



(11) **EP 3 611 298 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
19.02.2020 Bulletin 2020/08

(51) Int Cl.:
D06F 39/00 (2020.01)
D06F 39/02 (2006.01)
D06F 39/08 (2006.01)

(21) Application number: **19191913.3**

(22) Date of filing: **15.08.2019**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
KH MA MD TN

(72) Inventors:
• **ASIK, Rustem**
45030 Manisa (TR)
• **SEVER, Aykut**
45030 Manisa (TR)

(74) Representative: **Cayli, Hülya**
Paragon Consultancy Incorporated
Koza Sokak No: 63/2
GOP 06540 Ankara (TR)

(30) Priority: **16.08.2018 TR 201811990**

(71) Applicant: **Vestel Beyaz Eşya Sanayi ve Ticaret A.S.**
45030 Manisa (TR)

(54) **A WASHING MACHINE COMPRISING A WATER SOFTENING SYSTEM**

(57) A washing machine comprising a washing compartment (9); a water inlet (1); and a detergent drawer (8); characterized by comprising an ion exchanger chamber (7); regenerative material chamber (6); a group of water inlet valves (2) which comprises a first valve (2a) for delivering water to the detergent drawer (8), a second valve (2b) for delivering water to the regenerative material chamber (6), and a third valve (2c) for delivering water to the ion exchanger chamber (7); a first connection line (15) between the first valve (2a) and the detergent drawer (8); a second connection line (16) between the second valve (2b) and the regenerative material chamber (6); a third connection line (17) between the third valve (2c) and the ion exchanger chamber (7); a seventh connection line (20) between the regenerative material chamber (6) and the ion exchanger chamber (7); a first check valve (12) on the seventh connection line (20); an eighth connection line (21) between the ion exchanger chamber (7) and the detergent drawer (8); an eleventh connection line (27) between the detergent drawer (8) and the washing compartment (9); a first discharge arrangement for discharging the water which is used in the washing compartment (9); and a second discharge arrangement for removing the water that comes from the first discharge line and the solution present in the ion exchanger chamber (7) out of the machine.

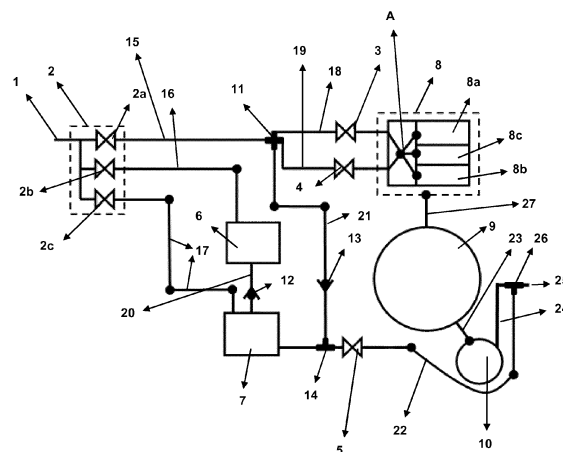


Figure 1

Description

Technical Field

[0001] The present invention relates to a washing machine comprising a water softening system.

Background of the Invention

[0002] Current washing machines comprise a body; a washing compartment located in the body and in which washing, rinsing, drying and such processes are carried out; a door which is opened and closed to allow access into the washing compartment; a water feeding line for feeding water from a source, which may be a mains supply, into the washing compartment in order for use in said washing and rinsing processes; and a drawer in which cleaning materials such as a solid or liquid detergent, fabric softener etc. are stored and, if needed, fed from the drawer into the washing compartment for use in washing and rinsing processes. In said machines, using hard mains water (i.e. water that contains relatively high amount of calcium and magnesium ions) for washing process reduces the washing performance, damages the fabric texture, and leads to various failures due to the lime scale build-up at the machinery.

[0003] In the state of art, various washing machine applications that comprise an internal water softening system are developed in order to solve said problems. One of these applications is provided in patent document no. EP2843101A1, wherein the document discloses a washing machine comprising a tank adapted to store a predetermined amount of liquid, a heating element adapted to heat the liquid inside the tank, a water inlet adapted to feed water from a mains supply, and a descaling unit. The descaling unit comprises a chamber which houses the descaling agent, a mixing chamber for mixing the descaling agent and a predetermined amount of water, and a water inlet pipe for providing water into the mixing chamber. The descaling unit further comprises an outlet pipe to enable connection between the mixing chamber and the tank. According to said application, a plurality of additional pumps should be used in order to circulate water among said units, and the system provides only softening of the heated water in the tank, without offering a solution to the use of soft water in rinsing and such processes.

