

(19)



Europäisches Patentamt

European Patent Office

Office européen des brevets



(11)

EP 0 829 221 A2

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
18.03.1998 Bulletin 1998/12

(51) Int. Cl.⁶: **A47L 15/50**

(21) Application number: 97115615.3

(22) Date of filing: 09.09.1997

(84) Designated Contracting States:
**AT BE CH DE DK ES FI FR GB GR IE IT LI LU MC
NL PT SE**

(72) Inventors:
• **Alesso, Pietro
Pinerolo (TO) (IT)**
• **Minnone, Giuseppe
Torino (IT)**

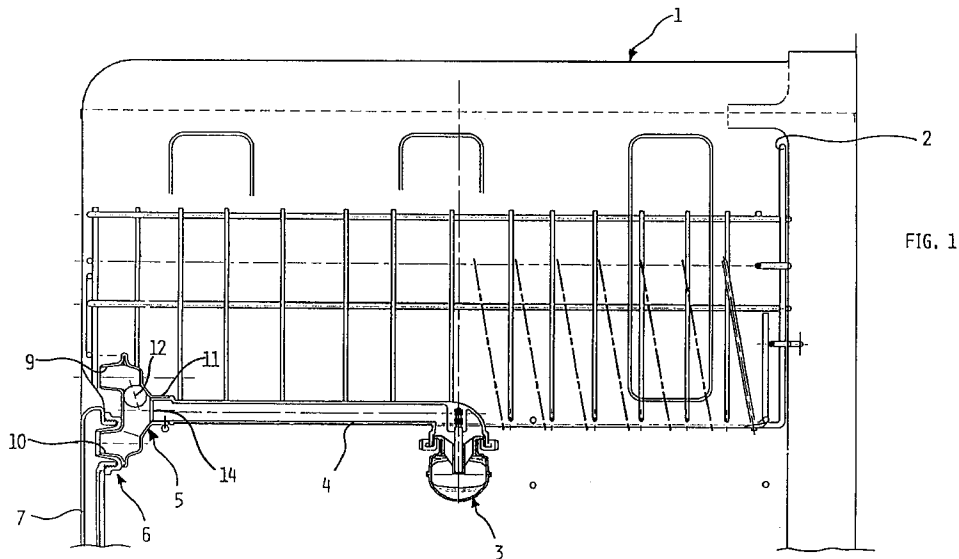
(30) Priority: 11.09.1996 IT TO960745

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

(54) Dishwashing machine with improved hydraulic circuit

(57) A dishwasher equipped with an upper crockery basket (2) capable of taking two different height positions, comprising a commutation device (5) to feed the upper sprayer (3) as a function of the height position selected for the basket (2). Said device (5) is practically integrated in a connecting element (4) between an hydraulic feed intake (6) and the upper sprayer (3), and

comprises two alternative inlets (9,10) and an outlet (11), between which flow deflecting means (12) are provided, which take an operating position depending on the pressure exerted by the wash fluid from the hydraulic intake (6).



EP 0 829 221 A2

Description

The present invention refers to a dishwashing machine of the kind described in the preamble of the annexed Claim 1.

As known, dishwashing machines usually comprise two crockery baskets, specifically an upper loading basket and a lower loading basket.

In such machines crockery are sprayed by two rotary sprinklers, which spray the wash fluid towards the baskets and are fed with fluid under pressure from a proper wash pump housed in the machine base; the lower sprinkler is generally fed and supported from the bottom by a tubular element directly connected with the pump body.

Some embodiments have the upper sprinkler fed from the top: a nozzle located in the ceiling of the wash tub which is fed by a duct from the pump, directs a fluid jet downwards; said jet flows across the air to reach a tapered receiving element and is centrally fastened to the machine upper basket. The air crossing separating the nozzle from the receiving element is provided to let the basket slide horizontally to carry out the normal extraction or insertion operations associated with loading/unloading of the crockery. The tapered receiving element associated with the upper rotary sprinkler and in connection with it, normally uses a Venturi tube system to avoid fluid turbulence and flowback. However, the jet of fluid coming out of the nozzle crosses the air and enters the tapered receiving element at high speed, hurting its walls and causing a noise that lasts practically for the whole washing time, which makes the appliance very noisy.

Moreover, since the upper basket of the dishwashing machine is usually adjustable in height (i.e. it can take at least two different positions, namely a higher and a lower one inside the wash tub to fit the dimensions of the objects to be washed), the air jump may be either greater or smaller according to the usage of the dishwasher. Therefore, it is obvious that when the upper basket is located on its lower position, the fluid flow across the air is greater and as a result the washing under this condition will be more critical. As a matter of fact, when there is such a condition it is more probable that a part of the fluid will not reach the tapered receiving element and fall outside it causing a reduced washing performance. Another negative effect under this condition is the higher noisiness caused by the fluid entering the tapered element.

With a view to reduce the noise problem and the losses of the fluid under pressure, dishwashers have been suggested, which are equipped with means suitable to remove the air jump between the upper nozzle and the tapered receiving element during the use of the machine.

