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(54) Improvements to the water softening system in a washing machine

Verbesserungen an einer Wasserenthärtungsvorrichtung in einer Waschmaschine

Améliorations apportées à un adoucisseur d'eau dans une machine à laver

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(56) References cited:
**EP-A- 0 219 704 DE-A- 2 630 164
FR-A- 1 420 017**

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Description

The present invention relates to an improved water softening system in a washing machine, particularly a dishwasher for domestic use, comprising a vessel of ion exchange resins which have to be periodically regenerated by passing a sodium chloride solution through them.

Softening systems of this type are known; in fact they are used in almost all the dishwashers for domestic use.

In these systems water for the washing supplied from the mains is passed through a resins vessel in order to minimize percentage of calcium which could hinder the activity of the detergents and leave dull deposits at the end of washing.

As the resins became exhausted after a certain volume of water has been softened, they have to be regenerated by passing a sodium chloride solution through them; in this way the resins' calcium ions are replaced by the sodium ions and the resins are so ready for a new water softening phase.

The water and salt (brine) volume which passes in contact with the resins is equivalent to the volume of water which, generally by gravity, is conveyed in the salt vessel, by a command of the timer to an electric valve arranged in the circuit; the possibility is usually provided to regulate the resin decalcification in function of the hardness of the mains water, by acting on a fixed regulation which causes a volume variation of the water which falls and, consequently, a bigger or smaller inflow of brine into the resins (decalcification with variable regeneration volume).

This system has the drawback that the resins are not always wetted by the same volume of brine, so that not always are all the resins treated by the brine, and the optimal resins regeneration is not achieved.

The features of the precharacterising portion of claim 1 are known from EP-A-0 219 704 which discloses a water softening system comprising a water softener, a salt container having an inlet, adapted to be supplied with a metered quantity of water, and an outlet connected to said water softener, and adjustable means for selecting the flow path of said metered quantity of water from the inlet to the outlet of said salt container. The solution as disclosed in the cited EP-A-0 219 704 presents some operating drawbacks, namely when the salt in the salt container is at a minimum level.

Object of the present invention is to provide a softening system wherein the resins regeneration regulation is not subject to the cited drawback of the above cited system.

To obtain said object, the subject of the present invention is a water softening system in a washing machine, particularly a dishwasher for domestic use, comprising:

- a vessel for ion exchange resins which have to be periodically regenerated by passing a sodium chlo-

ride solution through them,

- a salt container for sodium chloride having an inlet, adapted to be supplied with a fixed volume of water, and an outlet connected to said vessel for ion exchange resins,
- means operable for changing the path of said water within said salt container for varying the sodium chloride concentration of said fixed volume of water to be used for the regeneration of said ion exchange resins,

characterised in that said means allow the selection of the desired path or paths among a plurality of possible paths of different lengths, all located in the bottom of the salt container.

Further objects and advantages of the present invention will be clear from the detailed description which follows and from the attached drawings, which are supplied only as an explanatory and not limiting example, wherein:

figure 1 shows schematically a horizontal cross-section of the container where the brine is prepared in a system according to the invention, in a first operating condition;

figure 2 shows schematically a horizontal cross-section of the same container of figure 1, in a second operating condition;

figure 3 shows schematically in vertical cross-section the same container of figure 1.

With reference to figure 1, where there is schematically shown a horizontal cross-section of the container wherein the brine is prepared in a system according to the invention, in a first operating condition, reference number 1 indicates the resins vessel; reference number 2 indicates the pipe connector through which the water exits from the vessel 1; reference number 3 indicates the salt (sodium chloride) container for the brine preparation; reference number 4 indicates the pipe connector through which the regeneration water is let in the container 3; reference number 5 indicates the inlet connector of the water from the mains, to be softened, which is let in the vessel 1.

With reference numbers 6 and 7 there are indicated two alternative exits for the regeneration water coming from pipe 4; channel 6 has several exit holes 8a, 8b, 8c; channel 7 has other exit holes 9a, 9b, 9c.

A deviation device 10, commanded by a rotating device 12, provides for deviating the regeneration water towards channel 6 (see direction-arrow 11 of fig. 1); in this way the water exits in the container 3 through the range of holes 8.

