(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 597 513 A1**

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **93202909.3**

(22) Date of filing: **19.10.93**

(51) Int. Cl.[5]: **D06F 39/10**, D06F 39/08, D06F 39/02

(30) Priority: **12.11.92 IT MI922596**

(43) Date of publication of application:
18.05.94 Bulletin 94/20

(84) Designated Contracting States:
DE ES FR GB IT

(71) Applicant: **CANDY S.p.A.**
Via Missori, 8
I-20052 Monza (Milano)(IT)

(72) Inventor: **Fumagalli, Silvano**
Via Grigna, 2
I-20052 Monza (Milano)(IT)

(74) Representative: **Falcetti, Carlo et al**
Jacobacci, Casetta & Perani S.p.A,
Via Visconti di Modrone, 7
I-20122 Milano (IT)

(54) A washing machine with recirculated flow and with an upper filter element.

(57) A washing machine with recirculated flow comprises a filter element (13, 43) which is disposed in the recirculation circuit (11) downstream of the recirculation pump (7) and above the washing tank (2), in order to prevent the blockage of a detergent-dispensing nozzle and so as to be easily removable by the user without risk of the liquid overflowing.

The filter element (13, 43) may be associated with a drain-recirculation flow diverter (49, 51, 54) and enables easy inspection thereof.

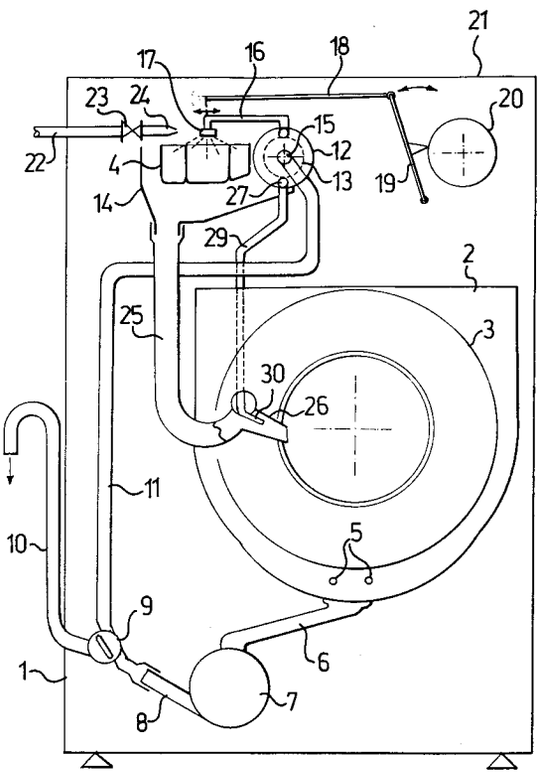


FIG.1

EP 0 597 513 A1

The present invention relates to a washing machine with recirculated flow and with an upper filter element.

It is known that there are washing machines on the market in which the liquid for filling the tank is recirculated in order to collect detergent from a detergent-holder disposed above the washing tank and/or in order to carry out washing by spraying from above.

The recirculation pump which is used for this purpose, and generally also for draining the washing machine, has to be disposed at a lower level than the washing tank since it is not convenient to use self-priming pumps.

In order to protect the pump and the circulation circuits, the washing machine normally has a removable filter disposed upstream of the pump and at a lower level than the bottom of the tank and hence at the same level as the pump, near the floor supporting the washing machine.

A removable filter thus located has two disadvantages; it is inconvenient to remove and requires the user to bend down to floor level. It also involves an overflow of water when it is opened, since it is disposed approximately at the level of the pump and is thus subject to backflow from the draining and recirculation pipes which necessarily transport the liquid to higher levels and cause it to fall towards the pump when the pump is switched off.

In washing machines which do not use recirculated flow, these disadvantages, which are very serious for the user, could be avoided by eliminating the filter and using self-cleaning draining pumps.

In washing machines with recirculated flow, this is not possible because the lint present in the fluid accumulates during washing and may obstruct the recirculation circuit and, in particular, the detergent-dispenser and/or spray nozzles, also leaving a thick deposit on the fabrics during the draining of the washing machine.

Filtering of the recirculated liquid is therefore essential and involves the problems indicated.

These problems are prevented by the washing machine with recirculated flow of the present invention, which has a filter disposed downstream of the recirculation pump and located above the washing tank, in practice, immediately below the clear top surface of the washing machine, so as not to be affected by backflow and, in any case, in a position such as to enable backflow to be drained into the underlying tank.