Brief Description of the Invention

[0004] The washing machine according to the present invention comprises at least one washing compartment in which main processes as washing/prewashing/rinsing are performed; at least one water inlet through which a connection is established with a water supply, which may be a mains supply, in order to supply water for use in main washing, prewashing and/or rinsing processes at the washing compartment; at least one detergent drawer

adapted to contain cleaning materials for use in washing and/or rinsing processes performed at the washing compartment; at least one ion exchanger chamber adapted to filter elements which are present in the water coming from the water inlet and cause hardness; at least one air tight regenerative material chamber which contains a regenerative material suitable for use in cleansing the ion exchanger chamber; at least one group of water inlet valves which comprises at least a first valve for delivering water, which comes from the water inlet, to the detergent drawer, at least a second valve for delivering water, which comes from the water inlet, to the regenerative material chamber, and at least a third valve for delivering water, which comes from the water inlet, to the ion exchanger chamber; at least a first connection line enabling water delivery between the first valve and the detergent drawer; at least a second connection line enabling water delivery between the second valve and the regenerative material chamber, thereby allowing the regenerative material in the regenerative material chamber to dissolve in water and create a solution in the regenerative material chamber; at least a third connection line enabling water delivery between the third valve and the ion exchanger chamber; at least a seventh connection line, located between the regenerative material chamber and the ion exchanger chamber, for delivering the solution created in the regenerative material chamber to the ion exchanger chamber; at least a first check valve located on the seventh connection line in order to prevent water transfer that may take place from the ion exchanger chamber to the regenerative material chamber in such cases as pressure increase occurred in the ion exchanger chamber; at least an eighth connection line located between the ion exchanger chamber and the detergent drawer and enabling softened water in the ion exchanger chamber to be delivered to the detergent drawer; at least an eleventh connection line located between the detergent drawer and the washing compartment and enabling the cleaning material/materials in the detergent drawer to be delivered to the washing compartment, wherein the cleaning material is dissolved by the water coming through the first connection line and/or by the softened water coming through the eighth connection line; at least a first discharge arrangement for discharging the water, which is used in the washing compartment, from said washing compartment following the washing/rinsing process; and at least a second discharge arrangement for removing the water that comes from the first discharge arrangement and the solution present in the ion exchanger chamber out of the machine after the regeneration process.

[0005] The washing machine of the present invention enable to use mains water and/or the softened water for various phases of the washing process such as main washing/prewashing/rinsing, and to deliver water hydraulically.

Object of the Invention

[0006] An object of the present invention is to provide a washing machine which comprises a water softening system.

[0007] Another object of the present invention is to provide a washing machine comprising a water softening system and having a water delivery line which allows mains water and/or softened water to be used for various phases of the washing process.

[0008] Yet a further object of the present invention is to provide a washing machine comprising a water softening system and having a water delivery line for delivering mains water and/or softened water hydraulically.

Description of the Drawings

[0009] Exemplary embodiments of the washing machine according to the present invention are illustrated in the attached drawings, in which:

Figure 1 is a schematic view of an exemplary embodiment of the washing machine according to the present invention.

Figure 2 is a schematic view of another exemplary embodiment of the washing machine according to the present invention.

[0010] All the parts illustrated in figures are individually assigned a reference numeral and the corresponding terms of these numbers are listed below:

Water inlet	(1)
Group of water inlet valves	(2)
First valve	(2a)
Second valve	(2b)
Third valve	(2c)
Fourth valve	(2d)
Fifth valve	(3)
Sixth valve	(4)
Seventh valve	(5)
Regenerative material chamber	(6)
Ion exchanger chamber	(7)
Detergent drawer	(8)
First chamber	(8a)
Second chamber	(8b)
Third chamber	(8c)
Washing compartment	(9)
Discharge unit	(10)
Second connection member	(11)
Fifth connection point	(A)
Sixth connection point	(B)
First check valve	(12)
Second check valve	(13)
Third connection member	(14)

(continued)

First connection line	(15)
Second connection line	(16)
Third connection line	(17)
Fourth connection line	(150)
Fifth connection line	(18)
Sixth connection line	(19)
Seventh connection line	(20)
Eighth connection line	(21)
Ninth connection line	(211)
Tenth connection line	(212)
Second discharge line	(22)
Drainage line	(23)
First discharge line	(24)
Main discharge line	(25)
First connection member	(26)
Eleventh connection line	(27)
Eighth valve	(50)
Hydraulic distribution system	(210)

Description of the Invention

[0011] In current washing machines, using hard mains water (i.e. water that contains relatively high amount of calcium and magnesium ions etc.) for washing process reduces the washing performance, damages the fabric texture, and leads to various failures due to the lime scale build-up at the machinery. In the state of art, various washing machine applications that comprise an internal water softening system are developed in order to solve said problems. However, said applications require use of a plurality of additional pumps and similar water delivery units, and cannot allow use of soft water and/or hard water for each phase of the washing process. For that reason, with the present invention, there is provided a washing machine which enables to use mains water and/or the softened water for various phases of the washing process, and has a water softening system comprising a water delivery line for delivering mains water and/or softened water hydraulically.

