

(19)



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11)

Publication number:

0 460 250 B1

(12)

EUROPEAN PATENT SPECIFICATION

(49)

Date of publication of patent specification: **23.08.95**

(51)

Int. Cl.⁶: **A47L 15/42**

(21)

Application number: **90110587.4**

(22)

Date of filing: **05.06.90**

(54)

Dishwashing machine with improved washing water dosage.

(43)

Date of publication of application:
11.12.91 Bulletin 91/50

(45)

Publication of the grant of the patent:
23.08.95 Bulletin 95/34

(84)

Designated Contracting States:
DE ES FR GB

(56)

References cited:
EP-A- 0 248 339
FR-A- 2 195 417
FR-A- 2 589 262
US-A- 3 835 880

(73)

Proprietor: **MERLONI ELETTRODOMESTICI**
S.p.A.
Viale Aristide Merloni, 45
I-60044 Fabriano (AN) (IT)

(72)

Inventor: **Bongini, Dino**
Via Marconi 36
I-60044 Fabriano (AN) (IT)
Inventor: **Samoncini, Mario**
Via L. Corsi 67
I-60044 Fabriano (AN) (IT)

EP 0 460 250 B1

Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid (Art. 99(1) European patent convention).

Description

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 tolerance 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 theoretic quantity required for the correct operation of the machine must be as little as possible.

It is known from EP-A-248 339 a method for controlling the supply of water to a washing machine wherein the sump shows a complicated hydraulic structure, comprising a collecting well, communicating with a control chamber, where the pressure sensitive means are located, via an overflow

wall on one side and with the intake of the circulation pump on the other side, via communication means having a calibrated section.

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, and a method for the dosage of the washing water in a dishwashing machine, comprising the characterizing feature of the annexed claims 1 and 5.

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 work-

ing. Furthermore, in correspondence 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 overlying 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 chance-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 occupied by the water surface, near the cor-

rect 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 established 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.

Claims

1. Dishwashing machine having high precision in the washing dosage, comprising 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), said sump (2) having at least a first port (5) communicating with the suction pipe of a pump (7) connected by its delivery side to at least one ware spraying arm (8) arranged inside said washing chamber (4), water level sensor means (10,11,12) being provided with said sump (2), the sensitive element (11) of said water level sensor means (10,11,12) being arranged directly inside said sump, characterized in that
 - the working volume of said sump (2) is 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 correspondence 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 (9) which is substantially comprised between 1/6 and 1/4 of the washing chamber (4) section.
2. Dishwashing machine, according to claim 1, characterised by the fact that it comprises an electric valve (16) controlling the water inlet in said sump (2), said valve being supplied by an electric circuit having in series at least first electric supply interruption means (18) and second electric supply interruption means (19).
 3. Dishwashing machine, according to claim 2, characterised by the fact that said first electric supply interruption means (18) are controlled by a timer (20) and said second electric supply interruption means (19) are controlled by said water level sensor means (10,11,12).
 4. Dishwashing machine, according to claim 2, characterised by the fact that said first electric supply interruption means (18) and/or said second electric supply interruption means (19) are represented by on-off or change-over switches.
 5. Method for the dosage of the washing water in a dishwashing machine comprising 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), said sump (2) having at least a first port (5) communicating with the suction pipe of a pump (7) connected by its delivery side to at least one ware spraying arm (8) arranged inside said washing chamber (4), water level sensor means (10,11,12) being provided with said sump (2), the method comprising the steps of
 - supplying washing water in said collecting sump (2), and
 - enabling, during said supply, said washing pump (7) for sucking in said sump (2) and feeding said spraying arm (8), so as that a quantity of water is kept in circulation outside said sump (2) while said pump (7) is working, said method being characterized in that it comprises the step of interrupting the water supply when into said sump (2) the water reaches a level (9) corresponding 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), at said

level (9) in the sump (2) the water surface showing an area which is substantially comprised between 1/6 and 1/4 of the washing chamber (4) section.