For instance, EP-A-401.767 describes a dishwashing machine with its upper basket adjustable in height, where a feeding duct to the upper sprinkler departs from

a pump and extends along the side wall and the bottom wall of the wash tub; on the bottom wall of the tub said duct ends in a boxed commutation device with two outlets at different heights having respective closing balls; each ball is housed in a sloped seat located in line with an outlet of the device. Thus, each ball is led by gravity to the closing position of its respective outlet.

The upper sprinkler of the dishwasher has a connecting tube suitable to be coupled alternatively with either one or the other outlet according to the height position selected for the basket. Such a tube has a protruding end suitable to enter the selected outlet and displace the relevant ball to let the fluid throughflow. Therefore, with the machine recycling pump in operation, the washing fluid is free to pass through the outlet where said protruding end is inserted, then reach the connecting tube and the sprayer. In this instance, the other outlet of the commutation device remains closed by the relevant ball, which remains in position due to its sloped seat and water pressure.

However, the above solution is connected with some problems. A first problem is the need of obtaining a proper seat on a tub wall, specifically the rear one, to locate the commutation device, which is rather bulky. This operation is obviously difficult for the molding of a rather complex part like the tub rear wall and involves higher costs.

A second problem related to the above solution is that the design of the commutation device may cause some hindrances to the water outflow from the connecting tube; moreover, in case of faults and/or malfunctions of the device, the latter cannot be easily reached and the eventual maintenance operations will be difficult.

Finally, also the need of obtaining a protruding end on the connecting tube with the sprayer will make more complicated the part manufacturing.

Another dishwashing machine is also known from the Italian Utility Model application No. MI92U00567, where the hydraulic intake on the tub rear wall has two ways in vertical direction.

In this instance the connecting tube with the sprayer has an hydraulic connector with three vertical terminals, of which only the central one allows hydraulic connection with the sprayer, whereas one of the other two terminals operates alternatively as a shutter for the hydraulic intake way unused.

Such an embodiment requires a considerably bulky connector as well as the use of a two-way hydraulic intake, with similar problems as previously mentioned with reference to EP-A-401-767.

Another problem related to the solution described in MI92U00567 concerns the higher precision required for the coupling between the connector and the hydraulic intake, as in this case two simultaneous joints will be needed instead of one.

WO83/01892 describes a dishwashing machine where the hydraulic intake has only one outlet, whereas the connecting tube with the sprayer has a connector

with two terminals in vertical position. Said terminals are equipped each one with a hollow bellows to be pressed against the hydraulic intake to make connection.

The bellows not in line with the hydraulic intake outlet is pressed against the tub rear wall and obstructed.

The problem related to such a solution is an unsafe sealing exerted by the bellow when it is in connection with the hydraulic intake with respect to the joint connections previously mentioned. Moreover, said solution may cause water to be retained and cause stagnation, specifically in the lower terminal due to the terminal shape itself. Finally, bellows are subject to deterioration with time due to the thermal cycles they are exposed to during washing and to their sliding over the tub rear wall that causes hardening and brittleness with local losses in their connection with the hydraulic intake.

It is the object of the present invention to solve the above problems and provide a dishwashing machine with a feed system for the upper sprinkler having a higher performance, easiness and precision compared to the known state of the art. In this frame, it is the main object of the present invention to provide a dishwashing machine where the feed tube to the upper sprinkler is provided with small means for simple and safe hydraulic connecting operations as a function of the height adjustments and displacements of the basket. It is another object of the present invention to provide a dishwashing machine equipped with a feed system to the upper sprinkler that does not require substantial changes to the molding cycle of the wash tub walls.

It is a further object of the present invention to provide a dishwashing machine fitted with a commutation device to feed the upper sprinkler at different height levels, easy to be reached in case of maintenance and repair operations.

In order to comply with these purposes, the object of the present invention is a dishwashing machine incorporating the characteristics of the claims annexed to this description and being an integral part of it.

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 a non limiting example, wherein:

- Fig. 1 shows a side section of the upper part of a dishwasher according to the present invention, with the upper crockery basket in a high position;
- Fig. 2 shows a side section of the upper part of the dishwasher of Fig. 1, with the upper basket in a low position;
- Fig. 3 shows a side section of a detail of the dishwasher of Fig. 1;
- Fig. 4 shows a side section of a detail of a dishwasher according to a first possible embodiment of the present invention;
- Fig. 5 shows a side section of a detail of a dishwasher according to a second possible embodiment of the present invention.

Fig. 1 shows the upper part of the wash tub of a dishwashing machine according to the present invention. Said tub, indicated as a whole by number 1, has an upper basket 2 with a spraying element 3 of known type and operation, being fastened to its lower side. Number 4 indicates a plastic tubular element, with one end hydraulically connected with the spraying element 3; the other end of the tubular element 4 has a connecting device 5, which is also formed by a substantially tubular element suitable to engage in an hydraulic intake 6 on the tub rear wall. Said hydraulic intake 6 is practically the outlet of a feeding tube 7 connected with a feed pump of the dishwashing machine, not shown here for simplicity's sake.

As it can be seen, particularly in Fig. 3, the connecting device 5 has an intermediate body 8 with two inlets, being located vertically one above the other, on the side directed to the hydraulic intake 6, specifically an upper inlet 9 and a lower inlet 10, whereas on the opposite side the intermediate body 8 has an outlet 11 connected with the tubular element 4.

