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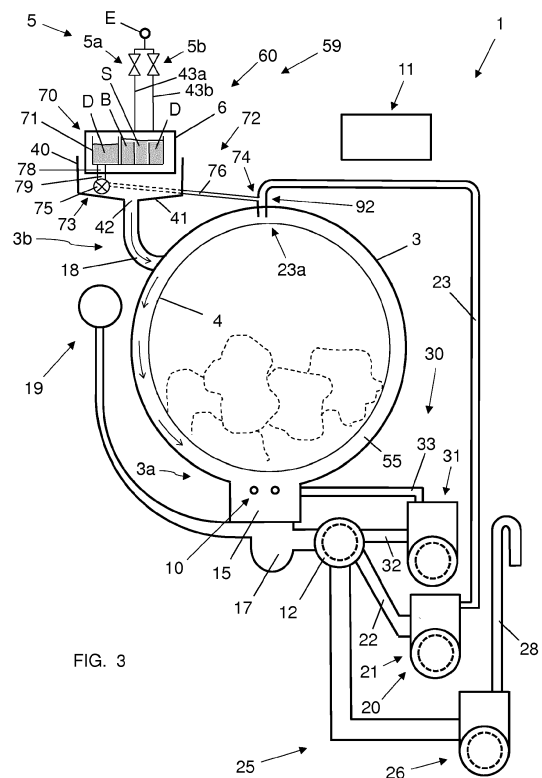
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(54) **LAUNDRY WASHING MACHINE WITH AN AUTOMATIC DOSING DEVICE**

(57) The invention relates to a laundry washing machine (1) comprising an automatic dosing device (70) having at least one container (71) suitable for receiving an amount of wash product (D) sufficient for a plurality of washing cycles and having a recirculation circuit (20) for transferring liquid from a first region (3a) of the washing tub (3) and for re-admitting the liquid into a second region (3b) of the washing tub (3). The automatic dosing device comprises a dispensing line (72) terminating at said recirculation circuit (20) which allows to convey the wash product (D) from the at least one container (71) to the washing tub (3).



Description

[0001] The present invention concerns the field of laundry washing techniques.

[0002] In particular, the present invention refers to a laundry washing machine equipped with an automatic dosing device for wash products.

BACKGROUND ART

[0003] Nowadays the use of laundry washing machines, both "simple" laundry washing machines (i.e. laundry washing machines which can only wash and rinse laundry) and laundry washing-drying machines (i.e. laundry washing machines which can also dry laundry), is widespread.

[0004] In the present description the term "laundry washing machine" will refer to both simple laundry washing machines and laundry washing-drying machines.

[0005] Laundry washing machines generally comprise an external casing, or cabinet, provided with a washing tub which contains a rotatable perforated drum where the laundry is placed. A loading/unloading door ensures access to the drum.

[0006] Laundry washing machines typically comprise a water supply unit and a products supply unit for the introduction of water and washing/rinsing products (i.e. detergent, softener, rinse conditioner, etc.) into the tub.

[0007] In laundry washing machines of known type the products supply unit may also be advantageously equipped with an automatic dosing device which is able to dose powder, liquid or other kinds of wash products from a container into the tub. In particular, the dosing device comprises one or more multidose containers, such as dispenser cartridges, which are filled with a large amount of a respective wash product that is then dispensed in a predetermined dose at any single washing cycle. Each multidose container is therefore advantageously filled with a quantity of wash product sufficient for several washing cycles.

[0008] According to the dosing device of the known type the multidose container is part of a removable drawer which is slidably received in a housing located within the cabinet. The housing is conformed so as to define at its bottom a lower dispensing housing (flushing chamber). The lower dispensing housing advantageously underlies the multidose container/s when the drawer sits in a closed position.

[0009] During a washing cycle when the wash product is required, a dose of wash product is conveyed from the multidose container into the lower dispensing housing, or flushing chamber. A proper flushing volume of water coming from an external water supply line is made flow through the flushing chamber and the water with the wash product then flow inside the tub.

[0010] The laundry washing machines equipped with an automatic dosing device of the known art pose some drawbacks.

[0011] A drawback posed by known automatic dosing devices lies in that they require a flushing chamber so that water may be provided to flush the wash products to the washing tub.

5 [0012] This negatively affects size and/or manufacturing costs of the dosing device and hence size and/or manufacturing costs of the laundry washing machine.

[0013] A further drawback posed by said automatic dosing devices lies in that they require complex water paths to convey water from the external water supply line to the flushing chamber and from there to the washing tub and also require complex wash products paths to convey wash products from the containers to the flushing chamber.

10 [0014] The object of the present invention is therefore to overcome the drawbacks posed by the known techniques.

[0015] It is an object of the invention to provide an alternative system for supplying a dose of a wash product into the washing tub in a laundry washing machine equipped with an automatic dosing device.

20 [0016] It is another object of the invention to provide a laundry washing machine equipped with an automatic dosing device having reduced complexity and/or size compared to laundry washing machines of known type.

DISCLOSURE OF INVENTION

[0017] The applicant has found that by providing a laundry washing machine comprising an automatic dosing device having at least one container suitable for receiving an amount of wash product sufficient for a plurality of washing cycles and having a recirculation circuit for transferring liquid from a first region of the washing tub and for re-admitting the liquid into a second region of the washing tub wherein the automatic dosing device comprises a dispensing line terminating at said recirculation circuit which allows to convey the wash product from the at least one container to the washing tub, it is possible to reduced the complexity and/or the size of the automatic dosing device and of the laundry washing machine compared to known system.

[0018] The present invention relates, therefore, to a laundry washing machine comprising:

- 45 - a cabinet supporting a washing drum adapted to receive laundry and a washing tub external to said washing drum;
- a water supply unit suited to supply water into said washing tub;
- 50 - an automatic dosing device suited to supply at least one wash product into said washing tub, said automatic dosing device comprising at least one container suitable for receiving an amount of said at least one wash product sufficient for a plurality of washing cycles;
- 55 - a recirculation circuit for transferring liquid from a first region of said washing tub and for re-admitting

- said liquid into a second region of said washing tub;
- a control unit for controlling functioning of said laundry washing machine;
- an interface unit by means of which the user may select and/or set parameters;

wherein said automatic dosing device comprises a dispensing line connecting said at least one container to said washing tub for conveying said at least one wash product from said at least one container to said washing tub and wherein said dispensing line terminates at said recirculation circuit.

[0019] In a preferred embodiment of the invention, dispensing line comprises an inlet side connected to said at least one container and an outlet side connected to the recirculation circuit.

[0020] Preferably, the dispensing line comprises a dispenser pump suitable for forcing said at least one wash product inside the dispensing line.

[0021] More preferably, the automatic dosing device comprises a dispenser pump and wherein the dispensing line is fluidly connected between an outlet of the dispenser pump and the recirculation circuit.

[0022] According to a preferred embodiment of the invention, said at least one container is a removable container.

[0023] In a preferred embodiment of the invention, the inlet side of the dispensing line and said at least one container are coupable through a connecting device.

[0024] Preferably, the connecting device preferably comprises a male portion communicating with the inlet side of the dispensing line or with the container and a female portion communicating with the container or with the inlet of the dispensing line.

[0025] More preferably, the male portion and the female portion are removable connectable one to the other.

[0026] According to a preferred embodiment of the invention, said at least one container is received in a drawer slidably coupled to the cabinet.

[0027] Preferably, said at least one container is received in a drawer slidably coupled to the cabinet and wherein the connecting device preferably comprises a male portion communicating with the inlet side of the dispensing line or with the container and a female portion communicating with the container or with the inlet of the dispensing line, the male portion being connected to the female portion when the drawer is in its inserted position and the male portion being disconnected from the female portion when the drawer is in its extracted position. In a preferred embodiment of the invention, the drawer comprises the interface unit.

[0028] According to a preferred embodiment of the invention, said at least one container is slidably arranged in the upper side of the cabinet so as to be accessible from the upper side of the cabinet.

[0029] Preferably, said at least one container is accessible from a top wall of the cabinet. Preferably, the recirculation circuit comprises a recirculation pump suitable

for forcing liquid inside the recirculation circuit. The recirculation circuit preferably comprises a first pipe fluidly connecting the washing tub to the recirculation pump. The recirculation circuit then preferably comprises a second pipe fluidly connecting the recirculation pump to the washing tub.

[0030] In a preferred embodiment of the invention, the dispensing line terminates at the first pipe or at the second pipe of the recirculation circuit.

[0031] In a further preferred embodiment of the invention, the dispensing line terminates close to a terminal nozzle of the second pipe.

[0032] Preferably, the first region is a bottom region of the washing tub.

[0033] Preferably, the second region is a bottom region of the washing tub or an upper region of the washing tub.

[0034] According to a preferred embodiment of the invention, the method further comprises a single-use wash products dispenser comprising at least one compartment suitable for receiving a dose of said at least one wash product at the beginning of each single washing cycle and the dose is then completely used in the single washing cycle.

[0035] In a preferred embodiment of the invention, said at least one compartment of the products dispenser and said at least one container of the automatic dosing device are part of a drawer slidably received in the cabinet.

[0036] Preferably, the drawer is slidably received in a drawer housing located within the cabinet.

[0037] According to a preferred embodiment of the invention, the drawer housing is suitable to receive said at least one wash product from said at least one container of the automatic dosing device and the drawer housing is fluidly connected to the washing tub.

[0038] In a first preferred embodiment of the invention, the recirculation circuit comprises a first circuit adapted to drain liquid from a bottom region of the washing tub and to re-admit such a liquid into the bottom region of the washing tub and wherein the dispensing line terminates at any point of the first recirculation circuit.

[0039] In a second preferred embodiment of the invention, the recirculation circuit comprises a second circuit adapted to drain liquid from a bottom region of the washing tub and to re-admit such a liquid into an upper region of the washing tub and wherein the dispensing line terminates at any point of the second recirculation circuit.

[0040] In a further aspect thereof, the present invention concerns a method for operating a laundry washing machine according to any of the preceding claims, wherein the method comprises a step of activating said dispensing line for conveying said at least one wash product from said at least one container to said washing tub and a step of activating said recirculation circuit for transferring liquid from said first region of said washing tub and for re-admitting said liquid into said second region of said washing tub.

[0041] Preferably, the step of activating the dispensing line comprises a step of activating a dispenser pump of

said dispensing line.

[0042] Preferably, the step of activating the recirculation circuit comprises a step of activating a recirculation pump of said recirculation circuit.

BRIEF DESCRIPTION OF THE DRAWINGS

[0043] Further characteristics and advantages of the present invention will be highlighted in greater detail in the following detailed description of preferred embodiments of the invention, provided with reference to the enclosed drawings. In the drawings, corresponding characteristics and/or components are identified by the same reference numbers. In such drawings:

- Figure 1 shows a perspective view of a laundry washing machine according to a first embodiment of the invention;
- Figure 2 shows a partially exploded view of the laundry washing machine of Figure 1 from another point of view;
- Figure 3 shows a schematic view of the laundry washing machine of Figure 1;
- Figure 4 shows the laundry washing machine of Figure 1 with the external casing removed;
- Figure 5 shows the laundry washing machine of Figure 4 from another point of view;
- Figure 6 shows a partial view of the laundry washing machine of Figure 1 with the external casing partially removed;
- Figure 7 is a plan view of some components of the laundry washing machine of Figure 4 isolated from the rest;
- Figure 8 shows the laundry washing machine of Figure 1 with the external casing removed with the drawer in its closed position;
- Figure 8A shows an enlarged view of a detail of Figure 8;
- Figure 9 represents a top plan view of Figure 8;
- Figure 10 shows the laundry washing machine of Figure 1 with the external casing removed and with the drawer in its open position;
- Figure 10A shows an enlarged view of a detail of Figure 10;
- Figure 11 represents a top plan view of Figure 10;
- Figure 12 shows a perspective view of a laundry washing machine according to a second embodiment of the invention and with the second drawer in its open position;
- Figure 13 shows the laundry washing machine of Figure 12 with the top side removed and from another point of view;
- Figure 14 shows the laundry washing machine of Figure 13 with the first drawer removed;
- Figure 15 shows a perspective view of a laundry washing machine according to a third embodiment of the invention;
- Figure 13 shows the laundry washing machine of

Figure 12 with the top side removed and from another point of view;

- Figure 14 shows the laundry washing machine of Figure 13 with the first drawer removed;
- 5 - Figure 15 shows a perspective view of a laundry washing machine according to a third embodiment of the invention;
- Figure 16 shows a partially exploded view of the laundry washing machine of Figure 15;
- 10 - Figure 17 shows the laundry washing machine of Figure 16 with the top side removed and from another point of view;
- Figures 18 to 20 show perspective views of laundry washing machines according to further embodiments of the invention;
- 15 - Figure 21 schematically shows further preferred embodiments of the invention.

DETAILED DESCRIPTION OF THE INVENTION

[0044] The present invention has proved to be particularly advantageous when applied to laundry washing machines, as described below. It should in any case be underlined that the present invention is not limited to laundry washing machines. On the contrary, the present invention can be conveniently applied to laundry washing-drying machines (i.e. laundry washing machines which can also dry laundry).

[0045] In the present description, therefore, the term "laundry washing machine" will refer to both simple laundry washing machines and laundry washing-drying machines.

[0046] With reference to Figures from 1 to 11 a laundry washing machine 1 according to a preferred embodiment of the invention is described.

[0047] The laundry washing machine 1 comprises an external casing or cabinet 2, in which a washing tub 3 is provided that contains a perforated washing drum 4 where the laundry to be treated can be loaded.