Patentansprüche

1. Geschirrspülmaschine mit hoher Präzision in der Waschwasserdosierung, umfassend einen Wassersammelbehälter (2), der unterhalb der tiefliegenden Wand (3) einer Spülkammer (4) angeordnet ist und eine Einlauföffnung in der tiefliegenden Wand (3) aufweist, welcher Sammelbehälter (2) mindestens eine erste Auslaßöffnung (5) aufweist, die mit der Ansaugleitung einer Pumpe (7) verbunden ist, die mit ihrer Ableitung zumindest an einen Geschirr-Sprüharm (8) angeschlossen ist, der innerhalb der Spülkammer (4) angeordnet ist, Wasserpegelmeßmittel (10, 11, 12), die mit dem Sammelbehälter (2) vorgesehen sind, wobei das sensitive Element der Wasserpegelmeßmittel (10, 11, 12) direkt innerhalb des Sammelbehälters angeordnet ist, **dadurch gekennzeichnet**, daß
 - das Arbeitsvolumen des Sammelbehälters (2) mindestens der Differenz zwischen der Gesamtmenge des Wassers, das für den Betrieb der Maschine benötigt wird, und der im Umlauf gehaltenen Wassermenge außerhalb des Sammelbehälters (2) entspricht, wenn die Pumpe (7) arbeitet, und
 - entsprechend dem Pegel (9), der in dem Sammelbehälter (2) durch eine Wassermenge erreicht wird, die gleich der Differenz ist, der Sammelbehälter (2) in einer horizontalen, planen Tangente zur Wasseroberfläche einen Durchlaßquerschnitt (9) zeigt, der im wesentlichen zwischen 1/6 und 1/4 des Querschnitts der Spülkammer (4) beträgt.
2. Geschirrspülmaschine nach Anspruch 1, **dadurch gekennzeichnet**, daß sie ein elektrisches Ventil (16) aufweist, das den Wassereinlaß in den Sammelbehälter (2) regelt, welches Ventil von einem elektrischen Stromkreis versorgt wird, der in Serie mindestens erste elektrische Stromunterbrechungsmittel (18) und zweite elektrische Stromunterbrechungsmittel (19) aufweist.
3. Geschirrspülmaschine nach Anspruch 2, **dadurch gekennzeichnet**, daß die ersten elektrischen Stromunterbrechungsmittel (18) von einem Zeitgeber (20) und die zweiten elektrischen Stromunterbrechungsmittel (19) durch

die Wasserpegelmeßmittel (10, 11, 12) gesteuert sind.

4. Geschirrspülmaschine nach Anspruch 2, **dadurch gekennzeichnet**, daß die ersten elektrischen Stromunterbrechungsmittel (18) und/oder die zweiten Stromunterbrechungsmittel (19) durch Ein/Aus- oder Wechselschalter dargestellt sind. 5
5. Verfahren zur Dosierung des Waschwassers in einer Geschirrspülmaschine, umfassend einen Wassersammelbehälter (2), der unterhalb der tiefliegenden Wand (3) einer Spülkammer (4) angeordnet ist und eine Einlauföffnung in der tiefliegenden Wand (3) aufweist, welcher Behälter (2) mindestens eine erste Auslaßöffnung (5) aufweist, die mit der Ansaugleitung einer Pumpe (7) verbunden ist, die mit ihrer Ableitung zumindest an einen Geschirr-Sprüharm (8) angeschlossen ist, der innerhalb der Spülkammer (4) angeordnet ist, Wasserpegelmeßmittel (10, 11, 12), die mit dem Sammelbehälter (2) vorgesehen sind, wobei das sensitive Element der Wasserpegelmeßmittel (10, 11, 12) direkt innerhalb des Sammelbehälters angeordnet ist, mit folgenden Verfahrensschritten: 10
 - Einlassen des Waschwassers ist den Sammelbehälter (2) und
 - die Spülpumpe (7) während des Einlassens in den Behälter (2) in die Lage zu versetzen, anzusaugen und den Sprüharm (8) zu versorgen, so daß eine Wassermenge außerhalb des Behälters (2) in Zirkulation versetzt ist, während die Pumpe (7) arbeitet, **dadurch gekennzeichnet**, 20
 - daß der Wassereinlaß unterbrochen wird, wenn in dem Behälter (2) das Wasser eine Höhe (9) erreicht, die der Differenz zwischen dem Gesamtvolumen des Wassers, das für den Betrieb der Maschine erforderlich ist, und dem Volumen des außerhalb des Behälters (2) zirkulierenden Wassers entspricht, in welcher Höhe (9) in dem Behälter (2) die Wasseroberfläche eine Fläche aufzeigt, die im wesentlichen zwischen 1/6 und 1/4 des Querschnitts der Spülkammer (4) einnimmt. 25

