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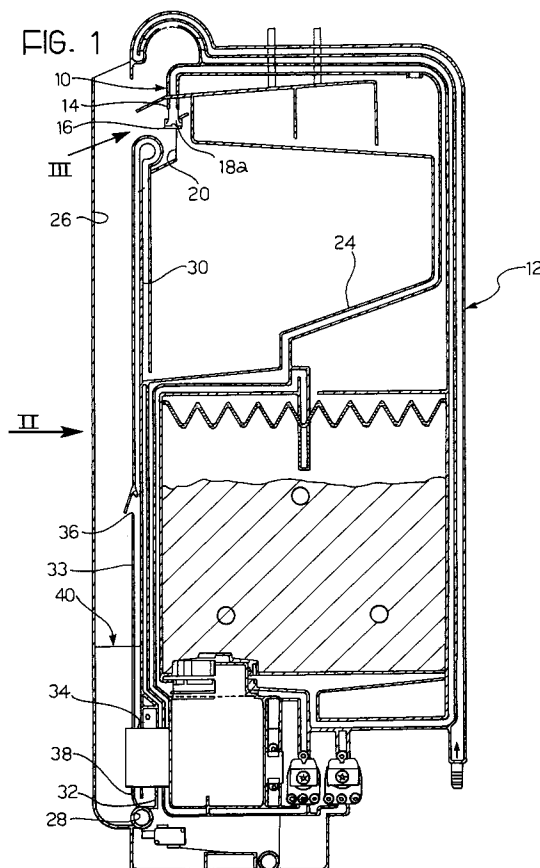
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01.12.93 Bulletin 93/48**Via Pasubio 8****I-12025 Dronero (Cuneo)(IT)**(84) Designated Contracting States:
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I-10060 Cantalupa (Torino)(IT)**Via Alfieri 17****I-10121 Torino (IT)**(54) **Equipment for measuring the quantity of water supplied to a domestic electric appliance.**

(57) The equipment comprises means for dividing a flow of water, which comes from a supply duct (10) and is directed into a washing tank of the domestic electric appliance, into at least two partial flows, means for determining whether the quantity of water which has flowed in one of the at least two partial flows, known as the measuring flow (22), corresponds to a predetermined value, the ratio between the value and the total quantity of water to be supplied to the washing tank being the same as the ratio between the measuring flow (22) and the total supply flow, and means for stopping the flow of supply water when the quantity of water which has flowed in the measuring flow (22) corresponds to the predetermined value.

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The present invention relates to equipment for measuring the quantity of water supplied to a domestic electric appliance, particularly a dishwasher.

Known equipment of the type indicated above is essentially of two different types.

Equipment of the first type measures the quantity of water present in the washing tank of the domestic electric appliance by means of floating or pressure-sensitive devices. The latter in particular are very simple and reliable in operation but are not very precise. In fact, they measure a volume of water with reference to the pressure it exerts, which is determined by the depth of the water. Because of the geometric configuration of the washing tank, however, the body of water is long and wide but shallow. Small errors relating to the pressure determination therefore translate into considerable errors in the determination of the volume of water.

Known equipment of the second type, on the other hand, measures the quantity of water admitted to the washing tank. This measurement can be made very precisely, for example, by directing the supply water into a chamber of a predetermined volume before sending it into the washing tank. In practice, since a chamber which would contain the entire volume of water to be supplied would occupy too much space, a smaller chamber is used and is filled several times until the total volume to be supplied is reached. This method therefore prolongs the time taken to supply the water.

In order to avoid this latter problem, the subject of the present invention is equipment for measuring the quantity of water supplied to a domestic electric appliance, particularly a dishwasher, characterised in that it comprises:

means for dividing a flow of water which comes from a supply duct, and is directed into a washing tank of the domestic electric appliance, into at least two partial flows,

means for determining whether the quantity of water which has flowed in one of the at least two partial flows, known as the measuring flow, corresponds to a predetermined value, the ratio between the value and the total quantity of water to be supplied to the washing tank being the same as the ratio between the measuring flow and the total supply flow, and

means for stopping the flow of supply water when the quantity of water which has flowed in the measuring flow corresponds to the predetermined value.

