



## Description

### FIELD OF THE INVENTION

**[0001]** The present invention concerns a device and the relative method for feeding water into a washer machine, in particular a dishwasher, glass-washer or suchlike.

**[0002]** The invention also concerns an anti-calcium unit for a washer machine which uses said device for feeding water.

### BACKGROUND OF THE INVENTION

**[0003]** It is known that in washer machines, such as for example dishwashers, for example the one described in EP-A1-1.452.123, glass-washers or suchlike, of the domestic or industrial type, the running water taken from the mains water supply is subjected to a treatment the function of which is to reduce the content of calcium before it is used in the washing cycles.

**[0004]** The anti-calcium treatment is performed by a unit normally comprising a first container filled with a saline solution having a desired degree of saturation, and a second container containing ion exchange resins which, as the washing water passes, determine a huge reduction of its calcium content.

**[0005]** It is also known, after a certain number of washing cycles, to effect a cycle to regenerate the resins, by activating a suitable valve, during which a certain quantity of clean water is made to circulate, firstly through the saline solution and then through the tank of resins.

**[0006]** It is also known that too low a level of hardness in the washing water can determine negative effects on the washing and on the correct functioning of the machine.

**[0007]** For example, too low a hardness of the water can cause damage to glasses and the more delicate dishes, to such an extent that the surfaces become worn and fragile. A negative formation of foam may also be generated, particularly in the event of excessive use of detergent.

**[0008]** From the point of view of functionality of the machine, too low a hardness of the water can cause cavitation of the washing pump, which leads to greater noisiness, lower working life of the pump and poor washing quality.

**[0009]** Since the anti-calcium unit determines a reduction in the level of the calcium in the running water, which has a substantially fixed percentage value, the level of hardness of the water at outlet depends on the level at inlet; this inlet level varies according to the source that feeds the mains water supply and, if the level of hardness is low, this causes an outlet hardness that can be lower than the minimum value that guarantees a correct functioning and prevents the disadvantages indicated above.

**[0010]** To overcome this problem, some washer machines provide a by-pass system, able to be selectively

activated in a timed manner or governed by the detection of a specific value of hardness in the water. By means of the by-pass, the water fed from the mains water supply is divided into two fractions, one of which passes through the anti-calcium unit while the other is not made to transit through said anti-calcium unit. The two fractions, one decalcified and the other not, are then mixed downstream of the anti-calcium unit before being sent to the washing chamber. In this way, the level of hardness in the water used for washing is prevented from going below a minimum limit, which can be pre-set and/or regulated.

**[0011]** The known solutions that provide this by-pass function therefore have three valves, a first loading valve connected to the mains water supply, a second valve for mixing the decalcified water and the hard water, and a third valve to activate the cycle to regenerate the resins.

**[0012]** The presence of three different valves determines on the one hand a high cost, on the other hand a risk of frequent malfunctions, breakdowns and the need for maintenance.

**[0013]** Systems to mix hydraulic flows are known, for example from DE-A-10009293, with two inlets and three outlets, which use only two valves and in which the third outlet is selected by means of the crossing of the two flows delivered simultaneously through the two inlets. This known device is used, substantially in the form of a mixer, to feed three different chambers by means of only two inlets, in each of which detergent or a cleaning agent can be delivered. However, this document does not provide for the crossed-flow distributor unit to assume a function of directing the flows of water, for example in order to condition the possible feed of water to the decalcifying system, or to the system to regenerate the relative filtering elements, or directly to the washing chamber.

**[0014]** It is therefore a purpose of the present invention to provide a device for feeding water into a washer machine which, while guaranteeing the specific functions of loading the washing water to be sent for decalcification, of by-pass for mixing the hard water, and of regenerating the resins, requires a lower number of valves with respect to the conventional solutions which need three different valves, given the same functionality and efficiency.

**[0015]** Another purpose is to obtain this reduction in the number of valves adopting a solution that is simple and economic to construct.

**[0016]** The Applicant has devised, tested and embodied the present invention to obtain these purposes and achieve other advantages, as shown hereafter.