Moreover, the filter is also easily and conveniently accessible to the user.

According to a further aspect of the invention, the filter element is formed as an integral structure with the detergent-dispenser unit of the washing machine.

According to a further aspect of the invention, the filter element is formed as a combined filter and diverter-valve system for diverting the output flow of the pump towards a drain or towards a detergent-holder drawer, considerably simplifying its structure and installation and consequently reducing costs.

Moreover, the combination of the valve system with the filter enables easy inspection and maintenance of the valve system which is disposed downstream of the filter and is thus protected from the damaging effect of solid residues (which are retained upstream) on the seals of the valve system.

According to a further aspect of the invention, the valve system associated with the filter is subservient to and operated by the same kinematic mechanism which controls the collection of detergent from the drawer, with further structural simplifications and rationalizations and consequent cost reductions.

The characteristics and advantages of the invention will become clearer from the following description of a preferred embodiment of the invention and from the appended drawings, in which:

Figure 1 is a schematic frontal section of a washing machine with recirculated flow and with an upper filter element formed according to the present invention,

Figures 2 and 3 are a frontal section and a section taken in the plane A-A of Figure 2, respectively, of a preferred embodiment of the integrated detergent-dispenser and filter unit for the washing machine of Figure 1,

Figure 4 is a partial frontal section, limited to the filter, of a variant of the unit of Figures 2 and 3, in which a drain/recirculation flow-diverter is formed integrally with the filter and functionally downstream thereof,

Figure 5 is a section of the variant of Figure 4 taken in the planes B-B of Figure 4,

Figure 6 is a frontal section of a variant of the flow-diverter of Figure 4.

With reference to Figure 1, the washing machine of the invention is constituted by a casing 1 housing a washing tank 2 containing a rotary drum 3 driven by a motor, not shown. The bottom of the tank houses heating elements 5.

The bottom of the tank communicates directly, by means of a pipe 6, with a suction pump 7, the output 8 of which is connected to a flow-diverter valve system 9 which can be operated to divert the flow output by the pump towards a drain pipe 10 or towards a recirculation pipe 11.

Unlike washing machines of the prior art, there is no filter between the pump 7 and the pipe 6 for draining the tank.

According to the invention, the recirculation pipe 11 leads to the input 15 of a filter 12 disposed above the tank 2 near a detergent-holder 4 housed in a box 14 for collecting the flow.

The filter is constituted by a fixed housing 12 and a removable, annular filter element 13.

The fixed housing of the filter has an outlet pipe 16 terminating in an orientable nozzle 17 disposed above the detergent-holder 4 so that the recirculated flow can remove detergent.

The orientation of the nozzle 17 is set by an operating rod 18 which is moved by the rocker-arm of a conventional cam programmer 20.

All these elements are housed in the upper portion of the washing machine near the top surface 21 thereof which, in front-loading washing machines, is normally left clear to permit built-in installation.

A mains water intake 22, which is controlled by a filler valve 23 and terminates in a nozzle 24, enables water to be admitted to the washing tank, the admission taking place over the detergent-holder 4 or into the box 14.

The box 14 communicates with the washing tank by means of a drain pipe 25 terminating in a spray nozzle 26. The filter element 13 can be removed axially from the front of its fixed housing (at least in the case of a front-loading washing machine), by means of a suitable rotation of the filter element and of a closure plug associated therewith.

In the case of top-loading washing machines, the filter element may be disposed so that the axis of the annular body is vertical, with removal taking place axially upwards.

Clearly, therefore, the filter is located in a conveniently accessible position in both cases.

Moreover, when the force of the pump 7 ceases, the liquid in the filter 12 and in the recirculation pipe 11 flows back towards the pump, emptying the filter.

The filter housing 12 may have an opening 27 for fractioning the recirculated flow directed towards the nozzle 17.

The flow-fractioning path is constituted by a pipe 29 connected to the opening 27 and terminating in an extractor nozzle 30 which cooperates with the nozzle 26 to impart a faster speed to the liquid flowing out of the pipe 25.

The flow-fractioning path ensures, if necessary, that the filter is emptied completely when the force of the pump 7 ceases. In the absence of this path, any liquid remaining in the filter collects in the box 14 when the filter is opened.

Alternatively, the small opening 27 opens directly into the box 14 and can bring about a very slight fractioning of the recirculated flow and ensure that the filter is drained completely when the pump 7 is inactive.

