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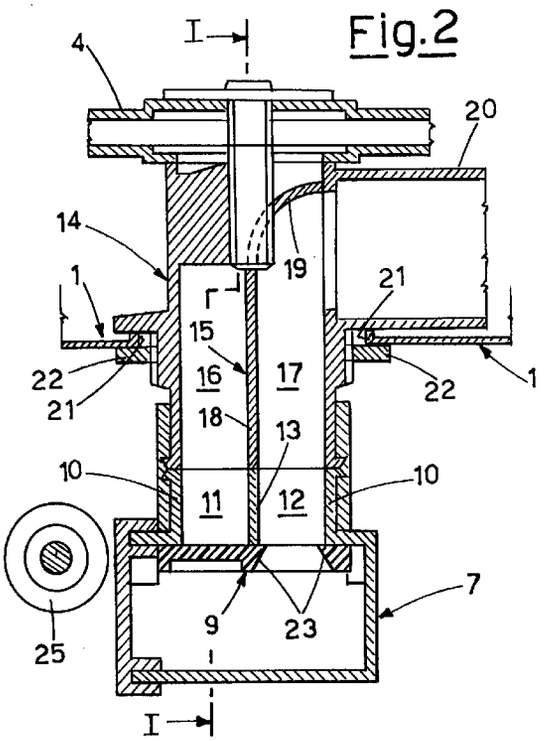
## (54) Device for controlling the flow of washing liquid for feeding the spraying rotors of a dishwasher machine

(57) A device for controlling the flow of washing liquid for feeding a first spraying rotor (4) and a second spraying rotor (4') of a dishwasher machine comprises an inlet conduit (5) connected to means for pumping the washing liquid, and at least a first outlet conduit (11;27,28;38) and a second outlet conduit (12;20;39) connected respectively to said first and second spraying rotors (4,4'); the control device comprises first means (9;30;42) for cutting off the flow of liquid, connected to said first outlet conduit (11;27,28;38) for controlling its opening and closure independently of the condition of the second outlet conduit (12;20;39).

Fig.2

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## Description

The present invention relates to a device for controlling the flow of washing liquid for feeding the spraying rotors of a dishwasher machine.

Known dishwasher machines comprise a washing tub in which two horizontal shelves are slidingly housed to hold the dishes to be washed, situated at the bottom (lower shelf) and mid-height (upper shelf) respectively of the washing tub. Two spraying rotors, lower and upper respectively, are associated to said shelves and fed with the washing liquid (mixture of water and detergent) by a motor pump connected to a sump located below the bottom of the washing tub and wherein the washing liquid diffused by the spraying rotors is collected.

In most dishwashers the two rotors are fed simultaneously, assuming that both the shelves have been loaded with dishes to be washed. The quantity of water which has to be fed into the tub of the dishwasher has to be such that the pump does not go into cavitation and that the pressure of the water emitted by the rotors is not too low.

Nevertheless the growing interest in dishwashers which require smaller volumes of water, with a consequent saving in detergent and electrical energy for heating the washing liquid, is known. For this purpose devices for controlling the flow of liquid sent by the pump to the rotors have been introduced and which allow one rotor to be fed at a time alternately. In this way the volume of water required by the dishwasher is smaller because the two rotors never operate simultaneously and the quantity of liquid in circulation is smaller. These are substantially devices for diverting the flow of washing liquid and are placed between the pump and the pipes for feeding liquid to the rotors, inside of which a cut-off part moves alternatively between two working positions, in each of which one of the pipes is closed while the other is open. The movement of the cut-off part is achieved either by means of an actuator or under the thrust of the liquid itself, the two working positions in this case being positions of instable equilibrium.

Nevertheless these devices too, due to the fact that the washing liquid is any case fed to both rotors, assume that both shelves are loaded with dishes to be washed. This can be inconvenient in some dishwashers which have differentiated programmes for washing twelve or six table settings. In this second case in fact it would be more useful to load all the dishes on the upper shelf alone (both for reasons of convenience for the user and better washing results, given that the temperature in the washing tub is higher at the top than at the bottom), and to feed only the upper rotor.

In view of the state of the art described here, the object of the present invention is that of providing a device for controlling the flow of washing liquid for feeding the spraying rotors which overcomes the aforementioned disadvantages.

In accordance with the present invention, this object is achieved thanks to a device for controlling the flow of washing liquid for feeding a first spraying rotor and a second spraying rotor of a dishwasher, comprising an inlet conduit connected to means for pumping the washing liquid, and at least a first outlet conduit and a second outlet conduit respectively connected to said first and second spraying rotors, characterised in that it comprises first means for cutting off the flow of liquid, which means being associated with said first outlet conduit to control its opening and closure independently of the condition of the second outlet conduit.

The control device according to the present invention enables continuous or discontinuous feeding of one of the two spraying rotors, while the other one can be independently fed or not. The rotor associated to the outlet conduit controlled by said cut-off means is preferably the lower one so that, should the dishwasher be programmed for washing six table settings, the dishes can be loaded on only the upper shelf, and the flow rate and pressure of the pump fully exploited to feed the washing liquid to the upper rotor alone.

