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A filter and flow-diverter unit for a washing machine with recirculation.

A filter and flow-diverter unit for a washing machine with recirculation comprises a cylindrical body (1) which has at least three fluid inlet/outlet connectors (17, 21, 16, 34, 36, 38) and which is open at the front in order to house a removable filter element (5, 8, 31) forming a flow path between a first connector (17, 38) of the body (1) and an internal connector (7, 32) of the removable element, the body also housing a diaphragm (22, 33) controlled by an actuator (24, 40) which closes and opens a second connector (21, 34) of the body and the connector (7, 32) of the removable element in a mutually exclusive manner.

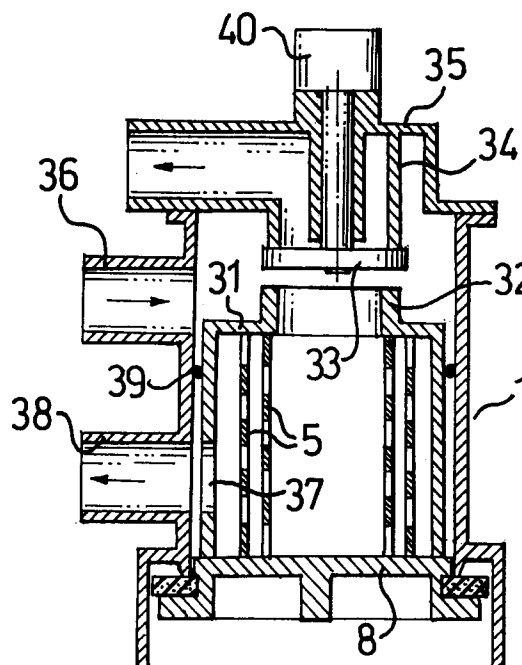


FIG.8

The present invention relates to a filter and flow-diverter unit for a washing machine with recirculation.

It is known that there are washing machines on the market in which the washing bath is recirculated into the washing tank along a recirculation path, and in which the draining pump is also used as the pump for supplying the recirculation path.

It is also known that it is possible to use flow-diverters or three-way valves which connect an inlet opening to one of two outlet openings for draining and for recirculation respectively, in a mutually exclusive manner, in order to divert the flow towards the drain or towards the recirculation path.

An example of this type of diverter is described schematically in the German patent application published under the No. 1610190.

A basic requirement which these diverters have to satisfy is that the drain opening must close perfectly, without leaks, even after repeated operation.

In the absence of perfect closure, when the diverter is in the recirculation position, the the washing liquid, which is circulated for quite considerable periods of time of the order of tens of minutes, may drain away to a large extent, with a consequent wastage of detergent and of the heat content of the liquid, which is generally heated, and with the possibility of the washing machine stopping because insufficient liquid remains in the washing tank.

Although a flow filter, generally disposed upstream of the pump, protects the circuit downstream to a certain extent, the recirculated liquid still contains solid particles and substances which may form deposits or cause mechanical or chemical wear of the seals.

A perfect seal upon closure and the effectiveness of the diverter are therefore ensured only by regular maintenance which requires skilled intervention and is difficult and laborious to carry out. In fact, the diverter is not readily accessible and it is necessary to open panels and/or lift the washing machine from the supporting floor in order to gain access to the device, to remove and dismantle it, and to check its efficiency and the state of the seals.

The installation of the diverter also adds to the construction costs of the machine since it requires the availability of suitable mechanical supports for fixing the diverter to the frame of the washing machine.

These problems are prevented by the filter and flow-diverter unit for a washing machine according to the present invention, which provides a unit in which the filter and the diverter are structurally combined in a single unit so that the removal of the filter element from the filter opens the diverter for

inspection and checks on its condition.

Moreover, the unit requires a single mechanical support rather than separate supports for separate functional units.

According to a further aspect of the invention, the removable filter element also comprises a pipe or connector portion of the diverter, thus affording free access to the movable element of the diverter for easier inspection and quicker replacement of seals where necessary.

According to a further aspect of the invention, the unit has an attachment to the body of a pump and a direct connection to the input of the pump so that the number of connecting pipes and their lengths are reduced to a minimum and a unitary pump, filter, and diverter unit is formed, which reduces the number of supports needed for fixing to the structure.