[0048] The tub 3 and the drum 4 both preferably have a substantially cylindrical shape. Between the tub 3 and the drum 4 a gap 55 is defined.

[0049] The cabinet 2 is provided with a loading/unloading door 8 which allows access to the drum 4.

[0050] The tub 3 is preferably suspended in a floating manner inside the cabinet 2, advantageously by means of a number of coil springs and shock-absorbers 9.

[0051] The drum 4 is advantageously rotated by an electric motor, not illustrated, which preferably transmits the rotating motion to the shaft of the drum 4, advantageously by means of a belt/pulley system. In a different embodiment of the invention, the motor can be directly associated with the shaft of the drum 4.

[0052] The drum 4 is advantageously provided with holes which allow the liquid flowing therethrough. Said holes are typically and preferably homogeneously distributed on the cylindrical side wall of the drum 4.

[0053] The tub 3 is preferably connected to the cabinet

2 by means of an elastic bellows 7, or gasket.

[0054] The tub 3 preferably comprises two complementary hemi-shells 13 and 14 structured for being reciprocally coupled to form the tub 3.

[0055] Laundry washing machine 1 advantageously comprises a control unit 11 connected to the various parts of the laundry washing machine 1 in order to ensure its operation. Laundry washing machine 1 preferably comprises an interface unit 16 (control panel), connected to the control unit 11, accessible to the user and by means of which the user may select and set the washing parameters, like for example a desired washing program. Usually, other parameters can optionally be inserted by the user, for example the washing temperature, the spinning speed, etc..

[0056] The bottom region 3a of the tub 3 preferably comprises a seat 15, or sump, suitable for receiving a heating device 10, as illustrated in Figure 6. The heating device 10, when activated, heats the liquid inside the sump 15.

[0057] The heating device 10 preferably comprises an electrical resistor of serpentine type. The heating device 10 is horizontally placed in the sump 15 and it extends substantially from a front part up to a rear part of the sump 15.

[0058] In different embodiments, nevertheless, the bottom region of the tub may be configured differently. For example, the bottom region of the tub may not comprise a seat for the heating device. The heating device may be advantageously placed in the annular gap between the tub and the drum.

[0059] In further embodiments, then, the heating device may not be present. The required heated water may come from an external hot water source.

[0060] In further embodiments the heating device may be different and suitable to heat the liquid in the tub, for example a hot air stream, a steam flow, microwaves source, infra-red rays, etc..

[0061] Laundry washing machine 1 advantageously comprises a water outlet circuit 25 suitable for withdrawing liquid from the bottom region 3a of the tub 3.

[0062] The water outlet circuit 25 preferably comprises a main pipe 17, a draining pump 26 and an outlet pipe 28 ending outside the cabinet 2.

[0063] The water outlet circuit 25 preferably further comprise a filtering device 12 arranged between the main pipe 17 and the draining pump 26. The filtering device 12 is adapted to retain all the undesirable bodies (for example buttons that have come off the laundry, coins erroneously introduced into the laundry washing machine, etc.).

[0064] This filtering device 12 can preferably be removed, and then cleaned, through a gate 14 placed advantageously on the front wall of the cabinet 2 of the laundry washing machine 1, as illustrated in Figures 1 and 2.

[0065] The main pipe 17 connects the bottom region 3a of the tub 3 to the filtering device 12. An inlet end 17a

of the main pipe 17 is advantageously positioned at the lower point of the tub 3, more preferably at the lower point of the sump 15, as illustrated in Figure 7.

[0066] An outlet end 17b of the main pipe 17 is connected to a front part 12a of the filtering device 12.

[0067] In a further embodiment, not illustrated, the filtering device 12 may be provided directly in the tub 3, preferably obtained in a single piece construction with the latter. In this case the filtering device 12 is fluidly connected to the outlet of the tub 3, in such a way that water or washing liquid drained from the tub 3 enters the filtering device 12.

[0068] The draining pump 26 is preferably connected to a rear part 12b of the filtering device 12 and conveys the liquid to the outlet pipe 28 through an outlet 29, the latest better visible in Figure 6 where the outlet pipe 28 has been removed.

[0069] Activation of the drain pump 26 drains the liquid, for example dirty water or water mixed with washing and/or rinsing products, from the tub 3 to the outside.

[0070] Laundry washing machine 1 advantageously comprises a first recirculation circuit 30, or mixing circuit 30. The mixing circuit 30 is adapted to drain liquid from the bottom region 3a of the tub 3 and to re-admit such a liquid (recirculated mixing liquid) into a first region of the tub 3, which corresponds substantially to the same bottom region 3a of the tub 3.

[0071] Preferably, the mixing circuit 30 is adapted to drain liquid from the bottom of the sump 15 and to re-admit such a liquid again into the sump 15. More preferably, the liquid is re-admitted again into the sump 15 below the heating device 10.

[0072] The mixing circuit 30 preferably comprises a first recirculation pump 31, a first recirculation pipe 32 connecting the filtering device 12 to the first recirculation pump 31 and a second recirculation pipe 33 connecting the first recirculation pump 31 to the bottom region 3a of the tub 3. The second recirculation pipe 33 is advantageously provided with a terminal portion 34, or nozzle, better visible in Figure 6. The terminal portion 34 advantageously ends inside the sump 15, as mentioned above.

[0073] The liquid from the bottom region 3a of the tub 3 is conveyed again towards the bottom region 3a of the tub 3 by activation of the first recirculation pump 31.

[0074] Advantageously, the liquid from the bottom region 3a of the tub 3 is conveyed towards the bottom region 3a of the tub 3 in the gap 55 between the tub 3 and the drum 4.

[0075] In a further embodiment, not illustrated, the mixing circuit may comprise a dedicated pipe connecting the bottom region of the tub to the recirculation pump; in this case the mixing circuit is advantageously completely separated from the water outlet circuit, i.e. completely separated from the filtering device 12 and the main pipe 17.

[0076] The mixing circuit is preferably realized for transferring a portion of a liquid from a bottom region of the tub to the same bottom region for mixing and/or dissolving the products.

[0077] In general, the mixing circuit is preferably realized for transferring liquid from a bottom region of the tub and for re-admitting such a liquid into the washing tub such that at least a portion of the re-admitted liquid reaches the bottom region of the washing tub without entering the washing drum.

[0078] More preferably, the mixing circuit is realized for transferring liquid from a bottom region of the tub and for re-admitting such a liquid into the washing tub such that all, or substantially all, the re-admitted liquid reaches the bottom region of the washing tub without entering the washing drum.

[0079] Laundry washing machine 1 preferably comprises a second recirculation circuit 20 adapted to drain liquid from the bottom region 3a of the tub 3 and to re-admit such a liquid into a second region 3b, or upper region, of the tub 3.

[0080] The second recirculation circuit 20 preferably comprises a second recirculation pump 21, a first recirculation pipe 22 connecting the filtering device 12 to the second recirculation pump 21 and a second recirculation pipe 23 connecting the second recirculation pump 21 to the upper region 3b of the tub 3. The second recirculation pipe 23 is preferably provided with a terminal nozzle 23a arranged preferably at the upper region 3b of the tub 3. The terminal nozzle 23a is opportunely arranged so that the liquid is sprayed into the perforated drum 4.

[0081] More preferably the terminal nozzle 23a is integrally formed in the bellows 7, as visible in Figure 4, and the liquid is therefore advantageously sprayed in a direction against the perforated drum 4.

[0082] The liquid from the bottom region 3a of the tub 3 is conveyed towards the upper region 3b of the tub 3 by activation of the second recirculation pump 21.

[0083] The second recirculation circuit 20 is advantageously activated in order to improve wetting of the laundry inside the drum 4 and for reducing the water required in the whole washing cycle.

[0084] In general, the second recirculation circuit is properly realized for transferring a portion of a liquid from a bottom region of the tub, preferably from the sump, to an upper region of the tub in order to enhance absorption of the liquid by the laundry.

[0085] Advantageously, laundry washing machine 1 comprises a device 19 suited to sense (or detect) the liquid level inside the tub 3.

[0086] The sensor device 19 preferably comprises a pressure sensor which senses the pressure in the tub 3. From the values sensed by the sensor device 19 it is possible to determine the liquid level of the liquid inside the tub 3. In another embodiment, not illustrated, laundry washing machine may preferably comprise (in addition to or as a replacement of the pressure sensor) a level sensor (for example mechanical, electro-mechanical, optical, etc.) adapted to sense (or detect) the liquid level inside the tub 3.

[0087] The laundry washing machine 1 advantageously comprises a wash products dispenser 59 to supply

wash products into the tub 3 during a washing cycle. Wash products may comprise, for example, detergent, rinse additives, fabric softener or fabric conditioners, waterproofing agents, fabric enhancers, rinse sanitization additives, chlorine-based additives, etc..

[0088] In the preferred embodiment here illustrated and described, the wash products dispenser 59 preferably comprises a single-use wash products dispenser 60 and an automatic dosing device 70 for multiple doses of wash products.

[0089] In the preferred embodiment here described and illustrated, the single-use wash products dispenser 60 comprises three compartments 61, 62 and 63 suited to be filled, for example, with detergent D, fabric softener S and bleach B.

[0090] In different embodiments, nevertheless, the single-use wash products dispenser may comprise further compartments suited to be filled with other type of wash products which are suitable to be used in the washing cycle.

[0091] Compartments 61, 62 and 63 of the single-use wash products dispenser 60 are filled with the respective wash product at the beginning of each washing cycle.

[0092] The automatic dosing device 70 here described and illustrated comprises a main container 71 which may be filled with a large amount of wash product, in particular detergent D, which is then dispensed in a predetermined dose during each washing cycle. The main container 71 is therefore filled with a quantity of detergent D sufficient for several washing cycles. The main container 71 advantageously comprises an inlet 90 with cover 91 for introduction of detergent D by the user.

[0093] In the preferred embodiment here described and illustrated, the compartments 61, 62 and 63 of the single-use wash products dispenser 60 and the main container 71 of the automatic dosing device 70 are part of a drawer 6 slidably received in a drawer housing 40 located within the cabinet 2.

[0094] The compartments 61, 62 and 63 are then preferably open at their upper side so that they can be easily filled by the user with the respective wash product.

[0095] The main container 71 is preferably a removable container 71, or cartridge, as illustrated in particular in Figure 2. The user may easily remove the cartridge 71 to refill it with detergent D or to replace it with another.

[0096] In different embodiments, nevertheless, the main container may be fixed to the drawer.

[0097] The main container 71 preferably has a substantially rectangular box-like shape which is capable of being received within the drawer 6.

[0098] In different embodiments, the main container may have any shape and size that is receivable within the drawer. The container may be flexible, rigid, expandable, or collapsible and may be made of any type of material.

[0099] Further features of the automatic dosing device 70 will be described later throughout the description.

[0100] In the preferred embodiment here illustrated

and described, as said above, the wash products dispenser 59 comprises both a single-use wash products dispenser 60 and an automatic dosing device 70 for multiple doses of wash products.

[0101] In a preferred embodiment of the invention, the washing cycle may be carried out using only the automatic dosing device 70. In this case, for example, the washing cycle will use a dose of detergent D supplied by the automatic dosing device 70. In this case, therefore, the use of the single-use wash products dispenser 60 will be neglected.

[0102] In another preferred embodiment of the invention, the washing cycle may be carried out using only the single-use wash products dispenser 60. In this case, for example, the washing cycle can use a dose of detergent D and/or a dose of softener S and/or a dose of bleach B supplied by the wash products dispenser 60. In this case, therefore, the use of the automatic dosing device 70 will be neglected.

[0103] In a further preferred embodiment of the invention, the washing cycle may be carried out using both the single-use wash products dispenser 60 and the automatic dosing device 70. In this case, for example, the washing cycle can use a dose of detergent D supplied by the automatic dosing device 70 and a dose of softener S and/or a dose of bleach B supplied by the wash products dispenser 60. The choice of the desired washing cycle between the different mentioned washing cycles, i.e. the use of both the single-use wash products dispenser and the automatic dosing device or the use of only one of them, may be preferably carried out automatically by the laundry washing machine which may sense the presence of wash products in the respective compartments or containers.

[0104] The laundry washing machine may sense the presence of wash products in the respective compartments or containers through suitable sensors preferably arranged at said compartments and/or containers. The sensor may be, for example, a conductivity sensor.

[0105] Alternatively, the choice of the desired washing cycle may be preferably directly inputted by the user through the interface unit 16.

[0106] The drawer housing 40, which receives the drawer 6 in its closed position, preferably has a sloped bottom wall 41 and an outlet 42 located at the rear of the sloped bottom wall 41. The outlet 42 communicates with a supply pipe 18 connected to the tub 3.

[0107] The supply pipe 18, as schematically illustrated in Figure 3 and visible in Figures 5 and 9, is preferably arranged laterally with respect to the tub 3 and preferably terminates at an upper region 3b of the tub 3. More preferably, the supply pipe 18 terminates at a rear side of the tub 3.

[0108] A water supply unit 5 is arranged in the upper part of the laundry washing machine 1 and is suited to supply water from an external supply line E. The water supply unit 5 advantageously comprises two controlled supply valve 5a, 5b and conduits 43a, 43b which termi-

nate at the products dispenser 60 towards the compartments 61, 62 and 63, as better visible in Figure 8A. The supply valve 5a, 5b are properly controlled, opened and closed, during the washing cycle. The water from the external supply line E is directed to one of the compartments 61, 62 and 63 by means of internal water paths (not illustrated) located in interior of the products dispenser 60.

