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(54) **Dishwashing machine with improved washing water dosage.**

(57) The present invention refers to a dishwashing machine having a high precision in the washing water dosage, which comprises a water collecting sump (2) arranged under the lower wall (3) of a washing chamber (4) and with a mouth defined in said lower wall (3). Sump (2) has at least a first port (5) communicating with the suction pipe of a pump (7) connected by its delivery side to at least one water spraying arm (8) arranged inside said washing chamber (4). In said sump (2) are provided water level sensor means (10). Said sump (2) shows a working volume at least equal to the difference between the total volume of water required for the operation of the machine and the volume of water kept in circulation, outside said sump (2), when the pump (7) is working. In corrispondence of the level (9) reached in said sump (2) by a water quantity equal to said difference, said sump (2) shows, in a horizontal plane tangent to the water surface, a passage section smaller than the section of the washing chamber (4).

EP 0 460 250 A1

The present invention refers to a dishwashing machine having a high precision in the dosage of the washing water.

As known, dishwashing machines are usually supplied with the water necessary to the washing operations, by enabling the opening of an electric valve arranged on the supply pipe connected to the water main. The supplied water is collected in a sump which is arranged under the washing chamber and whose mouth is defined in the lower wall of the washing chamber. Such a sump is connected to the suction pipe of a washing pump which supplies the spraying arms fitted in the washing chamber.

Usually, the sump has a volume smaller than the volume of water required for the operation of the machine and the level of the water charged in the machine rises over the lower wall of the washing chamber. The water inlet is interrupted when the water reaches a predefined level which is detected by means of appropriate sensor means, for instance a pressure switch with a sensor arranged in the sump.

In other types of machines the water inlet is done with the washing pump not operating, while in other types of machines the washing pump is enabled during such inlet, by presetting in a suitably way the sensor means.

In both cases, the water level at the end of the inlet reaches the washing chamber and so the water surface has an area substantially equal to the section of such chamber.

Due to this fact it is possible that great errors occur in the determination of the quantity of water charged.

In fact, using for instance as sensor means a pressure switch with good sensitivity, the detecting tollerance can be of some millimeters with variations of the quantity of charged water in the order of about one liter for each charging.

An error of this kind has a great importance, in consideration of the fact that each complete washing cycle needs usually five water charges.

In designing dishwashing machine, the precision in the determination of the quantity of charged water has a great importance because, in order to save both water and energy, the discrepancy between said quantity and the theoric quantity required for the correct operation of the machine must be as little as possible.

The main object of the present invention is to solve the above said problem realizing a dishwashing machine which has a high precision in the dosage of the washing water.

In order to achieve the above said object, it is an aim of the present invention to realize a dishwashing machine which, the water level detecting means sensitivity being the same and, as a consequence, the costs of such detecting means being equal, allows a more precise dosage of the water charged in the machine in respect of the machines of known type.

A further aim of the invention is to realize a dishwashing machine which shows reduced water and energy consumption.

This object and the said and other aims which could be better understood later, are obtained by a dishwashing machine having high precision in the washing water dosage, comprising a water collecting sump arranged under the lower wall of a washing chamber and with a mouth defined in said lower wall, said sump having at least a first port communicating with the suction pipe of a pump connected by its delivery side to at least one water spraying arm arranged inside said washing chamber, water level sensor means being provided within said sump, characterized in that said sump shows a working volume at least equal to the difference between the total volume of water required for the operation of the machine and the volume of water kept in circulation, outside said sump, when the pump is working, and in that, in corrispondence of the level reached in said sump by a water quantity equal to said difference, said sump shows, in a horizontal plane tangent to the water surface, a passage section smaller than said washing chamber section.

Further characteristics and advantages of the invention will appear better from the description of a preferred, not exclusive, embodiment of the dishwashing machine according to the invention, shown as an indicative and not limitative example in the accompanying drawings, where:

- figure 1 shows a lower portion of the dishwashing machine according to the invention, in a cross section on a vertical plane;
- figure 2 shows an inside plan of the lower wall;
- figure 3 shows a simplified scheme of the circuit controlling the electric supply valve of the machine; and
- figure 4 shows an enlarged section of figure 2 along the IV-IV axis.