### SUMMARY OF THE INVENTION

**[0017]** The present invention is set forth and characterized in the main claims, while the dependent claims describe other innovative characteristics of the invention.

**[0018]** In accordance with the purposes indicated above, a device for feeding water to a washer machine according to the present invention comprises a group of load valves connected to the main feed supply and having

two valves that can be selectively and independently activated.

**[0019]** The two valves are associated downstream with respective pipes which connect to a crossed-flow distributor unit having two inlets and three outlets.

**[0020]** To be more exact, a first inlet of the crossed-flow distributor unit is connected to a first of said valves and is coordinated with a relative first outlet, while the second inlet is connected to the second of said valves and is coordinated with a relative second outlet.

**[0021]** Opening only one of said valves causes the relative flow of water to pass through the crossed-flow distributor unit without any diversions, thus heading for the outlet coordinated with the relative inlet. By simultaneously opening both valves, determining the collision of the relative flows, the resultant flow is directed towards the third outlet, advantageously located in an intermediate position between the first and second outlet.

**[0022]** According to the invention, the crossed-flow distributor unit is used to distribute the flows of water, respectively and selectively, to the resin tank in order to decalcify said water, directly to the washing chamber in order to perform cycles with hard water, and to the salt tank in order to perform the regeneration cycle after a desired number of washing cycles.

**[0023]** The presence of the crossed-flow distributor unit allows to considerably simplify, both in structure and in functioning, the operations to direct the flows of water taken from the water network, alternately to the resin and the salt tanks or directly into the washing chamber. Thanks to this configuration with the crossed-flow distributor unit, only two valves are in fact enough to perform the functions of loading the washing water, mixing it with hard water and regenerating the resins.

**[0024]** In fact, a first outlet of the crossed-flow distributor unit can be suitably connected to the resin tank, in order to feed washing water to be subjected to decalcification before being sent to the washing chamber during a normal washing cycle.

**[0025]** A second outlet of the distributor unit can be connected directly to the washing chamber, in order to feed hard water without making it pass through the resin tank, and thus allow it to be mixed with the decalcified water, and consequently to maintain a desired minimum level of hardness in the washing water.

**[0026]** The third outlet, which is involved when the two valves are simultaneously opened, is connected to the tank of the regeneration water, and allows to carry out the cycle to regenerate the resins when required.

**[0027]** A preferred solution of the invention provides that the water outlet that communicates directly with the washing chamber is made in a structure in which the crossed-flow distributor unit and at least the tank for the clean regeneration water are also made.

**[0028]** According to a variant of this solution, said structure is made from an element in a single body, for example made of plastic and obtained by molding.

**[0029]** According to another variant, said element has

in a single body the connections for the resin and salt tanks, and also the pipes to convey the flows of water respectively to the resin and salt tanks.

**[0030]** The present invention therefore embodies a simple and economical solution which, with only two valves, allows to perform efficiently all the functions which, in conventional solutions in the state of the art, could only be obtained using three valves.

## 10 BRIEF DESCRIPTION OF THE DRAWINGS

**[0031]** These and other characteristics of the present invention will become apparent from the following description of a preferential form of embodiment, given as a non-restrictive example with reference to the attached drawings wherein:

- fig. 1 shows a functional diagram of the device for feeding water into a washer machine according to the present invention;
- fig. 2 shows one embodiment of the device according to the invention;
- figs. 3, 4 and 5 show another embodiment of the device according to the invention respectively in a perspective, front and side view.

## DESCRIPTION OF A PREFERENTIAL FORM OF EMBODIMENT OF THE INVENTION

**[0032]** With reference to the attached drawings, the number 10 denotes generally a device for feeding water to a washer machine such as a dishwasher or a glass-washer.

**[0033]** Of the washer machine, in fig. 1, the anti-calcium unit 11 is schematically shown, comprising a first container 12 containing a saline solution 13 and a second container 14 containing ion exchange resins 15, a discharge pan 16 and a tank 17 containing clean water used for the cycle to regenerate the resins 15.