Clearly, therefore, with the use of one of these measures, the removal of the filter is completely reliable and there is no risk of liquid overflowing.

Figures 2 and 3 are a frontal section and a cross section taken in the plane A-A of Figure 2, respectively, of a preferred embodiment of the filter which is formed as an integral part of the detergent-dispenser unit of the washing machine.

As already indicated, the detergent dispenser unit comprises a flow-collector box 14, preferably made by moulding reinforced plastics.

The box 14 houses the detergent holder 4 and a fixed cylindrical filter housing 33, the axis of which is disposed horizontally and which is open at the front and closed at the rear by a diaphragm 34.

A central axial pipe connector 35 for connection to the recirculation pipe 11 opens in the diaphragm 34, as do two respective upper and lower pipe connectors 36 and 37, which are flush with the internal wall of the housing 33.

The pipe connector 36 is connected to the output pipe 16 (Figure 1) and the pipe connector 37 is connected to the choking duct 29.

The housing houses a cylindrical filter element 38 closed at the front by a screw plug 39 with a sealing ring 40, engaged and screwed into a corresponding seat in the housing.

In the diagram of Figure 1, it can be noted that the flow diverter 9 is disposed upstream of the filter 12 and may therefore be subject to problems caused by lint and solid elements in the washing liquid.

According to a further aspect of the invention, this problem is eliminated by the formation of a filter body which also acts as a flow-diverter valve, disposed immediately downstream of the filter.

An element is thus obtained which not only eliminates the damaging effect on the flow-diverter of the solid residues (which are retained by the filter), but which also enables it to be inspected and maintained easily with the use, for this purpose, of the open compartment left empty by the removal of the filter element.

This embodiment is shown in Figures 4 and 5 which show the filter-diverter unit sectioned in a plane perpendicular to the axis of the cylindrical filter housing, and in the planes B-B of Figure 4, respectively.

The bottom of the cylindrical housing 43 opens into a chamber formed by a container 44 for the diverter and, unlike the housing of Figure 3, has only the axial pipe connector 35 for connection to the recirculation pipe.

The container 44 may be formed in one piece with the fixed housing 43 and the front portion of the collector box by a moulding operation, with multiple cooperating mould elements which are movable in transverse directions.

One side of the container 44 is open and has a coupling flange 45 cooperating with a facing flange 46 of a closure cover 47.

A through pipe connector 48 is fixed to the side opposite the flange by gluing or by thermocompression bonding and is extended internally by a cylindrical nozzle 49 integral with the connector or, preferably, screwed thereon.

The closure cover 47 also has a cylindrical nozzle 50 which is centred axially relative to the nozzle 49 and communicates with an outlet 51.

An electromagnetic or thermomechanical actuator 52 with a rod 53 which extends within the nozzle 50 and which, naturally, has suitable sealing rings, is fixed to the cover 47 and controls the position of a closure diaphragm 54 with opposed seals 55, 56, for alternatively closing the nozzle 49 or the nozzle 50 in a mutually exclusive manner.

After the recirculated flow admitted axially to the filter through the pipe connector 35 has been cleaned of solid residues by the filter element, it is sent into the chamber of the container 44 and, according to the position of the diaphragm 54, is recirculated through the nozzle 49 and the pipe connector 48 or is drained to the outside through the nozzle 50 and the outlet 51.

In the rest condition, with the washing machine switched off, the outlet nozzle 50 may be in the open condition and any liquid residues present in the filter and in the container 44 are thus drained through the outlet 51.

The opening of the filter then enables easy inspection and functional checking of the diverter.

Like the nozzle 49, the diaphragm 54 can also be screwed onto the rod 53 so that any replacement of the diaphragm or of the seals 55, 56 can be carried out quickly and easily, without the need to disassemble structural parts.

An arrangement of the integrated filter-diverter unit such as that described, which is fixed structurally to the detergent dispenser unit, enables further advantages to be achieved by the elimination of the electromagnetic actuator which is normally required to operate the diverter and its replacement with a simple mechanical control operated by the same kinematic mechanism which controls the dispensing of detergent.

This structural solution is shown in Figure 6 which is a frontal section of the filter-diverter unit and of the conventional kinematic programming mechanism of the washing machine, which is adapted to operate the diverter.

In Figure 6, elements functionally and structurally equivalent to the elements of Figure 4 are identified by the same reference numerals.

The diaphragm 54 is operated by a rod 53 controlled by an operating lever 57 pivoted at its centre on a pin 58 supported by a box-type support 59.