With reference to the cited figures, the dishwashing machine according to the invention, indicated as a whole with reference number 1, comprises a water collecting sump 2, which is arranged under the lower wall 3 of the washing chamber 4, and which presents a mouth defined in such lower wall.

Sump 2 presents, in known way, ports 5 and 6 connected respectively to the suction pipes of a washing pump 7, which supplies one or more spraying arms (8) fitted in the washing chamber 4, and of a drainage pump, of known type and not shown for simplicity.

According to the invention, sump 2 is realized so to have a working volume at least equal to the difference between the total volume of water required for the correct operation of the machine and the total volume of water that is kept in circulation, outside the sump, by washing pump 7 when working. Furthermore, in corrispondence of the level 9 reached in the sump by a volume of water equal to such difference, the sump shows, in a horizontal plane tangent to the water surface, a passage section notably smaller than the section of the washing chamber 4.

According to the type of machine, said passage section has an area which is preferably comprised between 1/6 and 1/4 of the section of the washing chamber 4.

The water level inside the sump 2 is detected by means of a pressure switch 10 of known type, which has a sensor 11 arranged inside the sump 2, below the level 9.

Sensor 11 is realized so to keep in its own zone 11a a quantity of air which undergoes a compression proportional to the level of the overlaying water. Zone 11a is connected by a pipe 12 with the body of the pressure switch which transforms the pneumatic signal into an electric command.

Inside the sump 2 there is also arranged in a known way a filter 13. In figure 3 it is shown in a very schematic and simplified way an electric circuit 14 which feeds the control device 15 of the supply electric valve 16 of the machine arranged on the supply pipe 17 connected to the water main. More in detail, circuit 14 provides in series first interruption means 18 of the electric supply and second interruption means 19 controlled respectively by the pressure switch 10 and by a timer which controls the various stages of the washing cycle of the machine. First interruption means 18 and second interruption means 19 are arranged in series and could be, for instance, on-off or change-over switches.

The water inlet in the dishwashing machine according to the invention is as follows.

At the start of the machine operation, timer 20 closes the switch 19 and pressure switch 10 does not act on switch 18, closed itself at this stage. In this way electric supply valve 16 is open and supply pipe 17 charges water in the machine, which collects in the sump 2. During the water inlet, it is enabled washing pump 7 which, sucking from the sump 2, conveys water to spraying arms 8.

The water inlet continues until the water in the sump reaches a level corresponding to the preset value of the pressure switch 10. With the sizing of the sump according to the invention, the water level corresponding to the preset of the pressure switch lays under the lower wall 3 of the washing chamber 4. In this way, possible tolerances in the preset value of the pressure switch can cause only very small variations of the charged water quantity because the passage section of the sump in the zone occuped by the water surface, near the correct level, is small and in any case notably smaller than the section of the washing chamber 4.

The achieving of the correct level cause the opening of the switch 18 and so the closure of the electric supply valve 16 which interrupts the water inlet.

It has been practically ascertained that the dishwashing machine according to the invention fulfils very well the extablished aim, because, due to the fact that the correct water level is reached in a zone of the machine which has a water passage section highly reduced in respect of the section of the washing chamber, by using a pressure switch with a sensitivity equal to the ones employed in the traditional dishwashing machines where such level lays over the lower wall, it is obtained a more precise dosage of the charged water.

A further advantage is that the inlet of a water quantity compensates in an automatic way for the operating tolerance of the washing pump and the spraying arms, and the water pipes geometric variations due to manufacturing spreads and circuit modifications, because the water dosage is done with the washing pump operating. Also for this reason, the final dosage depends on the easiness for water to fall in the sump, which is influenced by the crockery presence, that is to say the dosage is self-regulated in function of the crockery load.

Not last is the advantage that there is realized a dosage where, in case of an eventual partial obstruction of the filters or accidental water leaks, more water is charged granting in any way a correct washing.

The dishwashing machine so conceived can easily be modified in many ways, without departing from the inventive idea; moreover technical equivalent elements can be substituted for all details.