These and other features of the present invention will be made clearer by the following detailed description of some of its embodiments, illustrated by way of a non-limiting example in the accompanying drawings, in which:

Figure 1 is a section along a vertical plane of a dishwasher equipped with a control device according to a first embodiment of the present invention;
Figure 2 is a section along line II-II of Figure 1;
Figure 3 is a section along line III-III of Figure 1;
Figure 4 is a section along a vertical plane of a dishwasher equipped with said control device, during washing of a complete load of dishes;
Figure 5 is similar to Figure 1, but referred to the case of washing a partial load of dishes;
Figure 6 is a similar section to that in Figure 1, showing a control device according to a second embodiment of the present invention;
Figure 7 is a section along line VII-VII of Figure 6;
Figure 8 is a section along a vertical plane of a control device according to a third embodiment of the invention;
Figure 9 is a section along line IX-IX of Figure 8;
Figure 10 is similar to Figure 8, with the control device in a different working condition;
Figure 11 is similar to Figures 8 and 10, with the control device in a further working condition.

Figure 1 shows a washing tub 1 of a dishwasher, below which washing tub 1 a sump 2, wherein the washing liquid is collected, is mounted. Connected to the sump 2 is a motor pump 3 which, taking the liquid from the sump 2, sends it to a lower spraying rotor 4 extending from the bottom of the tub 1 inside the latter and related to a lower loading shelf 100 and to an upper spraying rotor 4', positioned approximately at mid-height inside the tub 1 and related to an upper loading shelf 101 (Figs. 4 and 5).

Connected to the outlet conduit 5 of the coil 6 of the pump 3 is a device 7 for cutting off the flow of washing liquid, consisting of a chamber 8 wherein a diaphragm 9, moving between two working conditions (shown as an unbroken line and dotted and dashed line respectively in Figure 1), is hinged. Above the chamber 8 a substantially cylindrical outlet conduit 10 is connected, divided internally into two semicylindrical conduits 11 and 12 by a baffle 13 (Fig. 2). Connected to the outlet conduit 10 is a flow diverter 14, also substantially cylindrical, and wherein a baffle 15, having a substantially vertical lower section 18, is also provided and which divides internally the flow diverter 14 into two semicylindrical conduits 16 and 17, and an upper elbow section 19 which joins the semicylindrical conduit 17 to a horizontal cylindrical conduit 20 for feeding the upper spraying rotor 4'. The flow diverter 14 is inserted in a special hole 21 of the tub 1, and is attached by means of a ring nut 22. The lower spraying rotor 4 is mounted, freely rotatably, above the flow diverter 14.

The diaphragm 9 has dimensions which correspond substantially to those of the chamber 8, and is attached at one end to a pin 24. Outside of the chamber 8 the pin 24 is connected to an actuator 25 which causes displacement of the diaphragm 9 into the two working positions. The diaphragm 9 has a semicircular opening 23 which, when the diaphragm 9 is in the closure position shown by a dashed and dotted line in Figure 1, is positioned below the mouth of the semicylindrical conduit 12.

When the diaphragm 9 is in the opening position (shown by an unbroken line in Figure 1), both the semicylindrical conduits 11 and 12 are open, and the water coming from the outlet conduit 5 of the pump 3 is distributed among the semi cylindrical conduits 11, 16 and 12, 17, thus feeding simultaneously both the lower rotor 4 and the upper rotor 4' (Fig. 4). When the diaphragm 9 is in the closure position, the mouth of the semicylindrical conduit 11 is closed, while the mouth of the semicylindrical conduit 12 is open: thus feeding of the lower rotor 4 is interrupted, while the upper rotor 4' continues to be fed (Fig. 5).

Figures 6 and 7 show a second embodiment of the device according to the invention. In this second embodiment, the control device forms a single body with the pump 3. Directly connected to the outlet 5 of the pump 3 is the conduit 20, always open, for feeding the upper rotor 4'. Said outlet conduit 5 comprises a substantially horizontal cylindrical end section 26 flowing into a chamber 27 which extends above to form a cylindrical appendage 28 whereon a conduit 29 is fitted and sealed for supporting and feeding the lower rotor 4. This conduit 29 is mounted on the tub 1 in a similar manner to the flow diverter 14 of the previous embodiment. Associated to the chamber 27 is a device for cutting off the fluid comprising a plug 30 controlled by an actuator 31 to move from a first working position, wherein the outlet of the end section 26 of the conduit 5 is open and leads into the chamber 27, to a second working position, wherein the plug 30 closes the outlet of the end section 26 of the conduit 5 (position shown by the dotted and dashed line in Figure 7).

When the plug 30 is in the opening position the water coming from the pump 3 is distributed between the conduit 20, always open, for feeding the upper rotor 4' and the conduit 29 for feeding the lower rotor 4. When however the plug 30 is in the closure position, the water cannot pass from the end section 26 of the outlet conduit 5 of the pump 3 into the chamber 27, and therefore the lower rotor 4 is not fed.

In Figure 7 a conduit 32 can also be seen, small in size and also connected to the outlet conduit 5 of the pump 3. This conduit can be used for feeding pressurised liquid in other points of the water supply circuit of the dishwasher. For example this pressurised liquid can be used for cleaning the microfilter normally installed in the sump 2 to filter the liquid coming from the washing tub 1. In dishwashers which allow recovery of the washing liquid used during the final phase of rinsing of a washing cycle, the conduit 32 can also be used for transferring the liquid contained in the washing tub 1 at the end of the final phase of rinsing to a recovery tank, wherein the liquid is stored until the subsequent washing cycle. Thus the pump 3 performs a double function.