The lower arm 60 of the lever engages a seat 61 in the rod 53.

A helical spring 62 wound onto a central bush of the lever 57 with one end engaged by a wall 63 of the support and the other end engaged by the lower arm 60 tends to rotate the lever, urging the diaphragm 54 against the recirculation nozzle 49, by means of the rod 53.

The end 64 of the upper arm of the lever 57 is engaged by an entrainment and compensation spring 65 fixed to a rod 66 for moving a nozzle, or equivalent flow-orienting device, over one or a plurality of compartments of a detergent-holder which is not shown since it is of known type.

The rod 66 is coupled to a rocker arm 67 of a cam programming device 68, also of known type.

The involute cam profile has a plurality greater than 2 of active levels, each of which corresponds to a predetermined position of the rod 66 and predetermined operative conditions.

For predetermined low active cam levels at which the spring 65 and the rod 66 do not exert a biasing effect (anticlockwise with reference to Fig. 6) on the lever 57, which is kept in the rest position by the spring 62, the movement of the lever 57 by the rod 66, by means of the compensation spring 65, causes the diaphragm 54 to close the recirculation circuit (the nozzle 49), opening the draining circuit (the nozzle 50).

For all the other active cam levels, the action of the rod 66 and of the spring 65 prevail over the torque of the spring 62, rotating the lever 57 anticlockwise to a second position in which the nozzle 49 is open and the draining nozzle 50 is closed.

Since the lever 57 has to behave as an element with two working positions, the spring 65 provides a resilient coupling which enables the rod 66 to assume a plurality of more than two working positions.

The base of the box-type support 59 conveniently, but not necessarily, opens into a pipe connector 69 which can be connected to the washing tank or to the flow-collector box 14, in order to send thereto any liquid which overflows through the sliding coupling between the rod 53 and the cover 47, thus making the use of seals on the rod unnecessary, in practice.

The rod therefore operates particularly smoothly and does not exert an appreciable resisting torque on the rocker arm of the programmer by means of the kinematic mechanism described.

A further advantage offered by the solution described in Figure 6 is that the flow-diverter can be operated with the machine switched off, by the manual rotation of the programming cam 68 with the filter element open.

Clearly, the foregoing description represents only one embodiment of the invention and of its preferred variants and many other variations may be introduced without departing from the spirit of the invention.

For example, the functions of the springs 62 and 65 may be made superfluous by a design of the lever 57 which affords it suitable resilience.

Moreover, as mentioned with reference to Figure 1, the function performed by the nozzle 17 for dispensing detergent from the container 4 may be performed by the nozzle 24 for filling the washing machine, the recirculated flow having the function solely of spraying the washing in the washing tank.

In this case, provided that the filter is disposed above the washing tank, the recirculation pipe 16 at the outlet of the filter may be connected directly to the draining pipe 25 and to the spray nozzle 26.

Although the invention is directed specifically towards washing machines with recirculated flow, for filtering the recirculated flow, it can also be applied to washing machines without recirculated flow, in which the self-cleaning pump does not itself require filter protection, in order to solve the same technical problem, that is, that of ensuring the cleanliness of the output flow of the pump which, in this case, is discharged into the domestic waste water drainage system and at the same time enables the filter to be maintained easily and reliably.

This ensures that lint and solid bodies present in the output flow of the pump do not obstruct or promote the obstruction of the domestic drainage system, resulting in the need for troublesome repairs.

Claims

1. A washing machine comprising a washing tank (2), a washing drum (3) in the tank, and a suction pump (7) with its intake (6) connected to the tank and its output connected to an output flow pipe (8), characterized in that it comprises a filter element (13, 43) which can be removed by the user, and which is housed in a fixed housing (12, 43) disposed spatially at a higher level than the tank (2) and disposed functionally downstream of the output of the pump.

2. A washing machine with recirculated flow comprising a washing tank (2) a washing drum (3) in the tank, a suction pump (7) with its intake (6) connected to the tank and its output connected to a flow-recirculation pipe (11), and a flow-outlet nozzle (17) supplied by the flow, characterized in that it comprises a filter element (13) which can be removed by the user and which is housed in a fixed housing (12, 43) disposed spatially at a higher level than the tank (2) and interposed functionally in the recirculation path between the flow-outlet nozzle (17) and the recirculation pipe (11).

3. A washing machine according to Claim 2, also comprising a detergent-holder drawer (4) and a box (14) for collecting the flow, in which the flow-output nozzle (17) is orientable over the drawer (4) in order to discharge the flow therein, the flow then being collected by the collector box (14).

