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

Waschmaschine mit Umlauf und mit oberem Filter

Machine à laver à recirculation et filtre placé en haut

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US-A- 2 959 286

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Description

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

It is known, and for example disclosed in document DE-A-1610190, 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, being 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.

US-A-2 936 604 discloses a washing machine where a filter dowstream of a recirculation pump is located above a washing tank, accessible from the top of the machine, which is open for loading.

The filter forms the terminal portion or nozzle of a recirculation duct which directly opens in the washing tank. Being the filter removable inside the tank, the above problems are inherently prevented because water overflow occurring when the filter is removed drops in the tank without spilling.

This arrangement is not feasible in washing machines where the recirculated liquid is sprayed through a nozzle, generally an orientable nozzle, over a detergent holder, separate from the washing tank, to collect detergent therefrom, the liquid with added detergent being then conveyed to the washing tank through a duct whose end is not easily accessible or not accessible at all by the user.

Moreover should a filter be located downstream of the detergent collecting nozzle, the nozzle and the detergent dispenser would not be protected from possible obstruction.

These problems are prevented by the washing machine with recirculated flow of the present invention, as recited in appended claim 1, which is provided with a removable filter, easily and conveniently accessible to the user, protects the detergent dispenser and detergent collecting nozzle from abstruction and prevents possible water spilling when the filter is opened.

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.

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 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), a removable filter element (13) for filtering said recirculated flow, housed in a fixed housing (12,43) having a filter inlet (15,35), a filter outlet pipe (16,36,48) and an opening for removal of said filter, and a flow-outlet nozzle (17) supplied by the flow and open over a detergent holder drawer (4), housed in a collector box (14), in order to discharge the flow in said drawer (4), the flow being then collected by said box (14) and conveyed to said tank through a drain pipe (25) ending in a spray nozzle (26),
characterised in that said filter element (13) is disposed functionally downstream of the output of said pump (7), said fixed housing (12,43) is disposed spatially at a higher level than the tank (2), said filter outlet pipe (16,36,48) terminates in said flow outlet nozzle (17) and in that said washing machine further comprises draining means (27,37,51) for collecting any liquid remaining in said housing (12,43) and conveying it into said tank.

2. A washing machine according to Claim 1, where said flow-outlet nozzle (17) is orientable over said drawer.

3. A washing machine according to claim 1 or 2 where said draining means comprises said box (14) said housing (12,43) being contained in said box, whereby any liquid remaining in the filter housing collects in the box when the filter is opened.

4. A washing machine according to Claim 1,2 or 3, in which said draining means comprises a flow-fractioning outlet (27) of said housing open in the lowest side of said housing for draining it.

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

6. A washing machine according to Claim 4, in which the flow-fractioning outlet (27) is connected, through a pipe (29), to an extractor nozzle (30) cooperating with said spray nozzle (26) to impart a faster speed to the liquid flowing out of said spray nozzle (26).

7. A washing machine according to the preceding claims, in which said housing (12, 33, 43) is integral with said 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), said valve system being functionally located downstream of said filter element.

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).

Patentansprüche

1. Waschmaschine mit Umlaufströmung und mit einem Waschbehälter (2), einer Waschtrommel (3) in dem Behälter, einer Saugpumpe (7), deren Einlaß (6) mit dem Behälter verbunden ist und deren Auslaß mit einer Strömungsrückführungsleitung (11) verbunden ist, einem abnehmbaren Filterelement (13) zum Filtern der umlaufenden Strömung, das in einem festen Gehäuse (12, 43) mit einem Filtereinlaß (15, 35), einer Filterauslaßleitung (16, 36, 48) und einer Öffnung zum Abnehmen des Filters untergebracht ist, und einer Strömungsauslaßdüse (17), welcher die Strömung zugeführt wird und die über einem Waschmittelaufnahmeschubfach (4) offen ist, das in einer Sammelbox (14) untergebracht

ist, um die Strömung in das Schubfach (4) austreten zu lassen, wobei die Strömung dann durch die Box (14) gesammelt und durch eine Entwässerungsleitung (25), die in einer Sprühdüse (26) endet, in den Behälter befördert wird, dadurch gekennzeichnet, daß das Filterelement (13) betriebsmäßig stromabwärts des Auslasses der Pumpe (7) angeordnet ist, das feste Gehäuse (12, 43) räumlich auf einer höheren Ebene als der Behälter (2) angeordnet ist, die Filterauslaßleitung (16, 36, 48) in der Strömungsauslaßdüse (17) endet und dadurch, daß die Waschmaschine des weiteren Entwässerungsmittel (27, 37, 51) beinhaltet, um jegliche Flüssigkeit, die in dem Gehäuse (12, 43) verbleibt, zu sammeln und sie in den Behälter zu befördern.