Figures 8-11 show a third embodiment of the device according to the invention. This device differs from the previous two due to the fact that, in addition to the possibility of interrupting feeding of water to the lower rotor 4, it allows feeding of water to both rotors to be interrupted. The outlet conduit 5 of the pump 3 flows into a chamber 33 which extends above to form a cylindrical and tubular appendage 34. A baffle 35 divides this tubular appendage 34 into two semicylindrical conduits 38 and 39. The latter extend inside the chamber 33, where they have widened mouths 40 and 41 above two respective plugs 42 and 43 moving independently under the control of respective actuators 44 and 45, between a position of opening and one of closure of the mouth of the respective semicylindrical conduits 38 and 39. Fitted and sealed on the tubular appendage 34, as in the case in Figure 2, is a flow diverter 46 wherein a baffle 47 defines two semicylindrical conduits 48 and 49. The baffle 47 is tilted above to join the conduit 49 to the cylindrical conduit 20 for feeding the upper rotor 4'.

Also connected to the chamber 33 are two conduits 51 and 52 which, when the plug 43 is in the position of opening of the semi cylindrical conduit 39 (Figs. 8 and 10), are closed, and are opened when the plug 43 is brought by the actuator 45 into the position of closure of the mouth 41 of the semicylindrical conduit 39 (Fig. 11). Like the conduit 32 of the device according to the previous embodiment, these conduits 51 and 52 allow liquid to be sent to the microfilter and to a recovery tank.

## Claims

1. Device for controlling the flow of washing liquid for feeding a first spraying rotor (4) and a second spraying rotor (4') of a dishwasher, comprising an inlet

conduit (5) connected to means for pumping the washing liquid, and at least a first outlet pipe (11;27,28;38) and a second outlet conduit (12;20;39) connected respectively to said first and second spraying rotors (4,4'), characterised in that it comprises first means (9;30;42) for cutting off the flow of liquid, which means are associated to said first outlet conduit (11;27,28;38) to control its opening and closure independently of the condition of the second outlet conduit (12;20;39).

2. Control device according to claim 1, characterised in that said second outlet conduit (12;20;39) is constantly open, so that the second spraying rotor (4') is always fed.

3. Control device according to claim 2, characterised in that said first outlet conduit and second outlet conduit are respectively a first semi cylindrical portion (11) and a second semi cylindrical portion (12) of a cylindrical conduit (10) defined by a baffle (13) inside said cylindrical conduit (10), said first cut-off means comprising a diaphragm (9) which can be rotated between an opening position and a closure position of said first semicylindrical portion (11) of the cylindrical conduit (10).

4. Control device according to claim 2, characterised in that said first cut-off means comprise a plug (30) sliding between an opening position and a closure position of said first outlet conduit (27,28).

5. Control device according to claim 1, characterised in that it comprises second means (43) for cutting off the flow of liquid, associated to said second outlet conduit (39) in order to control its opening and closure and which can be actuated independently of said first cut-off means (42).

6. Control device according to claim 5, characterised in that said first and second outlet conduits are two semicylindrical portions (38,39) of a cylindrical conduit (34), said first and second cut-off means comprising respectively a first and a second plug (42,43) sliding independently between a position of opening and position of closure of a respective semi cylindrical portion (38,39).

7. Control device according to any one of the previous claims, characterised in that said first spraying rotor (4) is associated to a lower loading shelf (100), and said second spraying rotor (4') is related to an upper loading shelf (101).

