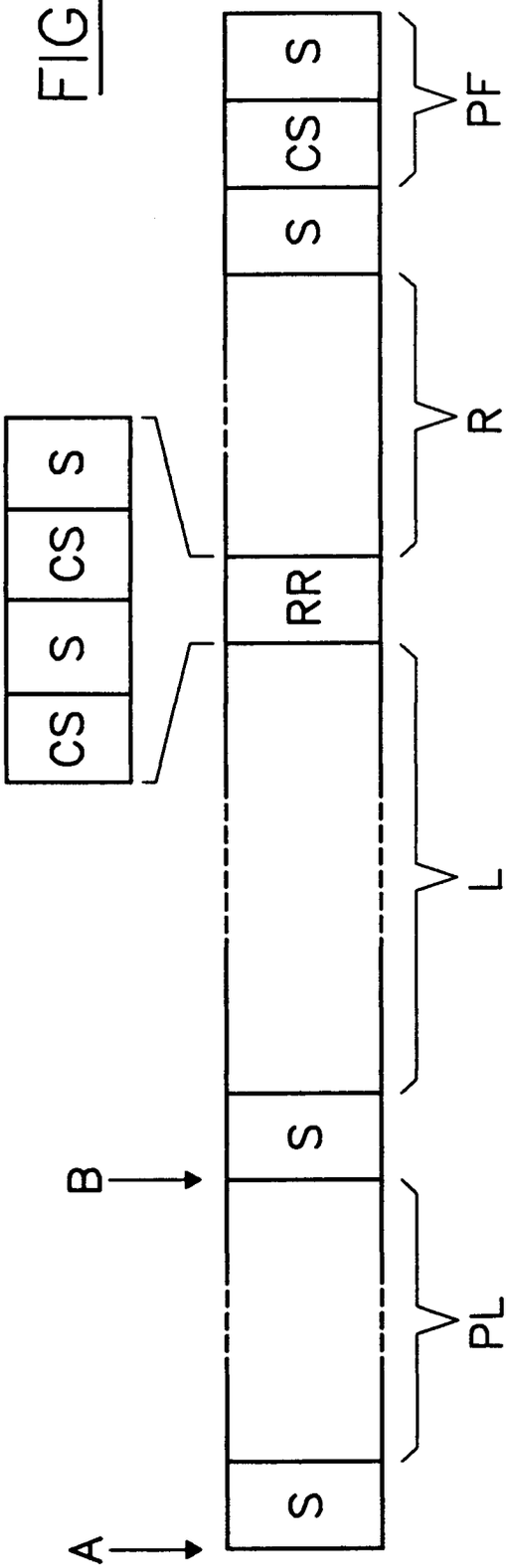
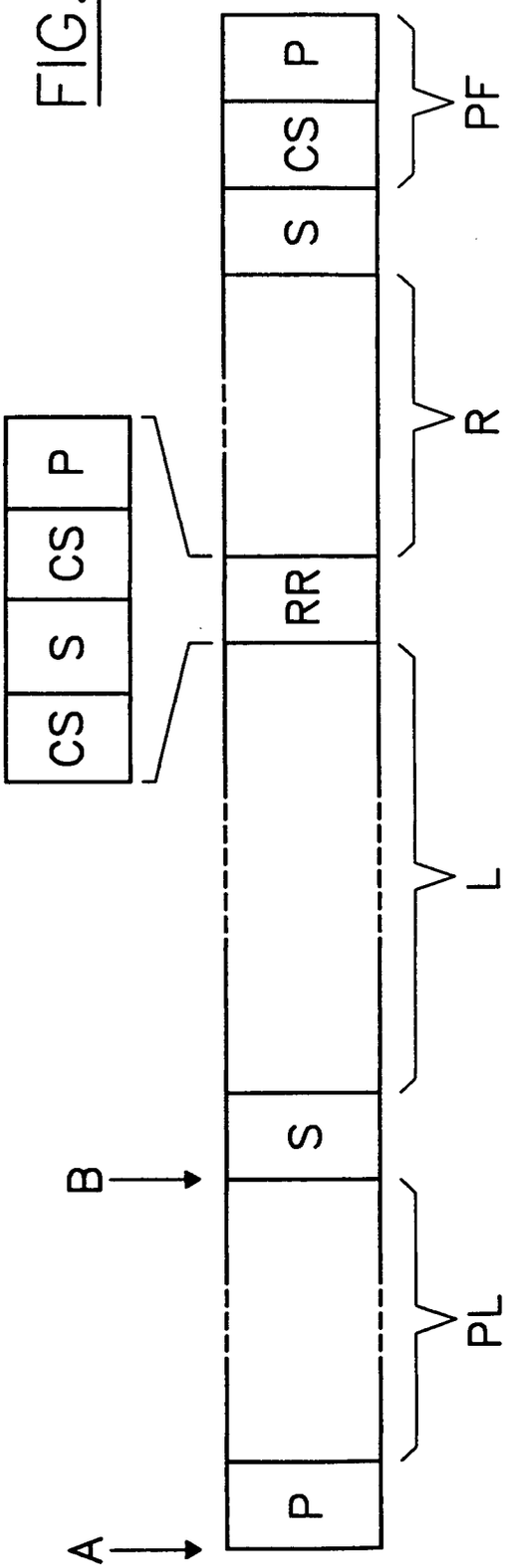