According to a further aspect of the invention, the design of the unit is such that it can be formed by the moulding of plastics material, with a small number of parts, that is, essentially three parts: a first part constituting a housing body, a second, removable part constituting the filter element and a portion of the diverter, and a third part constituting the rest of the diverter.

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 shows a preferred embodiment of the filter and flow-diverter unit according to the present invention sectioned in a horizontal plane,

Figures 2 to 6 show the filter and flow-diverter unit of Figure 1, sectioned in the section planes E-E, A-A, B-B, C-C, D-D of Figure 1,

Figure 7 shows a variant of the filter and flow-diverter unit according to the present invention, sectioned in a horizontal plane,

Figure 8 shows a second variant of the filter and flow-diverter unit formed according to the present invention.

With reference jointly to Figures 1 to 6, the filter and flow-diverter unit of the invention is constituted by a substantially cylindrical body 1, preferably formed of reinforced plastics, by moulding, and having an annular neck 2 at its open front end.

The end referred to as the front end relates to the normal conditions in which a filter is installed in a washing machine, which in fact provide for the filter device to be opened at the front.

The inner end of the body 1, which is also open, has a flange 3 for connection and attachment to the the body of a pump 4.

The cylindrical body 1 constitutes a housing for a removable element constituted by a filter element 5, a separating diaphragm 6, perpendicular to the

axis of the cylindrical body, a diametral pipe or connector portion 7 and a plug 8 for closing the front opening of the cylindrical body 1.

The plug 8 which engages the body 1 with a screw or bayonet connection, has a seal 9 and an operating knob 10.

The separating diaphragm 6, which has a sealing ring (an O-ring) cooperating with the body 1, separates a first front housing space in the cylindrical body from a second inner space which houses the filter 5.

The filter 5 has a diaphragm 11 which is parallel to the diaphragm 6, has a sealing ring (an O-ring) cooperating with the body 1, and is connected to the diaphragm 6 by a scoop-like element 12 (Figure 4).

Above the scoop 12, the body 1 opens into a first peripheral connector 13 for connection to a flow-inlet pipe coming from the washing tank.

The diaphragm 11 has a through-hole 14 between the dish of the scoop 12 and the space within the filter so that a flow admitted through the connector 13 passes from the scoop into the filter 5 and, having been filtered, emerges peripherally therefrom to be drawn through the intake 15 of the pump 4.

The cylindrical body 1 has a second peripheral connector 16 (Figures 1 and 5) in correspondence with the front housing space, and a third peripheral connector 17 (Figures 1 and 6) which opens in a position diametrically opposite a large lateral connector with a coupling flange 18.

A plug 19 having a counter-flange 20 cooperating with the flange 18 and a fourth connector 21 closes the lateral connector of the body 1. The connector 21 terminates within the plug in a rim parallel to the plane of the counter-flange 20.

The plug 19 houses a closure diaphragm 22, which is parallel to the plane of the counter-flange 20, has seals on both faces, and is supported by a rod 23 which is perpendicular to the diaphragm and is operated by an electromagnetic or, preferably, a thermal-expansion, actuator 24 in order to close and open the connector 21.

The diaphragm 6 of the removable element is fixed to the plug 8 by means of connecting arms 25, 26 resiliently supporting the connector 7 (Figures 1 and 6) which is disposed diametrically with one end facing the connector 17 and in contact with the body 1, preferably with sealing provided by a resilient seal 28, and the other end facing the diaphragm 22, in order to be closed thereby under the control of the actuator 24, as a mutually exclusive alternative to the closure of the connector 21.

As indicated in Figure 1, the outlet 29 of the pump 4 is connected to the connector 16 by a pipe 27 so that the output flow of the pump is admitted to the front housing space of the body 1, which it

leaves through the connector 17 or the connector 21 according to whether the diaphragm 20 is in a position for closing the connector 21 (and hence opening the connector 7) or in a position for closing the connector 7 (and hence for opening the connector 21).

A unitary and compact filter-diverter unit, constituted by a small number of parts which can be produced easily by the moulding of plastics material, is thus formed.