According to the invention, only a fraction of the total flow of supply water is thus measured, for example, by being made to flow into a chamber of predetermined volume which corresponds to a fraction of the total volume to be supplied, the fraction

corresponding to the ratio between the measuring flow and the total supply flow. At the same time, the rest of the supply flow is sent directly to the washing tank so that, when the chamber of predetermined volume is full of water, which is subsequently sent into the washing tank, the supply operation is stopped. This can be achieved quickly and accurately.

In a preferred embodiment of the invention, the means for stopping the flow of supply water can also detect whether the quantity of water present in the tank of the domestic electric appliance falls below a predetermined value during the normal operation cycle of the domestic electric appliance.

The equipment according to the invention thus has the further advantage that, like the known equipment of the first type described above, it enables the quantity of water present in the washing tank to be monitored during the operating cycle, whereas the known equipment which measures the flow of supply water does not offer this possibility.

It is, in fact, important to monitor the quantity of water present in the tank because, if it drops, the electrical element for heating the water could be at least partially above the water level and thus could be damaged by consequent overheating.

Further advantages and characteristics of the present invention will become clear from the detailed description which follows with reference to the appended drawings, provided by way of non-limiting example, in which:

Figure 1 is a front elevational view of a component of a domestic electric appliance including the equipment according to the invention,

Figure 2 is a side elevational view of the component of Figure 1,

Figure 3 shows a detail of the equipment according to the invention, on an enlarged scale,

Figure 4 is a plan view of one of the elements shown in Figure 3, and

Figure 5 is a section taken on the line V-V of Figure 4.

Mounted on the outlet end 14 of a duct 10, disposed downstream of a water softener for dishwashers (of known type described in detail in the Applicant's European Patent Application No. 93104160.2 and generally indicated 12 in Figures 1 and 2) is a disc 16 having a plurality of passages 18 out of each of which a respective partial flow of water can flow (Figures 3 to 5).

One of the passages 18a is isolated from the rest of the passages 18 by a sleeve 20 which projects from the disc 16 so that the flow 22 which flows out of the passage 18a and which, as will become clear from the following description, is known as the measuring flow, is directed into a receiving chamber 24 whilst the rest of the flows

are directed into an inlet duct 26 (Figure 1).

The duct 26 opens directly into a washing tank of the dishwasher, not shown in the drawings, through a filler 28. A siphon-shaped outlet duct 30 extending from the bottom of the receiving chamber 24 terminates in the detecting compartment 32 of a pressure switch 34.

The outlet duct 30 communicates with the inlet duct 26 by means of a first, upper opening 36 with a large cross-section and by means of a lower hole 38 having a cross-section substantially smaller than that of the outlet duct 30.

The pressure switch 34, which is of known type, can stop the flow of water supplied to the dishwasher by operating a valve, not shown in the drawings, when the pressure in its detecting compartment 32 exceeds a predetermined value. It can also emit a signal when the pressure in the detecting compartment 32 falls below a predetermined value, which may be the same as or different from the value mentioned above.

When the equipment is in operation, the flow of supply water which has passed through the softener 12 is divided into several partial flows as it flows through the passages 18 in the disc 16 mounted on the outlet end 14 of the duct 10.

The flow 22 (Figure 3), which is known as the measuring flow, is directed into the receiving chamber 24 by the sleeve 20 whilst the rest of the flows are channelled into the inlet duct 26 and from there through the filler 28 into the washing tank.

The receiving chamber 24 continues to fill with water until the siphon in the outlet duct 30 starts to operate causing the chamber to empty. The ratio between the volume of water present in the receiving chamber 24 when it starts to empty and the total quantity of water to be supplied to the washing tank is the same as the ratio between the measuring flow 22 and the total supply flow.

When it has passed through the siphon, the water which has flowed from the receiving chamber 24 first of all fills the portion 33 of the outlet duct 30 which is disposed below the opening 36 and the detecting compartment 32 of the pressure switch 34 connected thereto and then passes through the opening 36 into the inlet duct 26 and then into the washing tank.

The pressure switch 34 is thus activated and stops the flow of supply water since the desired quantity of water has already been supplied, some of the water reaching the washing tank directly and some indirectly through the receiving chamber 24.