4. A washing machine according to Claim 3, in which the housing has a flow-fractioning opening (27).

5. A washing machine according to Claim 4, in which the flow-fractioning opening (27) opens into the flow-collector box.

6. A washing machine according to Claim 4, in which the flow-fractioning opening (27) is connected to a circuit (29) for restricting the recirculated flow.

7. A washing machine according to the preceding claims, in which the housing (12, 33, 43) is integral with the flow-collector box (14).

8. A washing machine according to the preceding claims in which the housing (43) comprises a housing for a flow-diverter valve system (52, 54).

9. A washing machine according to Claim 8, in which the valve system (52, 54) comprises a nozzle (49) and a closure diaphragm (55) which are removable.

10. A washing machine according to Claim 8, comprising a kinematic mechanism (60) for the valve system, operated by a cam programmer (67, 68).

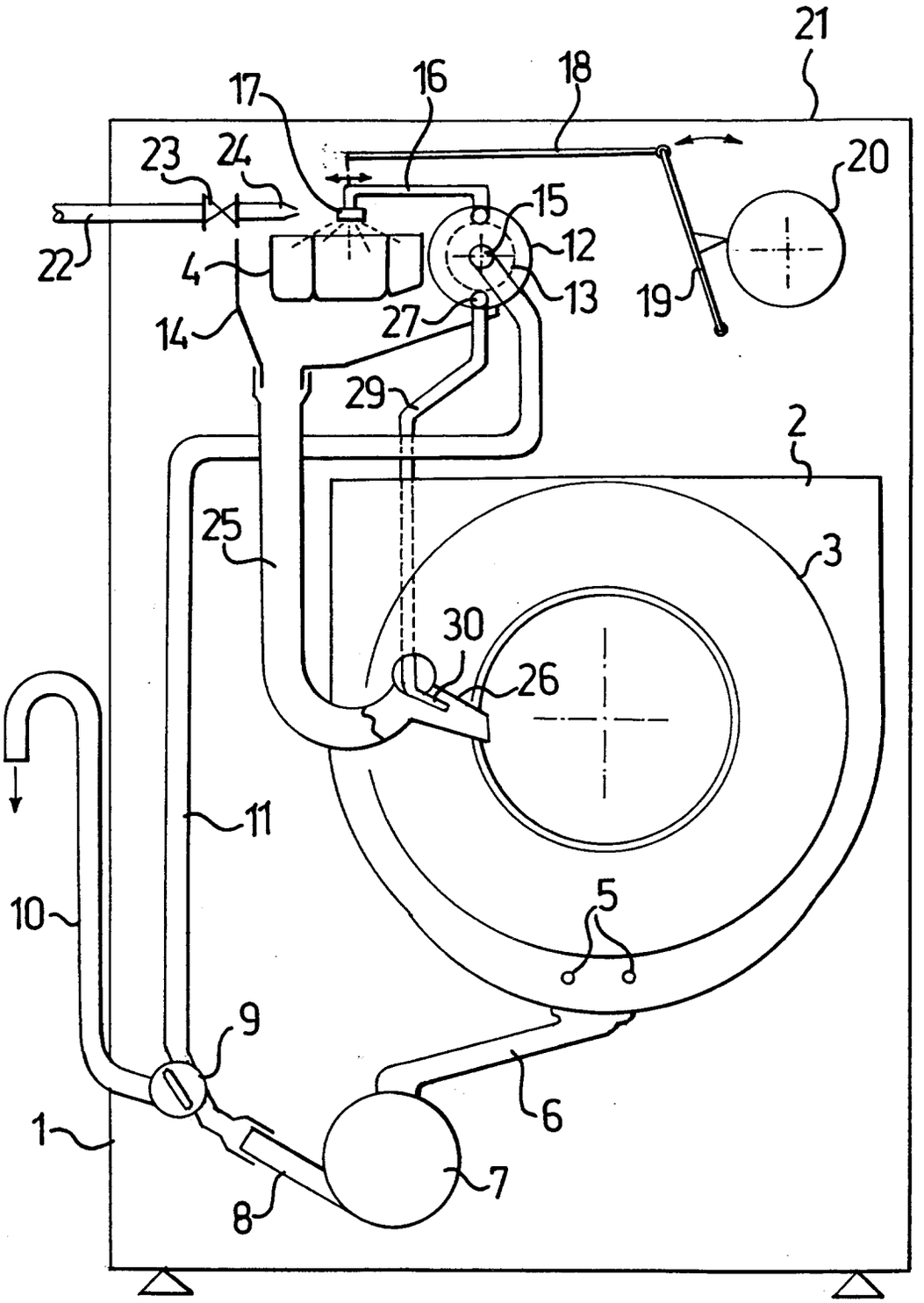


FIG.1

FIG.2

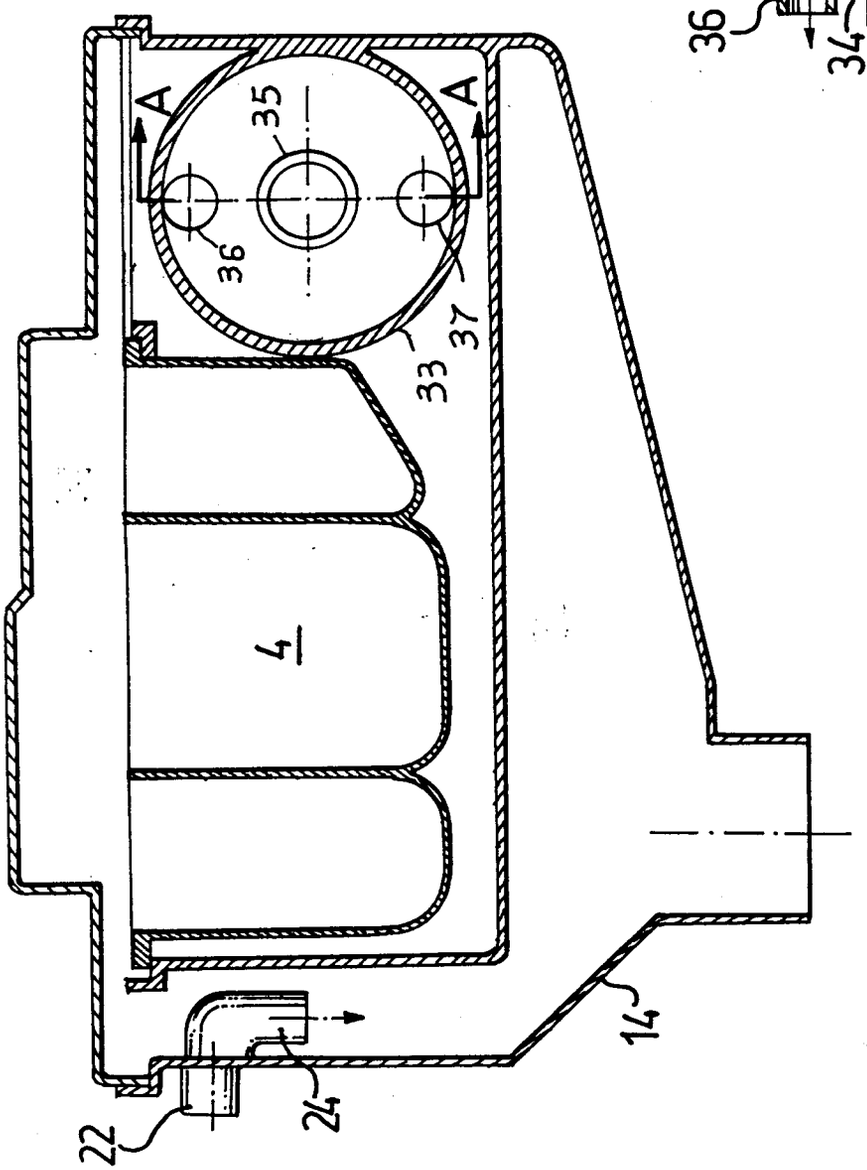
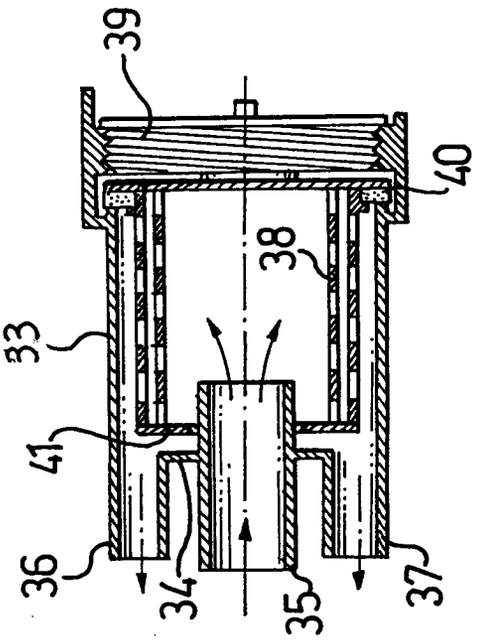