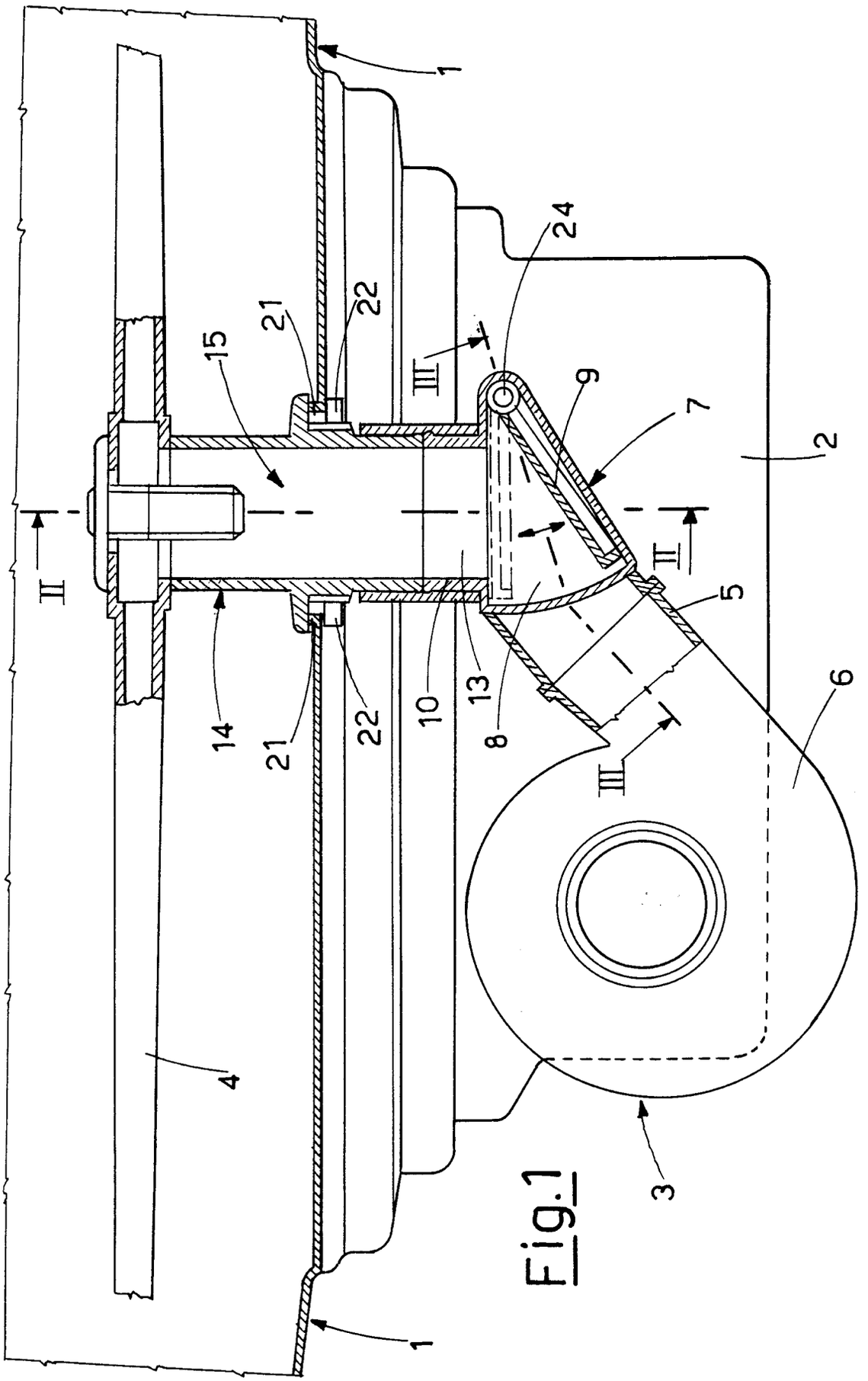


Fig.1

Fig.3

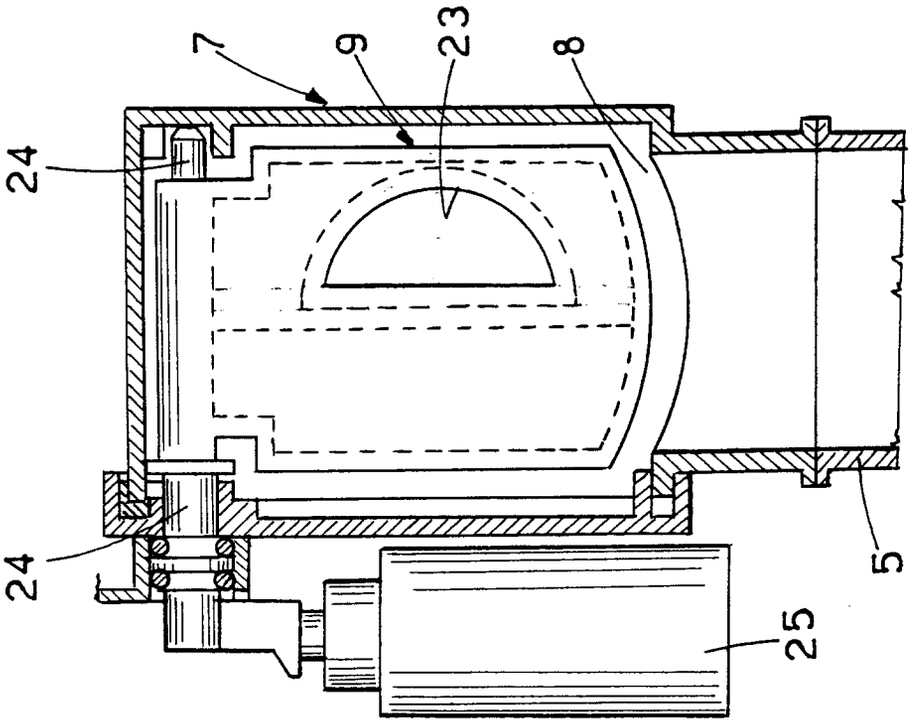
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Fig.2