[0109] Water is thus provided to one of the compartments 61, 62 and 63 to flush detergent D or fabric softener S or bleach B from the respective compartment 61, 62 and 63 to the tub 3 through the drawer housing 40, the outlet 42 and the supply pipe 18.

[0110] The water supply unit 5 also preferably comprises a water flow sensor (not shown), for example a flow meter, which makes it possible to calculate the quantity of water supplied from the external supply line E.

[0111] According to an aspect of the invention, the automatic dosing device 70 preferably comprises a dispensing line 72 suited to fluidly connecting the container 71 to the washing tub 3 for conveying the wash product (detergent D) from the container 71 to the washing tub 3. The dispensing line 72 advantageously comprises a conduit 76.

[0112] According to a preferred aspect of the invention, the dispensing line 72 has an inlet side 73 coupable to the container 71 and an outlet side 74 coupled to one of the recirculation circuits.

[0113] In the preferred embodiment here illustrated and described, the outlet side 74 of the dispensing line 72 is coupled to the second recirculation circuit 20 in a junction area 92. More preferably, the outlet side 74 of the dispensing line 72 is coupled to the second recirculation pipe 23 close to terminal nozzle 23a.

[0114] In different embodiments, as schematically illustrated in Figure 21, the outlet side of the dispensing line 72 may terminate at any other point of the second recirculation circuit 20, for example at any point of the second recirculation pipe 23 (see junction area 92a) or at any point of the first recirculation pipe 22 (see junction area 92b). In different embodiments, the outlet side 74 of the dispensing line 72 may terminate at any other point of the first recirculation circuit 30, for example at any point of the second recirculation pipe 33 (see junction area 92c) or at any point of the first recirculation pipe 32 (see junction area 92d).

[0115] The inlet side 73 of the dispensing line 72 preferably comprises a dispenser pump 75 which is properly controlled, activated and de-activated, during the washing cycle.

[0116] In particular, the dispenser pump 75 is activated during the washing cycle for transferring a quantity of detergent D, or a dose of detergent D, from the container 71 to the washing tub 3.

[0117] In different embodiments, the dispenser pump may be located at any point of the dispensing line.

[0118] The inlet side 73 of the dispensing line 72 is then advantageously fluidly connectable to the container

71. In the preferred embodiment here illustrated and described, the container 71 and the drawer 6 may assume an inserted working position, as illustrated for example in Figures 8, 8A and 9, or an extracted position, as illustrated for example in Figures 10, 10A and 11. At this purpose, the inlet side 73 of the dispensing line 72 and the container 71 are coupled through a connecting device 77. The connecting device 77 preferably comprises a male portion 78 which communicates with the dispenser pump 75 and a female portion 79 which communicates with the container 71. The female portion 79 of the container 71 is inserted in the male portion 78 when the container 71 is in its closed working position (as illustrated in Figure 8A).

[0119] The male portion 78 preferably comprises a valve, not illustrated, which is opened when the container 71 is in its closed working position and is automatically closed when the container 71 and the drawer 6 are moved towards the open position, so as to avoid detergent leakage.

[0120] Alternatively, the male portion may communicate with the container dispenser and the female portion may communicate with the dispenser pump

[0121] It is clear that in different embodiments, the connecting device may be differently realized.

[0122] From the above it follows that if the drawer 6 is in its inserted working position the container 71 is fluidly connected to the dispensing line 72 and if the drawer 6 is in its extracted position the container 71 is fluidly disconnected from the dispensing line 72.

[0123] As said above, the dispenser pump 75 is opportunely activated during the washing cycle for transferring a dose of detergent D to the washing tub 3.

[0124] In a preferred embodiment of the invention, then, during the washing cycle together with the activation of the dispenser pump 75 also the second recirculation circuit 20 is activated. The second recirculation circuit 20 is activated when liquid, in particular water, is present at the bottom region 3a of the tub 3. Advantageously, detergent D coming from the dispensing line 72 (from the conduit 76) and liquid (for example water) flowing through the second recirculation pipe 23 are mixed together in the junction area 92 and hence homogeneously sprayed over the laundry through the terminal nozzle 23a.

[0125] According to the preferred aspect of the present invention, by providing the automatic dosing device 70 with a dedicated dispensing line 72 for conveying the wash product (detergent D) from the container 71 to the washing tub 3 it is not necessary to provide a flushing chamber where the wash product (detergent D) is conveyed and where water is provided to flush the wash product to the washing tub.

[0126] The complexity and size of the automatic dosing device are therefore reduced with respect to the system of the known technique.

[0127] Also, the reduced complexity and size of the automatic dosing device gives freedom to place the dos-

ing device in a favourable position of the cabinet, as will become apparent from the description of other embodiments throughout the description.

[0128] Furthermore, according to another preferred aspect of the present invention, the provision of the automatic dosing device 70 with a dedicated dispensing line 72 terminating at a recirculation circuit allows mixing of the detergent with liquid flowing in the recirculation circuit and thus allows dilution of the detergent before it reaches the laundry. Advantageously, it is avoided that detergent D causes stains or halos on the laundry, as it may happen if detergent D is directly put on laundry.

[0129] Advantageously, therefore, the provision of the automatic dosing device 70 with a dedicated dispensing line 72 terminating at a recirculation circuit enhances a good dissolution of the detergent D in the water before it reaches the laundry.

[0130] In the preferred embodiment here illustrated and described, the wash products dispenser 59 comprises both the single-use wash products dispenser 60 and the automatic dosing device 70 for multiple doses of wash products.

[0131] In a further preferred embodiment, nevertheless, the wash products dispenser may comprise only the automatic dosing device for multiple doses of wash products, while the single-use wash products dispenser may be absent.

[0132] With reference to Figures from 12 to 14 a laundry washing machine 101 according to a further preferred embodiment of the invention is described.

[0133] Characteristics and components of the laundry washing machine 101 not visible in the Figures may be assumed to be the same as that previously described with reference to Figures 1 to 11.

[0134] In the preferred embodiment here illustrated and described, the wash products dispenser 159 preferably comprises a single-use wash products dispenser 160 and a separated automatic dosing device 170 for multiple doses of wash products.

[0135] The single-use wash products dispenser 160 may comprise one or compartments (not visible) suited to be filled with wash products which are suitable to be used in the washing cycle, for example detergent, fabric softener, bleach, etc..

[0136] Preferably, compartments of the single-use wash products dispenser 160 are part of a first drawer 106a slidably received in a housing located within the cabinet 2. Compartments of the single-use wash products dispenser 160 are filled with the respective wash product at the beginning of each washing cycle, as already explained above with reference to the first preferred embodiment.

[0137] The automatic dosing device 170 here described and illustrated preferably comprises two containers 171a, 171b which may be filled with a large amount of wash product, for example detergent D and softener S, which are then dispensed in a predetermined dose during each washing cycle. The containers 171a, 171b

are therefore filled with a quantity of detergent D and softener S sufficient for several washing cycles. Each container 171a, 171b advantageously comprises an inlet 190a, 190b with cover 191a, 191b for introduction of wash product by the user.

[0138] In the preferred embodiment here illustrated, the containers 171a, 171b of the automatic dosing device 170 are preferably part of a second drawer 106b slidably received in a housing located within the cabinet 2.

[0139] The containers 171a, 171b are preferably removable containers 171a, 171b, or cartridge. The user may easily remove the cartridges 171a, 171b to refill them with detergent D and softener S or to replace them with others.

[0140] In different embodiments, nevertheless, the containers may be fixed to the second drawer 106b.

[0141] The containers 171a, 171b preferably have a substantially rectangular box-like shape. In different embodiments, the containers may have any shape and size that is receivable within the second drawer 106b.

[0142] Furthermore, in the preferred embodiment here illustrated and described, the interface unit 16 (control panel) is arranged in a front side of the second drawer 106b.

[0143] The interface unit 16 preferably comprises a display which displays machine working conditions and/or then preferably comprises one or more selector devices which allow to select the appropriate wash program and/or to set other parameters.

[0144] For example, the selector devices may comprise a rotary knob, push buttons, capacitive switches, touch screen, etc.

[0145] In a preferred embodiment of the invention, the washing cycle may be carried out using only the automatic dosing device 170. In this case, for example, the washing cycle will use a dose of detergent D and of softener S supplied by the automatic dosing device 170. In this case, therefore, the use of the single-use wash products dispenser 160 will be neglected.

[0146] In another preferred embodiment of the invention, the washing cycle may be carried out using only the single-use wash products dispenser 160. In this case, for example, the washing cycle can use a dose of detergent D and/or a dose of softener S and/or a dose of bleach B supplied by the wash products dispenser 160. In this case, therefore, the use of the automatic dosing device 170 will be neglected.

[0147] In a further preferred embodiment of the invention, the washing cycle may be carried out using both the single-use wash products dispenser 160 and the automatic dosing device 170. In this case, for example, the washing cycle can use a dose of detergent D and of softener S supplied by the automatic dosing device 170 and a dose of bleach B supplied by the wash products dispenser 160.

[0148] The choice of the desired washing cycle between the different mentioned washing cycles, i.e. the use of both the single-use wash products dispenser and

the automatic dosing device or the use of only one of them, may be preferably carried automatically by the laundry washing machine which may sense the presence of wash products in the respective compartments or containers.

[0149] Alternatively, the choice of the desired washing cycle may be preferably directly inputted by the user through the interface unit 16.

[0150] According to an aspect of the invention, the automatic dosing device 170 preferably comprises two dispensing lines 172a, 172b suited to fluidly connecting the containers 171a, 171b to the washing tub 3 for conveying the wash products (detergent D and softener S) from the containers 171a, 171b to the washing tub 3. The dispensing lines 172a, 172b advantageously comprise conduits 176a, 176b.

[0151] According to a preferred aspect of the invention, each dispensing line 172a, 172b has an inlet side 173a, 173b coupable to the container 171a, 171b and an outlet side 174a, 174b coupled to one of the recirculation circuits.

[0152] In the preferred embodiment here illustrated and described, the outlet side 174a, 174b of each dispensing line 172a, 172b is coupled to the second recirculation circuit 20 in respective junction area 192a, 192b. More preferably, the outlet side 174a, 174b of each dispensing line 172a, 172b is coupled to the second recirculation pipe 23 close to terminal nozzle 23a.

[0153] In different embodiments, nevertheless, the outlet sides 174a, 174b of the dispensing lines 172a, 172b may terminate at any other point of the second recirculation circuit 20 or at any point of other recirculation circuits.

[0154] The inlet side 173a, 173b of each dispensing line 172a, 172b preferably comprises a respective dispenser pump 175a, 175b which is properly controlled, activated and de-activated, during the washing cycle.

[0155] In particular, the first dispenser pump 175a is activated during the washing cycle for transferring a quantity of detergent D, or a dose of detergent D, from the container 171a to the washing tub 3.

[0156] Analogously, the second dispenser pump 175b is activated during the washing cycle for transferring a quantity of softener S, or a dose of softener S, from the container 171b to the washing tub 3.

[0157] In different embodiments, the dispenser pumps may be located at any point of the respective dispensing line.

[0158] The inlet side 173a, 173b of each dispensing line 172a, 172b is then advantageously fluidly connectable to the respective container 171a, 171b. In the preferred embodiment here illustrated and described, the containers 171a, 171b and the second drawer 106b may assume an inserted working position (not shown) or an extracted position, as illustrated in all Figures 12 to 14. At this purpose, the inlet side 173a, 173b of each dispensing line 172a, 172b and the respective container 171a, 171b are coupled through a connecting device.

Each connecting device preferably comprises a male portion 178a, 178b which communicates with the dispenser pump 175a, 175b and a female portion 179a, 179b which communicates with the container 171a, 171b. The female portions 179a, 179b of the containers 171a, 171b are inserted in the male portions 178a, 178b when the containers 171a, 171b are in their closed working position.

[0159] The male portions 178a, 178b preferably comprises valves, not illustrated, which are opened when the containers 171a, 171b are in closed working position and are automatically closed when the containers 171a, 171b and the second drawer 106b are moved towards the open position, so as to avoid detergent leakage.

[0160] From the above it follows that if the drawer 106b is in its inserted working position the containers 171a, 171b are fluidly connected to respective dispensing lines 172a, 172b and if the drawer 106b is in its extracted position the containers 172a, 172b are fluidly disconnected from the respective dispensing lines 172a, 172b.

[0161] In a preferred embodiment of the invention, then, during the washing cycle together with the activation of one of the dispenser pumps 175a, 175b also the second recirculation circuit 20 is activated. Advantageously, detergent D or softener S coming from the respective dispensing line 172a, 172b (from conduit 176a or conduit 176b) and liquid (for example water) flowing through the second recirculation pipe 23 are mixed together in the junction area 192a, 192b and hence homogeneously sprayed over the laundry through the terminal nozzle 23a.

[0162] The above-mentioned advantages are therefore achieved.

[0163] Furthermore, as described above, the automatic dosing device 170 is separated from the single-use wash products dispenser 160. Advantageously, the automatic dosing device 170 may be conveniently arranged in suitable position in the cabinet 2 independently from the position of the single-use wash products dispenser 160.

[0164] Moreover, the automatic dosing device 170 does not need to be connected to the external supply line E. Advantageously, the automatic dosing device 170 may be conveniently arranged in suitable position in the cabinet 2 independently from the position of the external supply line E.

[0165] Positioning of the automatic dosing device 170 in the design of the laundry washing machine 101 can be advantageously carried out to optimize and/or reduce the size of the laundry washing machine 101.