The opening 36 may be positioned at will at a height such that the pressure exerted in the detecting compartment 32 of the pressure switch 34 by the column of water present in the portion 33 of the duct 30 disposed below the opening 36 is definitely greater than the minimum pressure necessary to

activate the switch. The pressure switch 34 need not, therefore, be of a particularly sophisticated type and can have a very wide calibration range.

The hole 38 does not play any substantial role in this first stage of operation. In fact, since its cross-section is small compared with that of the outlet duct 30, it offers considerable resistance to the passage of water and thus prevents the lower portion 33 of the outlet duct 30 from emptying rapidly and enables the pressure switch 34 to be activated.

The emptying takes place only subsequently over a longer period. The water in the outlet duct 30 and in the inlet duct 26, which in turn is connected to the washing tank, can thus reach the same level, indicated 40 in Figure 1 which, in normal operating conditions of the dishwasher, is above the position of the hole 38.

The level 40 reached by the water in the inlet duct 26 may fall, however, as a result of accidental and undesirable events, for example, if water actually leaks from the washing tank to the outside, or if a certain quantity of water becomes trapped in incorrectly-positioned items of crockery so that it cannot be used for washing.

In these circumstances, water flows through the hole 38 from the lower portion 33 of the outlet duct 30 towards the inlet duct 26 and these behave like communicating vessels in which the liquid levels tend to equalise. The flow of water through the hole 38 thus decreases the pressure in the detecting compartment 32 of the pressure switch 34 which is in communication with the lower portion 33 of the outlet duct 30.

The suitably-calibrated pressure switch 34 can thus provide an external indication of the decrease in pressure to show that there has been an anomalous reduction in the quantity of water actually available in the washing tank.

The equipment according to the invention thus not only enables the desired quantity of water to be supplied to the dishwasher quickly and accurately but also enables the actual presence of that quantity of water to be monitored during the operating cycle.

Claims

1. Equipment for measuring the quantity of water supplied to a domestic electric appliance, particularly a dishwasher, characterised in that it comprises:
 - means for dividing a flow of water, which comes from a supply duct (10), and is directed into a washing tank of the domestic electric appliance, into at least two partial flows,
 - means for determining whether the quantity of water which has flowed in one of the at least

two partial flows, known as the measuring flow (22), corresponds to a predetermined value, the ratio between the value and the total quantity of water to be supplied to the washing tank being the same as the ratio between the measuring flow (22) and the total supply flow, and means for stopping the flow of supply water when the quantity of water which has flowed in the measuring flow (22) corresponds to the predetermined value.

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2. Equipment according to Claim 1, characterised in that the dividing means comprise a disc (16) which is mounted on the outlet end (14) of the supply duct (10) and has a plurality of passages (18), out of each of which a respective partial flow can flow, the measuring flow (22) being directed by a sleeve (20), which isolates the respective passage (18a), into a receiving chamber (24) disposed hydraulically upstream of the washing tank of the domestic electric appliance, whilst the rest of the flows are directed through an inlet duct (26) directly into the washing tank, an outlet duct (30) extending from the bottom of the receiving chamber (24) forming a siphon which starts to operate when the quantity of water present in the receiving chamber (24) corresponds to the predetermined value.
3. Equipment according to Claim 2, characterised in that the stopping means comprise a pressure switch (34) which has a detecting compartment (32) in which the outlet duct (30) terminates, directing the flow of water from the receiving chamber (24) into the detecting chamber (32) so as to cause the flow of supply water to be stopped.
4. Equipment according to any one of the preceding claims, characterised in that the means (34) for stopping the flow of supply water can also detect whether the quantity of water present in the washing tank of the domestic electric appliance falls below a predetermined value during the normal operating cycle of the domestic electric appliance.
5. Equipment according to Claim 4, characterised in that the outlet duct (30) communicates with the inlet duct which opens into the washing tank by means of a connecting hole (38) which has a cross-section substantially smaller than that of the outlet duct (30) and is positioned below the level (40) which the water reaches in the inlet duct (26) during the normal operation of the domestic electric appliance.