[0012] The washing machine of the invention comprises at least one washing compartment (9) in which main processes as washing/prewashing/rinsing are performed; at least one water inlet (1) through which a connection is established with a water supply, which may be a mains supply, in order to supply water for use in main washing, prewashing and/or rinsing processes at the washing compartment (9); at least one detergent drawer (8) adapted to contain cleaning materials for use in washing and/or rinsing processes performed at the washing compartment (9); at least one ion exchanger chamber (7) adapted to filter elements which are present in the water coming from the water inlet (1) and cause hardness; at least one air tight regenerative material chamber (6) which contains a regenerative material (e.g. sodium

chloride) suitable for use in cleansing the ion exchanger chamber (7); at least one group of water inlet valves (2) which comprises at least a first valve (2a) for delivering water, which comes from the water inlet (1), to the detergent drawer (8), at least a second valve (2b) for delivering water, which comes from the water inlet (1), to the regenerative material chamber (6), and at least a third valve (2c) for delivering water, which comes from the water inlet (1), to the ion exchanger chamber (7); at least a first connection line (15) enabling water delivery between the first valve (2a) and the detergent drawer (8); at least a second connection line (16) enabling water delivery between the second valve (2b) and the regenerative material chamber (6), thereby allowing the regenerative material in the regenerative material chamber (6) to dissolve in water and create a solution in the regenerative material chamber (6); at least a third connection line (17) enabling water delivery between the third valve (2c) and the ion exchanger chamber (7); at least a seventh connection line (20), located between the regenerative material chamber (6) and the ion exchanger chamber (7), for delivering the solution created in the regenerative material chamber to the ion exchanger chamber (7); at least a first check valve (12) located on the seventh connection line (20) in order to prevent water transfer that may take place from the ion exchanger chamber (7) to the regenerative material chamber (6) in such cases as pressure increase occurred in the ion exchanger chamber (7); at least an eighth connection line (21) located between the ion exchanger chamber (7) and the detergent drawer (8) and enabling softened water in the ion exchanger chamber (7) to be delivered to the detergent drawer (8); at least an eleventh connection line (27) located between the detergent drawer (8) and the washing compartment (9) and enabling the cleaning material/materials in the detergent drawer (8) to be delivered to the washing compartment (9), wherein the cleaning material is dissolved by the water coming through the first connection line (15) and/or by the softened water coming through the eighth connection line (21); at least a first discharge arrangement (not shown in the figures) for discharging the water, which is used in the washing compartment (9), from said washing compartment (9) following the washing/rinsing process; and at least a second discharge arrangement (not shown in the figures) for removing the water that comes from the first discharge arrangement (said water may comprise various items such as cleaning material and particles on the laundry) and the solution present in the ion exchanger chamber (7) out of the machine after the regeneration process.

[0013] According to an exemplary embodiment of the invention, the water inlet (1) enables the washing machine to be connected to a water source that may be a mains supply. By means of the group of water inlet valves (2), the mains water received from the water inlet (1) is transferred to the relevant parts of the washing machine. The group of water inlet valves (2) comprises a first valve (2a) for feeding water to the detergent drawer (8); a sec-

ond valve (2b) for feeding water to the regenerative material chamber (6); and a third valve (2c) for feeding water to the ion exchanger chamber (7). Water from the first valve (2a) is delivered to the detergent drawer (8) by the first connection line (15); water from the second valve (2b) is delivered to the regenerative material chamber (6) by the second connection line (16); and water from the third valve (2c) is delivered to the ion exchanger valve (7) by the third connection line (17). Elements such as undissolved Calcium, Magnesium, Manganese in the mains water and causing hardness are filtered at the ion exchanger chamber (7) to reduce hardness of the water and obtain softened water. Mains water delivered to the ion exchanger chamber (7) via the third connection line (17) is softened therein and delivered to the detergent drawer (8) by means of the eighth connection line (21). Mains water delivered to the detergent drawer (8) by the first connection line (15) and/or softened water delivered to the detergent drawer (8) by the eighth connection line (21) dissolves the cleaning material/materials at the detergent drawer (8), and water that contains the dissolved cleaning materials is delivered to the washing compartment (9) by the eleventh connection line (27) and used therein to wash and/or rinse the laundry. Water softening capacity of the ion exchanger chamber (7) decreases over time depending on the hardness value of the mains water entering to the ion exchanger chamber (7), amount of water passing through the ion exchanger chamber (7), and capacity of the ion exchanger chamber (7). In case the ion exchanger chamber (7) reaches to a saturation point by the hardness elements that it draws thereon such that it is not able to perform function of water softening, it should be cleansed by the regenerative materials (e.g. sodium chloride, iodine-free salt) in order to re-perform the function of water softening. The regenerative material is provided inside the regenerative material chamber (6); and mains water delivered by the second valve (2b) and the second connection line (16) dissolves the regenerative material to prepare a solution. The solution prepared is delivered to the ion exchanger chamber (7) by the pressure of water alone, without using an additional electro-mechanical unit, by means of the seventh connection line (20) enabling the connection between the regenerative material chamber (6) and the ion exchanger chamber (7). Air tightness of the regenerative material chamber (6) plays a key role in performing regeneration process only by the mains pressure. The first check valve (12) located at the seventh connection line (20) prevents water transfer from the ion exchanger chamber (7) to the regenerative material chamber (6) via the water pressure occurred at the ion exchanger chamber (7) and avoids water pressure decrease that may happen at the ion exchanger chamber (7). Solution transferred to the ion exchanger chamber (7) is kept therein for a given period in order to weaken hardness elements accumulated on the ion exchanger chamber (7) and make them leave the ion exchanger chamber (7). Since the solution (regeneration liquid) contains oxidizing agents, it should not contact the

machine parts. Therefore, the solution in the ion exchanger chamber (7) is removed out of the machine by the second discharge arrangement. The washing liquid contained in the washing compartment (9) is removed out of the machine by the first discharge arrangement and the second discharge arrangement.