Employed materials and sizes can be of any type, according to technical art and needs.

Claims

1. Dishwashing machine having high precision in the washing water dosage, comprising a water collecting sump arranged under the lower wall of a washing chamber and with a mouth defined in said lower wall, said sump having at least a first port communicating with the suction pipe of a pump connected by its delivery side to at least one water spraying arm arranged inside said washing chamber, water level sensor means being provided within said

sump, characterized in that said sump (2) shows a working volume at least equal to the difference between the total volume of water required for the operation of the machine and the volume of water kept in circulation, outside said sump (2), when the pump (7) is working, and in that, in corrispondence of the level (9) reached in said sump (2) by a water quantity equal to said difference, said sump (2) shows, in a horizontal plane tangent to the water surface, a passage section smaller than said washing chamber section (4).

2. Dishwashing machine, according to claim 1, characterized in that said passage section is substantially comprised between 1/6 and 1/4 of the washing chamber section (4).

3. Dishwashing machine, according to claim 1, characterized in that said sensor means are represented by a pressure switch (10).

4. Dishwashing machine, according to one or more of the preceding claims, characterized in that it comprises an electric valve (16) controlling the water inlet in said sump (2), said electric valve (16) being supplied by an electric circuit having in series at least first electric supply interruption means (18) and second electric supply interruption means (19).

5. Dishwashing machine, according to claim 4, characterized in that said first electric supply interruption means (18) are controlled by a timer (20).

6. Dishwashing machine, according to claim 4, characterized in that said second electric supply interruption means (19) are controlled by said pressure switch (10).

7. Dishwashing machine, according to claim 4, characterizes in that said first interruption means (18) and/or said second interruption means (19) are represented by on-off or change-over switches.

8. Method for the dosage of the washing water in a dishwashing machine, characterized in that it consists in: supplying washing water to the inside of a water collecting sump (2) having a mouth defined in the lower wall (3) of the washing chamber (4), enabling, during said supply, the washing pump (7) which sucks in said sump (2) and feeds the spraying arms (8) of the machine, and interrupting the water supply when in the sump (2) the water reaches a level (9) lower than the bottom (3) of the washing chamber (4), said sump (2) being so sized that the water surface at said level (9) shows an area smaller than said washing chamber section (4).