FIG.3



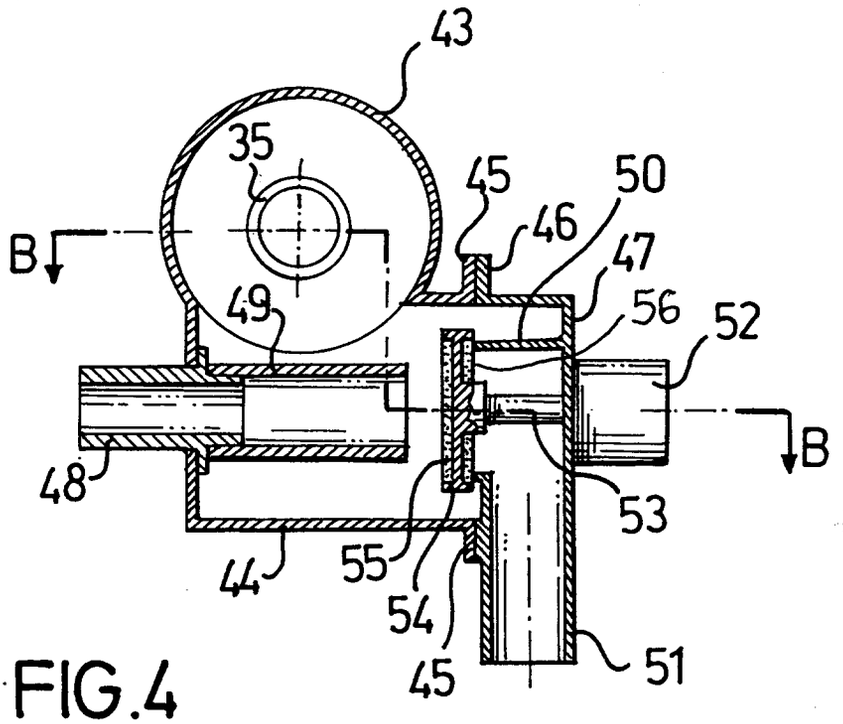

43
35
45
50
46
47
B
49
56
52
B
48
53
44
55
54
45
51

FIG.4

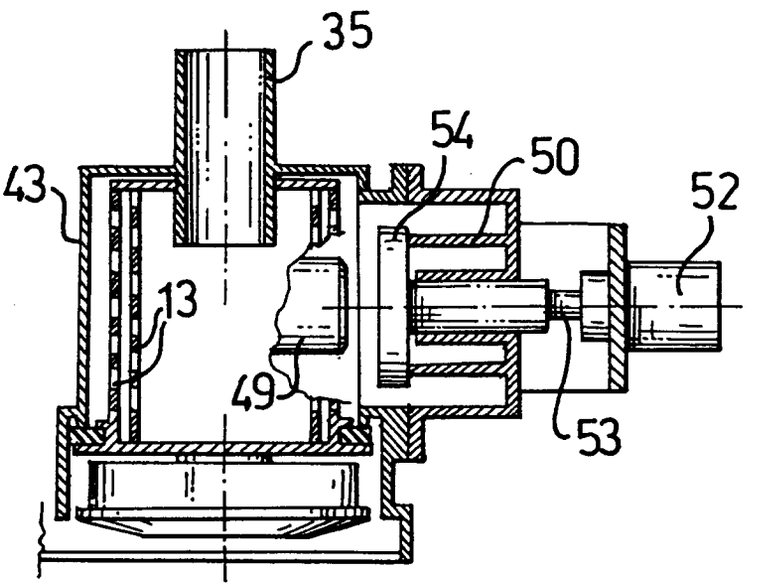

35
54
50
43
52
13
49
53

FIG.5

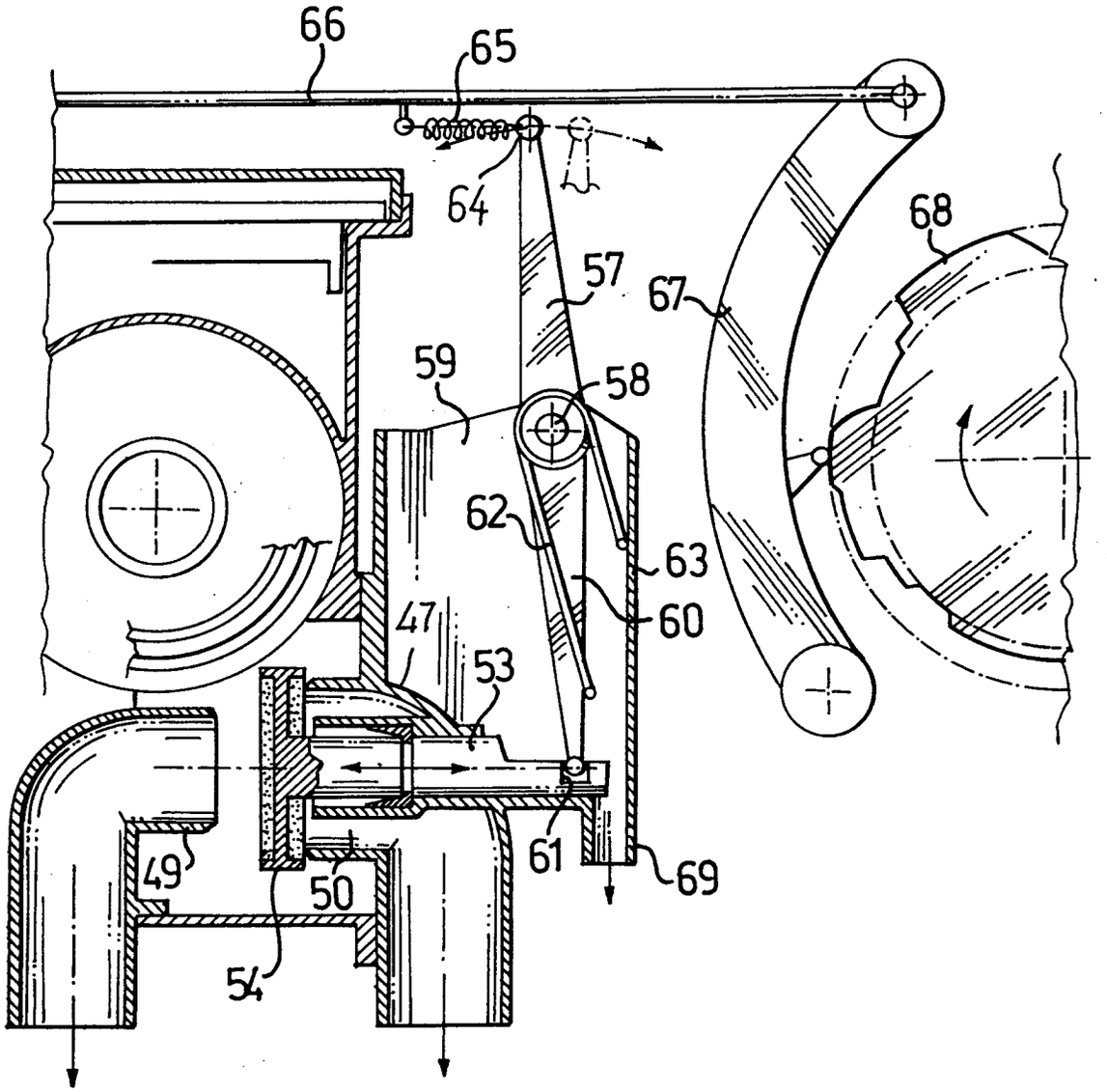


FIG.6

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 93 20 2909

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	US-A-2 936 604 (WHIRLPOOL CORPORATION) * column 4, line 44 - column 5, line 10; figures *	1,2	D06F39/10 D06F39/08 D06F39/02
A	US-A-2 959 286 (GORMAN-RUPP INDUSTRIES INC.) * column 4, line 14 - column 5, line 4; figures *	1,2,8	
A	DE-A-16 10 190 (SIEMENS-ELECTROGERÄTE GMBH) * claims; figure *	1-6	
A	DE-A-17 85 610 (SIEMENS-ELECTROGERÄTE GMBH) * page 5; figures 5,6 *	1,2,8-10	
A	DE-A-34 03 368 (LICENTIA PATENT-VERWALTUNGS-GMBH) * claims; figure 1 *	10	
A	US-A-2 586 508 (HORTON MANUFACTURING COMPANY)		TECHNICAL FIELDS SEARCHED (Int.Cl.5) D06F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	3 March 1994	Courrier, G

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

EPO FORM 1503 03.82 (P04C01)