Inside the intermediate body 8, i.e. the hollow space extending between the inlets 9-10 and the outlet 11 there is a ball 12 either in plastic material or lighter material. Such a ball 12 can freely slide inside the intermediate body 11 but is hindered from passing through the inlets 9 and 10 by chokes 13A and 13B, whose diameter is smaller than the diameter of ball 12.

On the contrary, the ball diameter is smaller than the diameter of the inlet 11; however, a grid indicated by number 14 is provided in correspondence with the connecting point between said outlet 11 and the connecting element 4, which hinders the ball 12 from going towards the element 4, although allowing the fluid flow. Obviously, other solutions may be provided to hinder the ball 12 from going to the element 4, such as for instance some projections or chokes in line with the mouth of the element 4 on the outlet 11.

Figs. 1 and 3 also show how the hydraulic intake 6 includes a part 15 practically formed by the end of the tube 7, which protrudes from the rear wall of tub 1 and has a female thread externally; onto such part 15 a ring nut 16 that has a male thread is screwed, with the eventual interposition of a seal. The ring nut 16 is suitable to be mechanically coupled with the inlet 9 or inlet 10, which have a section suitable to be inserted into the main hole of the ring nut 16, expressly shaped to this purpose.

As it can be seen, a corrugation 17 outside the inlets 9 and 10 of the intermediate body 8 is acting as a stop limit element for the mechanical coupling, i.e. for insertion of the inlet 9 or 10 of the intermediate body 8 in the intake 6.

Assembly of the device during the manufacturing stage is quite simple. To this purpose the operator simply needs to insert the ball 12 inside the body 8 and connect the latter with the end of the tubular element 4, previously fitted with the grid 14; said coupling between

the device 5 and the element 4 can be obtained using any technique already known, such as for instance a snap-fit type coupling.

It should be noted that the connecting device 5 forms an independent module that can be obtained independently from the tubular element 4 and used in various assemblies and configurations.

The device operates as follows.

When the basket 2 is in its high position, as in the instance of Fig. 1, the inlet 10 of the connecting device 5 is positioned in a way that it can be joined with the hydraulic intake 6 by a simple thrust towards the bottom of the tub 1 exerted on the basket 2 when the latter is relocated inside the dishwashing machine.

Under such condition, with the wash pump not in operation, the ball 12 rests by gravity on the choke 13B.

When the wash cycle is started and the fluid feed pump is activated, the fluid flow from the feed tube 7 and from the hydraulic intake 6 enters the connecting device 5 through the inlet 10.

Thus, the flow reaches the ball 12 that will be lifted by the fluid pressure and brought against the choke 13A, thus obstructing the throughway to the inlet 9.

As a result, the fluid flow can only go towards the outlet 11 and be fully channeled in the connecting element 4 towards the spraying element 3 (as said, the eventual run of the ball 12 inside the element 4 is hindered by suitable means 14).

Obviously, when the wash pump is disabled, the ball 12 will return by gravity to rest on the choke 13B.

Theoretically, if the ball 12 is lifted too strongly by the fluid flowing to the outlet 11 (specifically, if the ball 12 is obstructing and partially reducing the passage section of the wash fluid, thus causing a speed increase and consequent decrease of the static pressure), there could be an unstable situation due to a continuous uplifting and reject of the ball 12 from its seat 13A or 13B.

However, it is obvious that this risk can be eliminated in different ways, which are clear to the man skilled in the art, such as for instance providing some seats 13A and 13B which are sufficiently apart from each other, to ensure that the ball 12 (or another equivalent intercepting element) may locate in an area where the wash fluid has a sufficiently low speed or is substantially stagnating.

At any rate it can be seen that the ball 12 is acting as a fluid flow deflector and is suitable to change its operating position only as a function of the flow pressure itself.

Whenever it is required to change the upright position of the basket 2, bringing it to its lower position, as shown in Fig. 2, it is enough to withdraw the basket 2 a few centimeters so that the connecting device 5 (specifically the inlet 10) disengages from the hydraulic intake 6.

Subsequently, following the height adjustment of the basket 2 in a usually known manner, the upper track

9 of the connecting device 5 will be at the same height of the hydraulic intake 6.

Under this circumstance it will be enough to push the basket 2 towards the tub rear wall 1 to obtain the joining connection between the inlet 9 and the hydraulic intake 6.

Also in this instance, with the wash pump not in operation, the ball 12 will rest by gravity on the choke 13B. The device appears already correctly prearranged for operation as shown in Fig. 2, since the ball 12 is resting right on the choke (13B) corresponding to the inlet (10) to be obstructed.

When the wash cycle is started and the fluid feed pump enabled, the fluid flow from the feed tube 7 and from the hydraulic intake 6 enters the connecting device 5 through the inlet 9. Then the flow reaches the ball 12, already in position, which is maintained by the fluid pressure against the choke 13B, obstructing the way to the inlet 10. Therefore, also in this instance the fluid flow can only go to the outlet 11 to be fully channeled in the connecting element 4, to the spraying element 3.

Obviously, when the wash pump is disabled, the ball will remain by gravity in its rest position on the choke 13B.

It was previously referred to the instance where the connecting device 5 has two inlets 9 and 10 suitable to be inserted at least partially in the hydraulic intake 6 with a male-on-female mating; however, it is quite obvious that the same result can be obtained through an arrangement substantially opposed to the one described in the Figs. 1-3, i.e. with a female-on-male mating.