[0014] According to a preferred embodiment of the invention, the first discharge arrangement comprises at least one discharge unit (10) having at least one discharge pump (not shown in the figures); and at least one drainage line (23), located between the washing compartment (9) and the discharge unit (10), for delivering the water used at the washing compartment (9) to the discharge unit (10).

[0015] According to a preferred embodiment of the invention, the second discharge arrangement comprises at least a first discharge line (24) for delivering liquid between the discharge unit (10) and a main discharge line (25); at least a second discharge line (22) for delivering the solution, which is delivered to the ion exchanger chamber (7) for the regeneration process, from the ion exchanger chamber (7) to the main discharge line (25) after the regeneration process; at least a seventh valve (5) for delivering the solution through the second discharge line (22) to the main discharge line (25) to be discharged therefrom; and at least a first connection member (26), preferably in the form of a three-way connection unit, which connects the first discharge line (24) and the second discharge line (22) to the main discharge line (25).

[0016] According to a preferred embodiment of the invention, a first connection point at which the second discharge line (22) is connected to the first connection member (26) is located at a lower part of a second connection point (at a point that is closer to a base of the washing machine) at which the first discharge line (24) is connected to the first connection member (26). Thus, the solution prepared while the regeneration process takes place is prevented from passing to the discharge unit (10) and the first discharge line (24).

[0017] According to a preferred embodiment of the invention, the washing machine comprises at least one sensor (not shown in the figures) which is provided on the seventh connection line (20) and measures concentration of the regenerative material at the regenerative material chamber (6). In the embodiment, if an amount of the regenerative material decreases below a threshold value as a result of the measurement carried out, a warning is provided by at least one warning element (not shown in the figures) of the washing machine.

[0018] According to a preferred embodiment of the invention, the detergent drawer (8) comprises at least a first chamber (8a) adapted to contain a first cleaning material (e.g. a detergent) for use in a main washing phase; at least a second chamber (8b) adapted to contain a second cleaning material (e.g. a detergent) for use in a pre-washing phase; and at least a third chamber (8c) adapted to contain a third cleaning material (e.g. a fabric softener)

for use in a rinsing process and located between the first chamber (8a) and the second chamber (8b). In the embodiment, the washing machine comprises at least a second connection member (11) which is a four-way connection unit comprising a first connection point (not shown in the figures), a second connection point (not shown in the figures), a third connection point (not shown in the figures), and a fourth connection point (not shown in the figures). The first connection line (15) for delivering mains water to the detergent drawer (8) is connected to the first connection point; and the eighth connection line (21) for delivering softened water to the detergent drawer (8) is connected to the second connection point. The washing machine further comprises at least a fifth connection line (18) for delivering water between the third connection point and the second chamber (8b); at least a fifth valve (3) which is located on the fifth connection line (18); at least a sixth connection line (19) for delivering water between the fourth connection point and the first chamber (8a); and at least a sixth valve (4) which is located on the sixth connection line (19), wherein the fifth connection line (18) and the sixth connection line (19) intersect at a fifth connection point (A) so as to be connected to the third chamber (8c). The fifth connection point (A) is located before a first outlet at which the fifth connection line (18) is connected to the second chamber (8b) and a second outlet at which the sixth connection line (19) is connected to the first chamber (8a). In the embodiment, when the fifth valve (3) and the sixth valve (4) are opened together, water from the fifth connection line (18) and water from the sixth connection line (19) collide with each other at the fifth connection point (A) that is a midpoint, and said valves transfer the incoming water to the third chamber (8c). With said connection, both softened water and mains water are controlled by means of the fifth valve (3) and the sixth valve (6) such that they are allowed to be used for each step of the washing process (prewashing, main washing, rinsing).

[0019] According to a preferred embodiment of the invention, the ion exchanger chamber (7) is connected hydraulically to the eighth connection line (21) and the second discharge line (22) by at least a third connection member (14). In the embodiment, softened water from the ion exchanger chamber (7) is delivered to the eighth connection line (21) while the solution from the ion exchanger chamber (7) is removed out of the machine by the second discharge line (22). The washing machine further comprises at least a second check valve (13) which is located at the eighth connection line (21) and prevents mains water flow through the eighth connection line (11), thus allowing only softened water to pass. The second check valve (13) prevents hard mains water, which comes from the first valve (2a), from entering into the ion exchanger chamber (7). The aim here is to prevent the supply of mains water to the ion exchange chamber (7) in case that it is not desired to use the ion exchange chamber (7) and thus the water softening system.