The brine then arrives at the resins vessel 1, through the channel 14 when the electric valve 13 is open.

As the holes 8 are relatively far away from the inlet of channel 14, the regeneration water follows a quite long path through the brine, before arriving at the chan-

nel 14; the brine which passes in the resins vessel is consequently quite concentrated, and therefore able to perform a regeneration in the case of resins which have treated water which was very hard.

In figure 2, where there is schematically shown a horizontal cross-section of the same container of figure 1, in a second operating condition, there are represented the same elements, indicated with the same reference numbers.

The device 12, however, has been rotated through 90°, so that the deviation device 10 now provides for deviating the regeneration water towards channel 7; the water consequently exits through the range of holes 9, which are relatively close to the inlet of channel 14, and follows a quite short path through the brine, before arriving at the channel 14; the resulting brine is consequently not very concentrated, and therefore able to perform a regeneration in case of resins which have treated water whose hardness level was not very high.

In figure 3 there is schematically shown a vertical cross-section of the same container of figure 1; reference numbers 3, 4 and 12 indicates the same elements described with reference to figure 1.

With reference number 15 there is indicated a plastic spoon, furnished with the machine for detergent dosage purposes, which can be advantageously used also for executing the rotation of the command device 12, in order to choose the most suitable position in function of the hardness of the available water.

In fact the handle of the spoon 15 is so constructed that it can be inserted in an appropriate notch located in the rod of the command device 12.

The characteristics of the described softening system are clear from the given description and the annexed drawings.

From the description the advantages of the softening system that is the object of the present invention are also clear.

Particularly, they are represented by the fact that:

- by using an always constant volume of water, equivalent to the optimum one, there is obtained a full wetting of the resins in every regulating condition;
- the path followed by the regeneration water in the salt always occurs at the bottom of the container 3, so to exploit the greater possible concentration of the brine, which is always arranged in a stratified manner with maximum density in the lower zone; furthermore, the result is constant, whatever the quantity of salt remaining in the vessel, because the drawing is always done from the bottom;
- the regulation can be done very easily by the user, every time that there is this necessity.

It is clear that many variations to the softening system, described as an example, are possible for the man skilled in the art.

For instance it is possible to provide more than two

regulating positions, providing three or more exit channels for the regeneration water in the container 3, arranged at different distances from the inlet of the channel 14; providing a regulating system with three or more positions it is also easily possible to obtain a regulation of a gradual type, for example by selecting (in the case of three paths) firstly only the shorter path, then only the medium one, then the short and the medium ones together, then only the longer one, then the medium and the longer ones together.

Claims

1. Water softening system in a washing machine, particularly a dishwasher for domestic use, comprising:

- a vessel (1) for ion exchange resins which have to be periodically regenerated by passing a sodium chloride solution through them;
- a salt container (3) for sodium chloride having an inlet (4), adapted to be supplied with a fixed volume of water, and an outlet (14) connected to said vessel (1) for ion exchange resins;
- means (6-10,12) operable for changing the path of said water within said salt container (3) in order to vary the sodium chloride concentration of said fixed volume of water to be used for the regeneration of said ion exchange resins,

characterised in that said means (6-10,12) allow the selection of the desired path or paths among a plurality of possible paths of different lengths (6,8a,8b,8c;7,9a,9b,9c) being located in the lower most zone of the salt container (3).

2. Water softening system according to claim 1, characterised in that said means (6-10,12) for changing the path of the water within the salt container (3) are provided for directing the water which enters the salt container (3) at least to a first zone (9a,9b,9c) being nearer to said outlet (14) and to a second zone (8a,8b,8c) being further from said outlet (14).

3. Water softening system according to claim 1 or 2, characterised in that said means (6-10,12) for changing the path of the water within said salt container (3) comprise a deviation device (10,12) for the selection of the desired path or paths, said deviation device (10,12) being in particular operable to direct the water coming from said inlet (4) either towards said first zone (9a,9b,9c) or said second zone (8a,8b,8c).

4. Water softening system according to at least one of the previous claims, characterised in that said means (6-10,12) for changing the path of the water within the salt container (3) comprise at least a constraining channel (6,7) which is defined in the bottom of the salt container (3) and presents one or

more holes (8a,8b,8c;9a,9b,9c), said constraining channel (6,7) being in particular provided so as to convey the water coming from said inlet (4) to a pre-determined zone in the inside of the salt container (3).