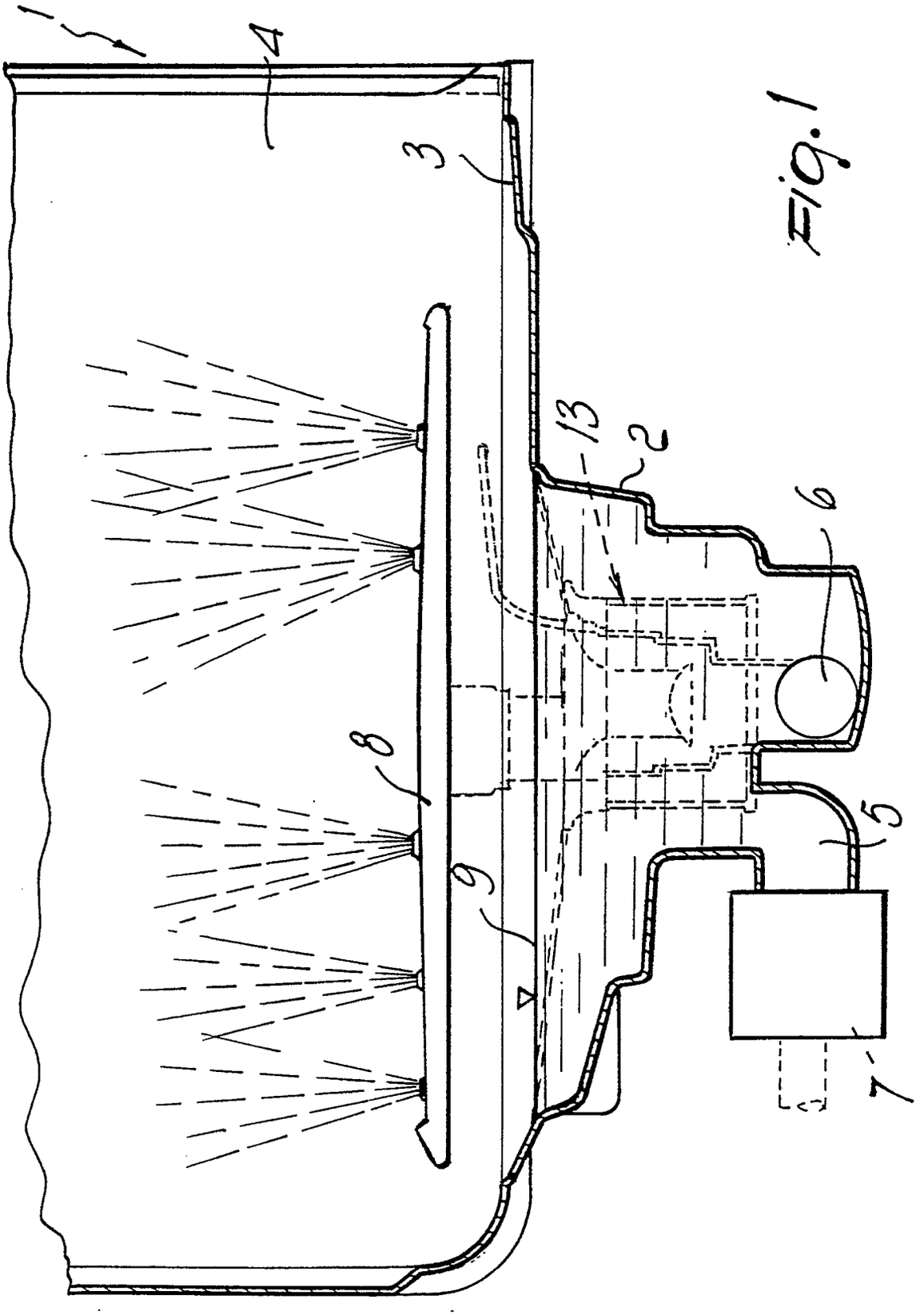

Fig. 1

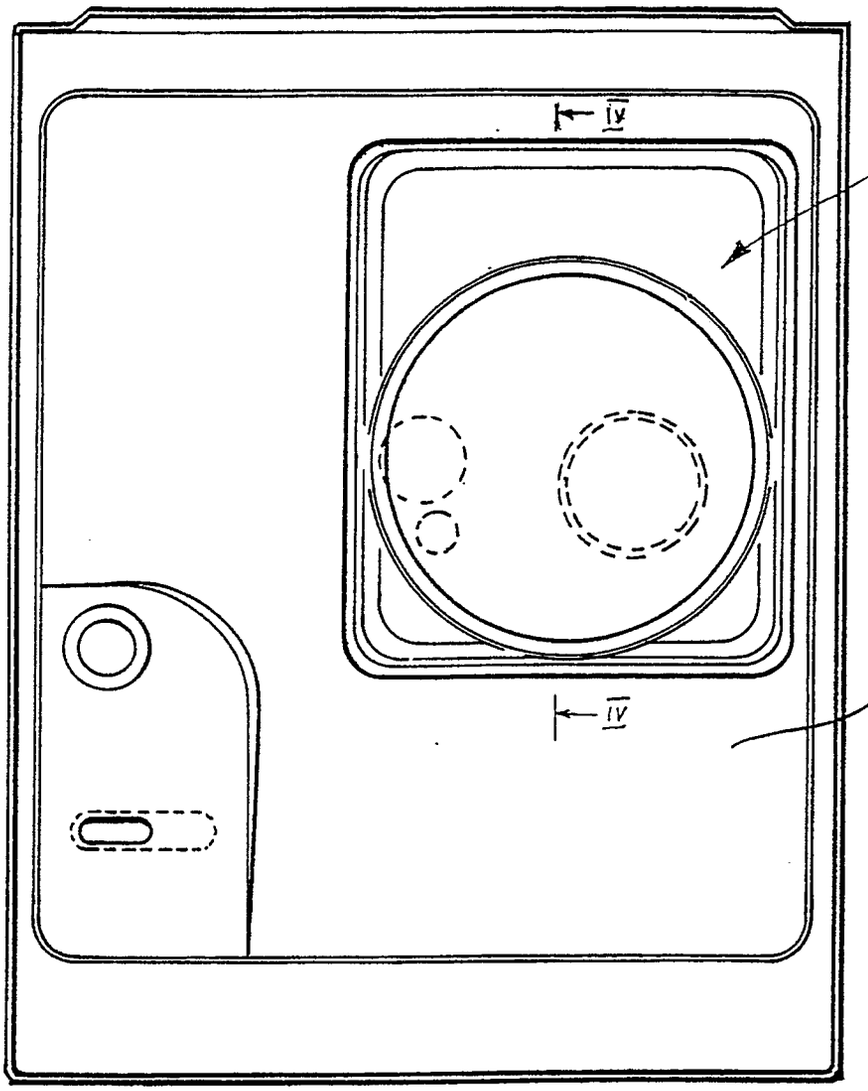

Fig. 2

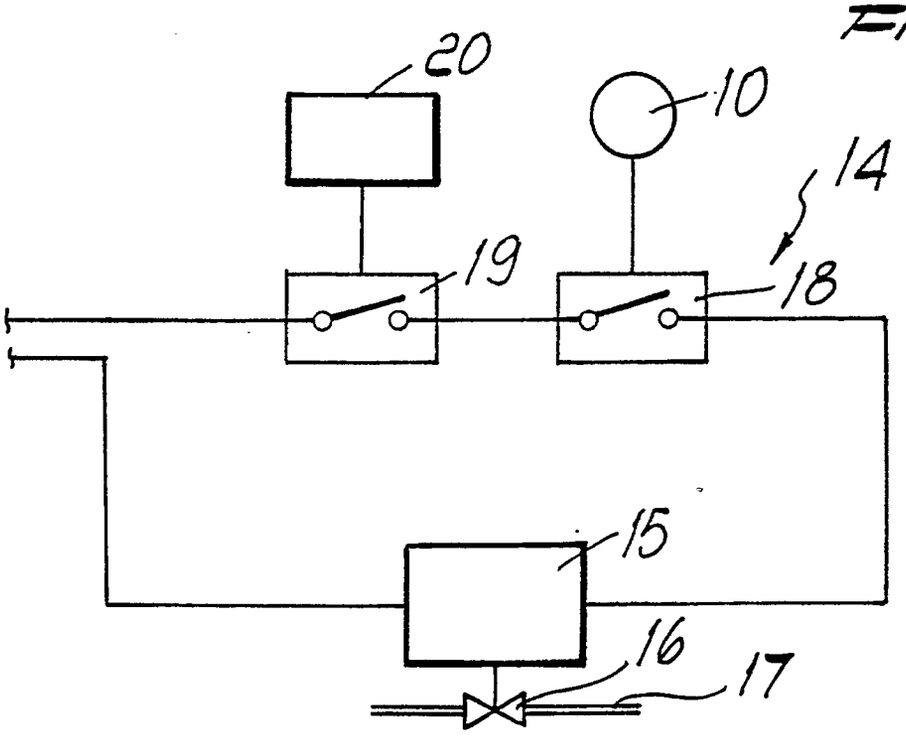

Fig. 3

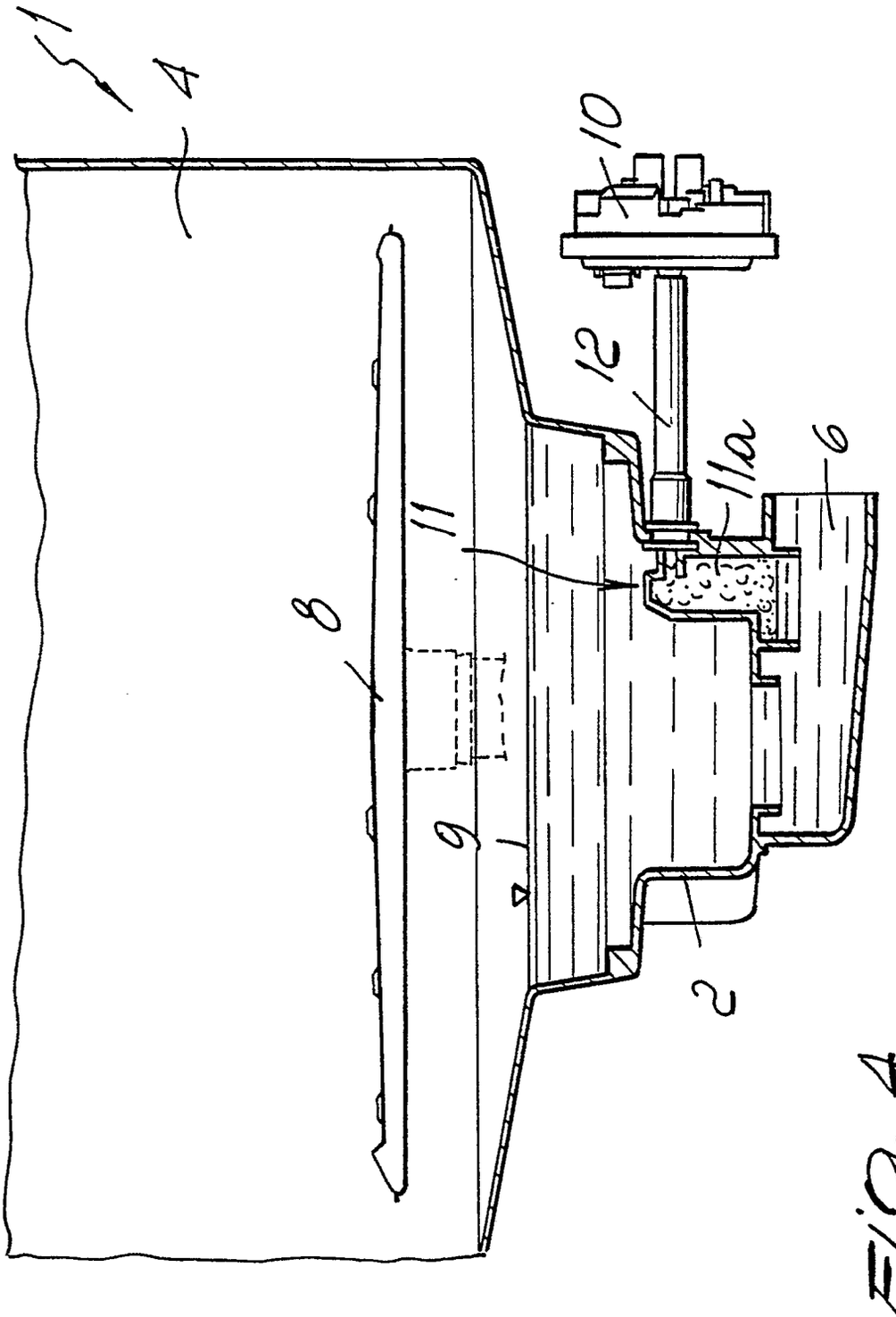

Fig. 4

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EUROPEAN SEARCH REPORT

Application Number

EP 90 11 0587

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	EP-A-0 248 339 (ZANUSSI) * the whole document *	1,3,8	A 47 L 15/42
A	FR-A-2 589 262 (LICENTIA) * page 2, lines 16 - 25; figure *	1,3,8	
A	US-A-3 835 880 (HOFFMAN) * column 4, lines 34 - 43; figure 2 *	4-7	
A	FR-A-2 195 417 (BAUKNECHT)		

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

A 47 L

The present search report has been drawn up for all claims

Place of search	Date of completion of search	Examiner
The Hague	07 January 91	SCHARTZ J.

CATEGORY OF CITED DOCUMENTS

X: particularly relevant if taken alone
Y: particularly relevant if combined with another document of the same catagory
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
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