FIG.2



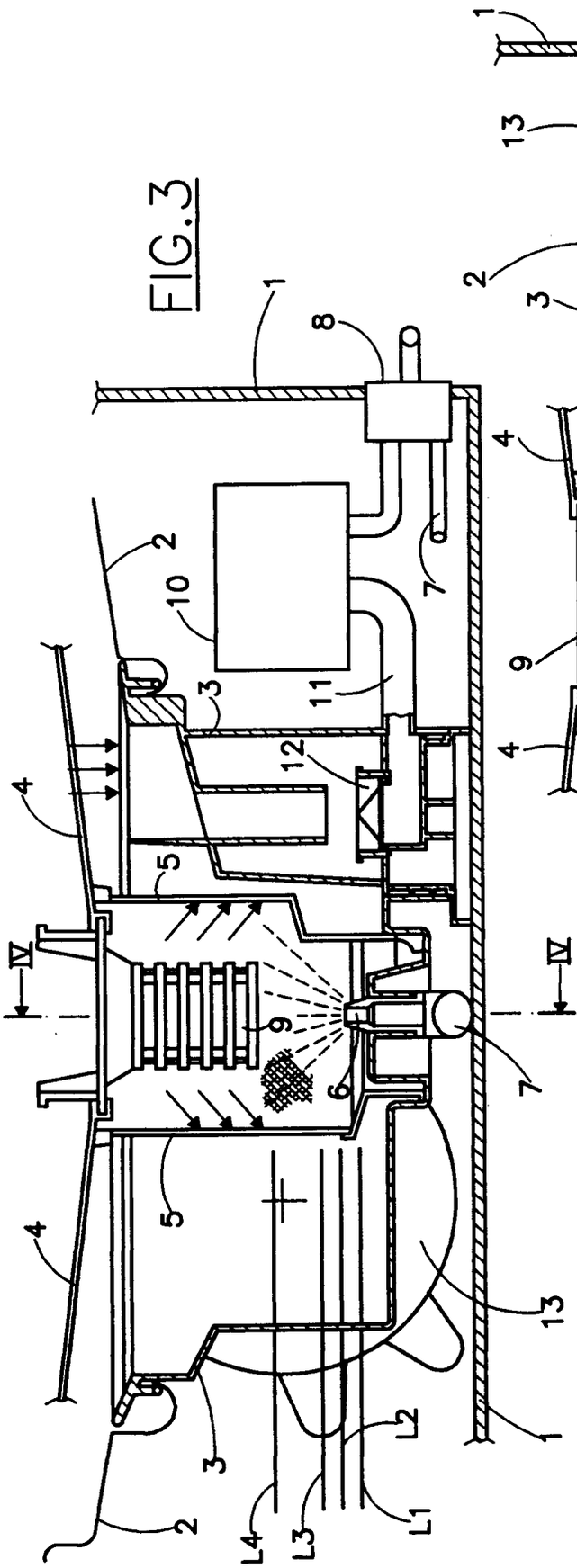


FIG.3

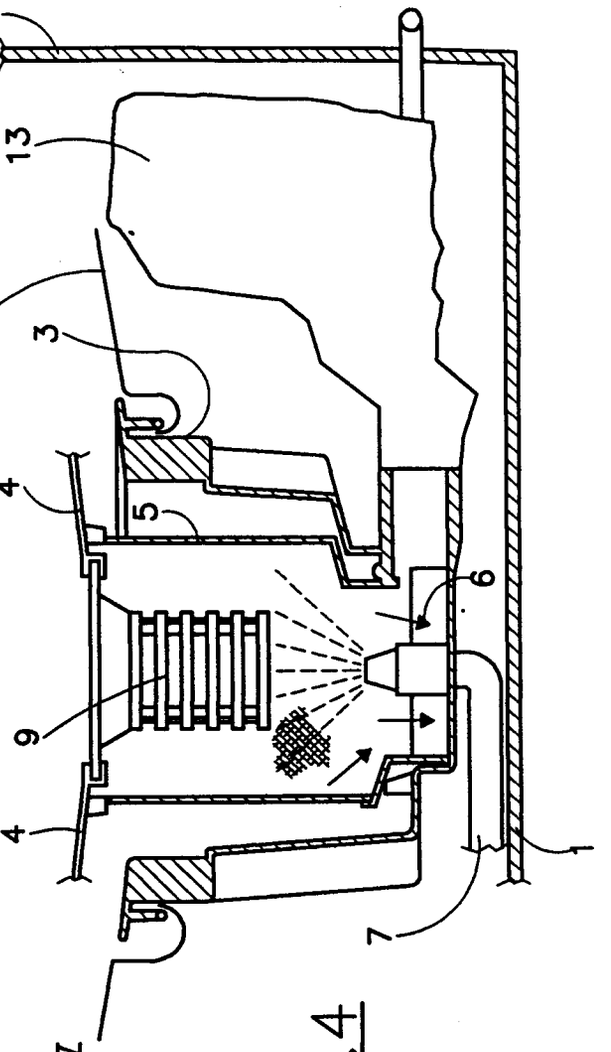


FIG.4