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5. Water softening system according to claims 3 and 4, characterised in that the deviation device (10,12) is operable for directing the incoming water either to a first (7) or a second constraining channel (6), the water entering the salt container (3) through the holes (8a,8b,8c;9a,9b,9c) of the channel (6,7) selected by means of the deviation device (10,12).

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6. Water softening system according to at least one of the previous claims, characterised in that the deviation device (10,12) is arranged in the bottom of the salt container (3).

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7. Water softening system according to claims 5, characterised in that the deviation device (10,12) is interposed between the constraining channels (6,7) so as to be shielded from possible jamming by the salt contained in the salt container (3).

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8. Water softening system according to one or more of the previous claims, characterised in that said means (6-10,12) for changing the path of the water within said salt container (3) comprise more than two channels which have different lengths and can be selected through the deviation device (10,12).

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9. Water softening system according to one or more of the previous claims, characterised in that the deviation device (10,12) is of the rotating type.

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10. Water softening system according to the previous claim, characterised in that a rod shaped element (15,12) is provided vertically in the salt container (3), for allowing the operation of the rotating deviation device from the top of the salt container (3).

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Patentansprüche

1. Wasserenthärtungsvorrichtung in einer Waschmaschine, insbesondere einer Geschirrspülmaschine für den Hausgebrauch, umfassend:

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- ein Gefäß (1) für ionenaustauschende Harze, welche periodisch regeneriert werden müssen, indem eine Natriumchlorid-Lösung durch sie hindurchgeleitet wird;
- einen Salzbehälter (3) für Natriumchlorid mit einem Einlaß (4), der für die Zufuhr einer vorgegebenen Wassermenge ausgelegt ist, und mit einem Auslaß (14), der mit dem Gefäß (1) für die ionenaustauschende Harze verbunden ist;
- Mittel (6-10, 12) zur Wegänderung des Was-

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sers in dem Salzbehälter (3), um die Natriumchlorid-Konzentration in der vorgegebenen Wassermenge zu variieren, welche zur Regeneration der ionenaustauschende Harze benutzt wird,

dadurch gekennzeichnet, daß die Mittel (6-10, 12) die Auswahl des oder der gewünschten Wege unter einer Vielzahl von möglichen Wegen verschiedener Länge (6, 8a, 8b, 8c; 7, 9a, 9b, 9c) erlauben, welche sich im untersten Bereich des Salzbehälters (3) befinden.

2. Wasserenthärtungsvorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß die Mittel (6-10, 12) zur Wegänderung des Wassers innerhalb des Salzbehälters (3) vorgesehen sind, um das in den Salzbehälter eintretende Wasser zumindest zu einem ersten Bereich (9a, 9b, 9c) näher am Auslaß (14) und zu einem zweiten Bereich (8a, 8b, 8c) weiter entfernt vom Auslaß (14) umzulenken.

3. Wasserenthärtungsvorrichtung nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß die Mittel (6-10, 12) zur Wegänderung des Wassers innerhalb des Salzbehälters (3) eine Umlenkungsvorrichtung (10, 12) zur Auswahl des oder der gewünschten Wege umfassen, wobei die Umlenkungsvorrichtung (10, 12) insbesondere derart betreibbar ist, daß sie das vom Einlaß (4) kommende Wasser entweder zum ersten Bereich (9a, 9b, 9c) oder zum zweiten Bereich (8a, 8b, 8c) leitet.

4. Wasserenthärtungsvorrichtung nach mindestens einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß die Mittel (6-10, 12) zur Wegänderung des Wassers innerhalb des Salzbehälters (3) mindestens einen Zwangsumlenkungskanal (6, 7) umfassen, der am Boden des Salzbehälters (3) angeordnet ist und ein oder mehrere Löcher (8a, 8b, 8c; 9a, 9b, 9c) aufweist, wobei der Zwangsumlenkungskanal (6, 7) insbesondere vorgesehen ist, um das vom Einlaß (4) kommende Wasser zu einem vorgegebenen Bereich innerhalb des Salzbehälters (3) zu befördern.