To this purpose Fig. 4 shows a possible variant embodiment of the present invention, where the same numbers of the previous figures are used to indicate the same components already illustrated or technically equivalent elements, by adding the index '.

Said Fig. 4 shows a variant embodiment of the type of mechanical/hydraulic coupling between the hydraulic intake 6' and nets 9' and 10', according to which the inlet 9' or 10' engages around the hydraulic intake 6', which in this instance is acting as a male instead of a female, as it is in the instance of Figs. 1-3. In this instance, the part 15' of the hydraulic intake 6' has a corrugated seal 18 instead of a threading, whose purpose is to warrant both the mechanical coupling and hydraulic sealing.

As it can be seen, in this instance the stop limit function of the nets 9' and 10' on the intake 6' is obtained by means of the corrugations 17' inside the inlets 9' and 10' themselves. It is obvious that in the instance of the embodiment of Fig. 4 the connecting device of the machine according to the present invention operates substantially as previously described.

It should still be noted that Figs. 1 and 2 show the instance where the end of the tubular element 4, on which the spraying element 3 is mounted, is directed downwards (in other words the sprayer 3 is at a lower height with reference to the tubular element 4; thus, for

this embodiment it is obvious that when the wash pump stops the fluid available in the tubular element 4 can freely flow out through the sprayer 3).

In still another embodiment the end of the tubular element 4 mentioned above can be directed upwards (in which case the sprayer 3 would be at a higher height with respect to the tubular element 4). Therefore, under such a situation, when the wash pump stops there could be a fluid stagnation inside the tubular element 4, since the ball 12 would obstruct the inlet 10 and hinder its out-flow.

To avoid this, the ball 12 can be favorably made of a light material or anyway of a floating material. Thus, in fact, when the wash pump stops and there is fluid inside the sprayer 3 and the tubular element 4, the ball 12 lifts up leaving the inlet 10 open up to a full drainage of the fluid from the tubular element and the sprayer.

The characteristics of the present invention are quite clear from the above description.

In particular, a dishwashing machine is described of the kind comprising an upper crockery basket capable of taking two different height positions, which has a commutation device to feed the upper sprayer as a function of the height position selected for the basket. Said device, which is practically integrated in the connecting element between the hydraulic feed intake and the sprayer, comprises two optional inlets and an outlet, including flow deflecting means suitable to change and/or maintain their own operating position as a function of the pressure exerted by the wash fluid from the hydraulic intake.

This avoids the need of providing a complex bulky hydraulic intake or specific protruding ends for the actuation of the flow deflection means.

Moreover, the device described above has the important feature of being easily reachable by simply withdrawing the basket from the tub, in case of maintenance operations, which may even be carried out directly by the user himself.

Also the advantages of the present invention will be apparent from the above description, among which the following ones should be mentioned:

- the air jump as provided by the known technique is removed at full advantage for the noise and the performance of the hydraulic circuit of the dishwasher, which also uses sealing means to remove possible fluid losses;
- the end of the feed tube from the machine pump has only an outlet, requiring no special seats nor changes to the tub molding process;
- water outflow through the device is safe and practically without any stagnation;
- the connecting device containing the flow deflection means is a small size element that does not limit the space available in the basket, it is a simple low-cost element and can be easily reached and dismantled for eventual maintenance operations;

- the connecting device may form an independent module, which can be obtained independently from the sprayer connecting element and be used in various assemblies and configurations.

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

For instance, it is possible to provide a rubber element inside the ring nut 16 of Fig. 3, or outside the inlets 9 and 10 to increase the performance of the hydraulic seal between the parts. Optionally, either inlets 9 and 10 or the whole connecting device 5 could have rubber-coated surfaces.

In another embodiment the ball could be replaced by other flow deflection elements, such as floats or shutters of various forms, or rocker elements, fitted with proper motion guides and suitable to be displaced by the fluid pressure.

To this purpose, Fig. 5 show a further possible embodiment of the present invention, according to which a rocker element or shutter is provided instead of a ball; this figure shows the same numbers as the previous figures to indicate the same components already illustrated or any elements technically equivalent by adding the index "

As it can be seen in Fig. 5, the flow deflection device according to the present invention comprises a rocker element or deflector 12" made of plastic material and hinged in a known manner to the body 8" of the device 5"; the coupling between the deflector 12" and the body 8" may be for instance by snap-fitting.

As it appears, also the deflector 12" acts as a flow deflector and is suitable to obstruct the inlet 9" or inlet 10" alternatively due to the pressure exerted by the wash fluid from the hydraulic feed intake 6", following the same procedures as previously described with reference to Figs. 1-4 without reducing the fluid throughflow section.

Concerning the embodiment of Fig. 5, it should be mentioned about the possibility of obtaining the deflector 12" in one piece with the plastic body 8" of the device 5"; in such an instance, the deflector 12" may change its operating condition through an elastic hinge or a 'film', practically through a simple thickness reduction of the plastic material of the deflector itself near its joining point with the body 8".

According to a further embodiment, also the chokes leading to the inlets of the connecting device may be fitted with seals to improve the ball sealing when the washing fluid under pressure enters the connecting device.