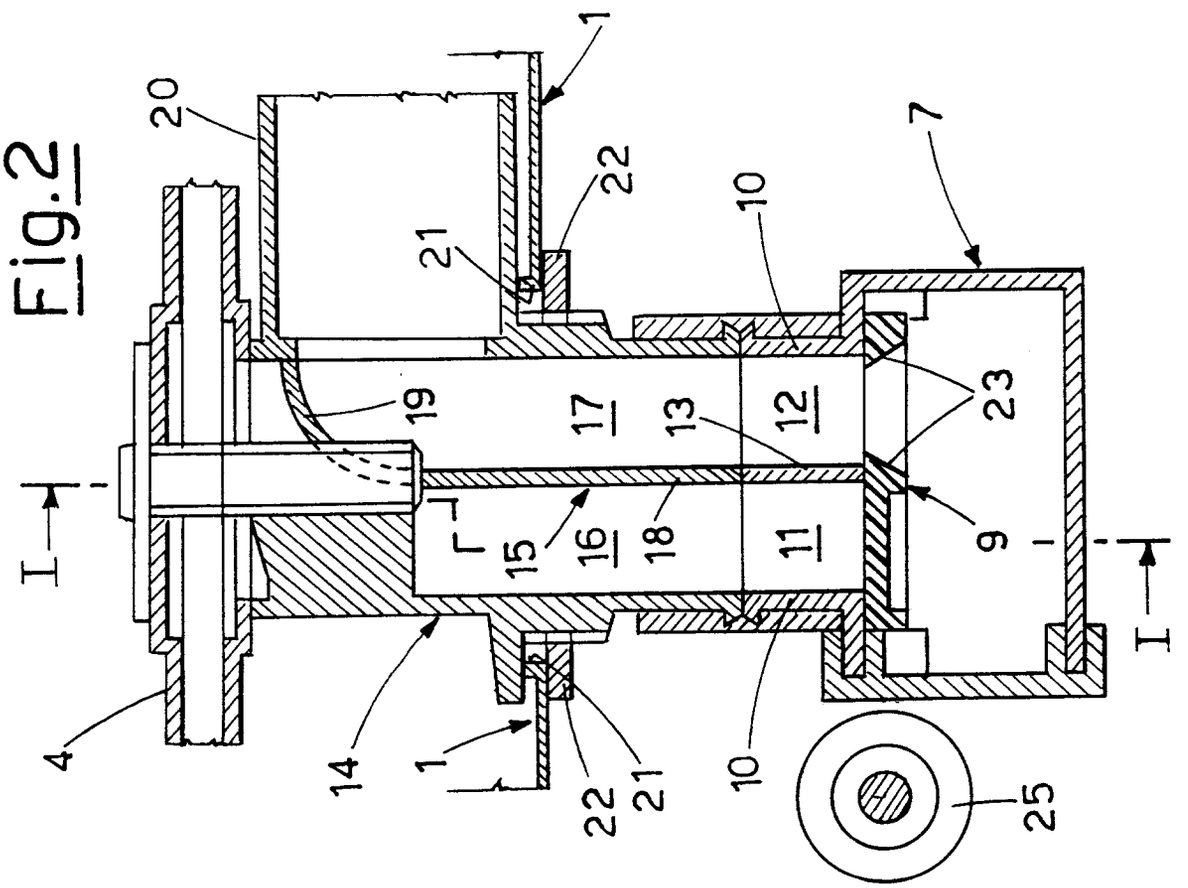
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Fig.5

