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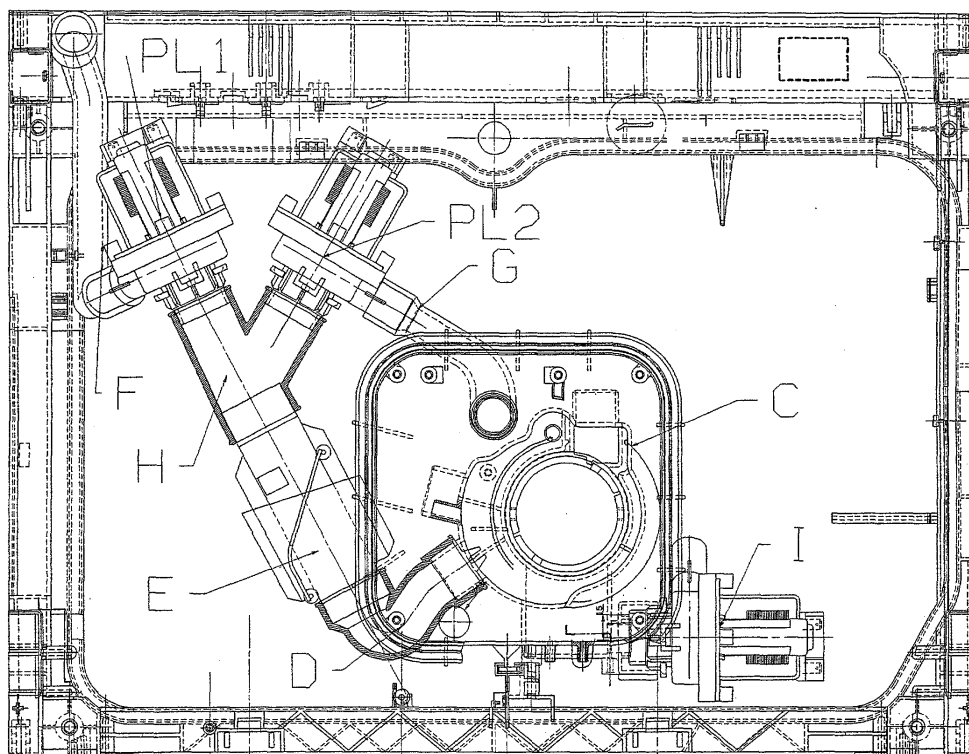
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(54) Dishwasher with improved hydraulic circuit

(57) A dishwasher with capacity of alternate wash on two racks includes an upper sprinkler and a lower sprinkler that receive water through respective delivery pipes (F, G), on the bottom of the washing tank there being arranged a collecting sump (C), a suction duct (D) branching out from the bottom of the latter. A connector (H) connects the suction duct (D) to two washing pumps (PL1, PL2), preferably synchronous pumps, that pump

the water directly into the two delivery pipes (F, G) respectively. In this way the user can choose between alternate wash and conventional wash, and the machine has a more efficient, simple and cheap structure (both to manufacture and to use) with respect to conventional machines in which the hydraulic circuit includes one or more valves for controlling the water flows to the sprinklers.

Fig. 2



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Description

[0001] The present invention relates to dishwashers, and in particular to a dishwasher provided with a washing pump for each sprinkler.

[0002] It is known that in modern dishwashers the user is often offered the possibility of running a "half load", i.e. a washing cycle in which only one of the sprinklers is used, or an "alternate" wash in which the two sprinklers are alternately supplied thus allowing to extend the washing of the dishes in one of the two racks.

[0003] This type of program is usually obtained through a single-delivery washing pump and a flow distribution valve controlled by the control unit of the machine to direct the water flow to the upper or lower sprinkler. However this conventional arrangement has various drawbacks both in manufacturing and using the machine.

[0004] Firstly, said flow distribution valve introduces in the hydraulic circuit great flow resistances that prevent the use of washing pumps of lower power with respect to machines with conventional simultaneous washing on both racks. It is known, in fact, that the power required in a hydraulic circuit is given by the product of flow rate by pressure, whereby once the water outflow pressure at the sprinklers (required to achieve good washing results) is determined it is clear that a decrease in flow rate should result in a corresponding decrease in the required power.

[0005] In real-life situations the flow rate decrease between the conventional washing mode and the alternate washing mode is 40%, therefore one would expect a 40% decrease also in the power of the washing pump. Actually, the decrease is much smaller since it is typically only about 10%, and the smaller difference is exactly due to the flow resistances mainly caused by the introduction of the flow distribution valve and by the layout of the required hydraulic circuit.