Claims

1. Dishwashing machine comprising a wash tub (1), at least a basket (2) suitable to slide in said tub (1) and capable of taking at least two different height positions, a fluid feed duct (7,7',7'') ending in an hydraulic feed intake (6;6';6'') located on a wall of said tub (1), a sprayer element (3) borne by said basket (2) and a tubular element (4,4',4'') borne by said basket (2), where a first end of said tubular element (4,4',4'') is connected with said sprayer (3) and a second end of said tubular element (4,4',4'') has a connecting element (5,5',5''), said connecting element having at least one outlet (11,11',11'') connected with the second end of said tubular element (4,4',4'') and at least two inlets (9,10; 9',10'; 9'',10'') that can be selectively coupled during usage with said hydraulic feed intake (6;6';6''), characterized in that a flow deviating device (12, 12', 12'') is provided in said connecting element (5,5',5''), between said inlets (9,10; 9',10'; 9'',10'') and said outlet (11,11',11''), which is capable of maintaining at least two alternative operating positions due to the pressure exerted by the wash fluid coming from said hydraulic feed intake (6;6';6'').
2. Dishwashing machine according to Claim 1, characterized in that said flow deviating device (12, 12', 12'') is suitable to take and/or maintain at least one of said positions exclusively due to the pressure exerted by the wash fluid fed from said hydraulic feed intake (6;6';6'').
3. Dishwashing machine according to Claim 1 or 2, characterized in that said flow deviating device (12, 12', 12''), when in said positions, does not cause any vacuum in the wash fluid flow.
4. Dishwashing machine according to Claim 2 or 3, characterized in that said flow deviating device comprises a shutter element (11,11',11'') proper to obstruct the inlet (9,10; 9',10'; 9'',10'') being not coupled with said hydraulic fed intake (6;6';6'').
5. Dishwashing machine according to Claim 4, characterized in that said flow deviating device (11,11',11'') is maintained in the closing position of said inlet (9,10; 9',10'; 9'',10'') by the pressure exerted by the wash fluid.
6. Dishwashing machine according to Claim 4, characterized in that said flow deviating device comprises a ball (11,11',11'').
7. Dishwashing machine according to at least one of the previous Claims, characterized in that means are provided (13A,13B; 13A',13B'; 13A'',13B'') proper to hinder the passage of said shuttering element or ball (12, 12', 12'') through said inlets (9,10; 9',10'; 9'',10''), said means comprising in particular chokes (13A,13B; 13A',13B'; 13A'',13B'') having smaller dimensions than the ones of said shuttering element or ball (12, 12', 12'').
8. Dishwashing machine according to at least one of the previous Claims, characterized in that second means (15;15') are provided proper to hinder the passage of said shuttering element or ball (12,12',12'') in said tubular element (4; 4'), said second means comprising in particular a grid (15;15') placed near an end of said tubular element (4; 4').
9. Dishwashing machine according to Claim 1, characterized in that said inlets (9,10; 9',10'; 9'',10'') are proper to engage in said hydraulic feed intake (6;6';6'') for the coupling of the parts, said hydraulic feed intake (6;6';6'') acting as a female element and said nets (9,10; 9',10'; 9'',10'') as a male element, or proper to engage on said hydraulic feed intake (6;6';6'') for the coupling of the parts, said hydraulic feed intake (6;6';6'') acting as a male element and said inlets (9,10; 9',10'; 9'',10'') as a female element.
10. Dishwashing machine according to at least one of the previous Claims, characterized in that hydraulic seal means are provided between said hydraulic feed intake (6;6';6'') and said inlets (9,10; 9',10'; 9'',10'').
11. Dishwashing machine according to Claim 1, characterized in that said connecting element (5;5';5'') is a separate part from said tubular element (4;4';4'') and is coupled with it and that coupling means are provided, specifically of the snap-fit type, between said connecting element (5;5';5'') and said tubular element (4;4';4'').
12. Dishwashing machine according to at least one of the previous Claims, characterized in that means (17;17';17'') are provided, proper to limit the run of said inlets (9,10; 9',10'; 9'',10'') inside or above said hydraulic feed intake (6;6';6'').
13. Dishwashing machine according to Claim 4, characterized in that said flow deviating device comprises a float.
14. Dishwashing machine according to Claim 4, characterized in that said flow deviating device comprises a rocker element proper to be displaced by the pressure of the wash fluid.
15. Dishwashing machine according to Claim 7, characterized in that seals are provided in line with said means (13A,13B; 13A',13B'; 13A'',13B'') proper to hinder the passage of said shutter element or ball

(12;12';12") through said inlets (9,10; 9',10'; 9',10").