2. Waschmaschine nach Anspruch 1, bei der die Strömungsauslaßdüse (17) über dem Schubfach orientierbar ist.

3. Waschmaschine nach Anspruch 1 oder 2, bei der die Entwässerungsmittel die Box (14) beinhalten und das Gehäuse (12, 43) in der Box enthalten ist, wodurch sich jegliche Flüssigkeit, die in dem Filtergehäuse verbleibt, in der Box sammelt, wenn der Filter geöffnet wird.

4. Waschmaschine nach Anspruch 1, 2 oder 3, bei der die Entwässerungsmittel einen strömungsteilenden Auslaß (27) des Gehäuses beinhalten, der an der tiefsten Seite des Gehäuses zu dessen Entwässerung offen ist.

5. Waschmaschine nach Anspruch 4, bei welcher sich der strömungsteilende Auslaß (27) in die Box öffnet.

6. Waschmaschine nach Anspruch 4, bei welcher der strömungsteilende Auslaß (27) über eine Leitung (29) mit einer Abzugsdüse (30) verbunden ist, die mit der Sprühdüse (26) zusammenwirkt, um der aus der Sprühdüse (26) austretenden Flüssigkeit eine höhere Geschwindigkeit zu verleihen.

7. Waschmaschine nach den vorhergehenden Ansprüchen, bei der das Gehäuse (12, 33, 43) aus einem Stück mit der Strömungssammelbox (14) besteht.

8. Waschmaschine nach den vorhergehenden Ansprüchen, bei der das Gehäuse (43) ein Gehäuse für ein Strömungsaufteilungs-Ventilsystem (52, 54) beinhaltet, wobei sich das Ventilsystem betriebsmäßig stromabwärts des Filterelements befindet.

9. Waschmaschine nach Anspruch 8, bei der das Ventilsystem (52, 54) eine Düse (49) und eine Verschlußmembran (55) beinhaltet, die abnehmbar sind.

10. Waschmaschine nach Anspruch 8, die einen kinematischen Mechanismus (60) für das Ventilsystem beinhaltet, der durch eine Nockenprogrammiereinrichtung (67, 68) betrieben wird.

Revendications

1. Machine à laver à recirculation d'écoulement comprenant une cuve de lavage (2), un tambour de lavage (3) dans la cuve, une pompe d'aspiration (7) ayant son entrée (6) reliée à la cuve et sa sortie reliée à un tuyau de recirculation d'écoulement (11), un élément formant filtre amovible (13) pour filtrer ladite recirculation d'écoulement, logé dans un logement fixe (12, 43) ayant une entrée de filtre (15, 35), un tuyau de sortie de filtre (16, 36, 48) et une ouverture pour l'enlèvement dudit filtre, et une buse de sortie d'écoulement (17) alimentée par l'écoulement et ouverte au-dessus d'un tiroir contenant du détergent (4), logé dans une boîte collectrice (14), afin de décharger l'écoulement dans ledit tiroir (4), l'écoulement étant ensuite recueilli par ladite boîte (14) et transporté vers ladite cuve par l'intermédiaire d'un tuyau d'évacuation (25) se terminant en une buse de pulvérisation (26),
caractérisée en ce que ledit élément formant filtre (13) est disposé, de manière fonctionnelle, en aval de la sortie de ladite pompe (7), ledit logement fixe (12, 43) est disposé dans l'espace à un niveau supérieur à la cuve (2), ledit tuyau de sortie de filtre (16, 36, 48) se termine en dite buse de sortie d'écoulement (17) et en ce que ladite machine à laver comprend, de plus, des moyens d'évacuation (27, 37, 51) pour recueillir tout liquide restant dans ledit logement (12, 43) et le transportant dans ladite cuve.

2. Machine à laver selon la revendication 1, dans laquelle ladite buse de sortie d'écoulement (17) peut être orientée au-dessus dudit tiroir.

3. Machine à laver selon la revendication 1 ou 2, dans laquelle lesdits moyens d'évacuation comprennent ladite boîte (14), ledit logement (12, 43) étant contenu dans ladite boîte, de sorte que tout liquide restant dans le logement de filtre se rassemble dans la boîte lorsque le filtre est ouvert.

