

(19)



(11)

EP 2 039 819 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:

25.03.2009 Bulletin 2009/13

(51) Int Cl.:

D06F 25/00 (2006.01)**D06F 39/08** (2006.01)**D06F 58/22** (2006.01)(21) Application number: **07425580.3**(22) Date of filing: **21.09.2007**

(84) Designated Contracting States:

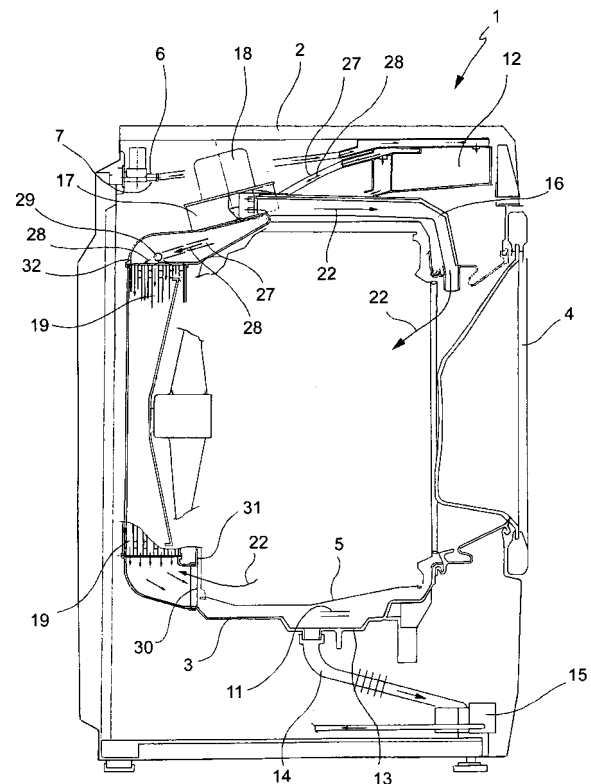
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC MT NL PL PT RO SE SI SK TR

Designated Extension States:

AL BA HR MK RS(71) Applicant: **Candy S.p.A.****20052 Monza (MI) (IT)**(72) Inventor: **Fumagalli, Silvano****20052 Monza, Milano (IT)**(74) Representative: **Leihkauf, Steffen Falk****Jacobacci & Partners S.p.A.****Via Senato, 8****20121 Milano (IT)**(54) **Washer-drier machine**

(57) A washer-drier machine (1) comprising a washing tank (3), a basket (5), a washing water delivery system (6, 7, 12) with a plurality of washing flow paths extending from one or more supply (6, 7), through a detergent tray (12), to the washing tank (3), a drying circuit (16, 17, 18, 19, 20, 21) with a first suction unit (17, 18), an air-to-air heat exchanger (19, 20) and a heating unit (21), said drying circuit being suitable to convey a drying air flow (22) through said basket (5), a cooling circuit (23, 24, 25, 20, 35) with a second suction unit (23, 24) suitable to intake a cooling air flow (26) from the environment and blow it through the air-to-air heat exchanger (19, 20) to cool the latter.

The washer-drier machine further comprises a fluff-rinse duct (27) that is configured to convey a flow of fluff-rinse liquid (28) to the drying circuit in order to remove the fluff therein.

**FIG. 1****EP 2 039 819 A1**

Description

[0001] The present invention relates to a domestic washer-drier machine which provides for washing and drying the laundry.

[0002] Washer-drier machines are known to comprise a support and housing structure, a washing tank being housed therein, which is provided with a front opening that can be closed by means of a porthole door that is hinged in front of the housing. Within the washing tank, a basket is housed rotatably about an horizontal or inclined axis, for the laundry to be accommodated therein to be washed and/or dried. The basket also defines a front opening that is located such as to match the opening of the washing tank, in order to load/unload the laundry.

[0003] The washing tank is suitable to contain the washing liquid during the laundry washing steps and to be a portion of the drying circuit during the laundry drying step.