5

10

15

20

25

30

35

40

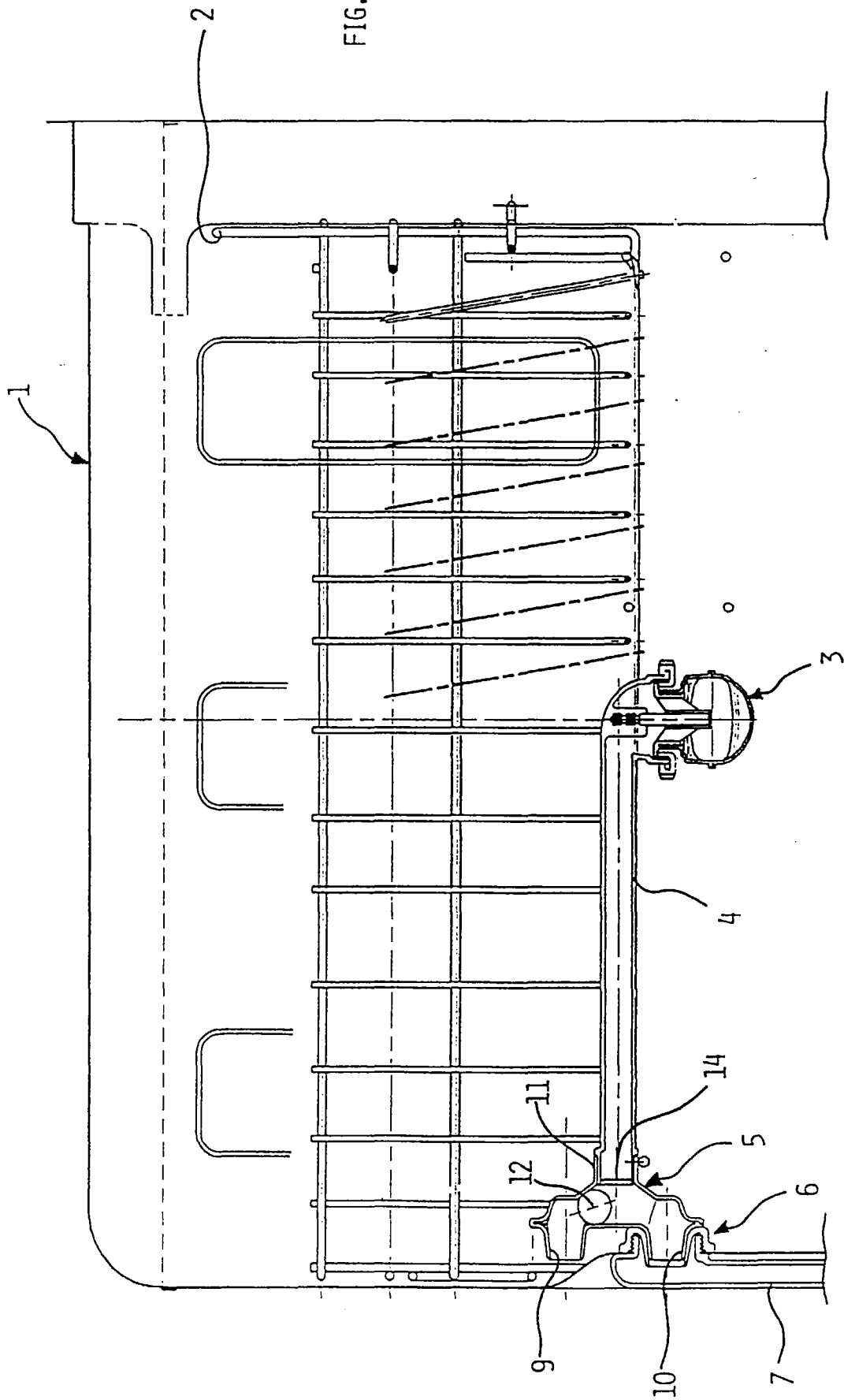
45

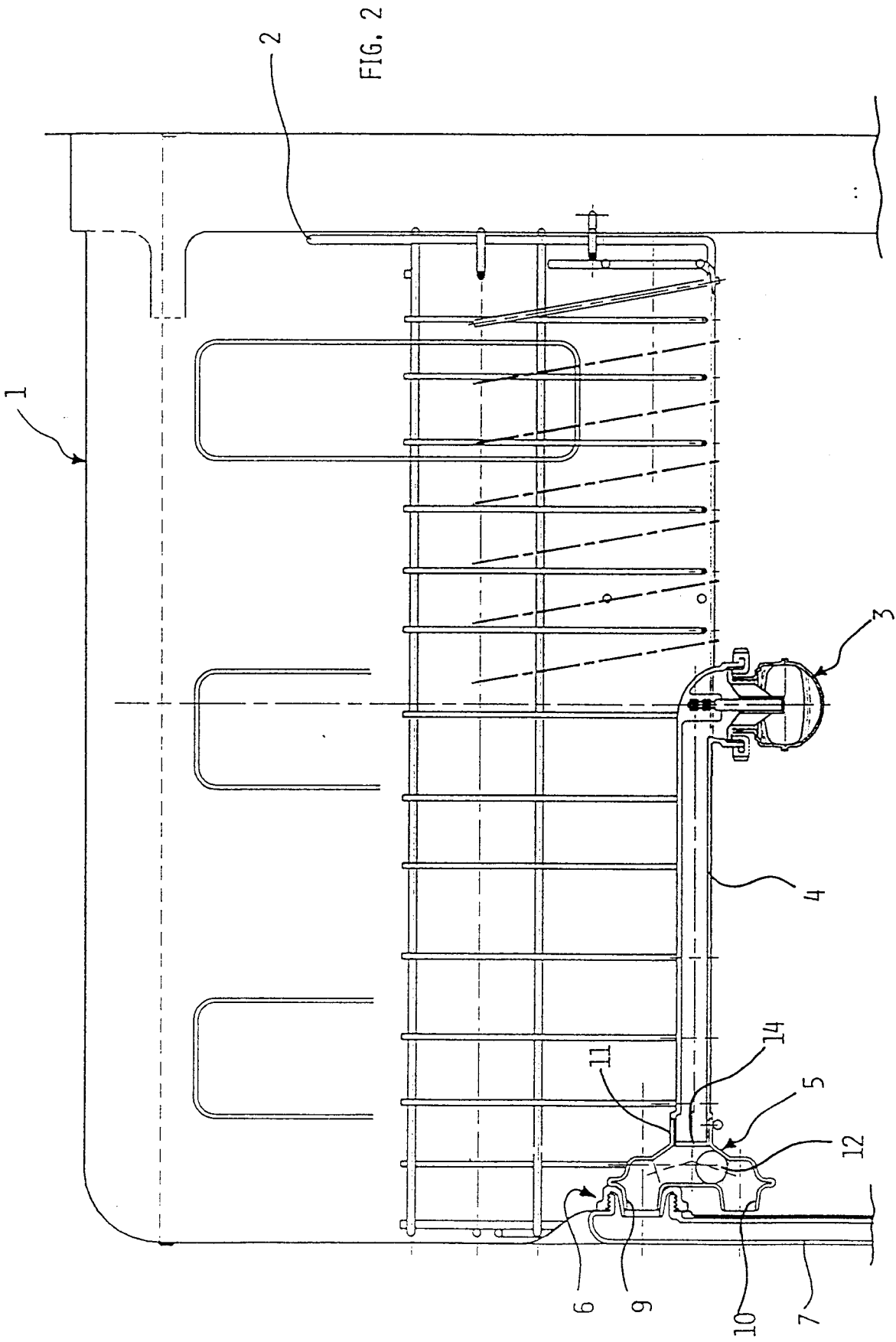