4. Machine à laver selon la revendication 1, 2 ou 3, dans laquelle lesdits moyens d'évacuation comprennent une sortie de fractionnement d'écoulement (27) dudit logement, ouverte dans le côté le plus inférieur dudit logement pour l'évacuer.

5. Machine à laver selon la revendication 4, dans la-

quelle la sortie de fractionnement d'écoulement (27) s'ouvre dans ladite boîte.

6. Machine à laver selon la revendication 4, dans laquelle la sortie de fractionnement d'écoulement (27) est reliée, par l'intermédiaire d'un tuyau (29), à une buse d'extraction (30) contribuant avec ladite buse de pulvérisation (26) à donner une vitesse plus rapide au liquide s'écoulant depuis ladite buse de pulvérisation (26).

7. Machine à laver selon les revendications précédentes, dans laquelle ledit logement (12, 33, 43) est en une pièce avec ladite boîte collectrice d'écoulement (14).

8. Machine à laver selon les revendications précédentes, dans laquelle le logement (43) comprend un logement pour un système de vanne de dérivation d'écoulement (52, 54) , ledit système de vanne étant situé, de manière fonctionnelle, en aval dudit élément formant filtre.

9. Machine à laver selon la revendication 8, dans laquelle le système de vanne (52, 54) comprend une buse (49) et une membrane de fermeture (55) qui sont amovibles.

10. Machine à laver selon la revendication 8, comprenant un mécanisme cinématique (60) pour le système de vanne, mis en oeuvre par un programmateur de came (67, 68).