[0004] A washing water delivery system that can be connected to the water supply is provided in order to load the tank with mains water and detergent substances and aids. This washing water delivery system comprises a plurality of electrovalves suitable to selectively adjust the supply to a plurality of flow paths extending downstream of these electrovalves through respective compartments of a detergent tray to the washing tank. On the bottom of the washing tank, a drain duct is provided with a discharge pump being associated therewith, which provides for the removal of the washing liquid from the tank and controls, together with the supply electrovalves, the level of liquid within the tank. An electric resistance being arranged within the tank in the gap between the tank wall and laundry basket is provided to heat the washing liquid contained in the tank.

[0005] The drying circuit of prior art washer-drier machines typically comprises a suction unit, a heat exchanger and a heating unit with electric resistances communicating with each other by means of a drying duct.

[0006] In such a loop circuit, the air flow generated by the suction unit is heated by the electric resistances and blown to the basket, where it causes the water contained within the tissues to evaporate as it passes through the wet laundry. In the heat exchanger, generally of the jet or atmospheric types, the humid air is cooled by a cold water flow. Due to this cooling, the vapour condensates and is collected and discharged together with the cooling water. The dehumidified air is then sucked again by the suction unit and recirculated.

[0007] This known solution entails, besides high electric power consumption, a non negligible water consumption, in the order of 40 - 50 L per drying cycle.

[0008] Washer-drier machines are further known, which carry out only the function of drying the laundry. In order to condensate the humidity in the drying air, these washer-drier machines cool the heat exchanger by means of a second cooling air flow from the environment, the so-called air-to-air heat exchange.

[0009] The need has been felt for a long time to implement the air-to-air heat exchanger known from drying machines also in washing machines in order to reduce the consumption of mains water absorbed to the purpose of cooling the heat exchanger.

[0010] First of all, the known attempts had to face the problem of fluff that develops from the laundry and are entrained by the drying air flow into the heat exchanger and also into the suction unit.

[0011] In atmospheric heat exchangers, the fluff is automatically captured by the cooling water and eliminated through the drain duct.

[0012] In the drying machines with air-to-air heat exchange system, filters are provided to be arranged in the drying circuit downstream of the laundry basket and upstream of the heat exchanger. These filters are usually accessible through the loading door to allow cleaning and replacing the same, when required.

[0013] The provision of a filter in a washer-drier machine having circuits and washing liquid levels that are configured such as to meet the washing requirements requires a reduction in the filter bulk, which filter has to be placed in a dry area that can be easily reached by the user for cleaning and replacement purposes. This entails an increase in the flow resistance with a consequent increase in the power required to achieve a predetermined drying air flow rate.

[0014] In order to avoid the above mentioned problems, EP 0 816 549 A1 has suggested a washing machine with an air-to-air heat exchanger and a large-sized self-cleaning fluff trap. In this washer-drier machine, an auxiliary duct branches off from the drain duct of the washing tank and a suitable auxiliary pump conveys a part of the washing or rinse liquid drained from the tank, through this auxiliary duct and a suitable sprinkler nozzle to the filter in order to perform cleaning.

[0015] Due to the additional hydraulic circuits and auxiliary pump, this solution entails high manufacturing costs, as well as the provision of a drying program which provides for a dedicated driving operation of the auxiliary pump.

[0016] The general object of the present invention is thus to provide a washer-drier machine that is provided with an air-to-air heat exchanger, having such characteristics as to overcome at least some of the drawbacks found when the air-to-air condensation technology is transferred from the drying machine to the washer-drier machine.

[0017] Within this general object, a further object of the present invention is to reduce the hydraulic components of the washer-drier machine and the electric power consumption to eliminate the fluff within the drying circuit.

[0018] This and other objects are achieved by means of a washer-drier machine according to claim 1. Advantageous embodiments are the object of the dependent claims.

[0019] According to the invention, the washer-drier machine for washing and drying the laundry comprises:

- a washing tank suitable to contain the washing liquid;
- a basket suitable to accommodate the laundry and being rotatably supported within the washing tank;
- a system for delivering the washing water with a plurality of washing flow paths extending from one or more supply electrovalves through corresponding compartments of a detergent tray, to the washing tank, in which the washing flows along said washing flow paths can be selectively adjusted by means of said one or more electrovalves,
- a drying circuit with a first suction unit, an air-to-air heat exchanger and a heating unit communicating with each other by means of a drying duct, said drying circuit being suitable to blow a drying air flow through said basket,
- a cooling circuit with a second suction unit and said air-to-air heat exchanger, wherein said cooling circuit is suitable to intake a cooling air flow from the environment and blow it to said air-to-air heat exchanger to cool the latter,
- a fluff-rinse duct that is configured to convey a flow of fluff-rinse liquid to the drying circuit in order to remove the fluff therein,

wherein the fluff-rinse duct branches off from at least one of the washing flow paths, such that the fluff-rinse flow can be selectively supplied by means of the same electrovalves (6, 7) together with the washing flow path (24; 25; 26; 8; 9; 10).