**[0034]** The feed device 10 comprises a crossed-flow distributor unit 18 with two inlets, respectively first 19a and second 19b, and three outlets, the first 20a coordinated with the first inlet 19a, the second 20b coordinated with the second inlet 19b and the third 20c disposed in an intermediate position between the first two.

**[0035]** A first feed pipe 21a, governed by a first valve 22a, is connected to the first inlet 19a, while a second feed pipe 21b, governed by a second valve 22b, is connected to the second inlet 19b.

**[0036]** The two valves 22a, 22b are advantageously of the solenoid type, and can be activated separately and independently from each other. The pipes 21a, 21b are connected through the respective valves 22a, 22b to the mains water supply.

**[0037]** With reference to fig. 1, and also figs. 3 and 4, we shall now describe the functioning of the device 10 for feeding water to a washer machine according to the invention.

**[0038]** When the first valve 22a is opened, while the second valve 22b is closed, the running water taken from the mains water supply is supplied by the pipe 30 to the first inlet 19a of the distributor unit 18 and sent to the coordinated first outlet 20a, in the direction of the arrow 23a. The first outlet 20a is connected to the feed pipe 24 which, following the arrow 25, takes the running water to pass directly through the container 14 of the resins 15, bypassing the salt container 12, and then feeds decalcified water to the washing chamber for a normal washing cycle.

**[0039]** When valve 22a is closed, and valve 22b is open, the running water is supplied, by the pipe 33, to the second inlet 19b of the distributor unit 18 and sent to the coordinated second outlet 20b, in the direction of the arrow 23b. The second outlet 20b is associated with a baffle-plate 26 which sends the running water directly inside the washing chamber, in the case of fig. 3 through the aperture 37. By suitably alternating, in a timed manner, the opening/closing of the two valves 22a, 22b, it is therefore possible to mix decalcified water with hard water, in order to obtain a desired level of hardness in the washing water, particularly if the water that feeds the mains water supply has a low level of hardness.

**[0040]** On the contrary, when both valves 22a, 22b are open, the relative flows collide and consequently the resultant flow transits through the third outlet 20c. The third outlet 20c is connected to a pipe 27 which takes the water to the regeneration tank 17 and from there firstly through the container 12 of the salt 13 and then, by means of a non-return valve 35, through the container 14 of the resins 15.

**[0041]** Therefore, by using the two valves 22a, 22b only, in relation to their selectively open/closed condition, the three functions are obtained, that is, of feeding decalcified washing water, of mixing it with hard water in order to maintain a minimum level of hardness in the water, and of activating the regeneration cycle when the washer machine requires it.

**[0042]** Fig. 2 shows one embodiment of a tank 17 for the clean regeneration water 28, conformed so as to incorporate inside it a crossed-flow distributor unit 18 of the type shown in fig. 1. In fig. 2 elements equal or equivalent to those present in fig. 1 have the same reference number.

**[0043]** The tank 17 is equipped with a first feed pipe 29, connected to the mains water supply which brings the running water through a channel 30 to the first inlet 19a of the distributor unit 18 and then to the coordinated outlet 20a. From this outlet 20a the water is made to pass through a channel 24, and then through an outlet pipe 31 to be sent for decalcification by passing through the tank 14 of resins 15 to be used in a normal washing cycle.

**[0044]** The tank 17 is also equipped with a second feed pipe 32, connected to the mains water supply, which takes the running water through a channel 33 to the second inlet 19b of the distributor unit 18, and then to the coordinated outlet 20b. From the outlet 20b, the water is

diverted by the baffle-plate 26 directly to the washing chamber in order to mix the running water with the decalcified water.

**[0045]** Even though it is not shown in fig. 2, the first 29 and second 32 feed pipes have, or are associated respectively with the valves 22a, 22b shown in fig. 1.

**[0046]** As explained above with reference to fig. 1, when both the pipes 29 and 32 are in the condition with running water passing through, that is, with the respective valves open, the respective flows collide inside the distributor unit 18, so that the resultant flow emerges from the third outlet 20c. This causes the passage from the tank 17 of an equal quantity of clean, regeneration water 28 through the outlet pipe 36, thus determining the execution of a programmed cycle to regenerate the resins according to the times set in the washer machine.