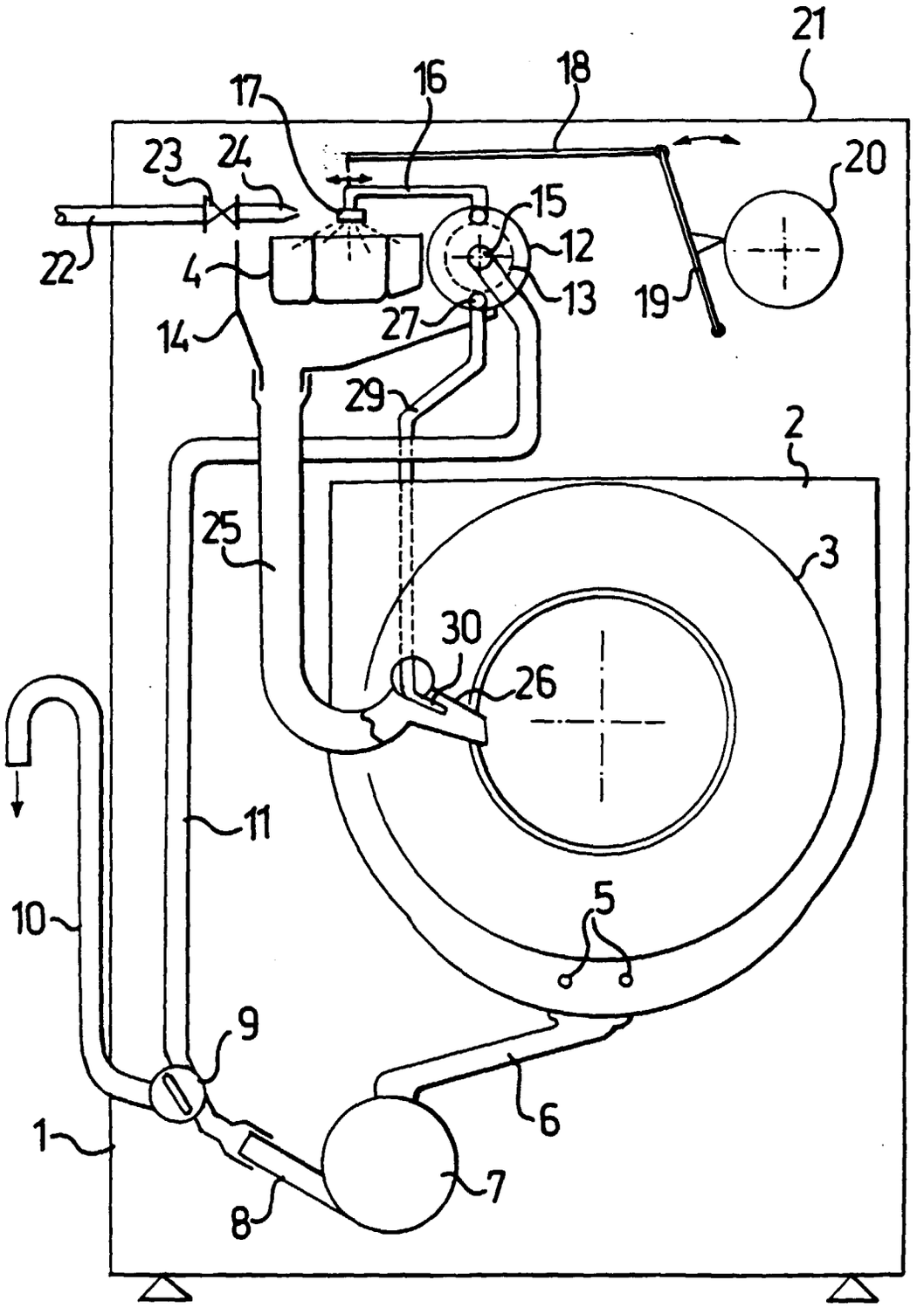
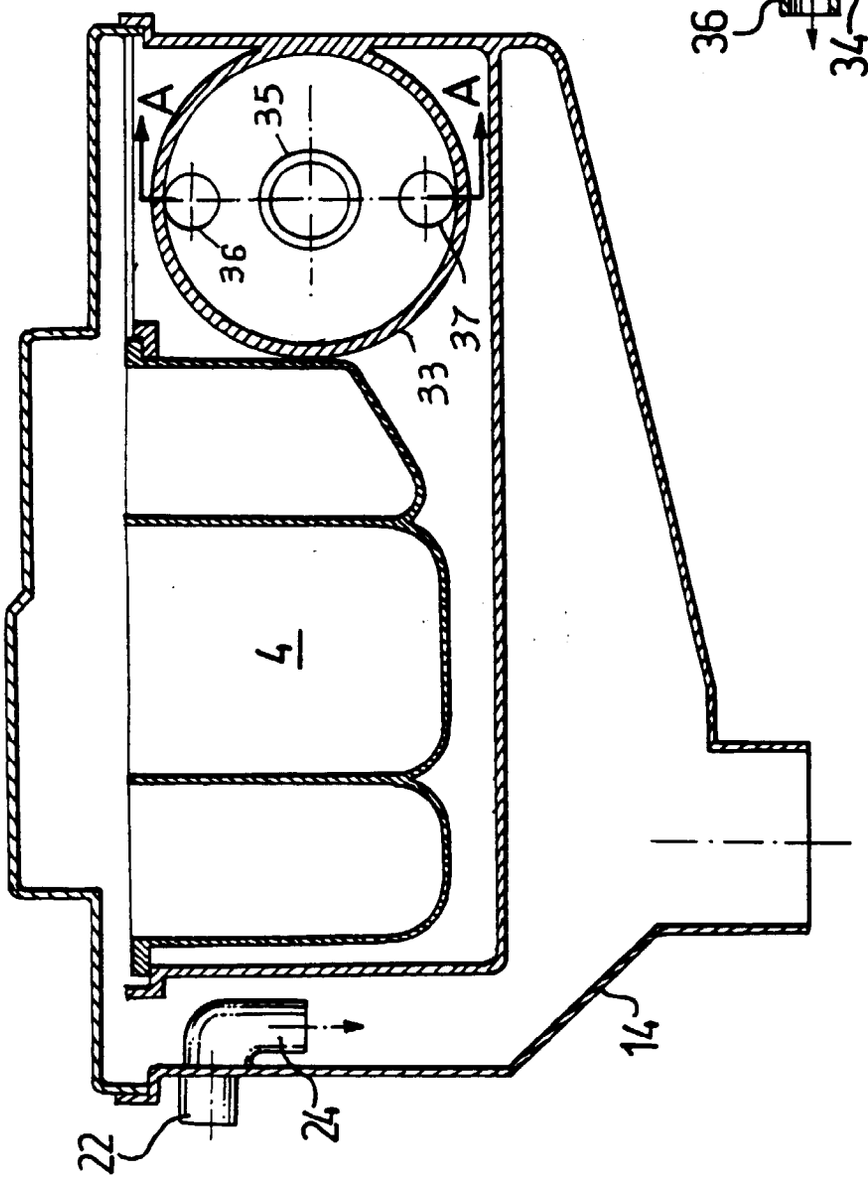