[0020] According to a preferred embodiment of the in-

vention, the group of water inlet valves (2) comprises at least a fourth valve (2d) for feeding water to the detergent drawer (8), in addition to the first valve (2a) for feeding water to the detergent drawer (8). In the embodiment, the first valve (2a) is connected directly to the second chamber (8b) by the first connection line (15). There is provided at least a fourth line (150) between the fourth valve (2d) and the first chamber (8a). Said connection allows water to be supplied from the first valve (2a) and the fourth valve (2d) to the first chamber (8a) and the second chamber (8b). The first connection line (15) and the fourth connection line (150) intersect at a sixth connection point (B) so as to be connected to the third chamber (8c). The sixth connection point (B) is located before a first outlet at which the first connection line (15) is connected to the second chamber (8b) and a second outlet at which the fourth connection line (150) is connected to the first chamber (8a). In the embodiment, at least one hydraulic distribution system (210) is provided on the eighth connection line (21), wherein at least a first outlet (not shown in the figures) of the hydraulic distribution system (210) is connected to the first connection line (15) by at least a ninth connection line (211), while at least a second outlet (not shown in the figures) of the hydraulic distribution system (210) is connected to the fourth connection line (150) by at least a tenth connection line (211). At least an eighth valve (50) is provided on the eighth connection line (21), which controls softened water flow into the hydraulic distribution system (210). In the embodiment, when the third valve (2c) is activated together with the eighth valve (50), hard water from the mains supply is passed through the ion exchanger chamber, hardness level thereof is decreased and transferred to the hydraulic distributor system (210). The hydraulic distribution system (210) enables only softened water to be transferred to the all chambers of the detergent drawer (8) by the ninth connection line (211) and the tenth connection line (212). The hydraulic distributor system (210) is able to be controlled electromechanically.

[0021] The washing machine of the present invention enables to use mains water and/or the softened water for various phases of the washing process such as main washing/prewashing/rinsing, and to deliver water hydraulically.

Claims

1. A washing machine comprising at least one washing compartment (9) in which processes as washing/prewashing/rinsing are performed; at least one water inlet (1) through which a connection is established with a water supply, which may be a mains supply, in order to supply water for use in washing, prewashing and/or rinsing processes at the washing compartment (9); at least one detergent drawer (8) adapted to contain cleaning materials for use in washing and/or rinsing processes performed at the

washing compartment (9), **characterized by** comprising at least one ion exchanger chamber (7) adapted to filter elements which are present in the water coming from the water inlet (1) and cause hardness; at least one air tight regenerative material chamber (6) which contains a regenerative material suitable for use in cleansing the ion exchanger chamber (7); at least one group of water inlet valves (2) which comprises at least a first valve (2a) for delivering water, which comes from the water inlet (1), to the detergent drawer (8), at least a second valve (2b) for delivering water, which comes from the water inlet (1), to the regenerative material chamber (6), and at least a third valve (2c) for delivering water, which comes from the water inlet (1), to the ion exchanger chamber (7); at least a first connection line (15) enabling water delivery between the first valve (2a) and the detergent drawer (8); at least a second connection line (16) enabling water delivery between the second valve (2b) and the regenerative material chamber (6), thereby allowing the regenerative material in the regenerative material chamber (6) to dissolve in water and create a solution in the regenerative material chamber (6); at least a third connection line (17) enabling water delivery between the third valve (2c) and the ion exchanger chamber (7); at least a seventh connection line (20), located between the regenerative material chamber (6) and the ion exchanger chamber (7), for delivering the solution created in the regenerative material chamber to the ion exchanger chamber (7); at least a first check valve (12) located on the seventh connection line (20) in order to prevent water transfer that may take place from the ion exchanger chamber (7) to the regenerative material chamber (6) in such cases as pressure increase occurred in the ion exchanger chamber (7); at least an eighth connection line (21) located between the ion exchanger chamber (7) and the detergent drawer (8) and enabling softened water in the ion exchanger chamber (7) to be delivered to the detergent drawer (8); at least an eleventh connection line (27) located between the detergent drawer (8) and the washing compartment (9) and enabling the cleaning material/materials in the detergent drawer (8) to be delivered to the washing compartment (9), wherein the cleaning material is dissolved by the water coming through the first connection line (15) and/or by the softened water coming through the eighth connection line (21); at least a first discharge arrangement for discharging the water, which is used in the washing compartment (9), from said washing compartment (9) following the washing/rinsing process; and at least a second discharge arrangement for removing the water that comes from the first discharge arrangement and the solution present in the ion exchanger chamber (7) out of the machine after the regeneration process.