**[0047]** Figs. 3-5 show an embodiment of a device 10 according to the invention which incorporates, substantially in a single block obtained by molding, the functions and components described heretofore.

**[0048]** To be more exact, the molded element incorporates the tank 17 for the clean regeneration water, the crossed-flow distributor unit 18 with relative inlets and outlets, the aperture 37 to introduce the hard water, that is, not decalcified, directly into the washing chamber, which can also function as a steam extractor, an additional air vent 38, a gooseneck choke 39 which prevents possible flow-back of the water into the feed pipes 30, 33, and also an auxiliary tank 40 that functions as an air trap.

**[0049]** The molded element also incorporates the rapid attachments for the connections of the salt tank 12 and the resin tank 14, and also the rapid connections 41 to attach the molded element to the walls of the inner structure of the dishwasher.

**[0050]** It is clear, however, that modifications and/or additions of parts may be made to the device 10 and the method for feeding water to a washer machine as described heretofore, without departing from the scope defined by the attached claims.

## Claims

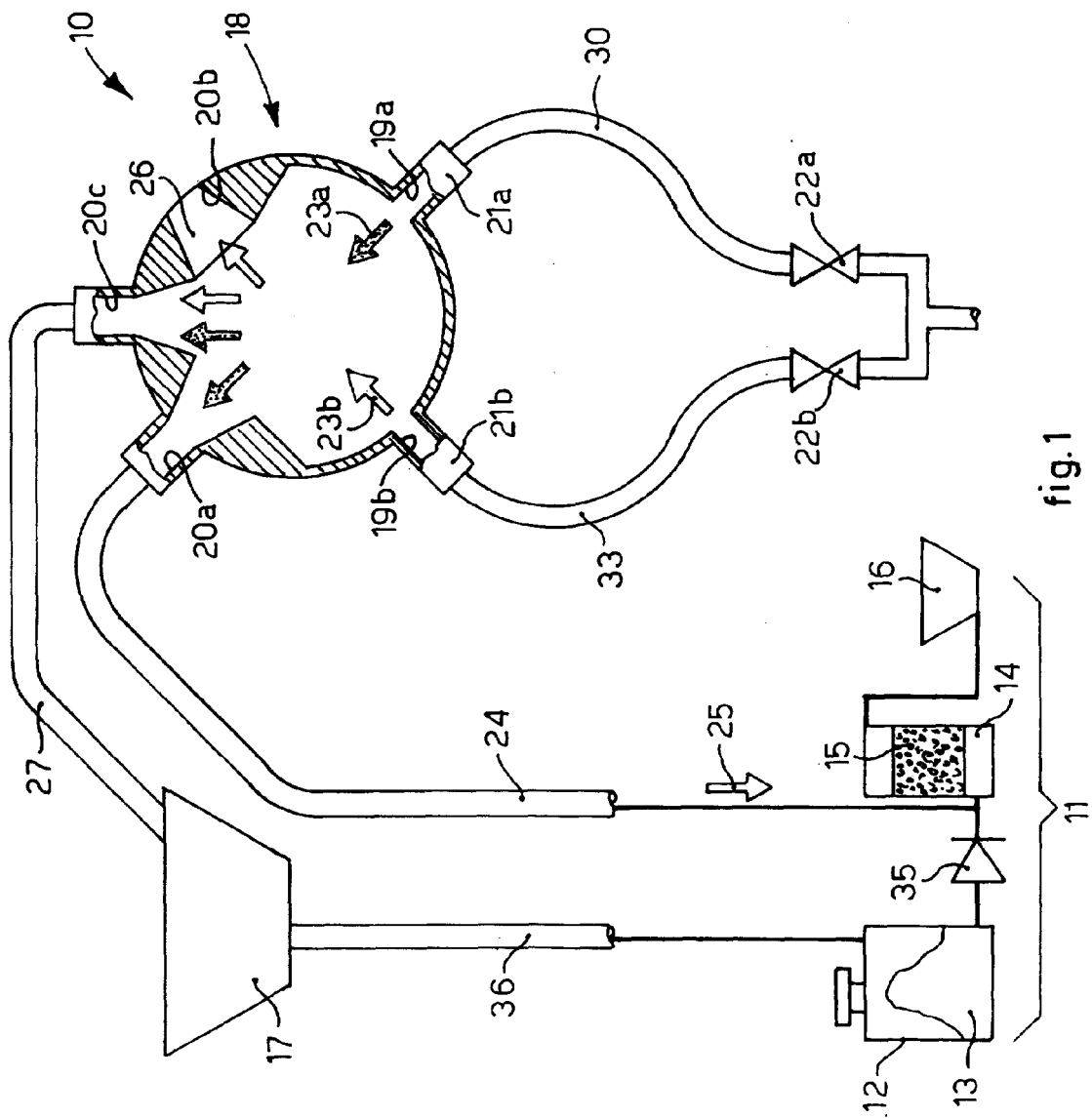
1. Device for feeding water into a washer machine, in particular a dishwasher equipped with an anti-calcium unit (11) comprising elements (14, 15) able to decalcify the washing water and elements (12, 13) able to regenerate the decalcification filtering elements, and a tank (17) for the execution, with clean water (28), of cycles to regenerate said filtering elements, **characterized in that** it comprises a group of load valves connected to the mains water supply and having two valves (22a, 22b), able to be selectively and independently activated, associated downstream with a crossed-flow distributor unit (18) having two inlets (19a, 19b) and three outlets (20a, 20b, 20c), wherein a first outlet (20a) of said crossed-