Revendications

1. Lave-vaisselle ayant une haute précision de dosage de lavage, comprenant un puisard collecteur d'eau (2) agencé sous la paroi inférieure (3) d'une chambre de lavage (4), et muni d'une bouche définie dans ladite paroi inférieure 55

re (3), ledit puisard (2) ayant au moins un premier orifice (5) qui communique avec le tuyau d'aspiration d'une pompe (7) reliée, par son côté de refoulement, à au moins un bras (8) d'arrosage de la vaisselle agencé à l'intérieur de ladite chambre de lavage (4), des moyens détecteurs du niveau d'eau (10, 11, 12) étant prévus dans ledit puisard (2), l'élément sensible (11) desdits moyens détecteurs du niveau d'eau (10, 11, 12) étant agencé directement à l'intérieur dudit puisard, caractérisé

- en ce que le volume de travail dudit puisard (2) est au moins égal à la différence entre le volume total d'eau nécessaire pour le fonctionnement de la machine et le volume d'eau maintenu en circulation à l'extérieur dudit puisard (2) lorsque la pompe (7) est en marche, et
 - en ce qu'au niveau (9) atteint dans ledit puisard (2) par une quantité d'eau égale à ladite différence, ledit puisard (2) présente, dans un plan horizontal tangent à la surface libre de l'eau, une section de passage (9) qui est sensiblement comprise entre 1/6 et 1/4 de la section de la chambre de lavage (4).
2. Lave-vaisselle selon la revendication 1, caractérisé en ce qu'il comprend une électrovalve (16) qui commande l'introduction d'eau dans ledit puisard (2), ladite valve étant alimentée par un circuit électrique comprenant en série au moins des premiers moyens (18) d'interruption de l'alimentation électrique et des deuxièmes moyens (19) d'interruption de l'alimentation électrique.
 3. Lave-vaisselle selon la revendication 2, caractérisé en ce que lesdits premiers moyens (18) d'interruption de l'alimentation électrique sont commandés par une minuterie (20) et lesdits deuxièmes moyens (19) d'interruption de l'alimentation électrique sont commandés par lesdits moyens détecteurs du niveau d'eau (10, 11, 12).
 4. Lave-vaisselle selon la revendication 2, caractérisé en ce que lesdits premiers moyens (18) d'interruption de l'alimentation électrique et/ou lesdits deuxièmes moyens (19) d'interruption de l'alimentation électrique sont représentés par des commutateurs marche-arrêt ou inverseurs.
 5. Procédé pour le dosage de l'eau de lavage dans un lave-vaisselle comprend un puisard collecteur d'eau (2) agencé sous la paroi inférieure

rieure (3) d'une chambre de lavage (4) et présentant une bouche définie dans ladite paroi inférieure (3), ledit puisard (2) ayant au moins un premier orifice (5) qui communique avec le tuyau d'aspiration d'une pompe (7) reliée par son côté de refoulement à au moins un bras (8) d'arrosage de la vaisselle agencé à l'intérieur de ladite chambre de lavage (4), des moyens (10, 11, 12) détecteurs du niveau d'eau étant prévus dans ledit puisard (2), le procédé comprenant la phase consistant à :

- introduire de l'eau de lavage dans ledit puisard collecteur (2), et
- mettre ladite pompe de lavage (7) en marche pendant ladite introduction pour aspirer dans ledit puisard (2) et alimenter ledit bras d'arrosage (8), de manière qu'une quantité d'eau soit maintenue en circulation à l'extérieur dudit puisard (2) pendant que ladite pompe (7) travaille, ledit procédé étant caractérisé en ce qu'il comprend la phase consistant à interrompre l'introduction d'eau lorsque l'eau atteint dans ledit puisard (2) un niveau (9) correspondant à la différence entre le volume total d'eau nécessaire pour le fonctionnement de la machine et le volume d'eau maintenu en circulation à l'extérieur dudit puisard (2), la surface libre de l'eau présentant, audit niveau (9) à l'intérieur du puisard (2), une aire qui est sensiblement comprise entre 1/6 et 1/4 de la section de la chambre de lavage (4).