2. A washing machine according to Claim 1, **characterized in that** the second discharge arrangement comprises at least a first discharge line (24) for delivering liquid between a first discharge arrangement and a main discharge line (25); at least a second discharge line (22) for delivering the solution, which is delivered to the ion exchanger chamber (7) for the regeneration process, from the ion exchanger chamber (7) to the main discharge line (25) after the regeneration process; at least a seventh valve (5) for delivering the solution through the second discharge line (22) to the main discharge line (25) to be discharged therefrom; and at least a first connection member (26) which connects the first discharge line (24) and the second discharge line (22) to the main discharge line (25).
5
3. A washing machine according to Claim 2, **characterized in that** the first connection member (26) is a three-way connection unit.
10
4. A washing machine according to any of the Claims 2 or 3, **characterized in that** a first connection point at which the second discharge line (22) is connected to the first connection member (26) is located at a lower part of a second connection point at which the first discharge line (24) is connected to the first connection member (26).
15
5. A washing machine according to any of the preceding claims, **characterized in that** the detergent drawer (8) comprises at least a first chamber (8a) adapted to contain a first cleaning material for use in a main washing phase; at least a second chamber (8b) adapted to contain a second cleaning material for use in a prewashing phase; and at least a third chamber (8c) adapted to contain a third cleaning material for use in a rinsing process and located between the first chamber (8a) and the second chamber (8b).
20
6. A washing machine according to Claim 5, **characterized in that** the washing machine comprises at least a second connection member (11) which is a four-way connection unit comprising a first connection point connected to the first connection line (15), a second connection point connected to the eighth connection line (21), a third connection point, and a fourth connection point; at least a fifth connection line (18) for delivering water between the third connection point and the second chamber (8b); at least a fifth valve (3) which is located on the fifth connection line (18); at least a sixth connection line (19) for delivering water between the fourth connection point and the first chamber (8a); and at least a sixth valve (4) which is located on the sixth connection line (19).
25
7. A washing machine according to Claim 6, **characterized in that** the fifth connection line (18) and the sixth connection line (19) intersect at a fifth connection point (A) so as to be connected to the third chamber (8c).
30
8. A washing machine according to any of the Claims 2 to 7, **characterized in that** the washing machine comprises a third connection member (14) which is a three-way connection unit connecting the ion exchanger chamber (7) hydraulically to the eighth connection line (21) and the second discharge line (22).
35
9. A washing machine according to any of the preceding claims, **characterized in that** the washing machine comprises at least a second check valve (13) which is located at the eighth connection line (21) and prevents mains water flow through the eighth connection line (21), thus allowing only softened water to pass.
40
10. A washing machine according to any of the Claims 1 to 5, **characterized in that** the group of water inlet valves (2) comprises at least a fourth valve (2d) for feeding water to the detergent drawer (8), in addition to the first valve (2a) for feeding water to the detergent drawer (8).
45
11. A washing machine according to Claim 10, **characterized in that** the first valve (2a) is connected directly to the second chamber (8b) by the first connection line (15).
50
12. A washing machine according to any of the Claims 10 or 11, **characterized in that** the washing machine comprises at least a fourth line (150) located between the fourth valve (2d) and the first chamber (8a).
55
13. A washing machine according to Claim 12, **characterized in that** the first connection line (15) and the fourth connection line (150) intersect at a sixth connection point (B) so as to be connected to the third chamber (8c).
60
14. A washing machine according to any of the Claims 12 or 13, **characterized in that** the washing machine comprises at least one hydraulic distribution system (210) provided on the eighth connection line (21), wherein at least a first outlet of the hydraulic distribution system (210) is connected to the first connection line (15) by at least a ninth connection line (211), and at least a second outlet of the hydraulic distribution system (210) is connected to the fourth connection line (150) by at least a tenth connection line (211).
65
15. A washing machine according to Claim 14, **characterized in that** the washing machine comprises at

least an eighth valve (50) which is provided on the eighth connection line (21) and controls softened water flow to the hydraulic distribution system (210).