[0020] Thereby, both the auxiliary duct and the auxiliary pump (known from EP 0 816 549 A1), which is only dedicated to the cleaning of the filter of the air-to-air heat exchanger can be eliminated, and the control of the fluff-rinse flow can be simplified.

[0021] Furthermore, as the auxiliary pump is eliminated, and the network pressure is used in order to remove the fluff from the drying circuit, the electric power consumption to operate the auxiliary pump are also eliminated.

[0022] In order to better understand the present invention and appreciate the advantages thereof, several embodiments will be described herein below by way of non-limiting examples, with reference to the annexed drawings, in which:

[0023] - Fig. 1 is a side sectional view of a washer-drier machine according to an embodiment of the invention;

[0024] - Fig. 2 is a front sectional view of the washer-drier machine in Fig. 1;

[0025] - Fig. 3 is a further partially sectional side view on a different sectional plane from that in Fig. 1.

[0026] - Fig. 4 is a partially sectional top view of the washer-drier machine in Fig. 1;

[0027] - Fig. 5 schematically illustrates a detergent tray with the respective washing flow paths and with the electrovalve unit of a washer-drier machine associated therewith according to a further embodiment of the invention;

[0028] - Fig. 6 schematically illustrates a detergent tray with the respective washing flow paths and with the elec-

trovalve unit of a washer-drier machine associated therewith according to a further embodiment of the invention;
[0029] - Fig. 7 schematically illustrates a detergent tray with the respective washing flow paths of a washer-drier machine according to a further embodiment of the invention.

[0030] With reference to the drawings, a washer-drier machine 1 comprises a support and housing structure 2, a washing tank 3 being housed therein, which is provided with a front opening that can be closed by means of a porthole door 4 being hinged in the front of the housing 2. Within the washing tank 3, a basket 5 is rotatably housed about a horizontal or inclined axis, for the laundry to be accommodated therein to be washed and/or dried.
The basket 5 also defines a front opening that is located such as to match the opening of the washing tank 3, in order to be capable of carrying out the loading/unloading of the laundry.

[0031] The washing tank 3 is suitable to contain the washing liquid during the laundry washing steps, and to be a portion of the drying circuit during the laundry drying step.

[0032] A washing water delivery system that can be connected to the water supply is provided in order to load the tank 3 with mains water and detergent substances and aids. This washing water delivery system comprises a plurality of washing flow paths extending from, for example, first 6 and second 7 supply electrovalves, through corresponding compartments 8, 9, 10 of a detergent tray 12, to the washing tank 3.

[0033] The washing flows along the washing flow paths can be selectively adjusted by means of the first and/or second electrovalves 6, 7.

[0034] On the bottom 13 of the washing tank 3, a drain duct 14 is provided with a discharge pump 15 being associated thereto, which provides for the removal of the washing liquid from the tank 3 and controls, together with the supply electrovalves 6, 7 the level of liquid within the tank 3.

[0035] To heat the washing liquid contained within the tank 3, a coiled electric resistance 11 is provided, which is arranged within the tank 3, particularly on the bottom of the latter, in the gap between the tank wall 3 and the laundry basket 5.

[0036] The washer-drier machine 1 further comprises a loop drying circuit with a suction unit, for example a fan impeller 17 driven by an electric motor 18, an air-to-air heat exchanger (preferably having a plurality of primary ducts 19 through which the drying air flow is blown and one or more secondary surfaces or ducts 20 that are blown or passed through by the cooling air flow), as well as an electric-resistance heating unit 21 which communicate with each other by means of a drying duct 16.