5

10

15

20

25

30

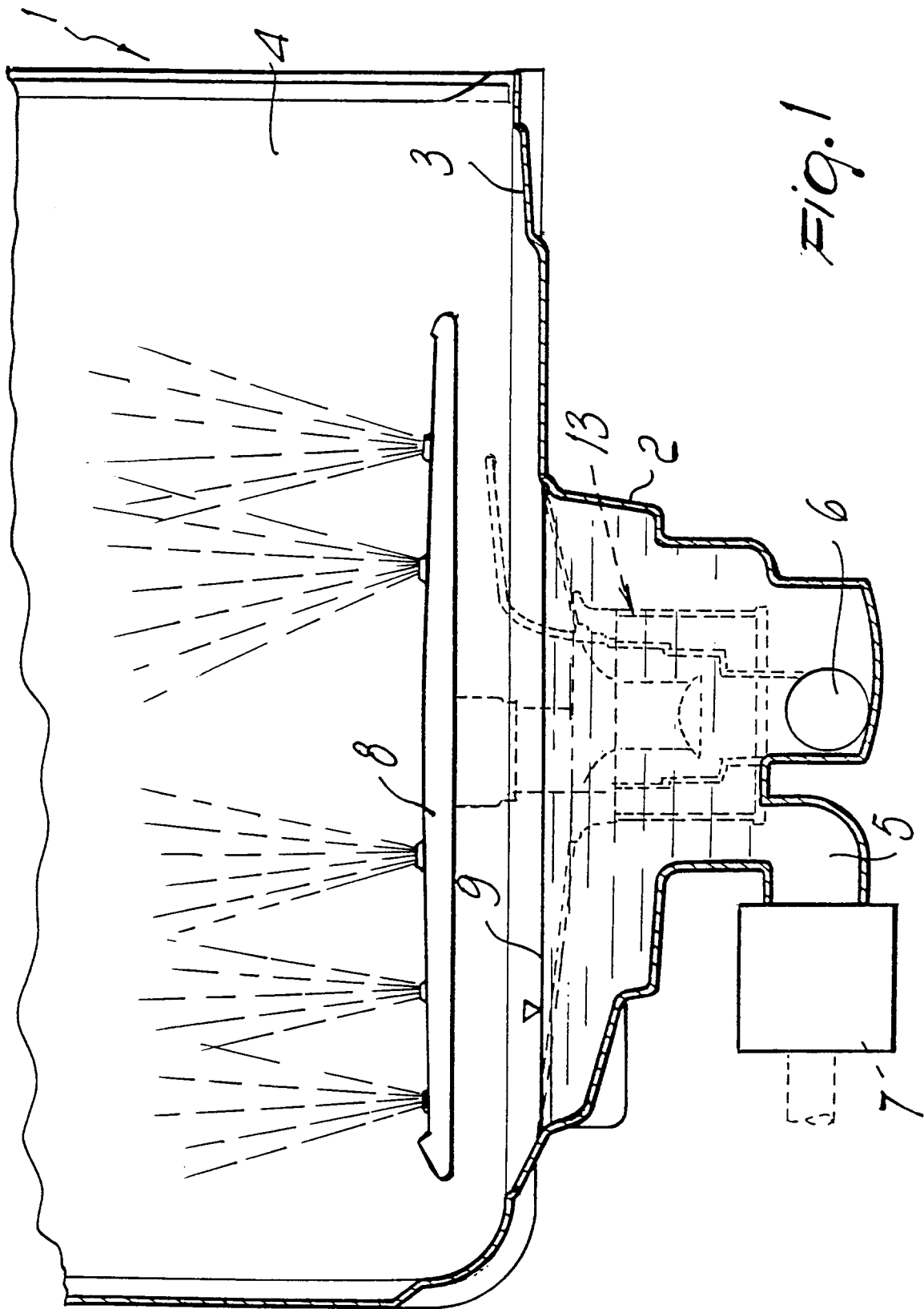
35

40

45

50