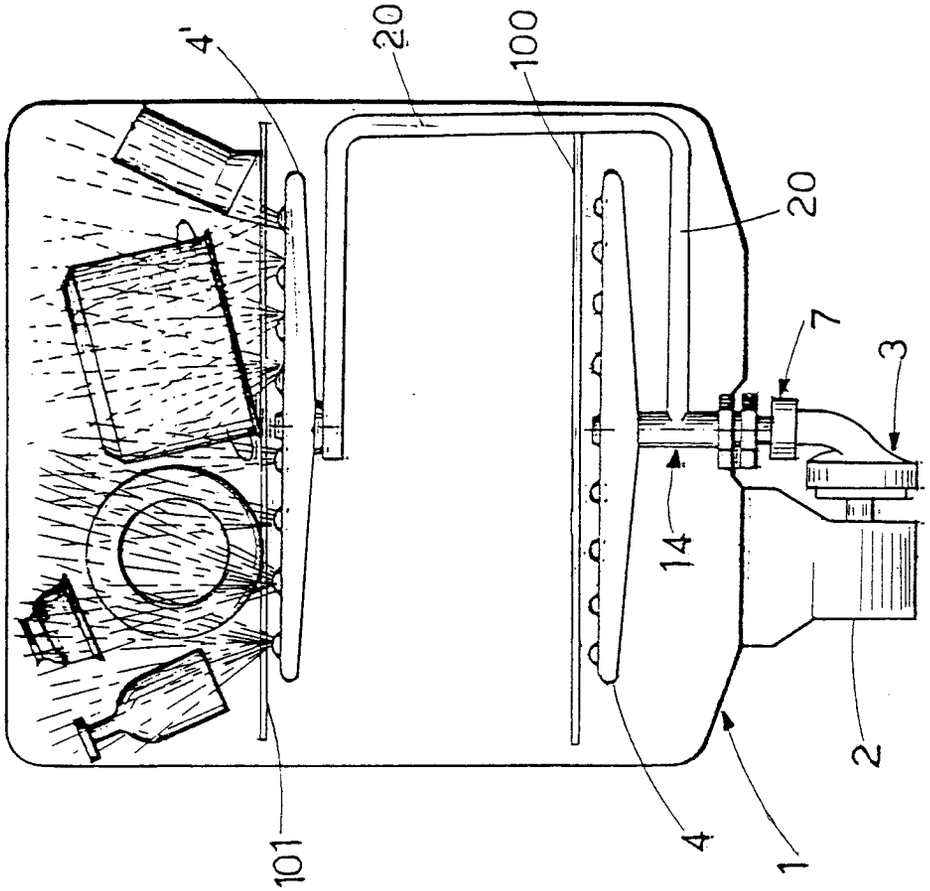



Fig.4

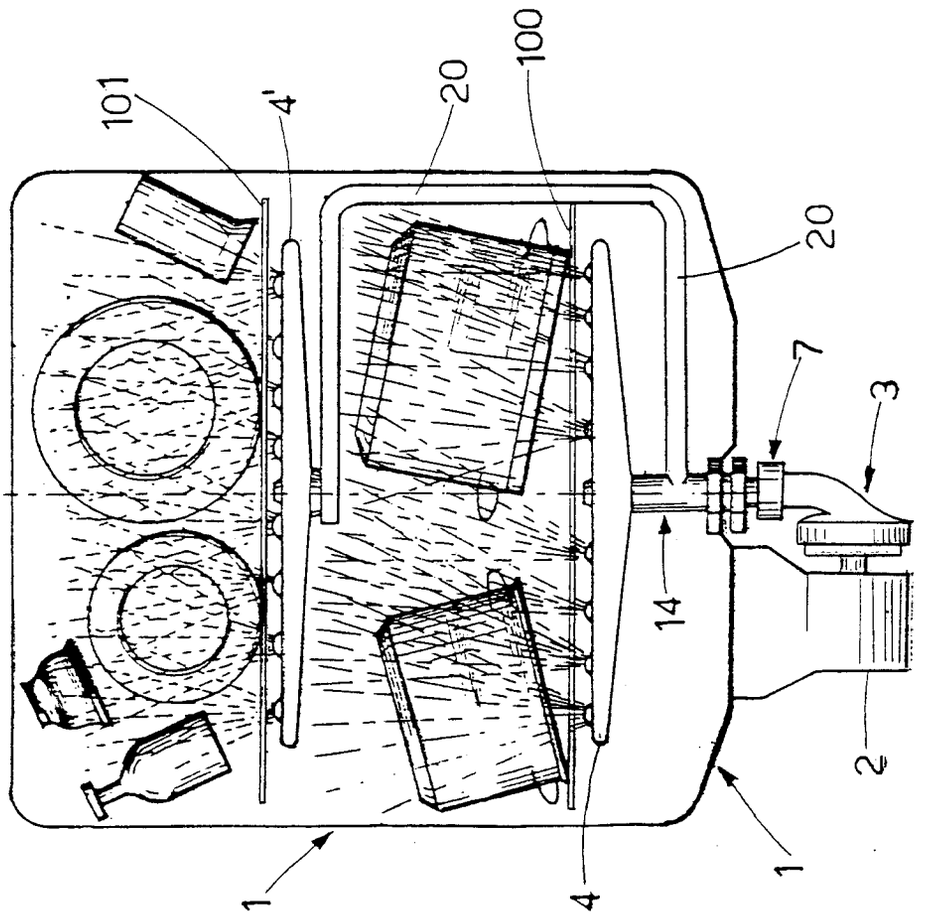