5. Wasserenthärtungsvorrichtung nach den Ansprüchen 3 und 4, dadurch gekennzeichnet, daß die Umlenkungsvorrichtung (10, 12) derart betreibbar ist, daß das einströmende Wasser entweder zu einem ersten (7) oder zweiten Zwangsumlenkungskanal (6) geleitet wird, wobei das durch die Löcher (8a, 8b, 8c; 9a, 9b, 9c) der Zwangsumlenkungskanäle (6, 7) in den Salzbehälter (3) eintretende Wasser durch Mittel der Umlenkungsvorrichtung (10, 12) ausgewählt wird.

6. Wasserenthärtungsvorrichtung nach mindestens einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß die Umlenkungsvorrichtung (10, 12) am Boden des Salzbehälters (3) angeordnet ist.
7. Wasserenthärtungsvorrichtung nach Anspruch 5, dadurch gekennzeichnet, daß die Umlenkungsvorrichtung (10, 12) zwischen den Zwangsumlenkungskanälen (6, 7) angeordnet ist, um gegen eine mögliche Zerstörung durch das im Salzbehälter (3) enthaltene Salz abgeschirmt zu sein.
8. Wasserenthärtungsvorrichtung nach einem oder mehreren der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß die Mittel (6-10, 12) zur Wegänderung des Wassers innerhalb des Salzbehälters (3) mehr als zwei Kanäle umfassen, die unterschiedlich lang sind und durch die Umlenkvorrichtung (10, 12) ausgewählt werden können.
9. Wasserenthärtungsvorrichtung nach einem oder mehreren der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß die Umlenkvorrichtung (10, 12) vom rotierenden Typ ist.
10. Wasserenthärtungsvorrichtung nach dem vorhergehenden Anspruch, dadurch gekennzeichnet, daß ein stabförmiges Element (15, 12) vertikal in dem Salzbehälter (3) vorgesehen ist, um den Betrieb der rotierenden Umlenkvorrichtung von der Oberseite des Salzbehälters (3) zu erlauben.

Revendications

1. Système d'adoucissement d'eau dans une machine à laver, en particulier une machine à laver la vaisselle à usage domestique, comportant :
- un réservoir (1) pour des résines échangeuses d'ion qui doivent être régénérées périodiquement en faisant passer une solution de chlorure de sodium à travers celles-ci,
 - un réservoir de sel (3) pour du chlorure de sodium ayant une entrée (4), prévue pour être alimentée avec un volume fixe d'eau, et une sortie (14) reliée audit réservoir (1) pour les résines échangeuses d'ion,
 - des moyens (6 à 10, 12) pouvant fonctionner afin de changer le passage de ladite eau dans ledit réservoir de sel (3) afin de modifier la concentration en chlorure de sodium dudit volume fixe d'eau devant être utilisé pour la régénération desdites résines échangeuses d'ion,
- caractérisé en ce que lesdits moyens (6 à 10, 12) permettent la sélection du passage ou des passages souhaités parmi plusieurs passages pos-

sibles de longueurs différentes (6, 8a, 8b, 8c; 7, 9a, 9b, 9c) qui se trouvent dans la zone la plus basse du réservoir de sel.