55



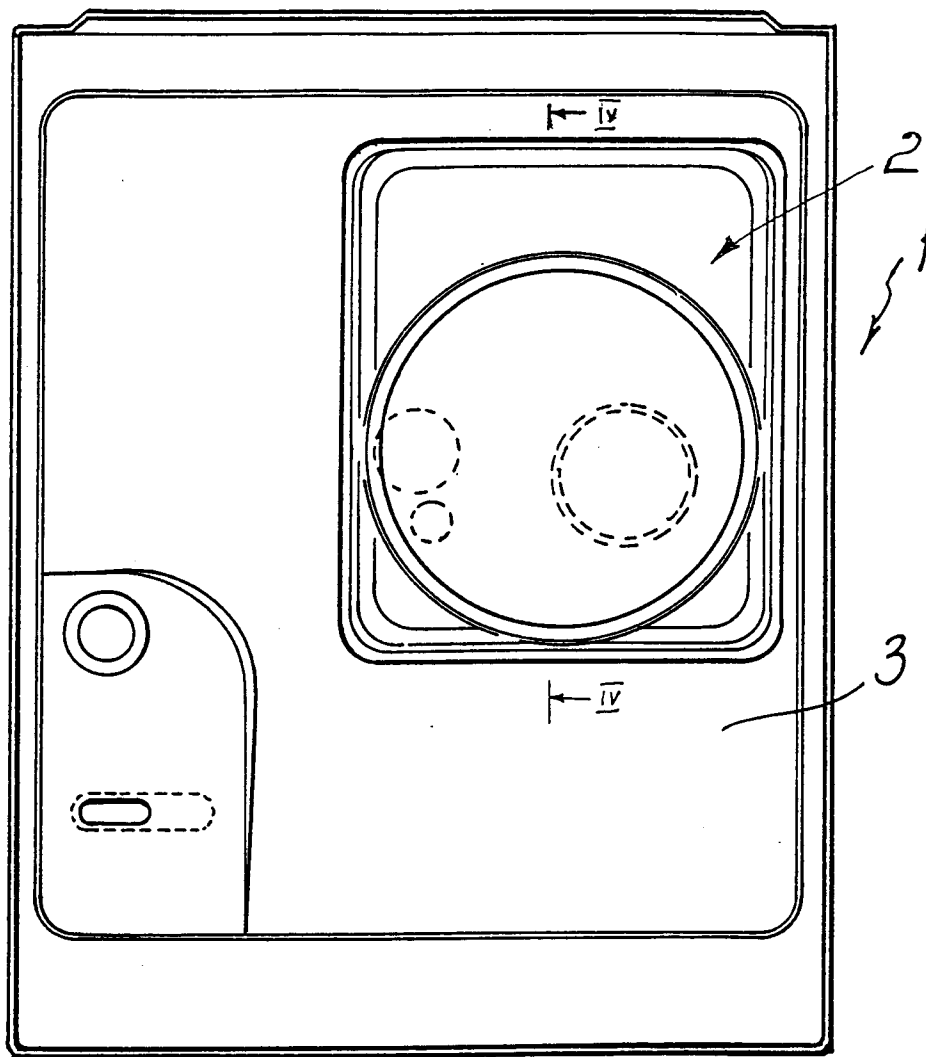


Fig. 2

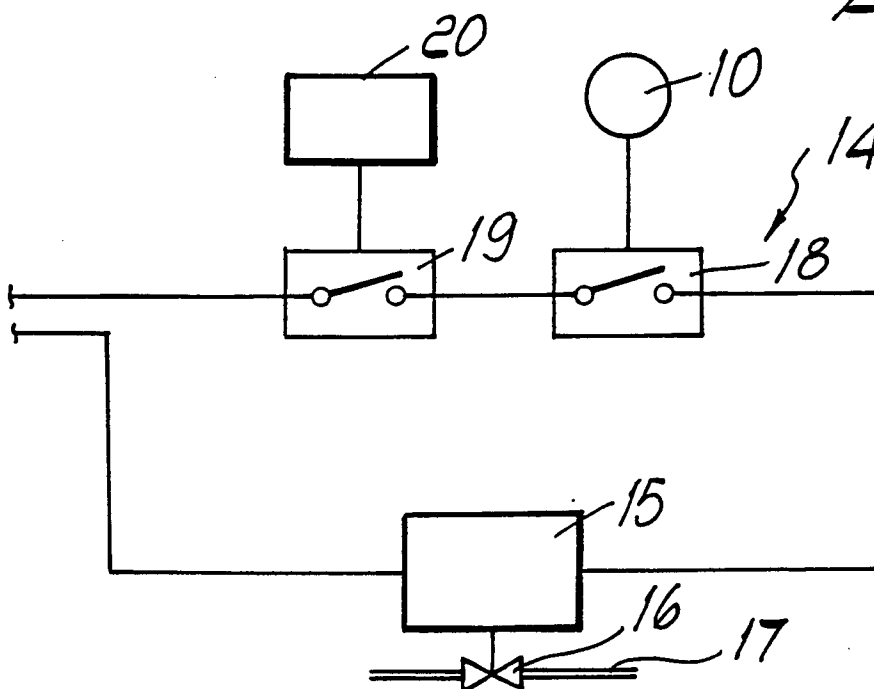