[0166] With reference to Figures from 15 to 17 a laundry washing machine 201 according to a further preferred embodiment of the invention is described.

[0167] Characteristics and components of the laundry washing machine 201 not visible in the Figures may be assumed to be the same as that previously described with reference to Figures 1 to 11.

[0168] In the preferred embodiment here illustrated

and described, the wash products dispenser 259 preferably comprises an automatic dosing device 270 for multiple doses of wash products.

[0169] The automatic dosing device 270 here described and illustrated preferably comprises three containers 271a, 271b, 271c which may be filled with a large amount of wash product, for example detergent D, softener S and bleach B which are then dispensed in a pre-determined dose during each washing cycle. The containers 271a, 271b, 271c are therefore filled with a quantity of detergent D, softener S and bleach B sufficient for several washing cycles. The containers 271a, 271b, 271c advantageously comprise each an inlet 290a, 290b, 290c with cover 291a, 291b, 291c for introduction of wash product by the user.

[0170] Preferably, containers 271a, 271b, 271c of the automatic dosing device 270 are slidably received in a housing located within the cabinet 2 and accessible from the top wall 2a of the cabinet 2.

[0171] The containers 271a, 271b, 271c are preferably vertically inserted in the housing, or vertically removed from the housing.

[0172] A lid 214 is preferably pivotally connected to the top wall 2a of the cabinet 2 to cover the containers 271a, 271b, 271c.

[0173] The containers 271a, 271b, 271c are preferably removable containers, or cartridge. The user may easily remove the cartridges 271a, 271b, 271c to refill them with detergent D, softener S and bleach B or to replace them with others.

[0174] In different embodiments, nevertheless, the containers may be fixed to the casing 2.

[0175] The containers 271a, 271b, 271c preferably have a substantially rectangular box-like shape. In different embodiments, the containers may have any shape and size that is receivable within the cabinet 2.

[0176] In the preferred embodiment of the invention, the washing cycle may be carried out using the automatic dosing device 270. In this case, the washing cycle will use a dose of detergent D, softener S or bleach B supplied by the automatic dosing device 270. In this case, therefore, a single-use wash products dispenser is not necessary.

[0177] In a further preferred embodiment of the laundry washing machine, the wash products dispenser 259 may also comprise a single-use wash products dispenser, for example arranged close to the automatic dosing device. The single-use wash products dispenser may comprise one or compartments suited to be filled with wash products which are suitable to be used in a single washing cycle. In this case, as already described in previous embodiments, the automatic dosing device and the single-use wash products dispenser may both be used during a washing cycle.

[0178] According to an aspect of the invention, the automatic dosing device 270 preferably comprises three dispensing lines 272a, 272b, 272c suited to fluidly connecting the containers 271a, 271b, 271c to the washing

tub 3 for conveying the wash products (detergent D, softener S and bleach B) from the containers 271a, 271b, 271c to the washing tub 3. The dispensing lines 272a, 272b, 272c advantageously comprise conduits 276a, 276b, 276c.

[0179] According to a preferred aspect of the invention, each dispensing line 272a, 272b, 272c has an inlet side coupable to the container 271a, 271b, 271c and an outlet side coupled to one of the recirculation circuits.

[0180] In the preferred embodiment here illustrated and described, the outlet side of each dispensing line 272a, 272b, 272c is coupled to the second recirculation circuit 20 in respective junction area 292a, 292b, 292c. More preferably, the outlet side of each dispensing line 272a, 272b, 272c is coupled to the second recirculation pipe 23 close to terminal nozzle 23a.

[0181] In different embodiments, nevertheless, the outlet sides of the dispensing lines 272a, 272b, 272c may terminate at any other point of the second recirculation circuit 20 or at any point of others recirculation circuits.

[0182] The inlet side of each dispensing line 272a, 272b, 272c preferably comprises a respective dispenser pump 275a, 275b, 275c which is properly controlled, activated and de-activated, during the washing cycle.

[0183] In particular, the first dispenser pump 275a is activated during the washing cycle for transferring a quantity of detergent D, or a dose of detergent D, from the container 271a to the washing tub 3.

[0184] Analogously, the second dispenser pump 275b is activated during the washing cycle for transferring a quantity of softener S, or a dose of softener S, from the container 271b to the washing tub 3.

[0185] Analogously, the third dispenser pump 275c is activated during the washing cycle for transferring a quantity of bleach B, or a dose of bleach B, from the container 271c to the washing tub 3.

[0186] In different embodiments, the dispenser pumps may be located at any point of the respective dispensing line.

[0187] The inlet side of each dispensing line 272a, 272b, 272c is then advantageously fluidly connectable to the respective container 271a, 271b, 271c. At this purpose, the inlet side of each dispensing line 272a, 272b, 272c and the respective container 271a, 271b, 271c are coupled through a connecting device. Each connecting device preferably comprises a male portion 278a, 278b, 278c which communicates with the dispenser pump 275a, 275b, 275c and a female portion 279a, 279b, 279c which communicates with the container 271a, 271b, 271c. The female portions 279a, 279b, 279c of the containers 271a, 271b, 271c are inserted in the male portions 278a, 278b, 278c when the containers 271a, 271b, 271c are in their inserted working position.

[0188] In a preferred embodiment of the invention, then, during the washing cycle together with the activation of one of the dispenser pumps 275a, 275b, 275c also the second recirculation circuit 20 is activated. Advantageously, detergent D, softener S or bleach B coming from

the respective dispensing line 272a, 272b, 272c (conduits 276a, 276b, 276c) and liquid (for example water) flowing through the second recirculation pipe 23 are mixed together in the junction area 292a, 292b, 292c and hence homogeneously sprayed over the laundry through the terminal nozzle 23a. The above-mentioned advantages are therefore achieved.

[0189] The above-mentioned advantages are therefore achieved.

[0190] Figure 18 shows a laundry washing machine 301 according to a further preferred embodiment of the invention.

[0191] Laundry washing machine 301 differs from the laundry washing machine 201 previously described with reference to Figures 15 to 17 in that the wash products dispenser 359 comprises an automatic dosing device 370 which has two containers 371a, 371b, instead of three containers.

[0192] The two containers 371a, 371b, may be filled with a large amount of wash product, for example detergent D and/or softener S (or bleach B) which are then dispensed in a predetermined dose during each washing cycle.

[0193] Preferably, containers 371a, 371b are slidably received in a housing located within the cabinet 2 an accessible from the top wall 2a of the cabinet 2.

[0194] The containers 371a, 371b, are preferably vertically inserted in the housing, or vertically removed from the housing.

[0195] Figure 19 shows a laundry washing machine 401 according to a further preferred embodiment of the invention.

[0196] Laundry washing machine 401 differs from the laundry washing machine 301 previously described with reference to Figure 18 in that the two containers 471a, 471b of the automatic dosing device 470 of the wash products dispenser 459 are obtained in a single piece construction. The two containers 471a, 471b define a completed, integral, unitary member.

[0197] Figure 20 shows a laundry washing machine 501 according to a further preferred embodiment of the invention.

[0198] Laundry washing machine 501 differs from laundry washing machine 101 previously described with reference to Figure 12 in that the second drawer 106b does not contain any container for any wash products. The second drawer 106b may be suitable to receive any other type of items.

[0199] It has thus been shown that the present invention allows all the set objects to be achieved. In particular, it makes it possible to provide an alternative system for supplying a dose of a wash product into the washing tub in a laundry washing machine equipped with an automatic dosing device.

[0200] It is underlined that the laundry washing machines illustrated in the enclosed figures are of the front-loading type; however it is clear that the system according to the invention can be applied as well to a top-loading

washing machine, substantially without any modification.

[0201] Furthermore, the laundry washing machines illustrated in the enclosed figures preferably comprise two recirculation circuits; however the invention can be applied as well to laundry washing machine having only one recirculation circuit or also to laundry washing machine having more than two recirculation circuits.

[0202] Reference to a recirculation circuit is meant to indicate a circuit realized for transferring liquid from a bottom region of the tub and for re-admitting such a liquid again into the washing tub.

[0203] In a preferred embodiment, liquid may preferably be re-admitted in the same bottom region of the tub.

[0204] In a further preferred embodiment, liquid may preferably be re-admitted to an upper region of the tub.

[0205] While the present invention has been described with reference to the particular embodiments shown in the figures, it should be noted that the present invention is not limited to the specific embodiments illustrated and described herein; on the contrary, further variants of the embodiments described herein fall within the scope of the present invention, which is defined in the claims.

Claims

1. A laundry washing machine (1; 101; 201; 301; 401; 501) comprising:

- a cabinet (2) supporting a washing drum (4) adapted to receive laundry and a washing tub (3) external to said washing drum (4);
- a water supply unit (5) suited to supply water into said washing tub (3);
- an automatic dosing device (70; 170; 270; 370; 470; 570) suited to supply at least one wash product (D, S, B) into said washing tub (3), said automatic dosing device (70; 170; 270; 370; 470; 570) comprising at least one container (71; 171a, 171b; 271a, 271b, 271c; 371a, 371b; 471a, 471b) suitable for receiving an amount of said at least one wash product (D, S, B) sufficient for a plurality of washing cycles;
- a recirculation circuit (20; 30) for transferring liquid from a first region (3a) of said washing tub (3) and for re-admitting said liquid into a second region (3b) of said washing tub (3);
- a control unit (11) for controlling functioning of said laundry washing machine (1; 101; 201; 301; 401; 501);
- an interface unit (16) by means of which the user may select and/or set parameters;

wherein said automatic dosing device (70; 170; 270; 370; 470; 570) comprises a dispensing line (72; 172a, 172b; 272a, 272b, 272c) fluidly connecting said at least one container (71; 171a, 171b; 271a, 271b, 271c; 371a, 371b; 471a, 471b) to said washing

tub (3) for conveying said at least one wash product (D, S, B) from said at least one container (71; 171a, 171b; 271a, 271b, 271c; 371a, 371b; 471a, 471b) to said washing tub (3) and wherein said dispensing line (72; 172a, 172b; 272a, 272b, 272c) terminates at said recirculation circuit (20; 30).

2. A machine (1; 101; 201; 301; 401; 501) according to claim 1, **wherein** said dispensing line (72; 172a, 172b; 272a, 272b, 272c) comprises an inlet side (73a; 173a, 173b) connected to said at least one container (71; 171a, 171b; 271a, 271b, 271c; 371a, 371b; 471a, 471b) and an outlet side (74a; 174a, 174b) connected to said recirculation circuit.

3. A machine (1; 101; 201; 301; 401; 501) according to any of the preceding claims, **wherein** said dispensing line (72; 172a, 172b; 272a, 272b, 272c) comprises a dispenser pump (75; 175a, 175b; 275a, 275b, 275c) suitable for forcing said at least one wash product (D, S, B) inside said dispensing line (72; 172a, 172b; 272a, 272b, 272c).

4. A machine (1; 101; 201; 301; 401; 501) according to any of the preceding claims, **wherein** said at least one container (71; 171a, 171b; 271a, 271b, 271c; 371a, 371b; 471a, 471b) is a removable container.

5. A machine (1; 101; 201; 301; 401; 501) according to any claims from 2 to 4, **wherein** said inlet side (73a; 173a, 173b) of said dispensing line (72; 172a, 172b; 272a, 272b, 272c) and said at least one container (71; 171a, 171b; 271a, 271b, 271c; 371a, 371b; 471a, 471b) are coupable through a connecting device (77).

6. A machine (1; 101; 201; 301; 401; 501) according to claim 5, **wherein** said connecting device (77) preferably comprises a male portion (78; 178a, 178b; 278a, 278b, 278c) communicating with said inlet side (73a; 173a, 173b) of said dispensing line (72; 172a, 172b; 272a, 272b, 272c) or with said container and a female portion (79; 179a, 179b; 279a, 279b, 279c) communicating with said container or with said inlet of said dispensing line (72; 172a, 172b; 272a, 272b, 272c).

7. A machine (1; 101) according to any of the preceding claims, **wherein** said at least one container (71; 171a, 171b) is received in a drawer (6; 106b) slidably coupled to said cabinet (2).