[0037] In such a loop circuit, the air flow 22 generated by the suction unit 17, 18 is heated by the electric resistance 21 and blown to the basket 5, where it causes the water contained within the tissues to evaporate as it passes through the wet laundry. The heat exchanger 19, 20

is arranged downstream of the laundry basket 5 (with reference to the direction of the drying air flow 22) and cools the humid air from the basket 5 in the primary ducts 19, which are, in turn, cooled by means of cool air taken in from the environment and conveyed to the secondary ducts 20 adjacent to the primary ducts 19.

[0038] Due to this cooling, the vapour condensates and is collected and discharged. The dehumidified air is then sucked back from the suction unit 17, 18 and recirculated.

[0039] An open cooling circuit is provided to cool the air-to-air heat exchanger 19, 20, with a second suction unit, such as a fan impeller 23 that is operated by an electric motor 24 and being in flow communication with the external environment, such as through suitable suction/release openings or grids 25 being formed within the housing 2.

[0040] The cooling circuit is configured to take a cooling air flow 26 from the environment and convey the latter through said secondary surfaces or ducts 20 of the air-to-air heat exchanger 19, 20 in order to cool the walls they share with the primary ducts 19.

[0041] The washer-drier machine 1 further comprises a fluff-rinse duct 27 that branches off from at least one of the washing flow paths (6, 7, 8, 9, 10, 12) upstream of the washing tank 3 and connected to the drying circuit. Thereby, a fluff-rinse flow 28 can be selectively supplied by means of the same electrovalves (6, 7) that drive the supply of the flows within the washing flow path/s (6, 7, 8, 9, 10, 12).

[0042] Thereby, the fluff can be removed from the drying circuit, while eliminating the auxiliary pump that is only dedicated to cleaning the heat exchanger filter.

[0043] Furthermore, by eliminating the auxiliary pump and using the network pressure in order to remove the fluff from the drying circuit, the electric power consumption for operating the auxiliary pump is also eliminated.

[0044] According to an embodiment, the fluff-rinse duct 27 is connected to the drying circuit in an upper end portion 32 of the heat exchanger 19, 20 or downstream of the heat exchanger 19, 20 (with reference to the direction of the drying air flow 22) and the primary ducts 19 of the heat exchanger 19, 20 are oriented or inclined such that the fluff-rinse flow 28 passes through these primary ducts 19 countercurrently to the drying air flow 22. The first suction unit 17, 18 is arranged upstream and preferably above the connection of the fluff-rinse duct 27 such that the fluff-rinse flow 28 only involves the heat exchanger 19, 20 and not the fan impeller 17.

[0045] Preferably, means are provided to deliver the fluff-rinse flow 28, such as a spray nozzle 29 configured to deliver the fluff-rinse liquid on all the primary ducts 19 of the heat exchanger 19, 20, and possibly, to increase the pressure therein.

[0046] According to an embodiment, the heat exchanger 19, 20 is arranged between a rear wall 31 of the washing tank 3 and a rear wall of the housing 2.

[0047] A suction opening 30 formed within the lower

part of the rear wall 31 of the washing tank 3 connects the interior of the tank 3 to the lower end of the heat exchanger 19, 20, and particularly to the primary ducts 19. These primary ducts 19 extend from the bottom up to the upper end portion 32 of the heat exchanger 19, 20, which portion is in flow communication with the suction unit 17, 18 being arranged above the washing tank 3.

[0048] Thereby, the fluff-rinse flow 28 fed by the spray nozzle 29 in the upper end portion 32 of the heat exchanger 19, 20 passes through the primary ducts 19 from the top down against the direction of the drying air flow 22. Along its path, the fluff-rinse flow 28 cleans the primary ducts 19 and carries the fluff, through the suction opening 30 to the tank bottom 13, from which they are drained together with the fluff-rinse water and condensate.

[0049] According to an embodiment, the drying circuit is not provided with fluff traps. According to an alternative embodiment, a fluff trap can be arranged upstream of the heat exchanger 19 (with reference to the drying air flow 22) such that the fluff-rinse flow also cleans the filter.