Fig.6

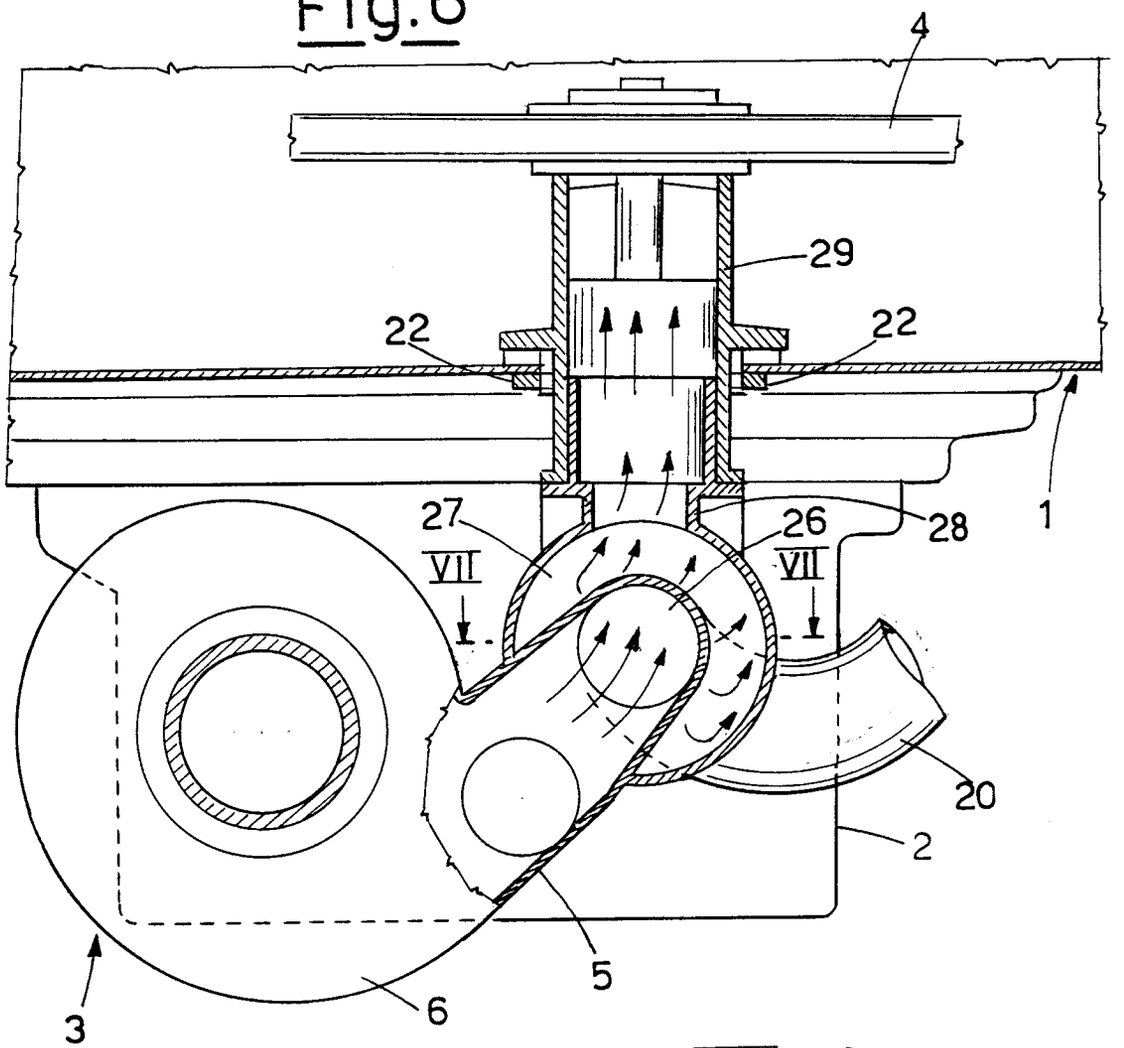
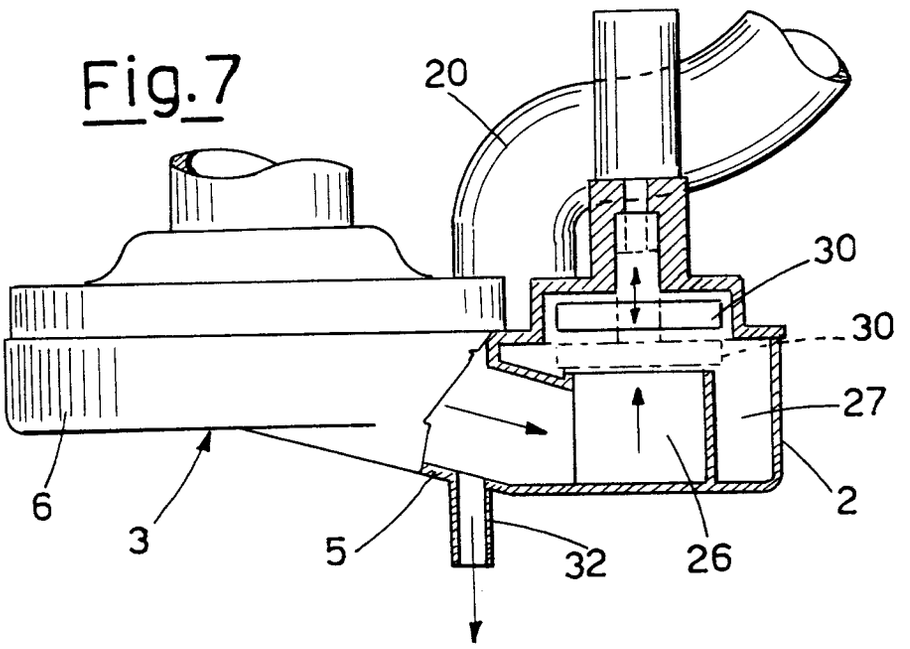