8. A machine (1; 101) according to claims 7 and 6, **wherein** said male portion (78; 178a, 178b; 278a, 278b, 278c) is connected to said female portion (79; 179a, 179b; 279a, 279b, 279c) when said drawer (6; 106b) is in its inserted position and the male portion (78; 178a, 178b; 278a, 278b, 278c) is disconnected

- from the female portion (79; 179a, 179b; 279a, 279b, 279c) when the drawer (6; 106b) is in its extracted position.
9. A machine (101) according to any of the preceding claims, **wherein** said drawer (106b) comprises said interface unit (16). 5
10. A machine (1; 101; 201; 301; 401; 501) according to any of the preceding claims, **wherein** said at least one container (71; 171a, 171b; 271a, 271b, 271c; 371a, 371b; 471a, 471b) is slidably arranged in the upper side of said cabinet (2) so as to be accessible from the upper side of said cabinet (2). 10
11. A machine (201, 301, 401; 501) according to any of the preceding claims, **wherein** said at least one container (271a, 271b, 271c; 371a, 371b; 471a, 471b) is accessible from a top wall (2a) of said cabinet (2). 15
12. A machine (1; 101; 201; 301; 401; 501) according to any of the preceding claims, **wherein** said recirculation circuit (20, 30) comprises a recirculation pump (21, 31) suitable for forcing liquid inside said recirculation circuit (20, 30). 20
13. A machine (1; 101; 201; 301; 401; 501) according to claim 12, **wherein** said recirculation circuit (20, 30) comprises a first pipe (22, 32) fluidly connecting said washing tub (3) to said recirculation pump (20, 30). 30
14. A machine (1; 101; 201; 301; 401; 501) according to claim 12 or 13, **wherein** said recirculation circuit (20, 30) comprises a second pipe (23, 33) fluidly connecting said recirculation pump (21, 31) to said washing tub (3). 35
15. A machine (1; 101; 201; 301; 401; 501) according to claim 13 or 14, **wherein** said dispensing line (72; 172a, 172b; 272a, 272b, 272c) terminates at said first pipe (22, 32) or at said second pipe (23, 33) of said recirculation circuit (20, 30). 40
16. A machine (1; 101; 201; 301; 401; 501) according to claim 14 or 15, **wherein** said dispensing line (72; 172a, 172b; 272a, 272b, 272c) terminates close to a terminal nozzle (23a) of said second pipe (22). 45
17. A machine (1; 101; 201; 301; 401; 501) according to any of the preceding claims, **wherein** said first region is a bottom region (3a) of said washing tub (3). 50
18. A machine (1; 101; 201; 301; 401; 501) according to any of the preceding claims, **wherein** said second region is a bottom region (3a) of said washing tub (3) or an upper region (3b) of said washing tub (3). 55
19. A machine (1; 101) according to any of the preceding claims, **wherein** it further comprises a single-use wash products dispenser (60; 160) comprising at least one compartment (61, 62, 63) suitable for receiving a dose of said at least one wash product (D, S, B) at the beginning of each single washing cycle and said dose is then completely used in said single washing cycle.
20. A machine (1) according to claim 19, **wherein** said at least one compartment (61, 62, 63) of said products dispenser (60) and said at least one container (71) of said automatic dosing device (70) are part of a drawer (6) slidably received in said cabinet (2).
21. A machine (1; 101; 201; 301; 401; 501) according to claim 19, **wherein** said drawer (6) is slidably received in a drawer housing (40) located within the cabinet (2).
22. A machine (1; 101; 201; 301; 401; 501) according to claim 21, **wherein** said drawer housing (40) is suitable to receive said at least one wash product (D, S, B) from said at least one container (71; 171a, 171b; 271a, 271b, 271c; 371a, 371b; 471a, 471b) of said automatic dosing device (70; 170; 270; 370; 470; 570) and said drawer housing (40) is fluidly connected to said washing tub (3).
23. A machine (1; 101; 201; 301; 401; 501) according to any of the preceding claims, **wherein** said recirculation circuit (30) comprises a first circuit adapted to drain liquid from a bottom region (3a) of said washing tub (3) and to re-admit such a liquid into said bottom region (3a) of said washing tub (3) and wherein said dispensing line (72; 172a, 172b; 272a, 272b, 272c) terminates at any point of said first recirculation circuit (30).
24. A machine (1; 101; 201; 301; 401; 501) according to any of the preceding claims, **wherein** said recirculation circuit (20) comprises a second circuit adapted to drain liquid from a bottom region (3a) of said washing tub (3) and to re-admit such a liquid into an upper region (3b) of said washing tub (3) and wherein said dispensing line (72; 172a, 172b; 272a, 272b, 272c) terminates at any point of said second recirculation circuit (30).
25. A method for operating a laundry washing machine (1; 101; 201; 301; 401; 501) according to any of the preceding claims, **wherein** it comprises a step of activating said dispensing line (72; 172a, 172b; 272a, 272b, 272c) for conveying said at least one wash product (D) from said at least one container (71; 171a, 171b; 271a, 271b, 271c; 371a, 371b; 471a, 471b) to said washing tub (3) and a step of activating said recirculation circuit (20; 30) for transferring liquid from said first region (3a) of said washing tub (3) and

for re-admitting said liquid into said second region
(3a, 3b) of said washing tub (3).

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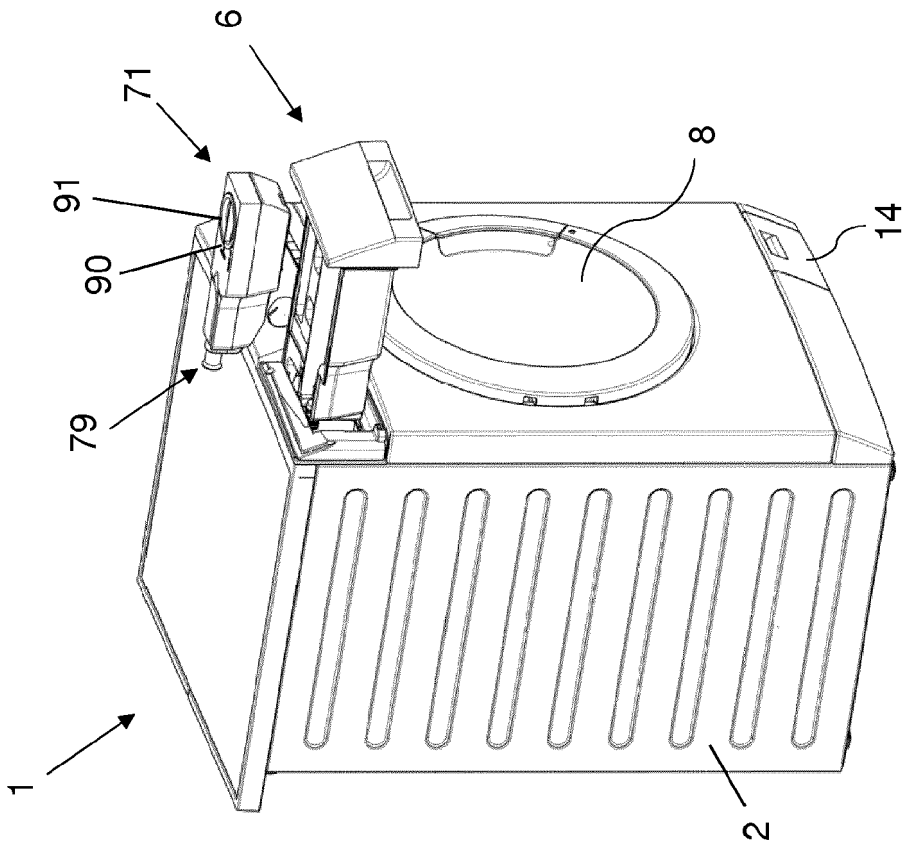