This unit, which is easy to install, can be supported directly by the body of the pump, constituting a unitary structure therewith, or may be fixed to the frame of the washing machine by very simple means, for example, by a flange 30 disposed on the periphery of the neck 2.

The most important characteristic of this unit is that when the filter element housed in the body 1 is removed, the connector 7, which forms part of the removable element, and the diaphragm 22, are made readily accessible for inspection, checking and maintenance, without the need to dismantle parts or to carry out skilled operations.

Naturally, Figures 1 to 6 show only a preferred embodiment of the invention to which many variations may be introduced.

Figure 7 shows schematically an alternative embodiment in which the positions of the connector 13 for admitting the flow to the filter and of the inlet 15 to the pump 4 are interchanged in comparison with the embodiment of Figure 1.

In this case, the filter element 5 is open at its inner end in order to receive the flow from the connector 13 which is formed in the body 1 and is disposed axially, and the flange 3 for connection to the body of the pump 4 is formed laterally or, more generally, peripherally, on the body 1.

The other characteristics of the unit are substantially unchanged from those of the unit of Figure 1.

Figure 8 shows schematically a third alternative embodiment which may be adopted in washing machines which have self-cleaning pumps and are therefore intrinsically protected from lint and dirt, and in which the filter has the sole function of cleaning the recirculated flow.

In Figure 8, the filter element 5 is housed in a cylindrical casing 31 which in turn is housed in the cylindrical body 1.

The cylindrical casing 31 communicates with the housing space within the body 1 through an axial connector 32 facing an axial connector 34 formed in an internal closure plug 35 of the body 1, which is wholly equivalent to the flanged plug 19 of Figure 1.

A diaphragm 33 interposed between the connectors 32 and 34 is controlled by an actuator 40 in exactly the same way as that of Figure 1, in

order to close and open the connectors 32 and 34 in a mutually exclusive manner.

A connector 36 which opens into the inner portion of the body 1 admits the output flow of a pump to the body 1.

According to the position of the diaphragm 33, the flow is discharged through the connector 34 or is admitted to the casing 31 from which, having been filtered, it emerges through a hole 37 in the casing and an outlet connector 38 of the body 1.

A sealing ring (an O-ring) 39 between the body 1 and the casing 31 separates an inner space of the body, into which the connectors 36 and 34 open and which houses the diaphragm 33, from an outer space which houses most of the casing 31, including the hole 37, and in which the connector 38 opens.

The plug 8, which is fixed to the casing 31, closes the front of the body 1.

The removal of the casing 31 and of the filter element housed therein clearly enables inspection and maintenance of the diaphragm 33 and of its seals.