flow distributor unit (18) is connected to said anti-calcium unit (11) in order to feed washing water to be sent to said decalcification elements (14, 15), a second outlet (20b) of said distributor unit (18) is connected, by means of an outlet (37), to the washing chamber for mixing hard water with decalcified water, and a third outlet (20c) is connected with said tank (17) of the regeneration water, in order to send the water to said elements (12, 13) to regenerate the decalcification filtering elements.

2. Device as in claim 1, **characterized in that** said crossed-flow distributor unit (18) is incorporated into said tank (17) for the water (28) used in the regeneration cycles of said anti-calcium unit (11).
3. Device as in claim 2, **characterized in that** at least the aperture (37) for the direct introduction of the water into the washing chamber is made in a single piece in said tank (17) for the regeneration water (28).
4. Device as in claim 2, **characterized in that** at least also the connections for a tank for the salt (12) and for a tank for the resins (14) are made in a single piece in said tank (17) for the regeneration water (28).
5. Device as in claim 2, **characterized in that** at least also a gooseneck choke (39) having an antirflow-back function is made in a single piece in said tank (17) for the regeneration water (28).
6. Device as in claim 2, **characterized in that** at least also an air vent (38) is made in a single piece in said tank (17) for the regeneration water (28).
7. Device as in claim 2, **characterized in that** at least also the connections (41) for attachment to the walls of the inner structure of the washer machine are made in a single piece in said tank (17) for the regeneration water (28).
8. Device as in claim 2, **characterized in that** at least also an auxiliary tank that functions as an air trap is made in a single piece in said tank (17) for the regeneration water (28).
9. Device as in any claim from 2 to 8, **characterized in that** said tank (17) is made by molding a single plastic element.
10. Method for feeding water into a washer machine, in particular a dishwasher equipped with an anti-calcium unit (11) comprising elements (14, 15) able to decalcify the washing water and elements (12, 13) able to regenerate the decalcification filtering elements, and a tank (17) for the execution, with clean

water (28), of cycles to regenerate said filtering elements, **characterized in that** a first and a second flow of running water are made to transit alternately, by opening relative valves (22a), from a first (19a) and from a second (19b) inlet of a crossed-flow distributor unit (18) towards a respective first (20a) and second (20b) outlet in order to feed respectively running water to said decalcification elements (14, 15), and directly into the washing chamber, by means of an aperture (37), for mixing hard water with decalcified water, and a third flow resulting from the first two by means of the simultaneous opening of both said valves (22a, 22b) is made to pass through a third outlet (20c) of said crossed-flow distributor unit (18) in order to feed running water to said tank (17) and then to said regeneration elements (12, 13) of the decalcification elements so as to perform a cycle of regeneration of said anti-calcium unit (11).