2. Système d'adoucissement d'eau selon la revendication 1, caractérisé en ce que lesdits moyens (6 à 10, 12) destinés à modifier le passage de l'eau dans le réservoir de sel (3) sont prévus pour diriger l'eau qui entre dans le réservoir de sel (3) au moins vers une première zone (9a, 9b, 9c) qui est plus proche de ladite sortie (14) et une deuxième zone (8a, 8b, 8c) qui est éloignée de ladite sortie (14).
3. Système d'adoucissement d'eau selon la revendication 1 ou 2, caractérisé en ce que lesdits moyens (6 à 10, 12) destinés à modifier le passage de l'eau dans ledit réservoir de sel (3) comportent un dispositif de détournement (10, 12) pour la sélection du passage ou des passages souhaités, ledit dispositif de détournement (10, 12) servant en particulier à diriger l'eau provenant de ladite entrée (4) vers ladite première zone (9a, 9b, 9c) ou bien vers ladite deuxième zone (8a, 8b, 8c).
4. Système d'adoucissement d'eau selon au moins une des revendications précédentes, caractérisé en ce que lesdits moyens (6 à 10, 12) destinés à modifier le passage de l'eau dans le réservoir de sel (3) comportent au moins un canal forcé (6, 7) qui est défini dans le fond du réservoir de sel (3) et présente un ou plusieurs trous (8a, 8b, 8c; 9a, 9b, 9c), ledit canal forcé (6, 7) étant prévu en particulier de façon à transporter l'eau provenant dudit tuyau (4) vers une zone prédéterminée à l'intérieur du réservoir de sel (3).
5. Système d'adoucissement d'eau selon les revendications 3 et 4, caractérisé en ce que le dispositif de détournement (10, 12) sert à diriger l'eau d'entrée vers un premier (7) ou bien vers un deuxième canal forcé (6), l'eau entrant dans le réservoir de sel (3) par les trous (8a, 8b, 8c; 9a, 9b, 9c) du canal (6, 7) choisi au moyen du dispositif de détournement (10, 12).
6. Système d'adoucissement d'eau selon au moins une des revendications précédentes, caractérisé en ce que le dispositif de détournement (10, 12) est prévu dans le fond du réservoir de sel (3).
7. Système d'adoucissement d'eau selon la revendication 5, caractérisé en ce que le dispositif de détournement (10, 12) est interposé entre les canaux forcés (6, 7) de façon à être protégé d'une obturation possible par le sel contenu dans le réservoir de sel (3).
8. Système d'adoucissement d'eau selon une ou plusieurs des revendications précédentes, caractérisé

en ce que lesdits moyens (6 à 10, 12) destinés à modifier le passage de l'eau dans ledit réservoir de sel (3) comportent plus de deux canaux qui ont des longueurs différentes et peuvent être choisis grâce au dispositif de détournement (10, 12).

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9. Système d'adoucissement d'eau selon une ou plusieurs des revendications précédentes, caractérisé en ce que le dispositif de détournement (10, 12) est du type rotatif.

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10. Système d'adoucissement d'eau selon la revendication précédente, caractérisé en ce qu'un élément en forme de tige (15, 12) est prévu verticalement dans le réservoir de sel (3) afin de permettre l'actionnement du dispositif de détournement rotatif depuis le dessus du réservoir de sel (3).