Claims

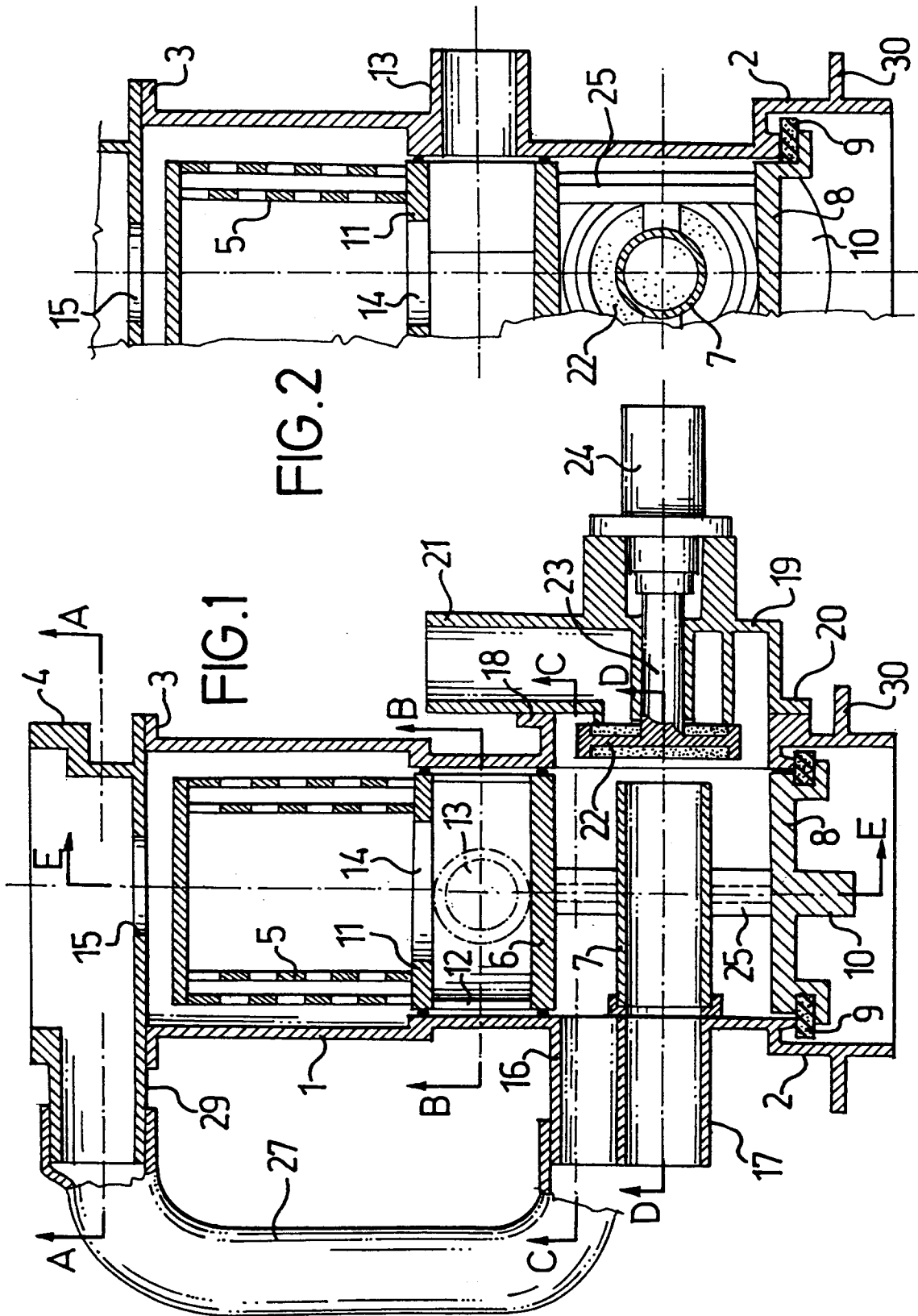
1. A filter and flow-diverter unit for a washing machine comprising:

- a cylindrical housing body (1) with at least one open end and having at least first (17, 38), second (21, 34), and third (16, 35) connectors, each connectible to a fluid inlet/outlet pipe,
- a removable element (5, 8, 31) housed in the cylindrical body and comprising a plug (8) for closing the open end of the cylindrical body, a filter unit (5), and means (7, 37) for forming a first flow path, connected to the first connector (17, 38) and terminating in a fourth connector (7, 32) facing the second connector (21, 34),
- a diverter diaphragm (22, 33), housed in the cylindrical body, between the second (21, 34) and fourth (7, 32) connectors and controlled by an actuator (24, 40) in order to close and open the second (21, 34) and fourth (7, 32) connectors in a mutually exclusive manner so that an output flow admitted to the cylindrical body by the third connector (16, 36) is discharged selectively through the first connector (17, 38), which is connected to the fourth connector (7, 32), or through the second connector (21, 34).

2. A filter unit according to Claim 1, in which the filter unit (5) is inserted in the flow path be-

tween the first (38) and fourth (32) connectors.

3. A filter unit according to Claim 1, in which the cylindrical body has a fourth, inlet opening (13) and a fifth, outlet opening (15) for a second flow path and in that the filter unit (5) is inserted in the second flow path between the fourth (13) and fifth (15) openings.
4. A filter unit according to Claim 3, also comprising a pump (4) with its intake connected to the fifth opening (15) and its output connected to the third opening (16).
5. A filter unit according to Claim 3, in which the cylindrical body (1) has a flanged connector (18) and comprises a plug (19) with a counter-flange (20) for closing the flanged connector (18), the second connector (21) opening in the plug (19).
6. A filter unit according to Claim 5, in which the diaphragm (22) is supported by a rod (23) slidable in the plug (19) and controlled by the actuator (24).
7. A filter and diverter unit according to Claim 6, in which the means for forming a first flow path comprise a tubular element (7) disposed diametrically in the cylindrical body (1) with one end facing the first connector (17) and the other end facing the closure diaphragm (22).
8. A filter and diverter unit according to Claim 7, in which the removable element comprises resilient means (25, 26) for supporting the tubular element (7) to enable axial adaptation of the tubular element (7) to the cylindrical body (1).