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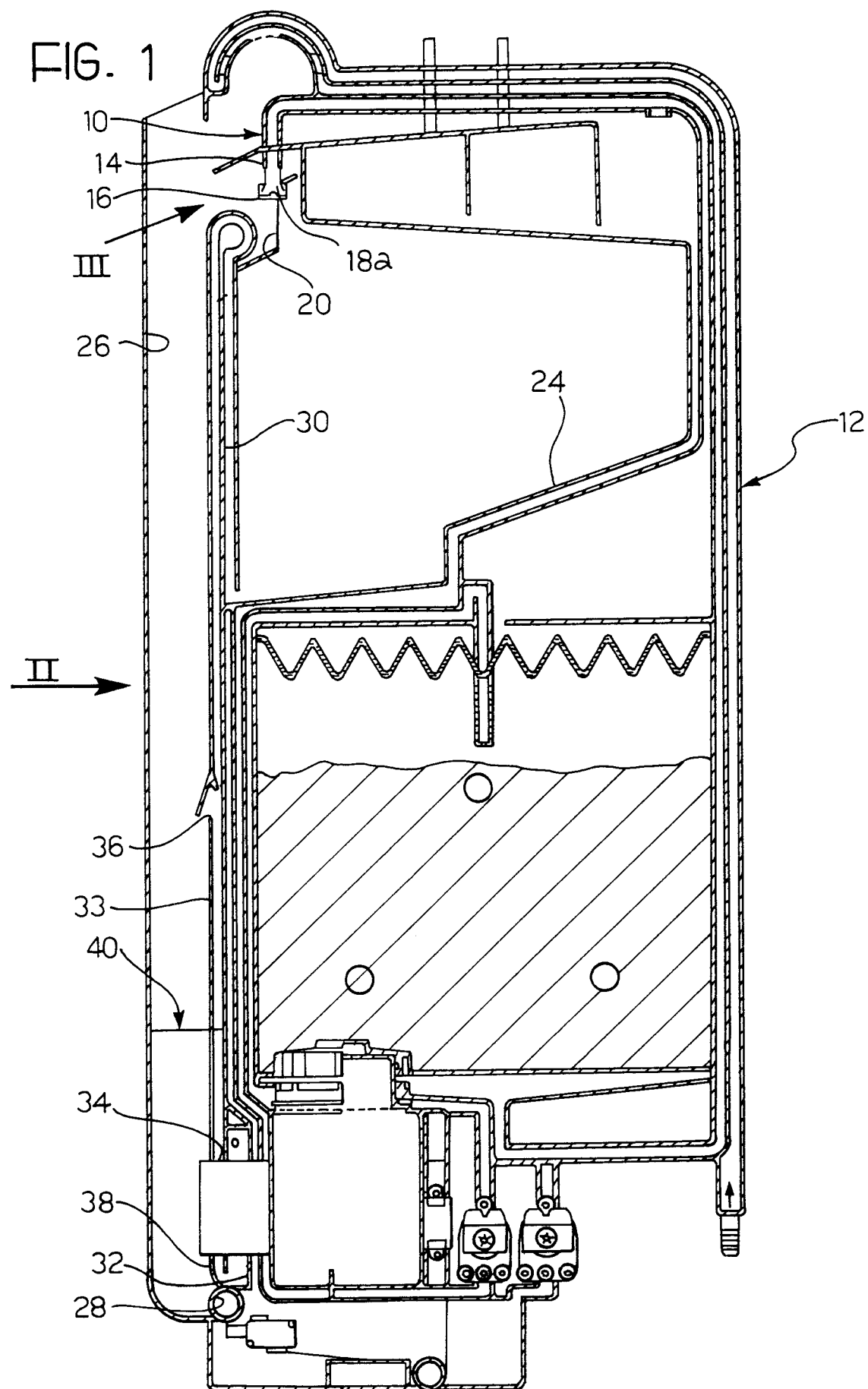
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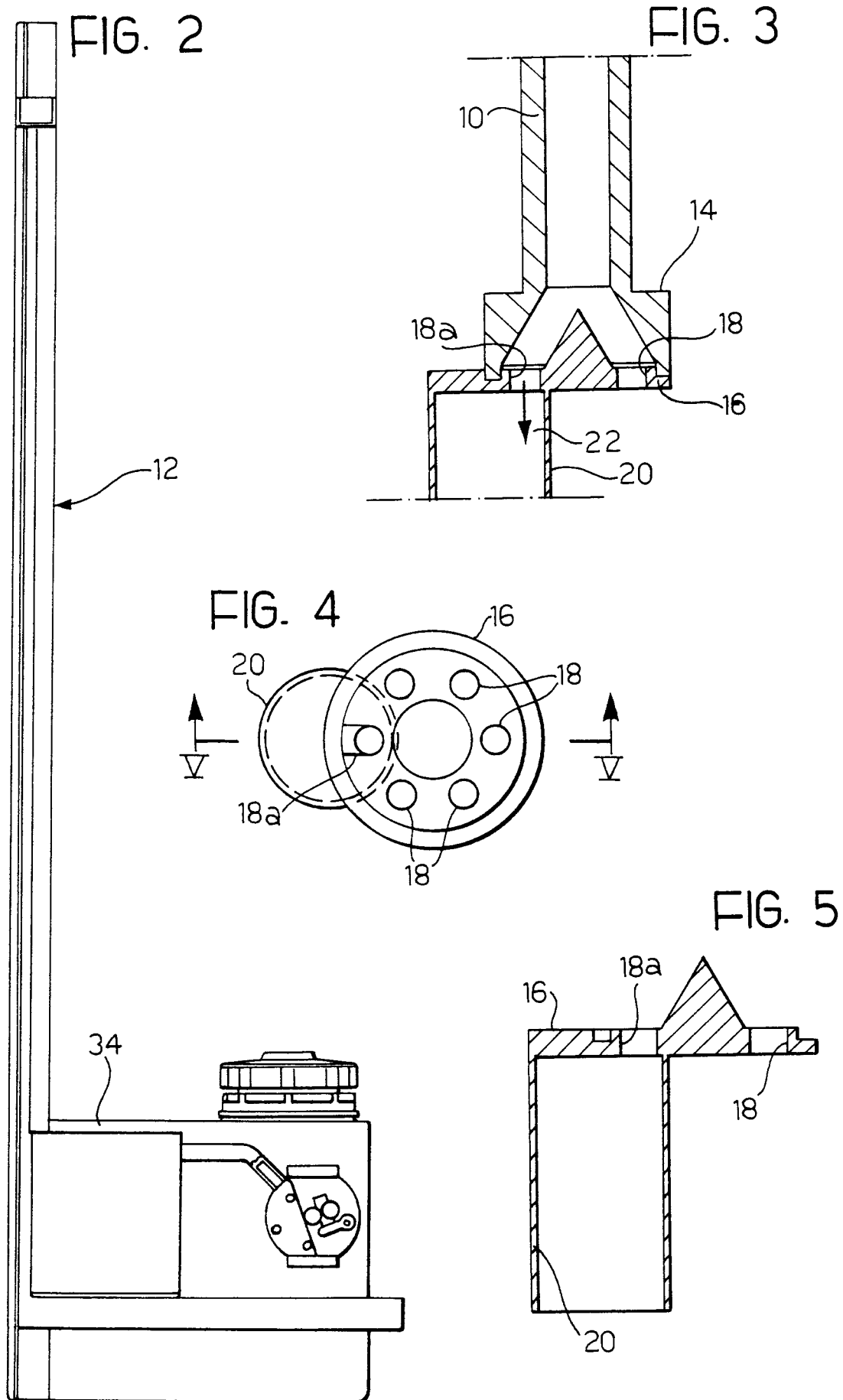
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6. Equipment according to any one of the preceding claims, characterised in that it is integrated in a water softener for softening the flow of water supplied to the domestic electric appliance.







European Patent
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EUROPEAN SEARCH REPORT

Application Number

EP 93 10 7612

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-2 716 252 (BOSCH-SIEMENS HAUSGERÄTE GMBH) * page 4, line 21 - page 7, line 26; claim 1; figure 1 *	1	A47L15/42 D06F39/08

A	EP-A-0 439 397 (ESSWEIN S.A.) * abstract; column 1, lines 4 - 45; column 2, line 16 - column 7, line 17; figures 1, 2 *	1	

A	EP-A-0 248 339 (INDUSTRIE ZANUSSI S.P.A.) * abstract; column 2, line 10 - column 5, line 39; figures 1 - 3 *	1	

			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			A47L D06F
The present search report has been drawn up for all claims			
Place of search BERLIN		Date of completion of the search 18 AUGUST 1993	Examiner BEITNER M.
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	