50

55

7

FIG. 1





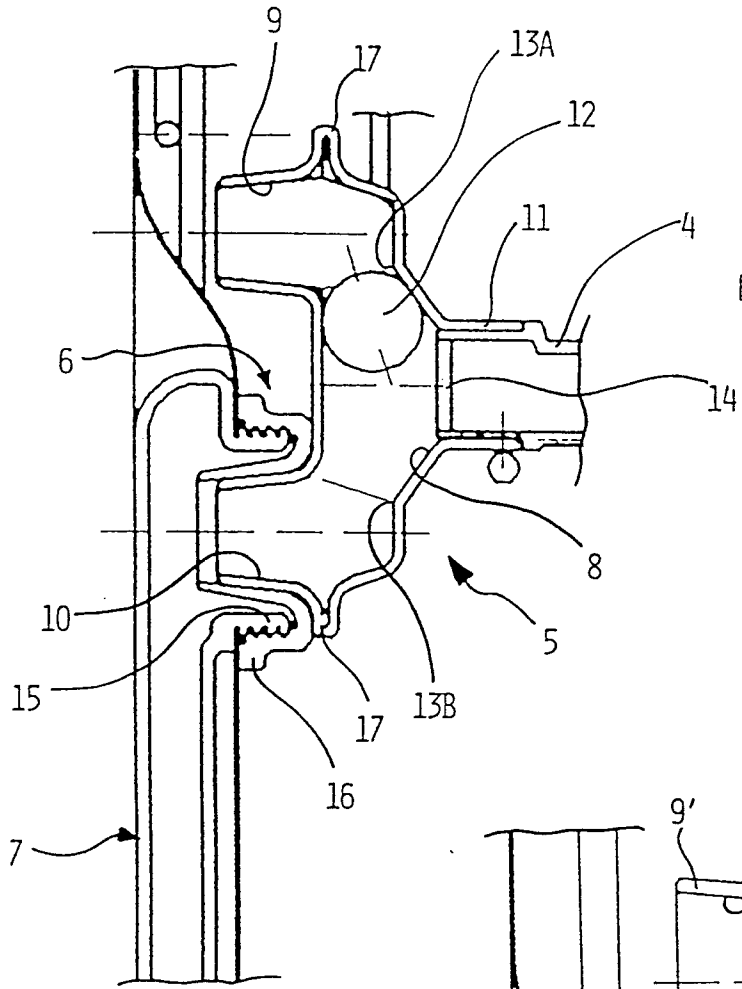


FIG. 3