[0050] Preferably, the air-to-air heat exchanger 19, 20 is configured as a battery approximatively having the shape of a parallelepiped flattened in the axial direction of the basket 5 and widened in the lateral direction, such as to allow the same to be positioned between the rear wall 31 of the tank 3 and the rear wall of the housing 2 without substantially increasing the overall dimensions of the appliance. For an optimum use of the space available, the heat exchanger 19, 20 comprises a cavity at the driving means imparting the rotary motion to the basket 5, for example a discharge 33 formed at a pulley (not shown, in order to avoid burdening the drawings).

[0051] According to an embodiment, the washer-drier machine comprises a control unit being configured such that, during at least one step of the drying cycle, the fluff-rinse flow is continuously activated.

[0052] According to a further embodiment, the control unit of the washer-drier machine is configured such that, during at least one step of the drying cycle, the fluff-rinse flow is sequentially activated.

[0053] According to a still further embodiment, the control unit of the washer-drier machine is configured such that the fluff-rinse flow is only and automatically activated during washing and/or rinse cycles, such as to carry out the cleaning of the heat exchanger by means of the water that, after it has passed through the heat exchanger 19, 20, is used to wash and/or rinse the laundry, while the water consumption during the drying cycle is equal to zero.

[0054] A further aspect of the present invention relates to conveying the drying flow 22 and cooling flow 26 by means of the respective suction units 17, 18 and 23, 24.

[0055] In accordance with an embodiment, the suction units for the drying flow and cooling flow can be operated and controlled in an independent manner such as to allow carrying out an independent variation in the flow rate of the individual flows. This independent variation in the flow

rates of the drying flow 22 and cooling flow 26 is controlled by the same control unit 34 of the washer-drier machine 1 that drives the drying programs and adapts the flow rate of the drying flow 22 to the residual humidity of the laundry and the flow rate of the cooling flow 26 to the ambient temperature.

[0056] The humidity of the laundry can be directly or indirectly detected, and indicatively by measuring the laundry electrical conductivity or by measuring the temperature of the drying flow 22 upstream and downstream of the basket 5 or estimated based on the temperature progress as a function of the time elapsed from the beginning of the drying cycle.

[0057] In accordance with a further embodiment, the control unit 34 is configured such as to control and adjust the flow rate of the drying flow 22 and/or the supply of the heating unit 21 as a function of the environment temperature, such as to adapt the drying flow 22 to the heat absorption capacity of the environment in which the washer-drier machine 1 is operating.

[0058] In order to allow said variability of both flows, both electric motors 18, 24 are varying speed motors.

[0059] According to an embodiment, the opening 25 for sucking ambient air is formed in the rear wall 35 of the housing 2 at about the upper end portion 32 of the heat exchanger 19, 20. A (preferably rubber) short pipe 35 is connected to the suction opening 25 connecting the opening 25 to the second suction unit 23, 24. The second suction unit 23, 24 is connected to the heat exchanger 19, 20 by means of a diagonal tube 41 which has an opening section 42 facing a longitudinal side of the heat exchanger 19, 20, and preferably extending over more than half the length of this longitudinal side. The diagonal tube 41 is inclined relative to the direction of the primary ducts 19 such that the cooling flow 26 blows the surfaces and/or ducts 20 of the heat exchanger 19, 20 in an inclined direction and countercurrently relative to the partial drying flows 22 in the primary ducts 19. This configuration has proved to be particularly effective to the purpose of the air-to-air heat exchange.

[0060] According to an embodiment, the drying circuit, including the first suction unit 17, 18, the heating means 21 and the air-to-air heat exchanger 19, 20 and the cooling circuit, including the second suction unit 23, 24 and excluding the suction opening 25, are all connected to the tank-ballast unit such as to move together with the latter. In fact, the only flexible connection is that between the suction opening 25 and second suction unit 23, 24.

[0061] According to embodiments (Fig. 5 and 6) the two electrovalves 6, 7 are placed in parallel and supplied by means of an inlet duct 36 in common. Each electrovalve 6, 7 has its own outlet duct 37, 38 connected to the detergent tray 12. The electrovalves 6, 7 can be controlled independently of each other in order to be capable of selectively opening and closing said outlet ducts 37, 38.