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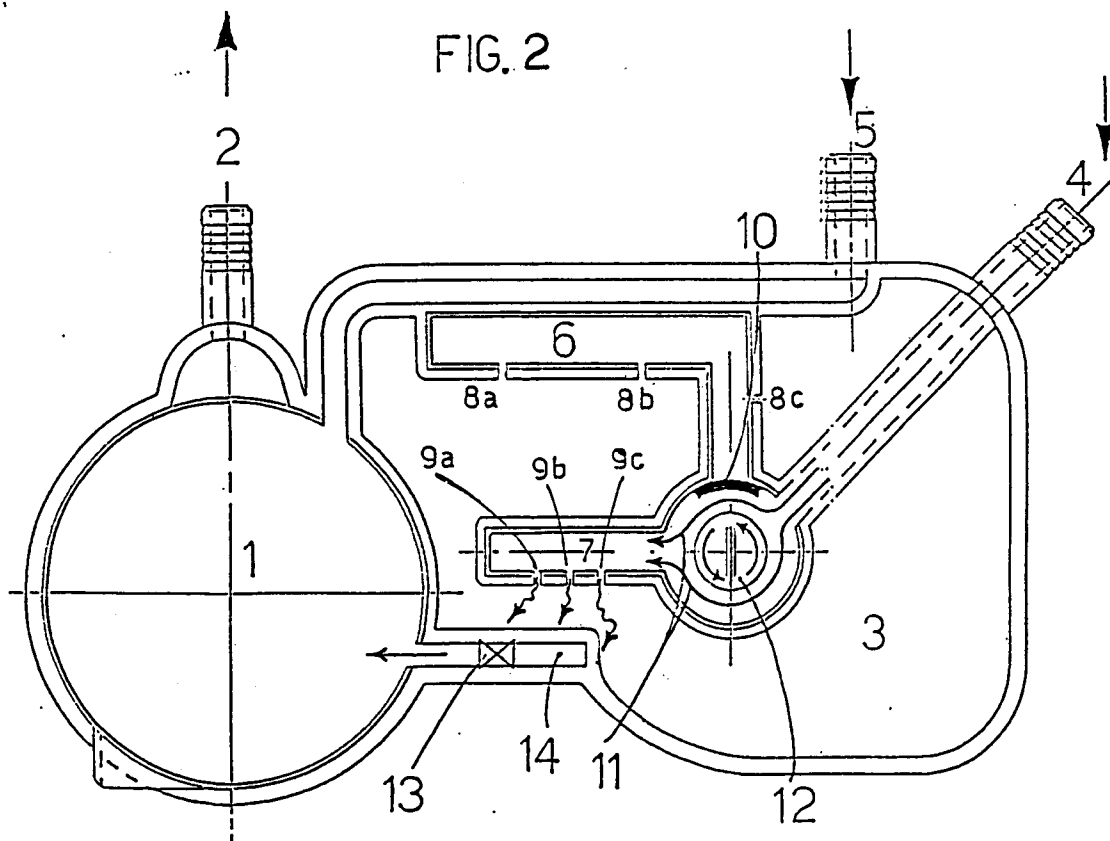
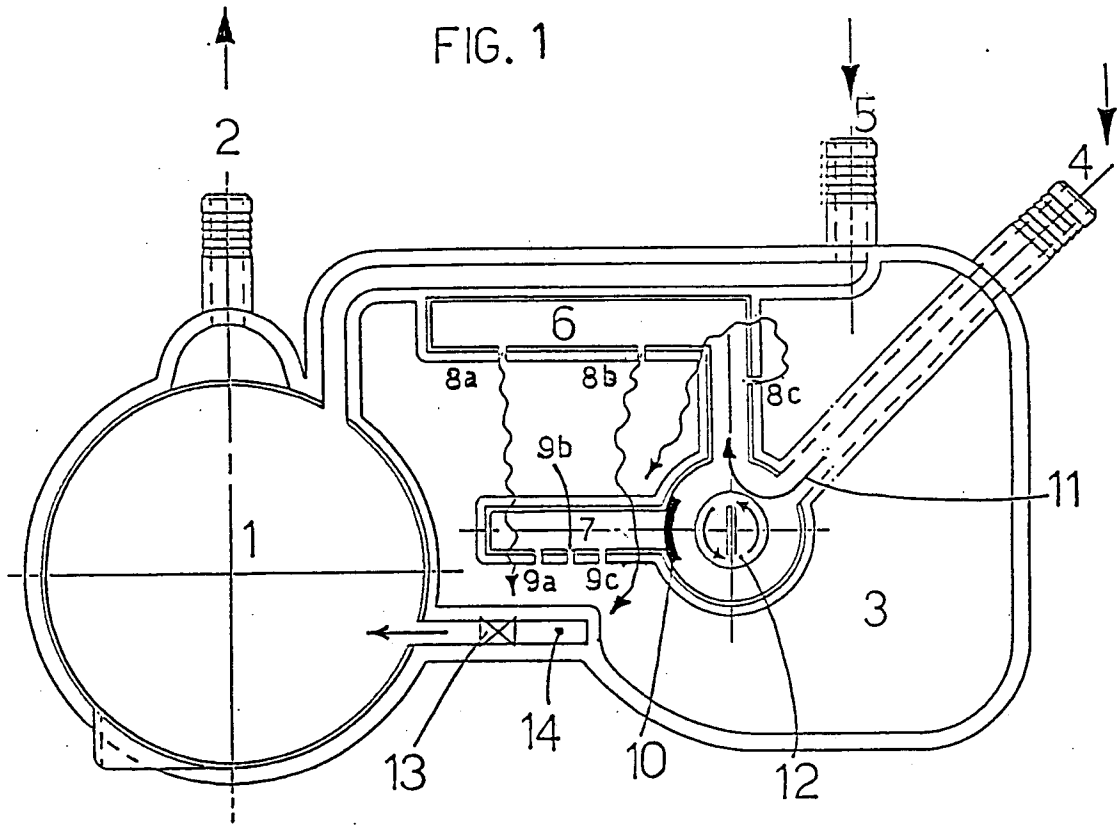


FIG. 3