FIG. 1

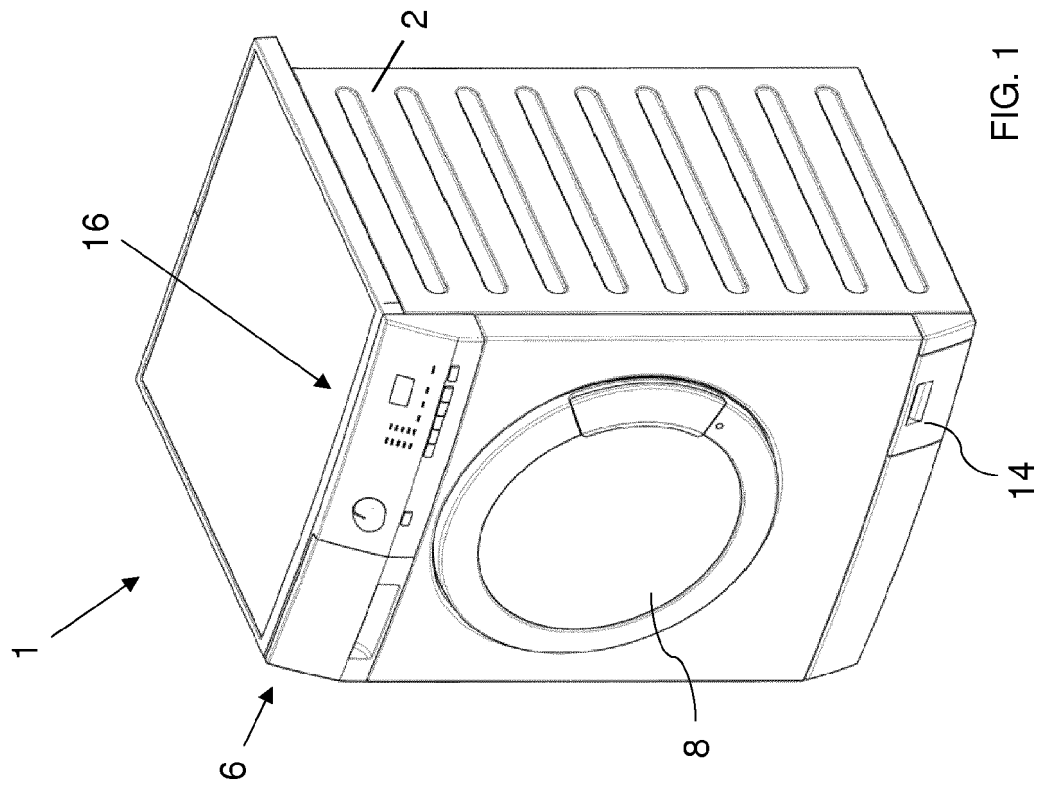


FIG. 2

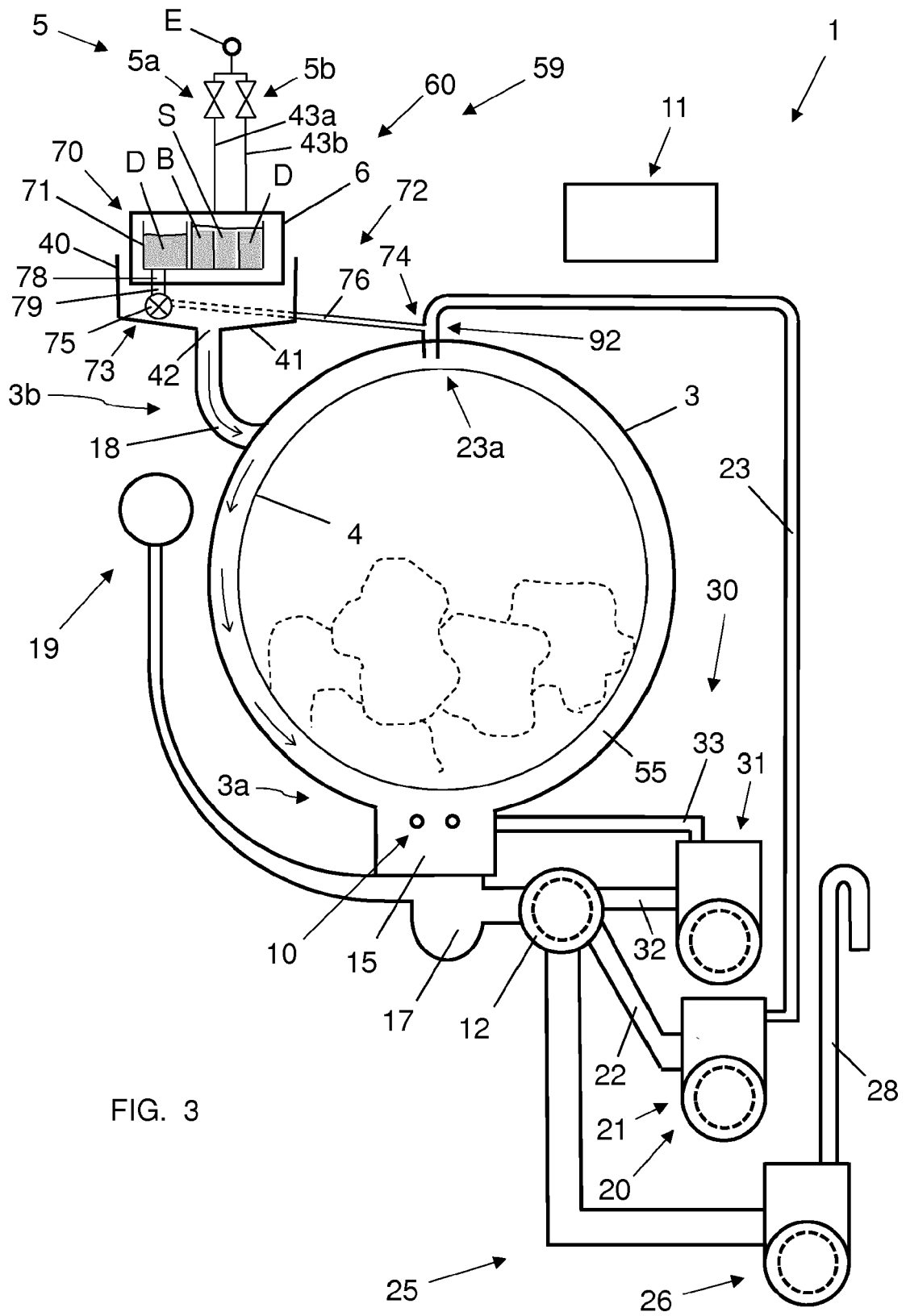


FIG. 3

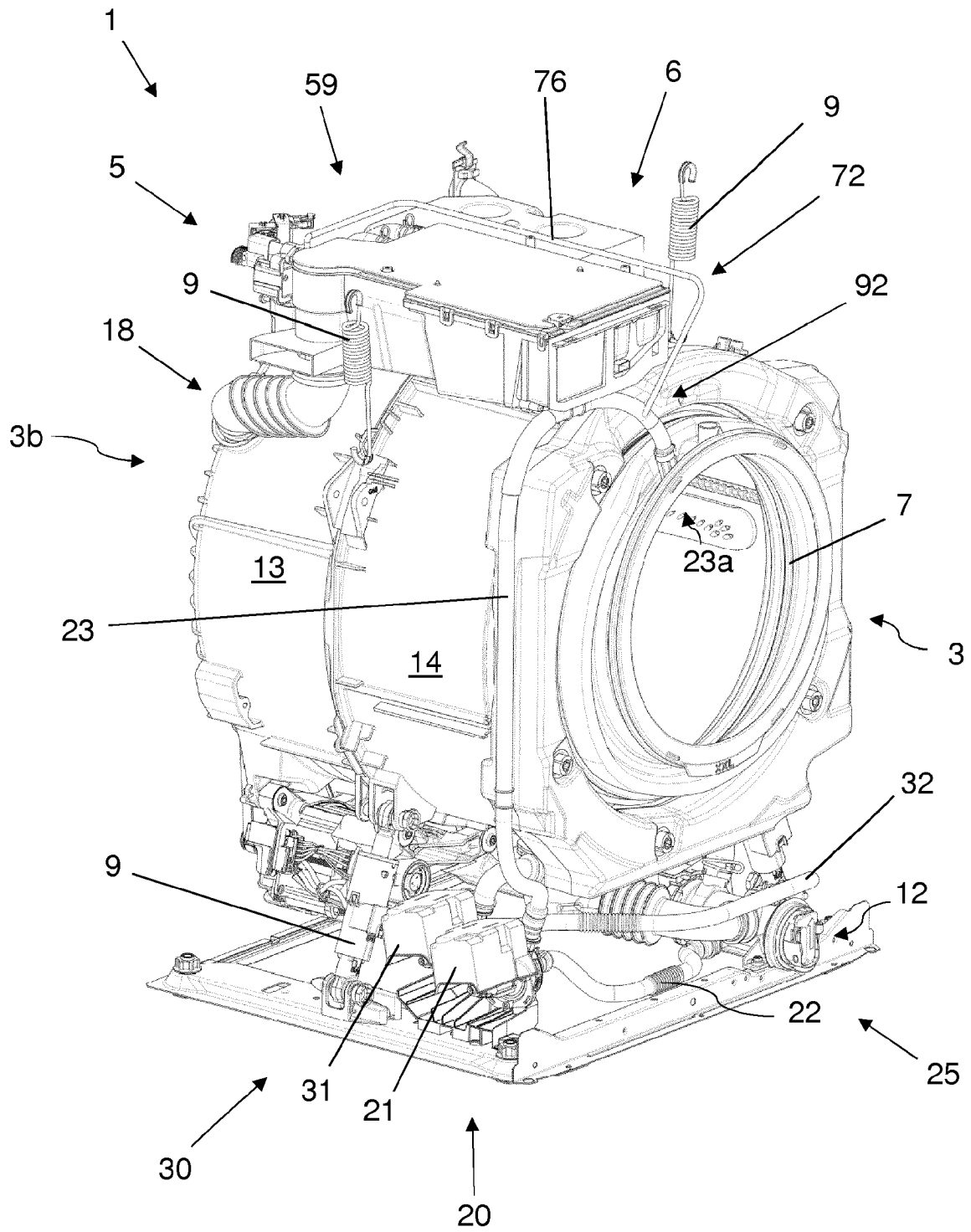


FIG. 5

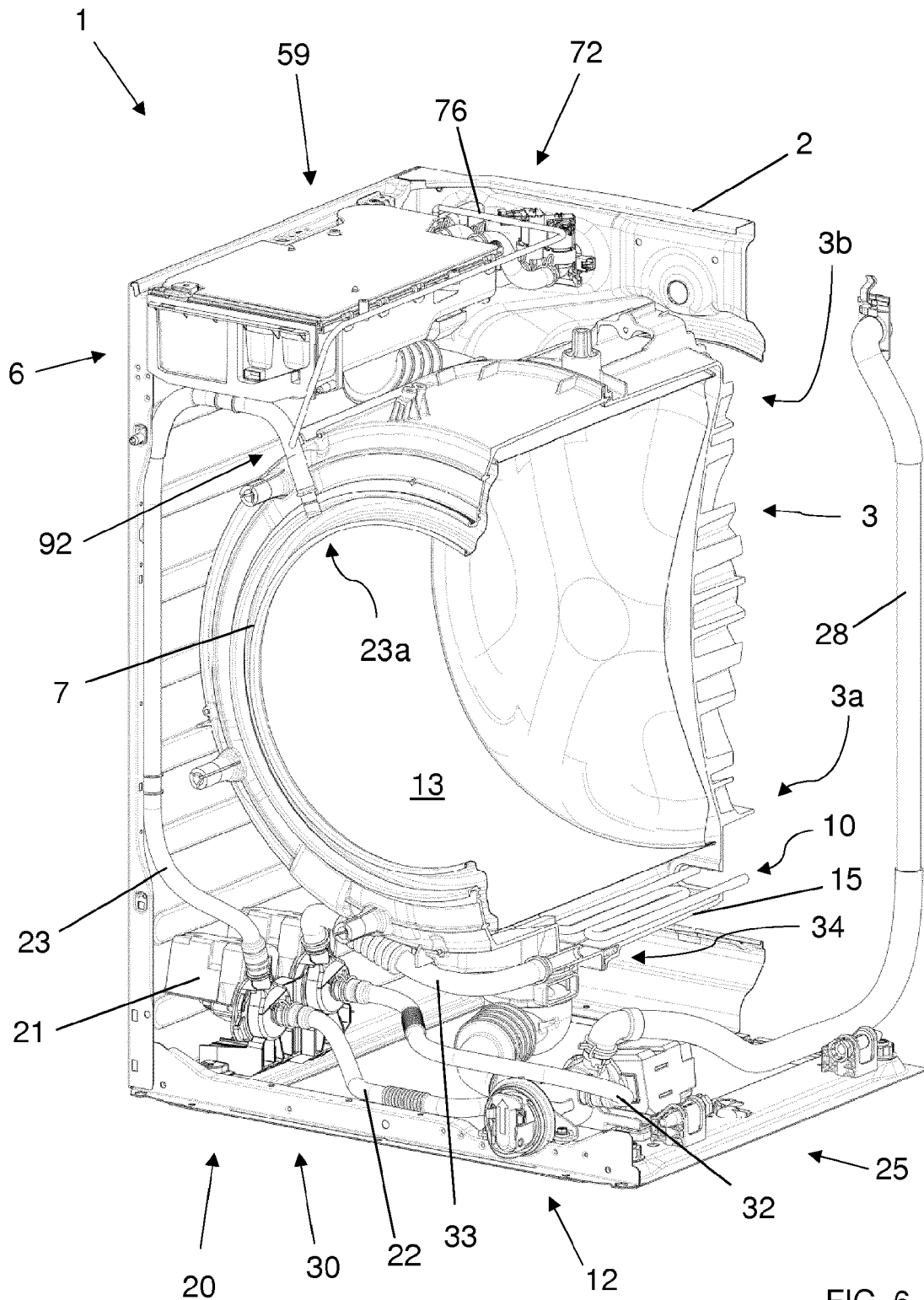


FIG. 6