[0062] The detergent tray 12 preferably comprises three compartments, i.e.:

- a PRE compartment 8 intended to accommodate a pre-washing detergent;
- a LAV compartment 9 intended to accommodate a washing detergent;
- an ADD compartment 10 intended to accommodate an additive.

[0063] The outlet ducts 37, 38 of the electrovalve unit 6, 7 are configured and oriented such as to define an intersection point of the flows delivered from the first 37 and second 38 outlet ducts. Thereby, by means of the three configurations, as follows:

[0064] - first electrovalve 6 opened and second electrovalve 7 closed;

[0065] - first electrovalve 6 closed and second electrovalve 7 opened;

[0066] - first electrovalve 6 opened and second electrovalve 7 opened; three separate flows can be delivered, i.e. a first individual flow in the direction of the first outlet duct 37, a second individual flow in the direction of the second outlet duct 38 and a third crossed flow (with both electrovalves 6, 7 opened) in a resulting direction of the two individual flows in the intersection point.

[0067] By means of the three flows, two compartments of the detergent tray 12 and the fluff-rinse duct 27 can be supplied in a controlled and independent manner. A third compartment of the detergent tray 12, preferably the additive compartment 10 is supplied simultaneously with the fluff-rinse duct 27 for cleaning the heat exchanger 19, 20. The flow through the third compartment, e.g. ADD 10 may be branched off from the fluff-rinse flow 28 or vice versa or the third compartment is arranged in series upstream the fluff-rinsing duct 27.

[0068] Referring back to the electrovalve group 6, 7, 36, 37, 38, an embodiment will be described herein below, which aims at differentiating the flow rate of the flow according to the type of use. Particularly, a powerful fluff-rinse flow is desired to be achieved with a higher flow rate than the washing flows. To this purpose, a configuration has been devised, which has an inlet flow rate about of 16 L/min and delivers:

[0069] - 8 L/min with an individual electrovalve opened and

[0070] - 16 L/min with two electrovalves opened (8 L/min + 8 L/min).

[0071] According to this embodiment (Fig. 5), the common inlet duct 36 has reducing or inlet passing means 39 defining a flow rate max value in this inlet duct 36, e.g. 16 L/min and each of the electrovalves 6, 7 or respective outlet ducts 37, 38 comprises reducing means or outlet passing means 40 defining a max flow rate value in each of these outlet ducts 37, 38 of about half the max inlet flow rate, for example 8 L/min. Consequently, the electrovalves 6, 7 can individually deliver half the max inlet flow rate (for example, 8 L/min) or simultaneously (with both electrovalves 6, 7 opened) a total flow rate equal to the value of the inlet max flow rate (for example, 16 L/min).

[0072] Thereby, the flow rate of the crossed flow (washing flow of the condenser 19, 20) results to be higher than, and more precisely twice the flow rate of the individual flow of each outlet duct 37, 38 with an individual electrovalve opened. This advantageously allows eliminating the fluff from the primary ducts 19 of the heat exchanger 19, 20 by means of a potent water jet, without having to use the same high flow rate even for pre-washing and washing operations, thus differentiating the consumption of mains water for the various uses within a washing and drying cycle.

[0073] Alternatively, a configuration of the electrovalve unit can be envisaged, which has an inlet flow rate about of 16 L/min and that delivers:

[0074] - 8 L/min with an individual electrovalve opened and

[0075] - 8 L/min with two electrovalve opened (4 L/min + 4 L/min).

[0076] In this case, the common inlet duct 36 has inlet passing means 39A defining the max flow rate value in this inlet duct 36, e.g. 8 litres per minute and each of the electrovalves 6, 7 or respective outlet ducts 37, 38 comprises outlet passing means 40 defining the max flow rate value in each of these outlet ducts 37, 38 approximately equal to the max inlet flow rate, for example 8 litres per minute. Thereby, the electrovalves 6, 7 can individually deliver the max inlet flow rate (for example 8 litres per minute with an individual electrovalve opened) or simultaneously (with both electrovalves 6, 7 opened) a total flow rate equal to the value of the max inlet flow rate (for example 8 litres per minute). In the second case, each outlet duct would deliver a flow of about half (e.g. 4 litres per minute) the max inlet flow rate (e.g. 8 litres per minute).