[0006] A second drawback stems from the fact that such a valve requires a "closed loop" control in that it is necessary to know the position of the flow distributor for a correct operation of the machine. Therefore this implies a greater complexity of the electronic control unit with respect to the management of the usual devices contained in a dishwasher (electrovalves, heating resistance, etc.) that are controlled in an "open loop" manner.

[0007] Finally, the impossibility of being able to wash simultaneously on both racks is a strong limitation to the flexibility of use of the machine. In fact the alternate wash, in order to assure good washing results, requires long times since washing alternately on a single rack implies almost doubling the times. This increase in length can be tolerated for the "standard" cycle that defines the power saving category of the machine, but is badly tolerated for the other cycles since the market asks for the possibility of choosing between long cycles with low consumption and short cycles with a higher

consumption.

[0008] Another alternative is a double-delivery pump with two valves that independently control the supply to the two sprinklers. Obviously, the presence of two valves and of a double-delivery pump implies an increase in bulkiness, a further increase in the machine manufacturing cost, as well as a further decrease in reliability since both the hydraulic circuit and the electronic control unit are even more complicated.

[0009] Therefore the object of the present invention is to provide a dishwasher which overcomes the above-mentioned drawbacks. This object is achieved by means of a dishwasher with two washing pumps each being directly connected to a sprinkler.

[0010] The main advantage of the dishwasher according to the present invention is exactly that of allowing to dispense with the valve(s) to control the supply to the two hydraulic circuits of the two sprinklers. This results in a greater efficiency of the hydraulic circuit that has much lower flow resistance, thanks to the simplified layout.

[0011] Another important advantage is that of being able to use less powerful synchronous pumps, that are less bulky and more reliable than the usually employed asynchronous pumps.

[0012] Still another advantage stems from the fact of allowing the user to choose between the alternate wash and the conventional wash on both racks simultaneously, so as to be able to reduce the length of the washing cycle.

[0013] A global advantage of this dishwasher is therefore that of achieving the above-mentioned functionality through a very simple and cheap structure, with positive results as to cost and reliability.

[0014] These and other advantages and characteristics of the dishwasher according to the present invention will be clear to those skilled in the art from the following detailed description of an embodiment thereof, with reference to the annexed drawings wherein:

Fig.1 is a diagrammatic vertical sectional view of a conventional dishwasher provided with an upper sprinkler and a lower sprinkler; and

Fig.2 is a top plan view of the lower portion of the present dishwasher showing the improved hydraulic circuit.

[0015] With reference to said figures, there is seen that a dishwasher conventionally includes an upper sprinkler A and a lower sprinkler B, that receive water through respective delivery pipes F, G. On the bottom of the tank there is arranged a collecting sump C, a suction duct D branching out from the bottom of the latter and passing through a heating member E.

[0016] The novel aspect of the present dishwasher is the presence of a connector H that connects duct D to two washing pumps PL1, PL2 that pump water directly into pipes F, G respectively.

[0017] The size and shape of the various connecting piping D, F, G, H are designed to reduce to a minimum the flow resistances optimizing the hydraulic circuit. Such an optimization allows to use as washing pumps PL1, PL2 synchronous pumps similar to those already used in conventional dishwashers as drain pump (indicated by I).

[0018] The use of such highly reliable pumps implies costs and bulkiness significantly lower with respect to the conventional solution of asynchronous washing pump (with starter capacitor) and flow distribution valve. Furthermore, pumps PL1, PL2 can be controlled through an "open loop" same as all other actuators present in a dishwasher, thus achieving a reduction in complexity and cost of the electronic control unit. Finally, with this type of control it is even possible to use electromechanical timers, which is impossible in known arrangements.

[0019] It should be noted that it is also possible to provide a "closed loop" control of the correct operation of pumps PL1, PL2, but this is only a "plus" that can be implemented on high-range models since it is not strictly necessary for the correct operation of the machine.

[0020] In the alternate washing mode when a flow rate of about 30 lt/min is required, the applicant has calculated and tested that it is sufficient to use a 50/60W pump to achieve pressure levels suitable to assure the best washing results. It is therefore possible to obtain that actual power decrease which is not obtainable with the flow distribution valve.

[0021] It is also clear that by operating pumps PL1 and PL2 simultaneously there is obtained the conventional washing mode in which both sprinklers operate (in this mode the flow rate is about 50 lt/min). It is therefore possible to carry out washing cycles of reduced length with respect to the alternate washing cycles, thus meeting the market requests.

[0022] The improvement as to length reduction is obtained not only for the normal washing cycles but also for the "standard" cycle: in fact it is possible to use the alternate washing mode only in those phases (heating) when due to energy saving a small amount of water is inside the dishwasher. On the contrary, in the "cold" phases it is possible to use the conventional washing mode, thus reducing the length of these phases without affecting the effectiveness.