11. Anti-calcium unit (11) for a washer machine, for example a dishwasher or a glass-washer, comprising a first tank (12) for a regenerating substance (13), a second tank (14) for decalcification elements (15), a non-return valve (35) which connects said first (12) to said second (14) tank, a first pipe (36) which connects said first tank (12) to a tank (17) containing clean water in order to perform cycles to regenerate said decalcification elements (15), a second pipe (24) which connects said second tank (14) to the water network, and an aperture (37) communicating with a washing chamber of said washer machine, **characterized in that**, it comprises a crossed-flow distributor unit (18) with three outlets and two inlets, wherein a first (20a) of said outlets is connected to said pipe (24) for the selective feed of the water to said second tank (14) to decalcify the water, a second (20b) of said outlets is connected to said pipe (36) to feed the water to said first tank (12) in order to perform cycles to regenerate the decalcification elements, and a third (20c) of said outlets is directly connected to said aperture (37) to introduce water into the washing chamber.



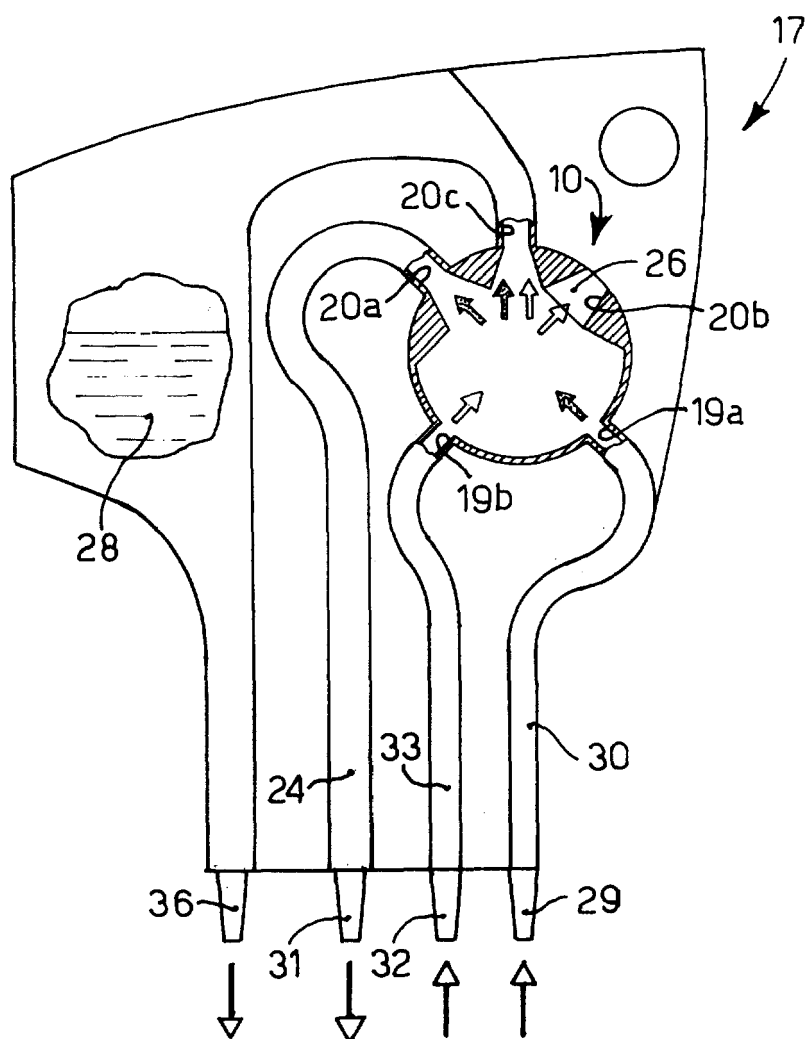
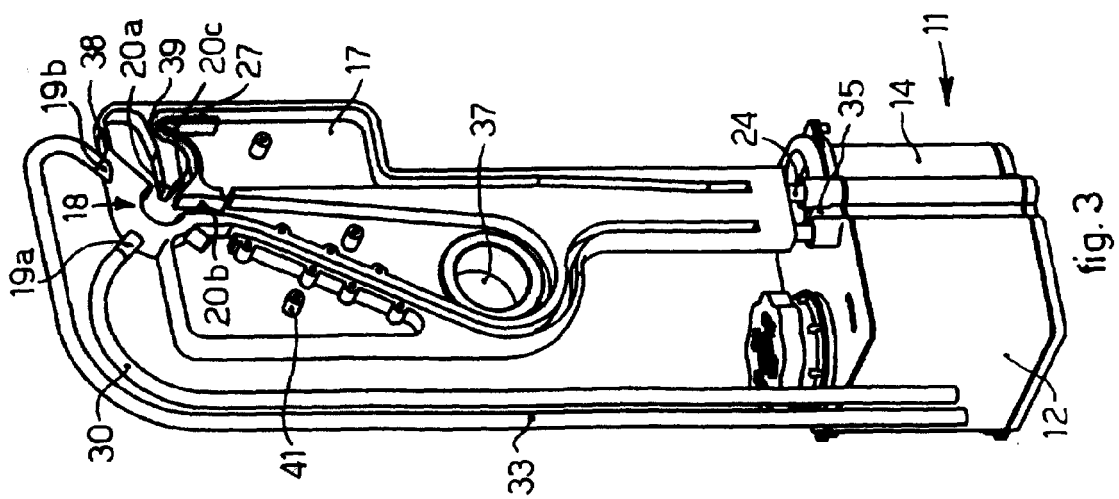
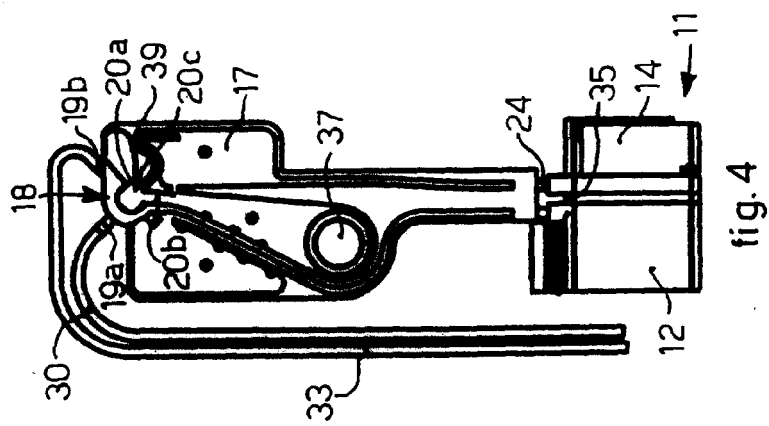
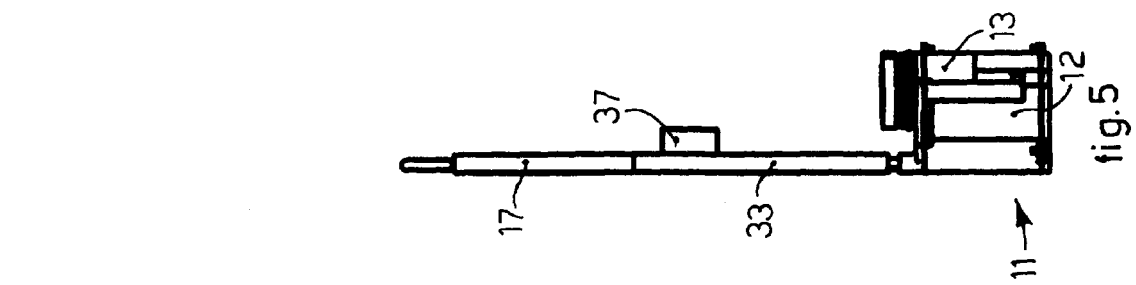


fig. 2





**REFERENCES CITED IN THE DESCRIPTION**

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**Patent documents cited in the description**

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