FIG.1

FIG.2



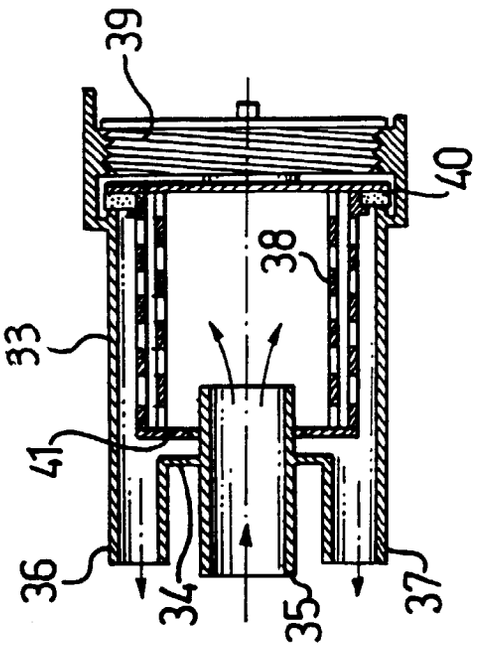


FIG.3

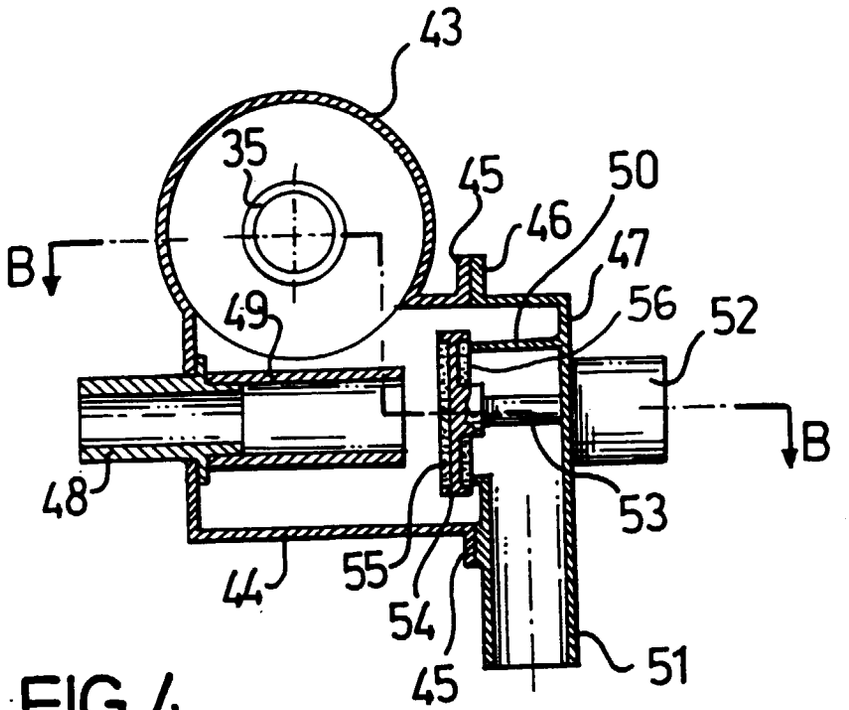

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FIG.4