[0023] It is therefore clear how this arrangement allows to combine the two different washing modes, conventional and alternate, while achieving high washing performance with a flexibility in cycle composition that can not be obtained with present machines.

[0024] It is clear that the above-described and illustrated embodiment of the dishwasher according to the invention is just an example susceptible of various modifications. In particular, size and shape of the various connecting piping D, F, G, H can be changed according to specific needs, and the washing pumps PL1, PL2 can be of any kind.

Claims

1. A dishwasher including an upper sprinkler (A) and a lower sprinkler (B) that receive water through respective delivery pipes (F, G), on the bottom of the washing tank there being arranged a collecting sump (C), a suction duct (D) branching out from the bottom of the latter, **characterized in that** it further includes a connector (H) suitable to connect said suction duct (D) to two washing pumps (PL1, PL2) that pump the water directly into said two delivery pipes (F, G) respectively.
2. A dishwasher according to claim 1, **characterized in that** the washing pumps (PL1, PL2) are synchronous pumps.
3. A dishwasher according to claim 1 or 2, **characterized in that** it includes electromechanical timers to control the washing pumps (PL1, PL2).
4. A dishwasher according to claim 1 or 2 or 3, **characterized in that** the suction duct (D) passes through a heating member (E).

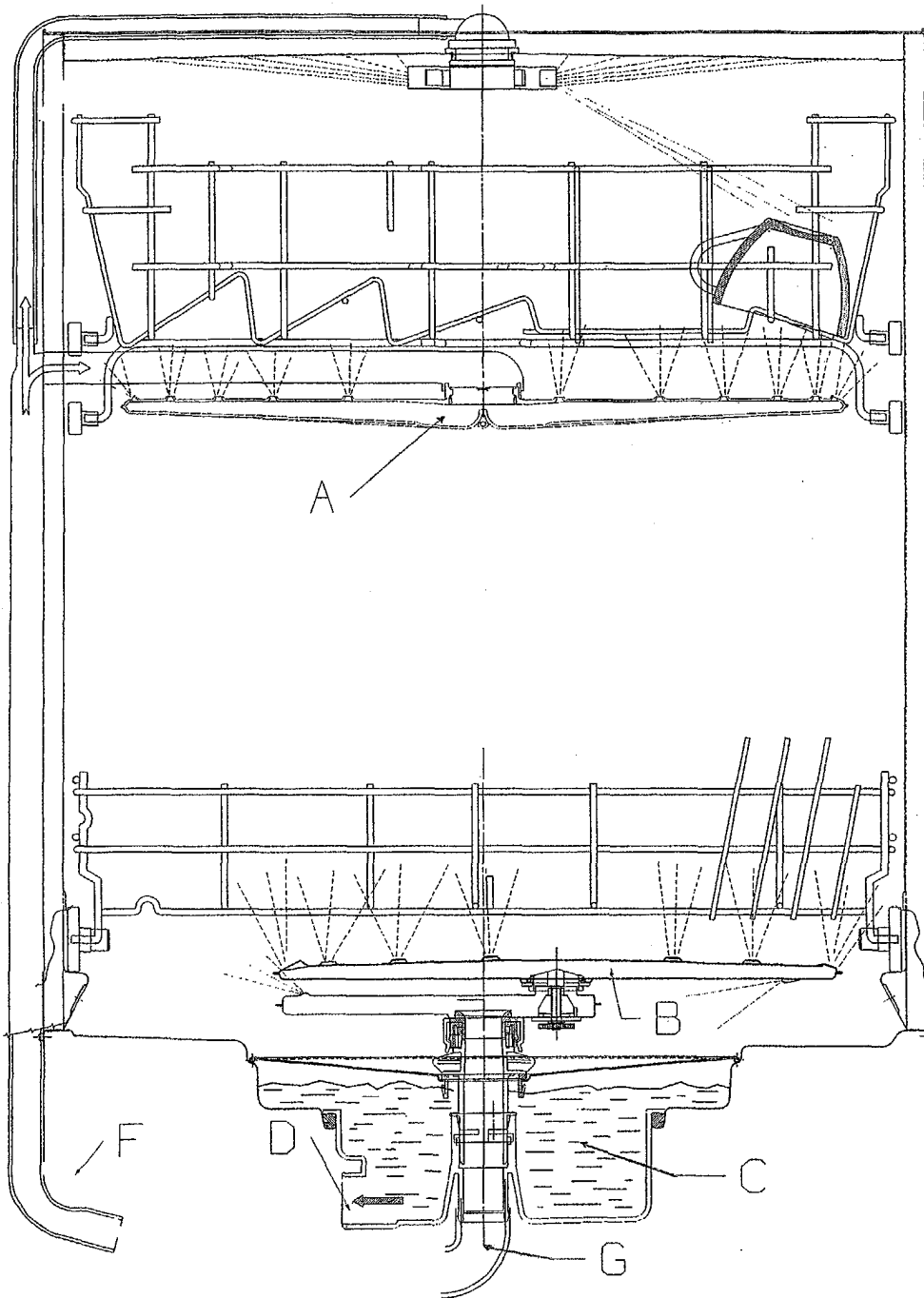


Fig. 1

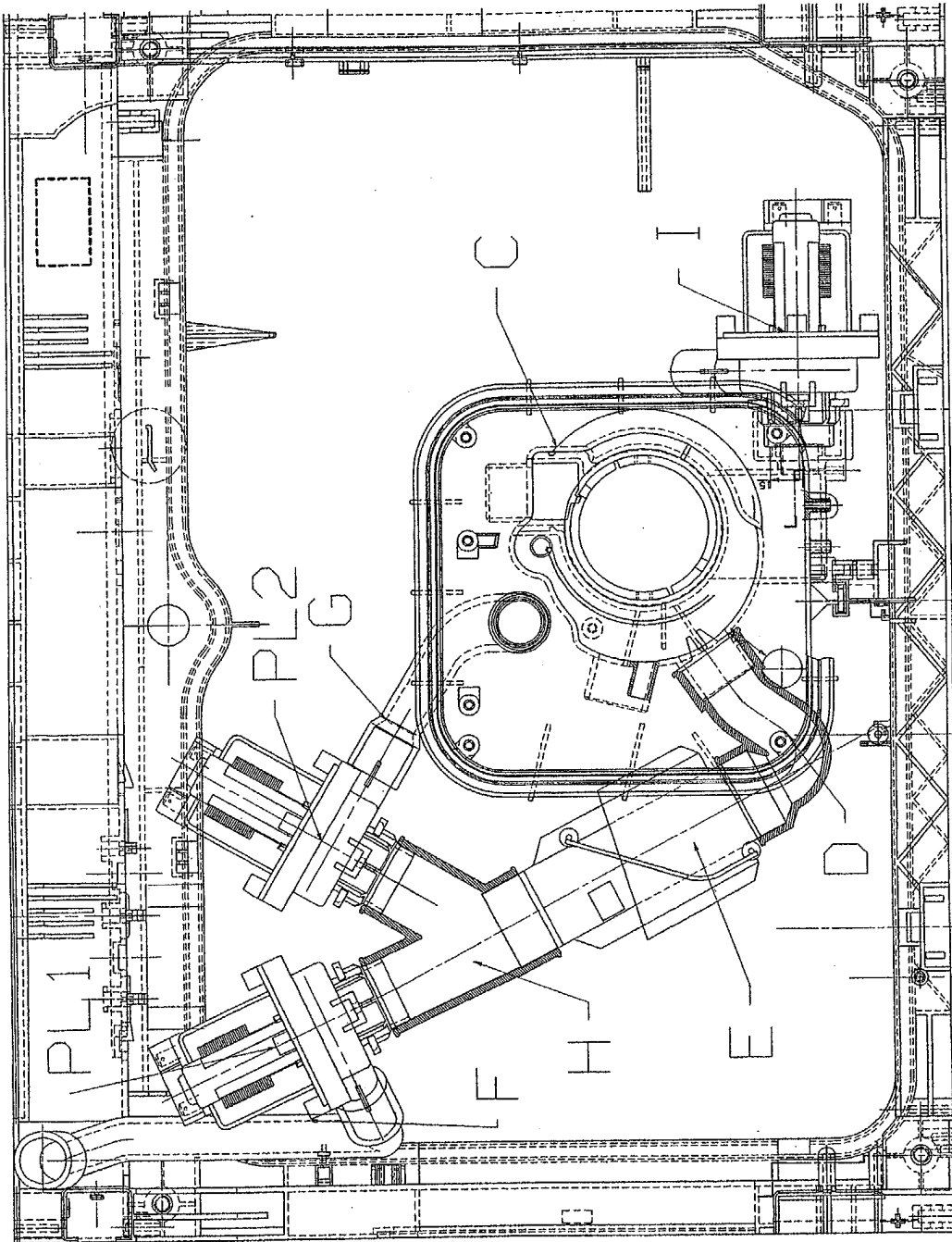


Fig. 2



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EUROPEAN SEARCH REPORT

Application Number
EP 04 42 5055

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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 June 2004	Examiner Papadimitriou, S
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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EPO FORM 1503 03.82 (P04C01)

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