Fig.7



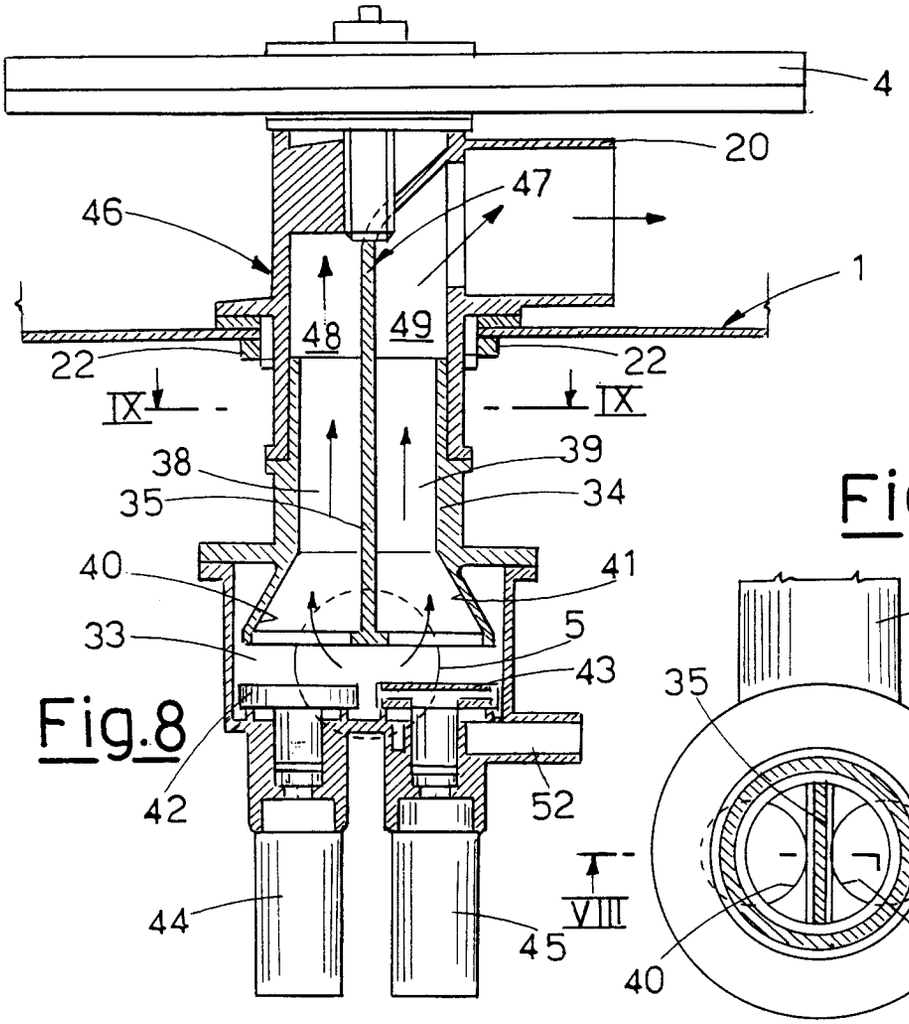



Fig.8

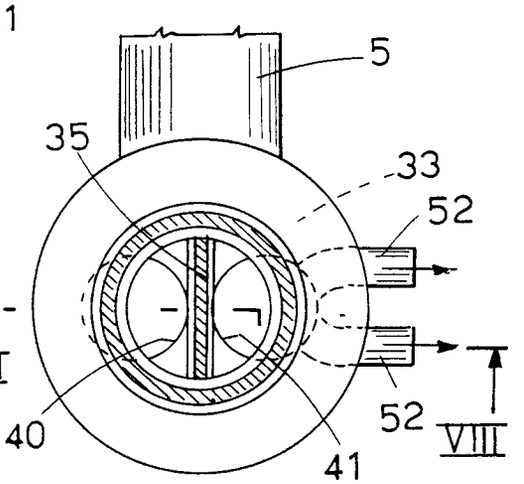



Fig.9

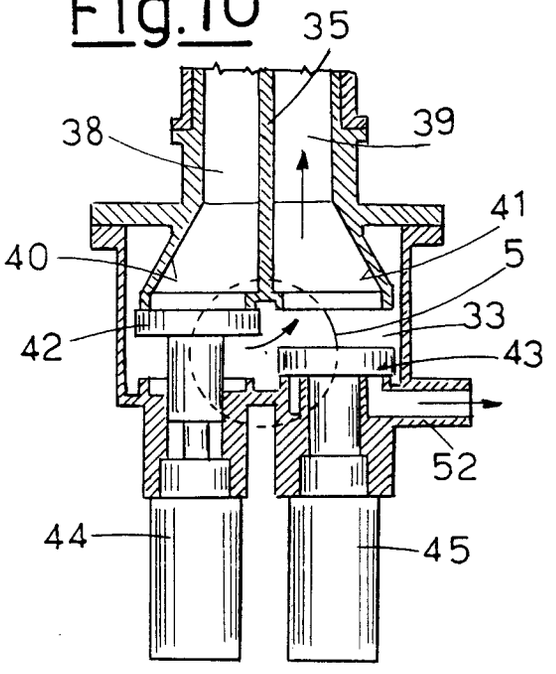



Fig.10

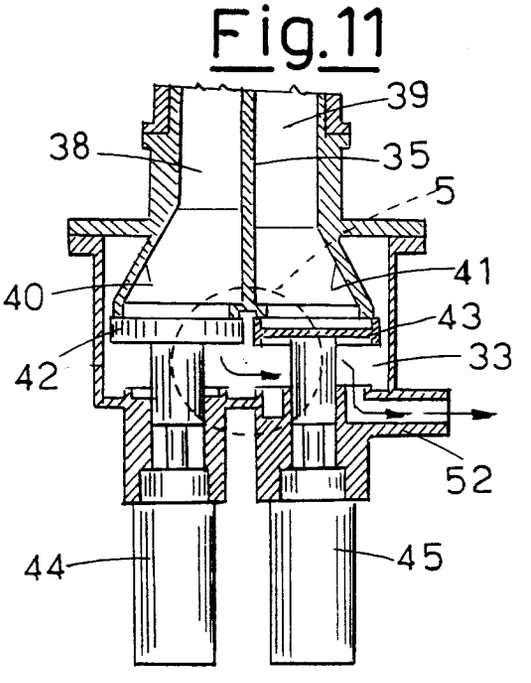



Fig.11

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# EUROPEAN SEARCH REPORT

Application Number
EP 95 20 1934

## 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.6) |
|---|---|---|---|
| A | FR-A-2 443 231 (ESSWEIN S.A.)<br>* the whole document * | 1-7 | A47L15/42 |
| A | DE-A-39 11 305 (INDUSTRIE CANDY S.P.A.)<br>* abstract; figure 1 * | 1-7 | |
| A | FR-A-2 457 670 (LICENTIA PATENT-VERWALTUNGS-GMBH)<br>* claim 1 * | 1 | |
| A | DE-A-34 06 698 (BUDERUS AG)<br>* abstract; figure 1 * | 1 | |
| A | US-A-4 730 630 (P. RANFT)<br>* the whole document * | 1 | |
| A | DE-A-23 45 908 (LICENTIA PATENT-VERWALTUNGS-GMBH)<br>* claims 1-4; figure 1 * | 1 | |
| A | DE-A-34 41 023 (BOSCH-SIEMENS HAUSGERÄTE GMBH)<br>* figure 1 * | 3 | TECHNICAL FIELDS SEARCHED (Int.Cl.6)<br>A47L<br>D06F |
| A | FR-A-2 651 427 (ESSWEIN S.A.)<br>* the whole document * | 7 | |

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| THE HAGUE | 29 November 1995 | Kellner, F |

CATEGORY OF CITED DOCUMENTS

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