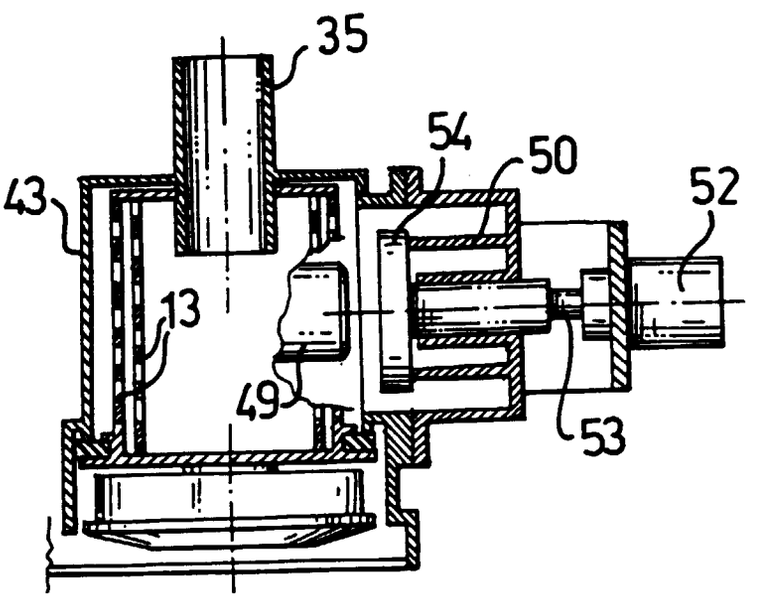

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FIG.5

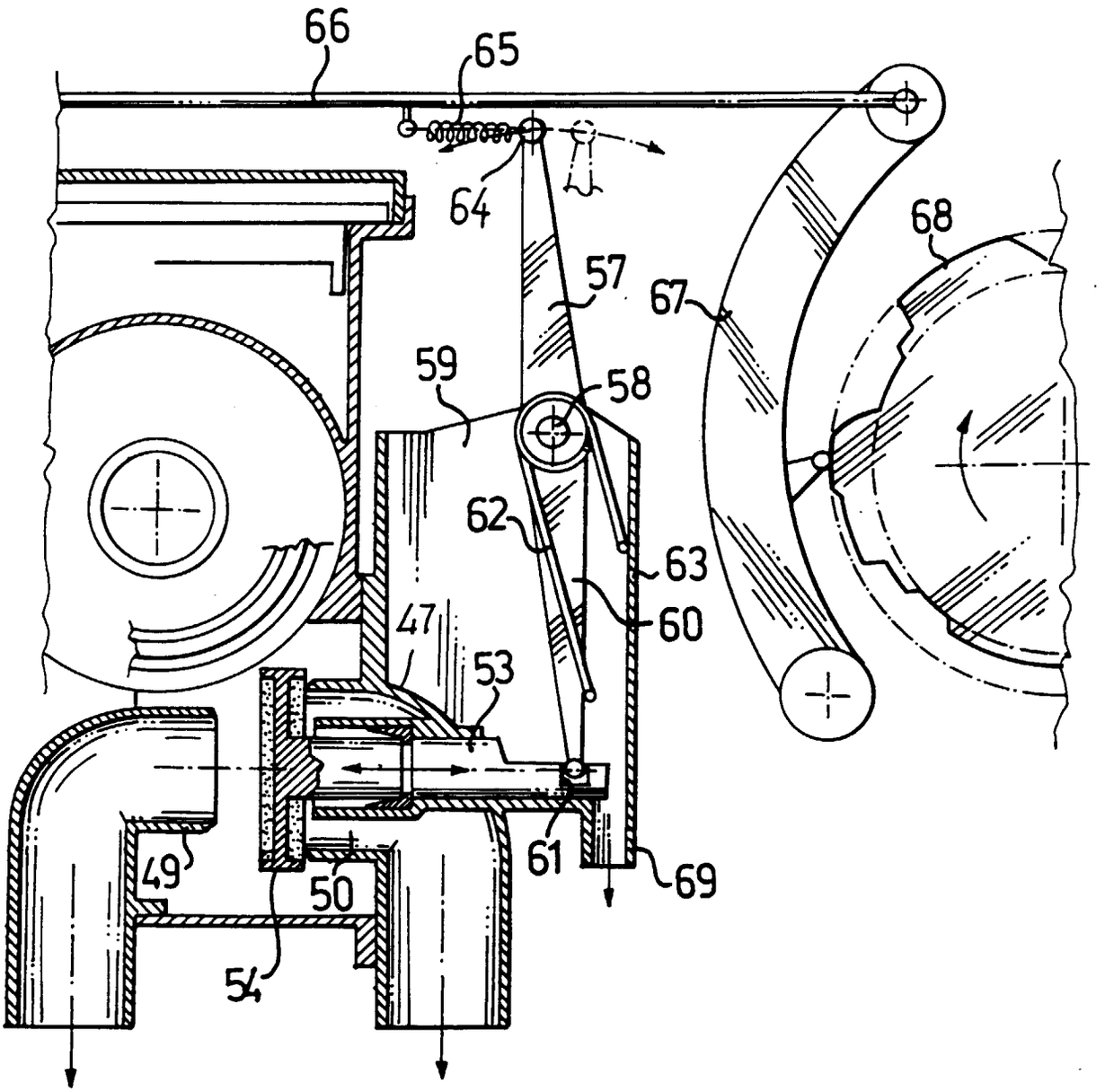


FIG.6