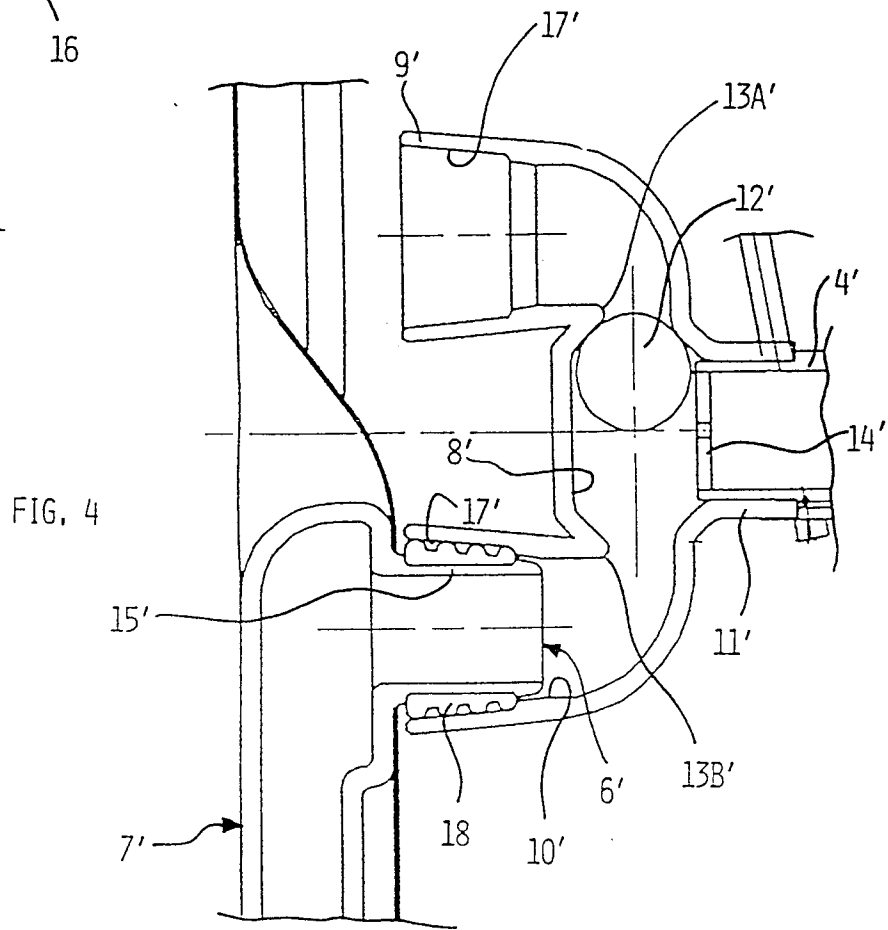


FIG. 4

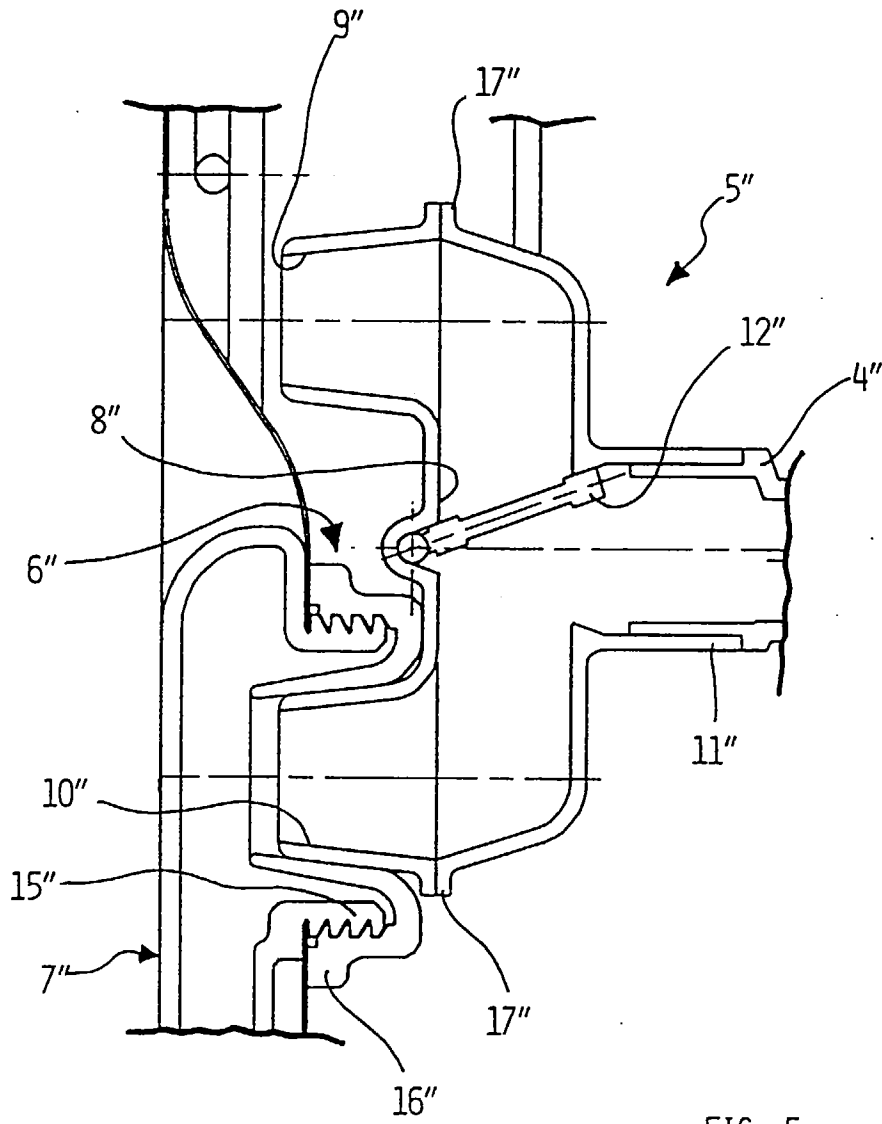


FIG. 5