5

10

15

20

25

30

35

40

45

50

55

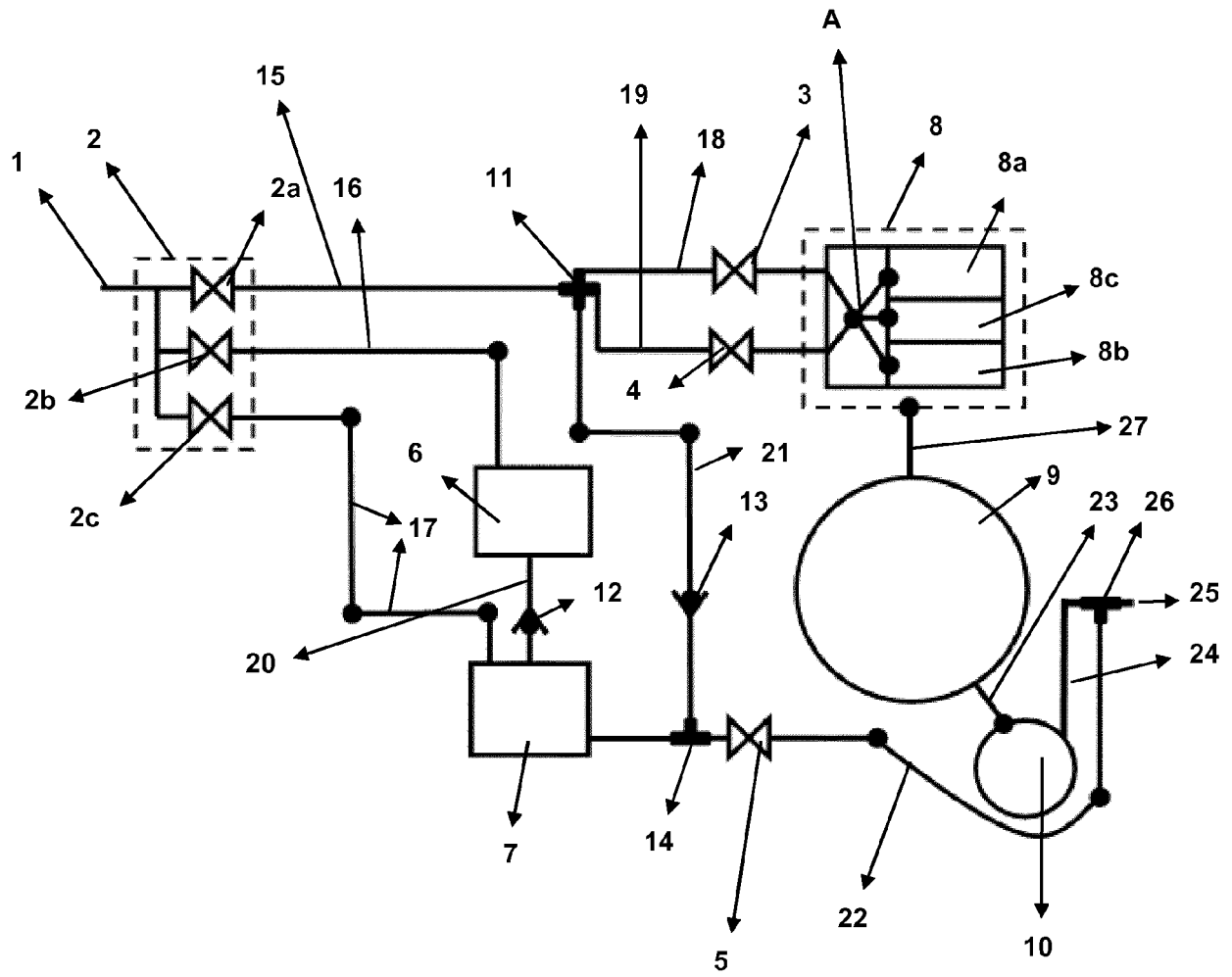


Figure 1

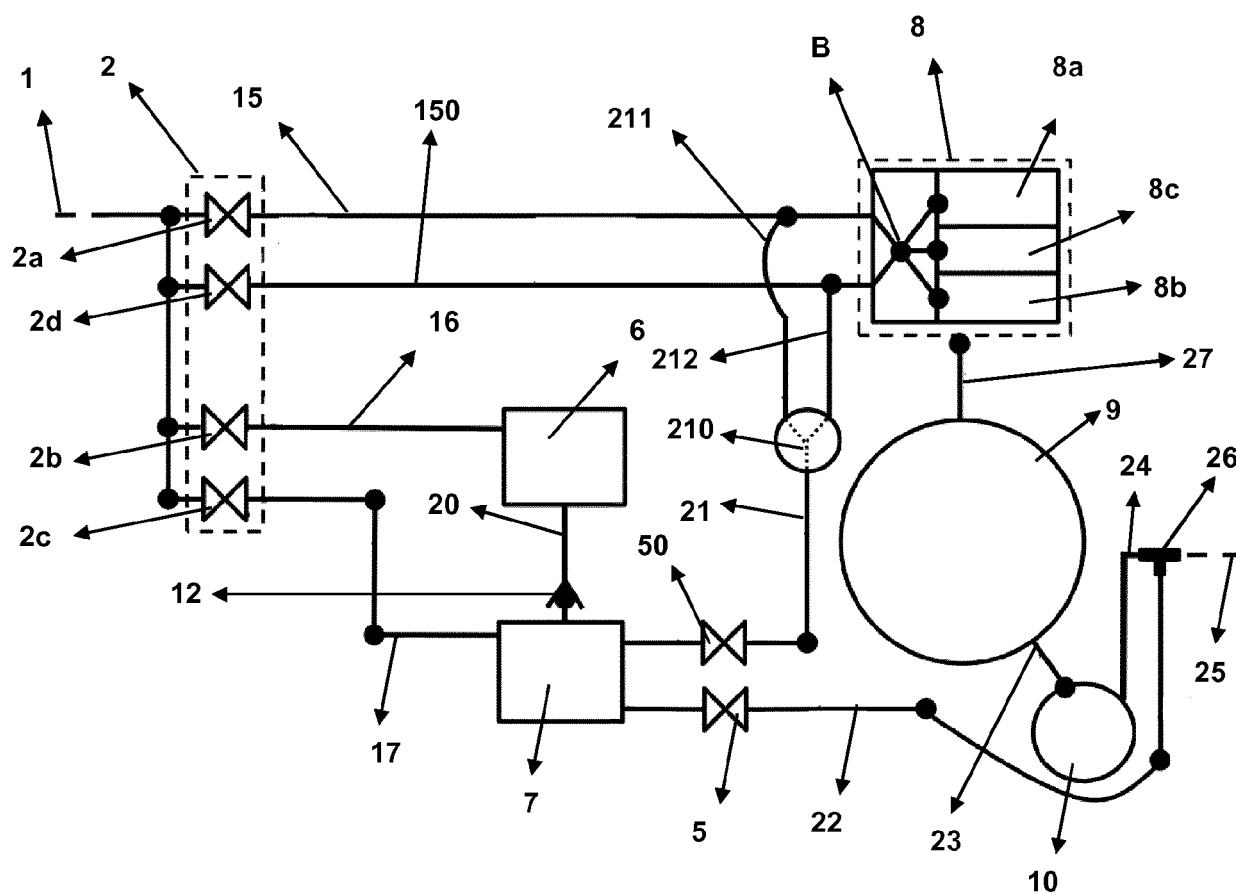


Figure 2



EUROPEAN SEARCH REPORT

Application Number
EP 19 19 1913

5

10

15

20

25

30

35

40

45

50

55

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2015/204005 A1 (FAVARO DANIELE [IT] ET AL) 23 July 2015 (2015-07-23)	1-6,8,9	INV. D06F39/00 D06F39/08 ADD. D06F39/02
Y	* abstract * * paragraphs [0039] - [0061], [0068], [0073] - [0142], [0165] - [0170], [0177], [0178], [0186], [0187]; figures *	7,10-15	
Y	----- US 2005/262881 A1 (RIZZETTO PIETRO [IT]) 1 December 2005 (2005-12-01) * abstract; figures * * paragraphs [0018] - [0038]; figures *	7,13	
Y	----- US 2016/010266 A1 (DEL POS MAURIZIO [IT] ET AL) 14 January 2016 (2016-01-14) * abstract; figures * * paragraphs [0212] - [0232] *	10-15	
X	DE 35 27 047 A1 (LICENTIA GMBH [DE]) 5 February 1987 (1987-02-05) * the whole document *	1-6, 10-12, 14,15	TECHNICAL FIELDS SEARCHED (IPC)
X	DE 23 46 801 A1 (STEININGER K & J [AT]) 11 April 1974 (1974-04-11) * page 6, line 10 - page 9, last line; figure *	1,2	D06F
A	----- US 2016/326678 A1 (STABON ELISA [IT] ET AL) 10 November 2016 (2016-11-10) * abstract; figures 1,2 * * paragraphs [0037], [0038], [0057], [0081] - [0090], [0137] *	3-15	
X	----- US 2016/326678 A1 (STABON ELISA [IT] ET AL) 10 November 2016 (2016-11-10) * abstract; figures 1,2 * * paragraphs [0037], [0038], [0057], [0081] - [0090], [0137] *	1-5,8	
A	----- US 2014/165665 A1 (DEL POS MAURIZIO [IT] ET AL) 19 June 2014 (2014-06-19) * abstract; figures 1,9-14 *	6,7,9-15	
A	----- US 2014/165665 A1 (DEL POS MAURIZIO [IT] ET AL) 19 June 2014 (2014-06-19) * abstract; figures 1,9-14 *	1-15	
		-/--	
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 13 December 2019	Examiner Prosig, Christina
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			

EPO FORM 1503 03.82 (P04C01)



EUROPEAN SEARCH REPORT

Application Number
EP 19 19 1913

5

10

15

20

25

30

35

40

45

2

50

55

EPO FORM 1503 03.82 (P04C01)