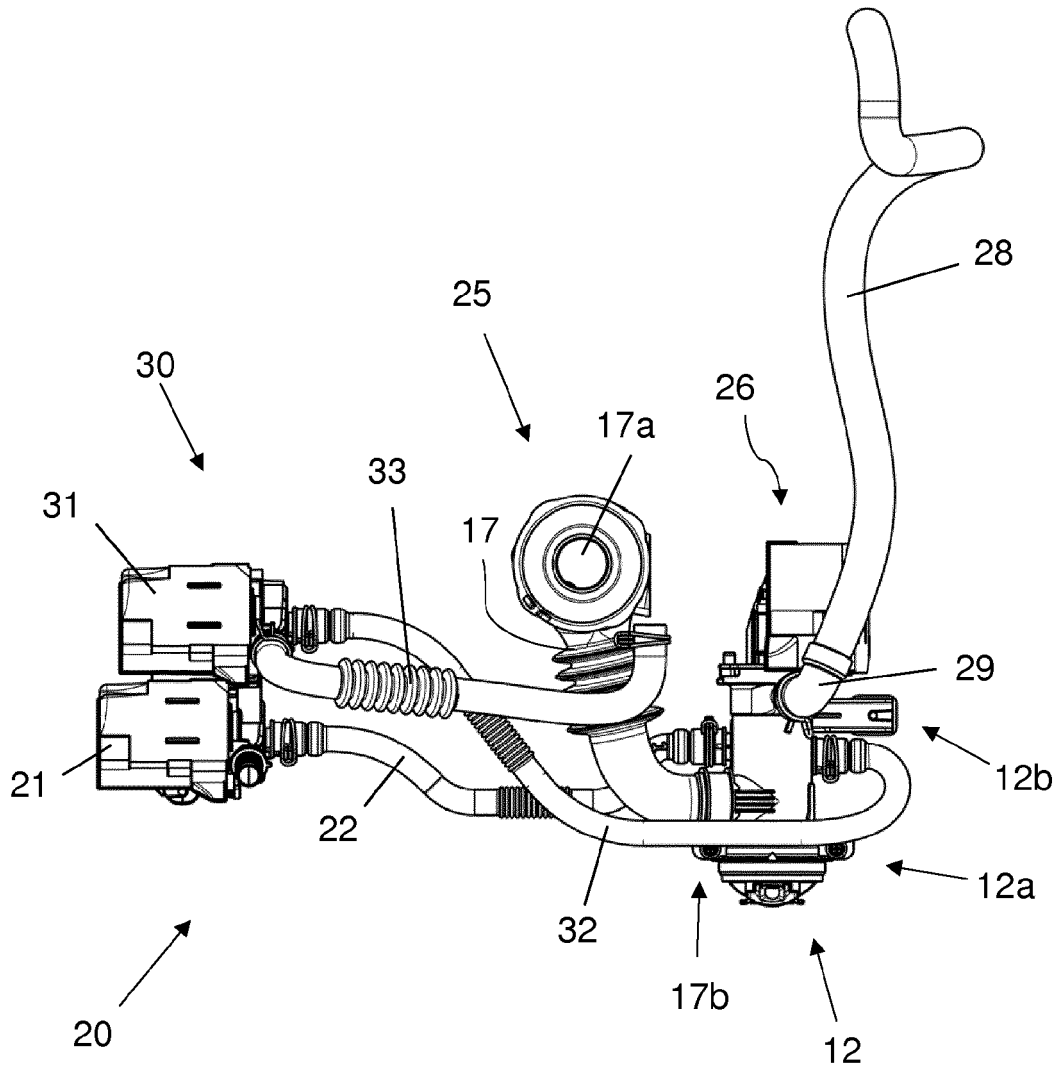


FIG. 7

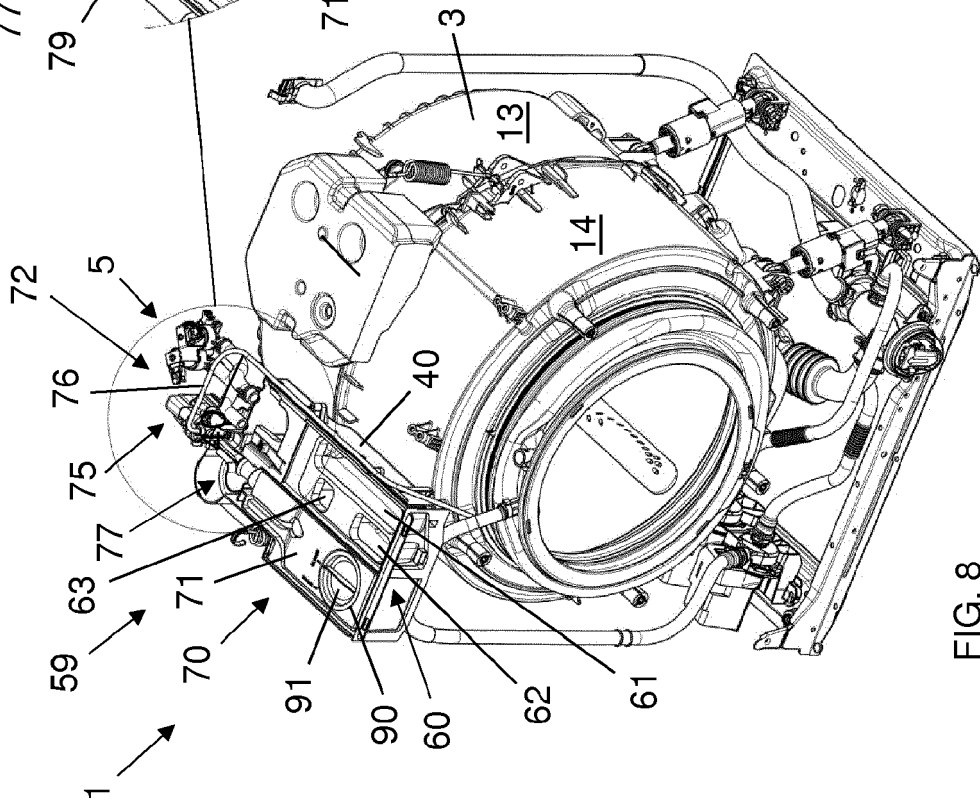
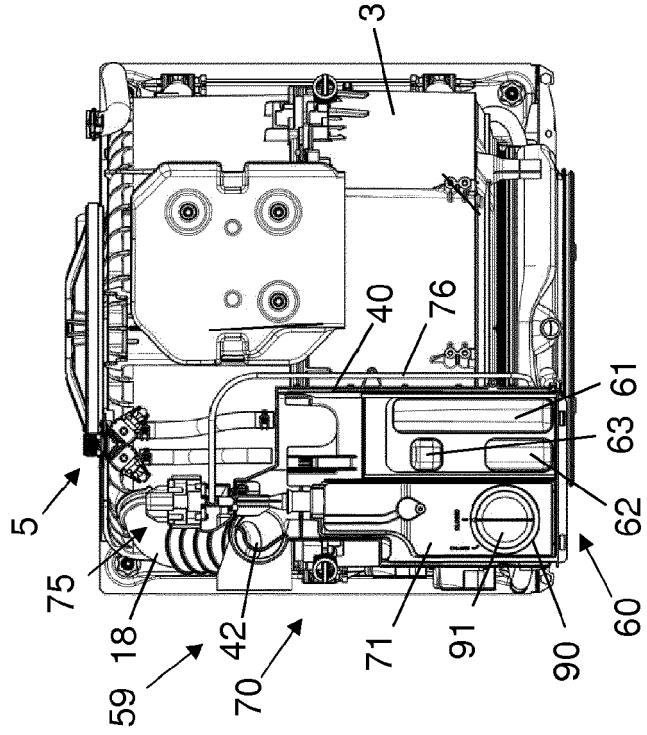
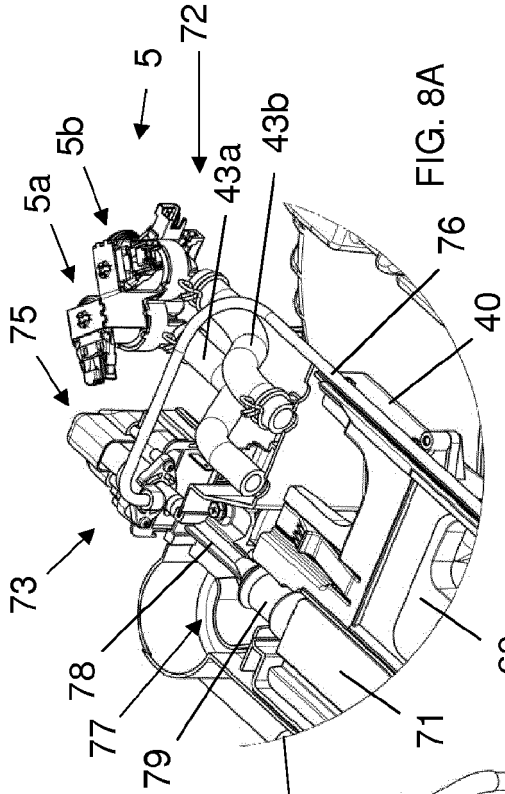
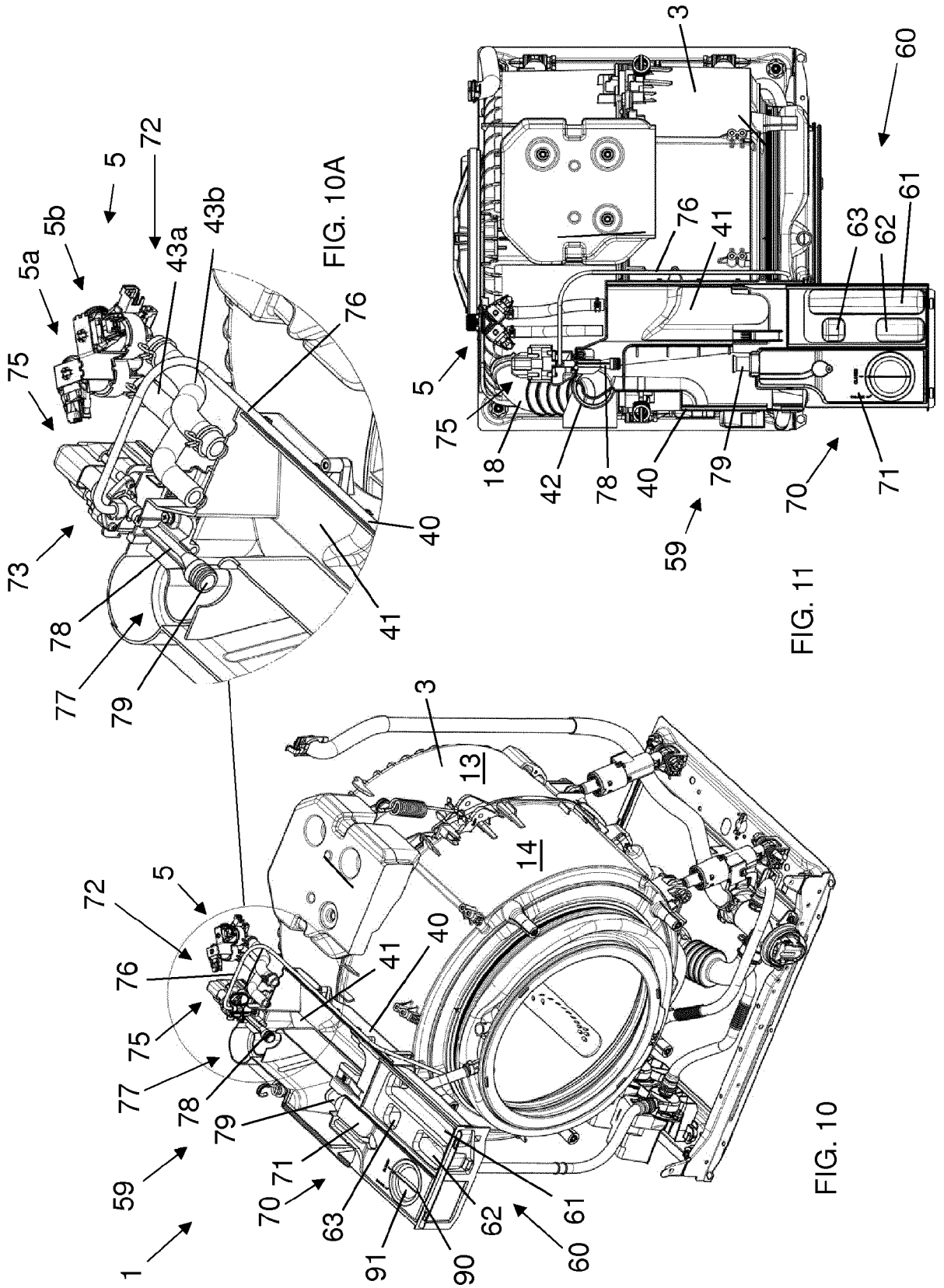