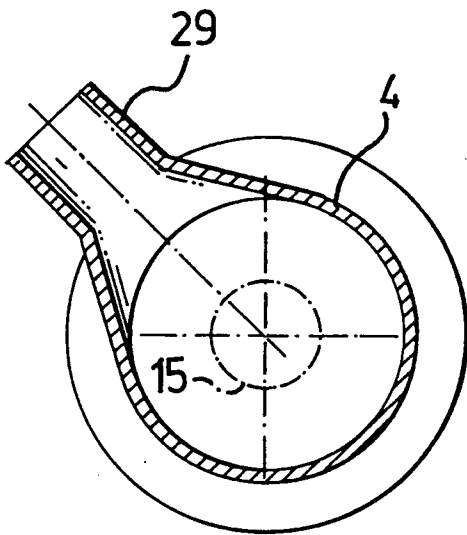


FIG. 3

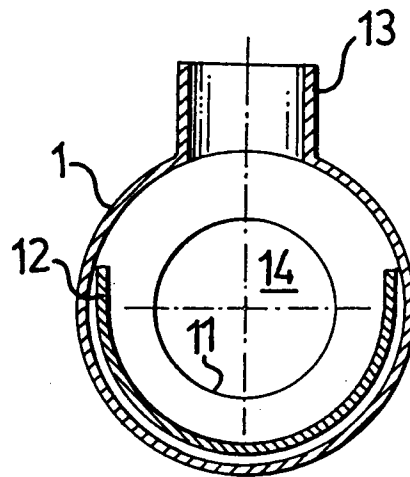


FIG. 4

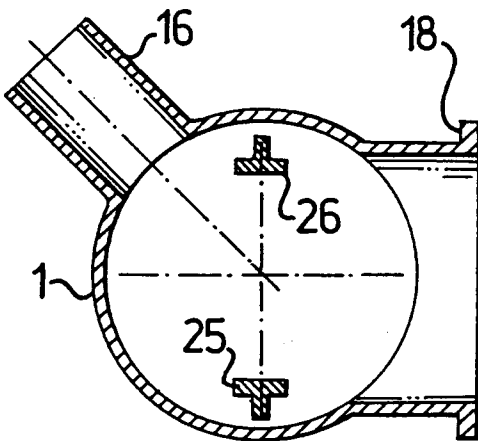


FIG. 5

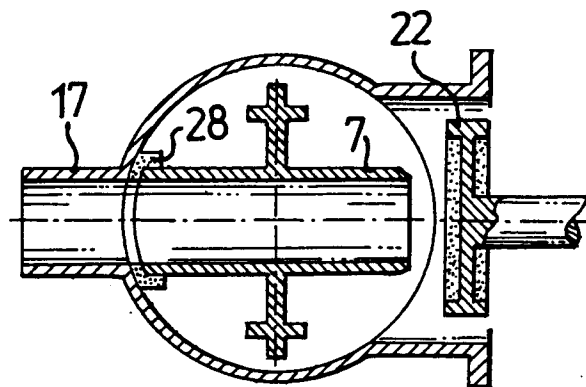


FIG. 6

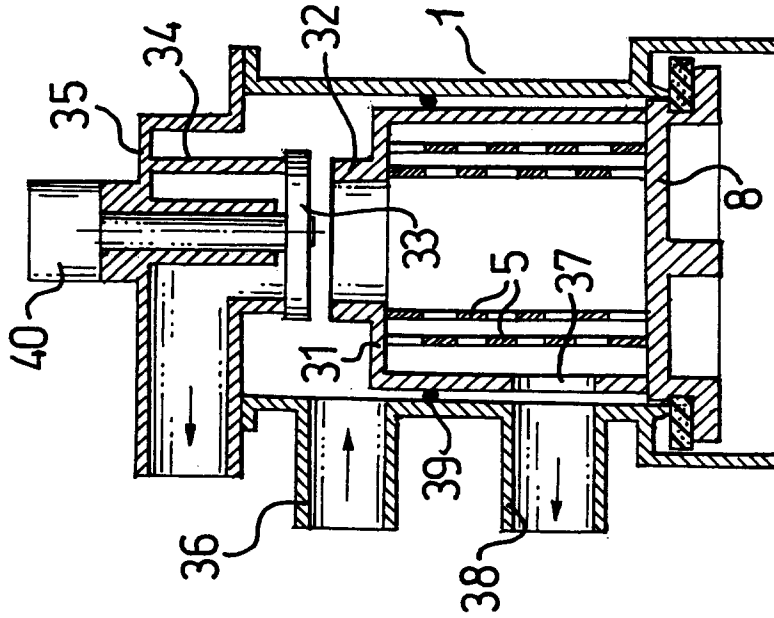


FIG. 8

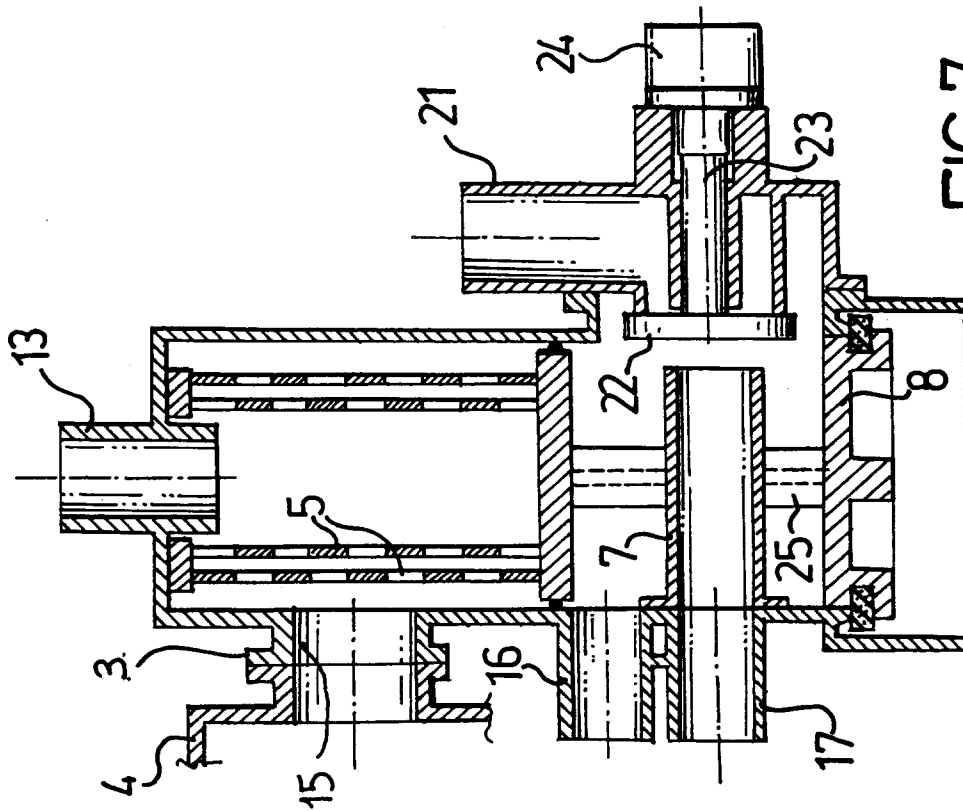


FIG. 7



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 93 20 2519

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)
A	DE-A-17 85 610 (SIEMENS-ELECTROGERÄTE GMBH) * page 5; figures 5,6 * ---	1,2,6	D06F39/10 D06F39/08
A	US-A-2 959 286 (GORMAN-RUPP INDUSTRIES INC.) * the whole document * ---	1	
A	US-A-2 512 394 (THE APEX ELECTRICAL MANUFACTURING CO.) * the whole document * ---	1	
A	CH-A-473 933 (AIRNAF S.A.) * the whole document * -----	4	
			TECHNICAL FIELDS SEARCHED (Int.Cl.5)
			D06F
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 22 February 1994	Examiner Courrier, G
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