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	DE 15 85 797 A1 (LICENTIA GMBH) 21 September 1972 (1972-09-21) * the whole document *	1-4,8	
A	WO 2006/004269 A1 (NINE TECH CO LTD [KR]; SUN NAMKYU [KR]) 12 January 2006 (2006-01-12) * abstract * * paragraph [0006]; figures * -----	1-4,8	
			TECHNICAL FIELDS SEARCHED (IPC)
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 13 December 2019	Examiner Prosig, Christina
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			

ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.

EP 19 19 1913

5

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

13-12-2019

10

15

20

25

30

35

40

45

50

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2015204005 A1	23-07-2015	AU 2013283242 A1	05-02-2015
		CN 104487623 A	01-04-2015
		EP 2679716 A1	01-01-2014
		EP 2867398 A1	06-05-2015
		PL 2867398 T3	29-09-2017
		US 2015204005 A1	23-07-2015
		WO 2014001472 A1	03-01-2014

US 2005262881 A1	01-12-2005	AT 435325 T	15-07-2009
		CA 2503205 A1	25-11-2005
		EP 1600546 A1	30-11-2005
		ES 2327638 T3	02-11-2009
		PL 1600546 T3	31-12-2009
		US 2005262881 A1	01-12-2005

US 2016010266 A1	14-01-2016	EP 2959049 A1	30-12-2015
		US 2016010266 A1	14-01-2016
		WO 2014121820 A1	14-08-2014

DE 3527047 A1	05-02-1987	NONE	

DE 2346801 A1	11-04-1974	AT 315792 B	10-06-1974
		CH 556425 A	29-11-1974
		DE 2346801 A1	11-04-1974
		IT 1013568 B	30-03-1977

US 2016326678 A1	10-11-2016	AU 2013409581 A1	30-06-2016
		CN 105874114 A	17-08-2016
		EP 3090085 A1	09-11-2016
		US 2016326678 A1	10-11-2016
		WO 2015101391 A1	09-07-2015

US 2014165665 A1	19-06-2014	AU 2012292217 A1	06-02-2014
		BR 112014002508 A2	14-03-2017
		CN 103717798 A	09-04-2014
		EP 2554737 A1	06-02-2013
		RU 2014107939 A	10-09-2015
		US 2014165665 A1	19-06-2014
		WO 2013017482 A2	07-02-2013

DE 1585797 A1	21-09-1972	CH 468504 A	15-02-1969
		DE 1585797 A1	21-09-1972
		SE 320349 B	09-02-1970

WO 2006004269 A1	12-01-2006	KR 20050095422 A	29-09-2005
		WO 2006004269 A1	12-01-2006

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

55

13-12-2019

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- EP 2843101 A1 [0003]