FIG. 8A

FIG. 9

FIG. 8



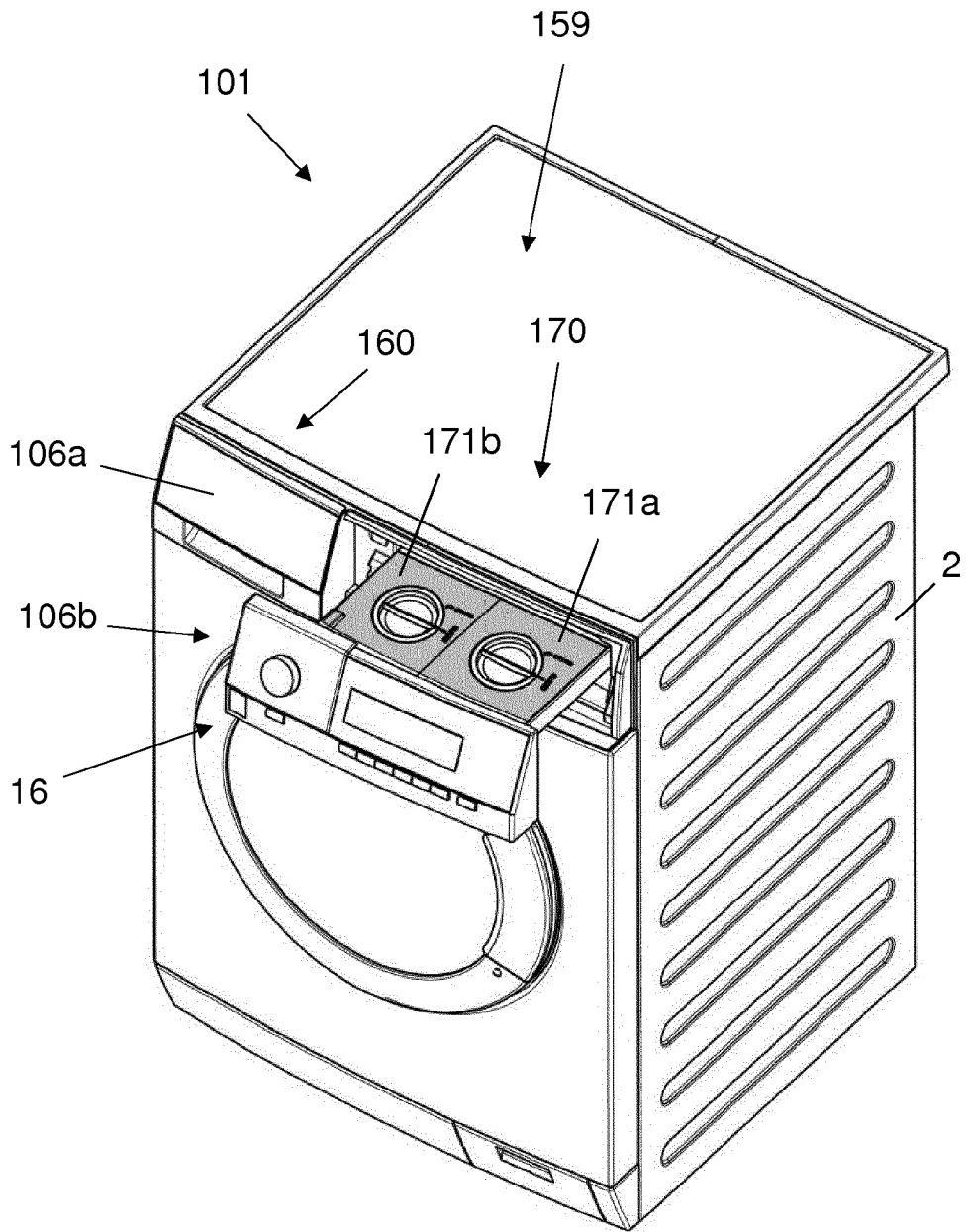


FIG. 12

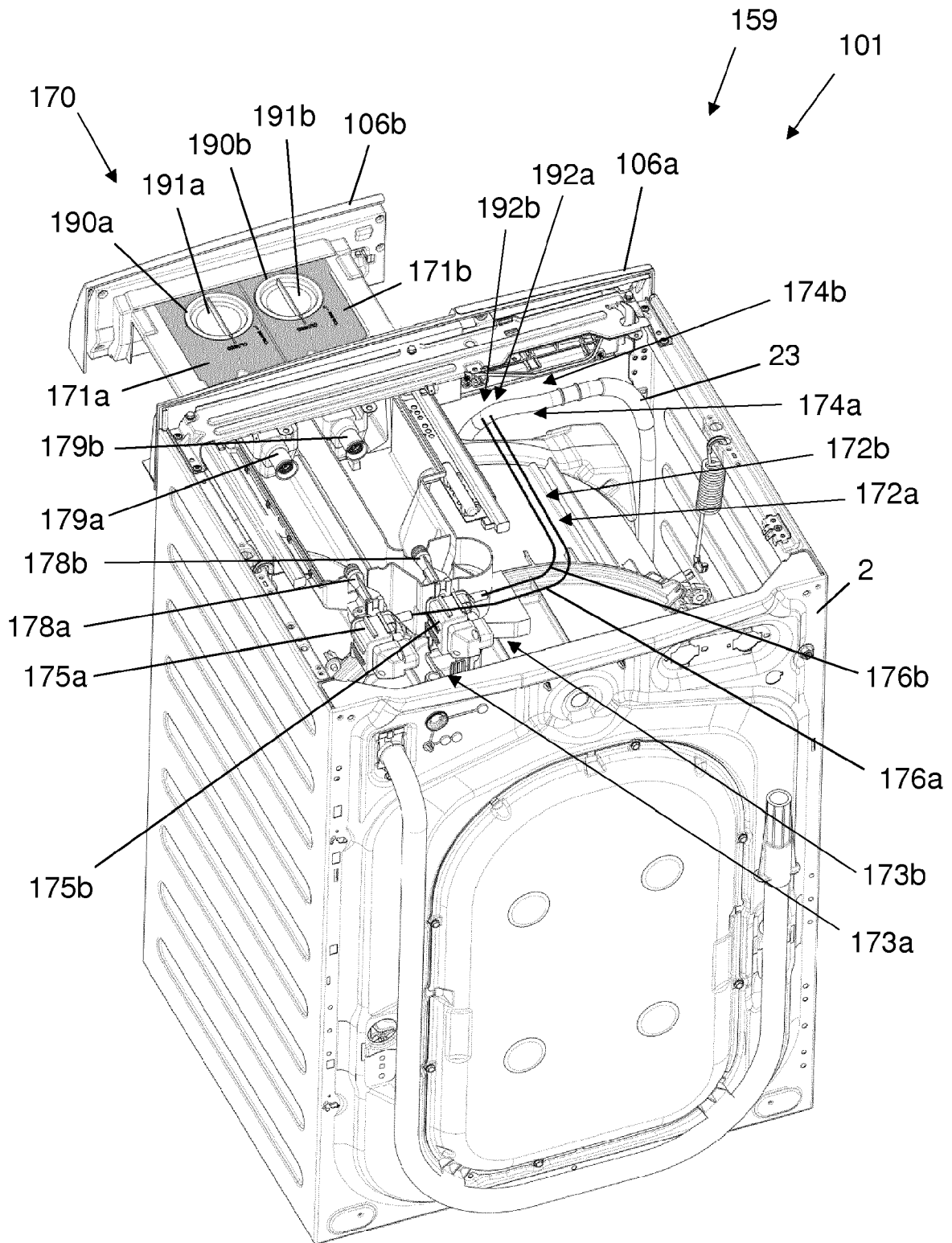


FIG. 14

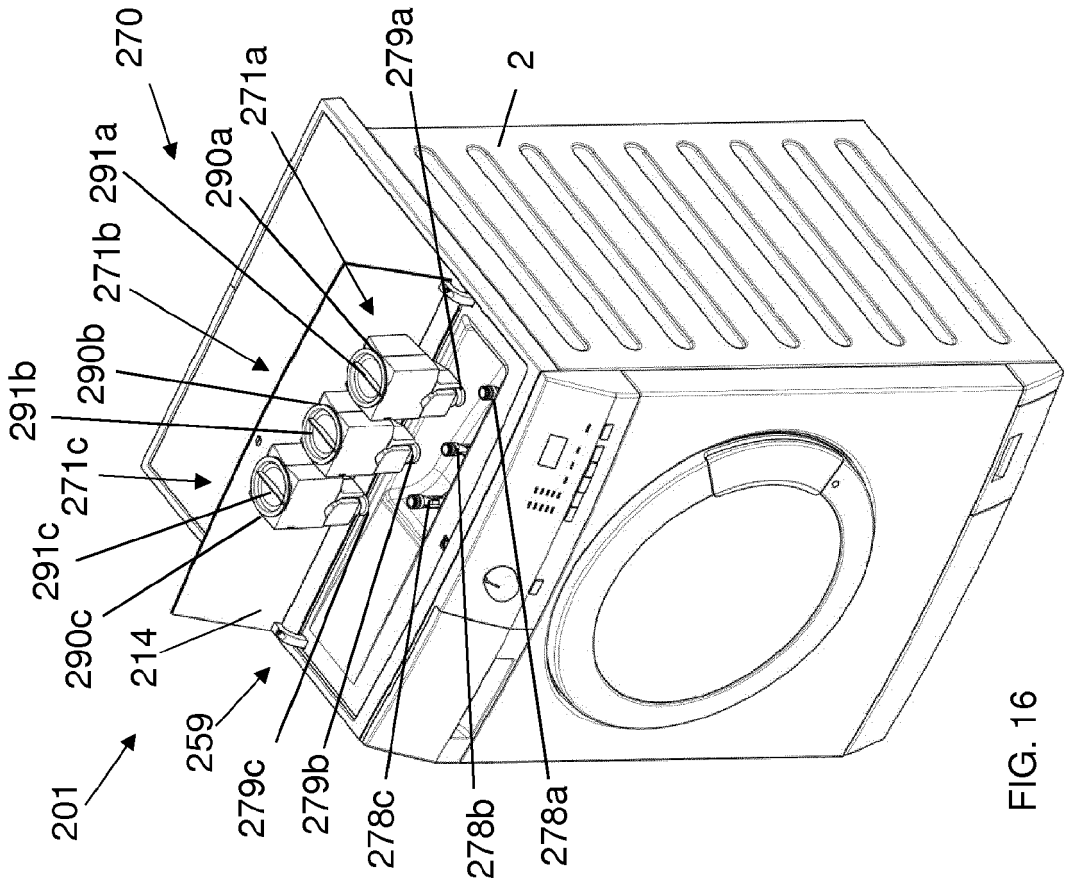


FIG. 16

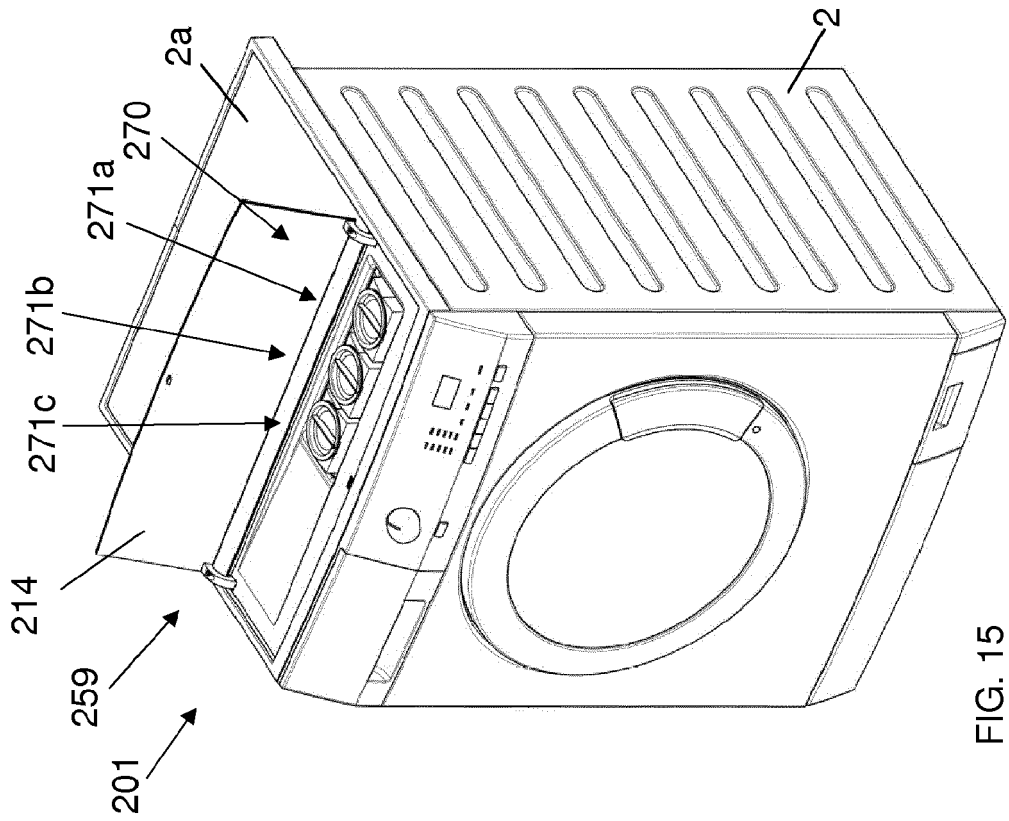


FIG. 15

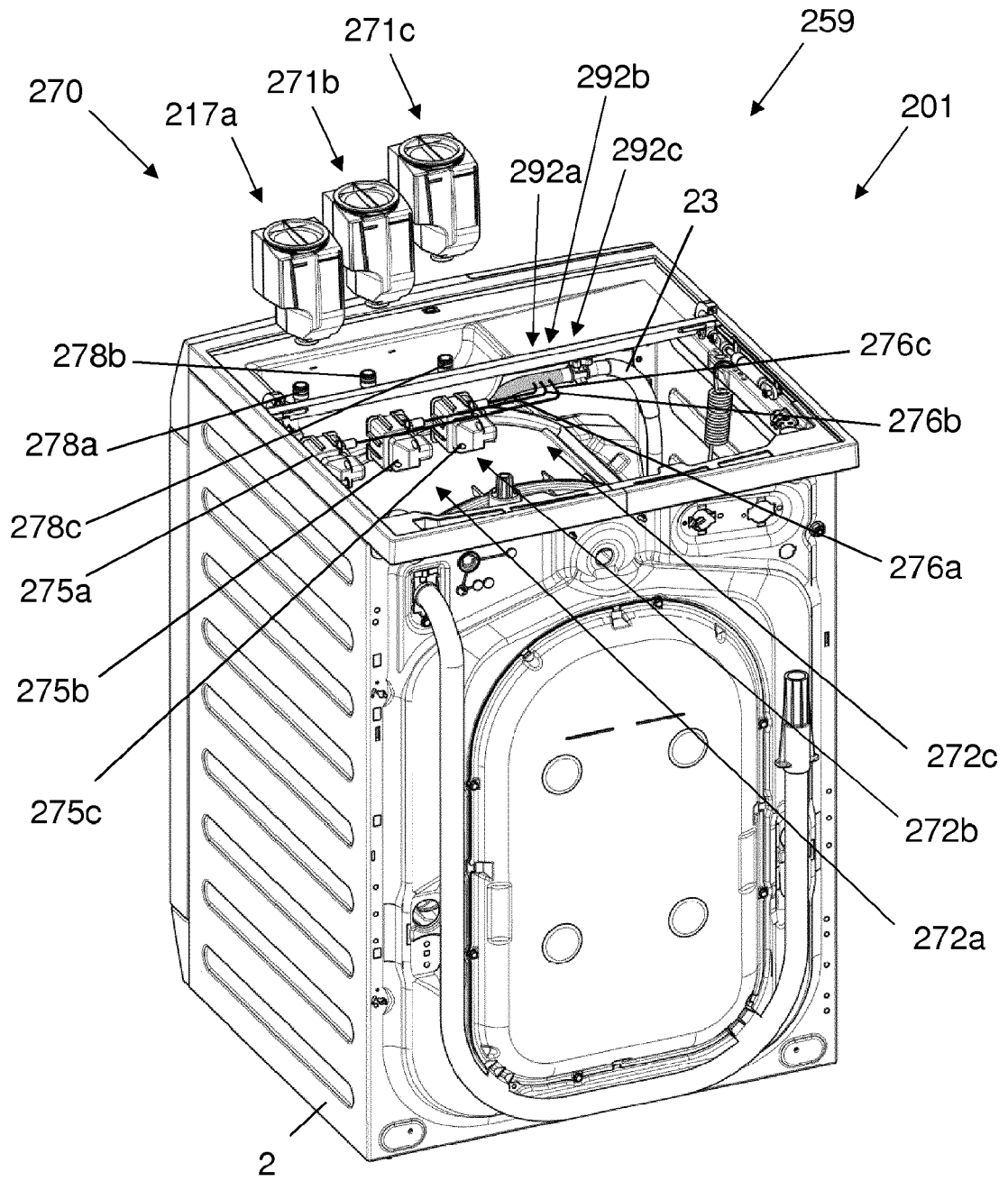


FIG. 17

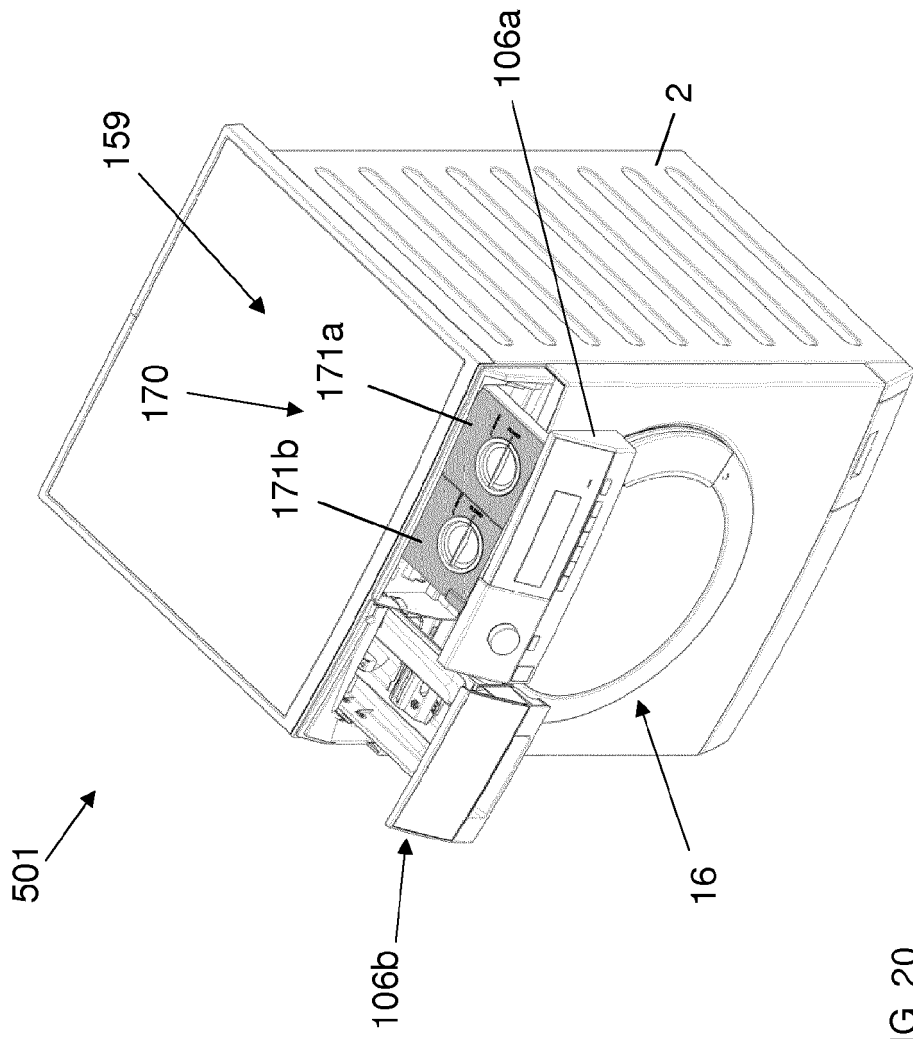


FIG. 20



EUROPEAN SEARCH REPORT

Application Number
EP 18 20 8824

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Y	* columns 9-10; figures 1,5 * -----	16	
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Y	* paragraphs [0034] - [0048]; figure 1 * -----	16	
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			D06F
Place of search		Date of completion of the search	Examiner
Munich		20 March 2019	Stroppa, Giovanni
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