Fig. 3

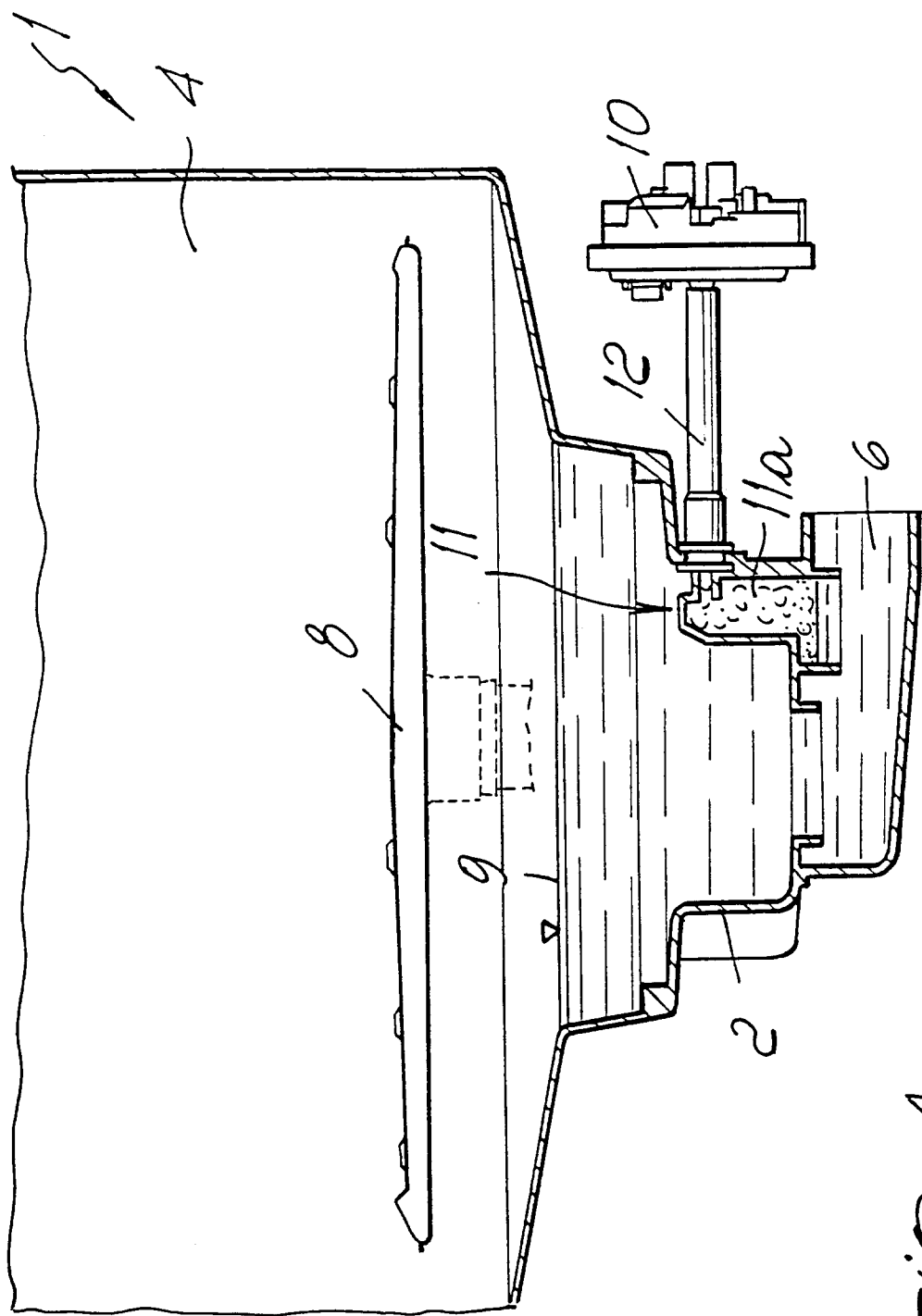


Fig. 4