[0077] Thereby, the flow rate of the crossed flow (washing flow of the condenser 19, 20) results about equal to the flow rate of the individual flow of each outlet duct 37, 38 with an individual electrovalve opened. This would allow using the same electrovalve units as already used in the washing machines without drying function.

[0078] According to an embodiment of the invention, the control unit is configured such as to allow selecting a drying program having three steps (an early heating step, a subsequent operating temperature and a subsequent final cool down step), wherein:

[0079] - the electric resistance 21 is operated during the first two steps and remains turned off during the cool down step;

[0080] - the suction means 17, 18 of the drying flow are operated throughout the three steps;

[0081] - the suction means 23, 24 of the cooling flow are operated only during the last two steps (operating temperature and cool down), while they remain turned off during the first heating step;

[0082] - the discharge pump is operated at predetermined intervals during the drying step at the operating temperature in order to eliminate the condensate and liquid with the fluff accumulated on the tank bottom.

[0083] Obviously, to the washer-drier machine according to the present invention, those skilled in the art, aiming at meeting contingent and specific requirements, may carry out further modifications and variations, all being however contemplated within the scope of protection of the invention, such as defined in the annexed claims.

Claims

1. A washer-drier machine (1) for washing and drying the laundry comprising:

- a washing tank (3) suitable to contain the washing liquid;
- a basket (5) suitable to accommodate the laundry and being rotatably supported within the washing tank(3);
- a washing water delivery system (6, 7, 12) with a plurality of washing flow paths extending from one or more supply electrovalves (6,7), through corresponding compartments (8, 9, 10) of a detergent tray (12), to the washing tank (3), wherein the washing flows along said washing flow paths are selectively adjustable via said one or more electrovalves (6,7),
- a drying circuit (16, 17, 18, 19, 20, 21) with a first suction unit (17, 18), an air-to-air heat exchanger (19, 20) and a heating unit (21) which communicate with each other by means of a drying duct (16), said drying circuit being suitable to deliver a drying air flow (22) through said basket (5),
- a cooling circuit (23, 24, 25, 20, 35) with a second suction unit (23, 24) and said air-to-air heat exchanger (19, 20), wherein said cooling circuit is suitable to intake a cooling air flow (26) from the environment and blow it to said air-to-air heat exchanger (19, 20) to cool the latter,
- a fluff-rinse duct (27) that is configured to convey a flow of fluff-rinse liquid (28) to the drying circuit in order to remove the fluff therein,

characterized in that said fluff-rinse duct (27) branches off from at least one of said washing flow paths (6, 7, 12), such that said fluff-rinse flow (28) can be selectively supplied by means of at least one of the same electrovalves (6, 7) together with said washing flow path (6, 7, 12).

2. The washer-drier machine (1) according to claim 1, wherein the fluff-rinse duct (27) is connected to the drying circuit in an upper end portion (32) of the heat exchanger (19, 20) and downstream of the heat exchanger (19, 20) with reference to the direction of the drying air flow (22) and one or more primary ducts (19) of the heat exchanger (19, 20) are oriented such that the fluff-rinse flow (28) passes through these

- primary ducts (19) countercurrently relative to the drying air flow (22).
3. The washer-drier machine (1) according to claim 1 or 2, comprising delivery means (29) of the fluff-rinse flow (28) which are configured to deliver the fluff-rinse liquid throughout the primary ducts (19) of the heat exchanger (19, 20). 5
 4. The washer-drier machine (1) according to claim 3, wherein said delivery means (29) of the fluff-rinse flow (28) comprise means for increasing the flow pressure. 10
 5. The washer-drier machine (1) according to any preceding claim, wherein the heat exchanger (19, 20) is arranged between a rear wall (31) of the washing tank (3) and a rear wall of the housing (2). 15
 6. The washer-drier machine (1) according to any preceding claim, wherein said drying circuit is not provided with fluff traps. 20
 7. The washer-drier machine (1) according to any preceding claim, wherein the air-to-air heat exchanger (19, 20) is configured as a battery approximatively having a parallelepiped shape flattened in the axial direction of the basket (5) and widened in the lateral direction and wherein the heat exchanger (19, 20) comprises a cavity at the driving means imparting the rotary motion to the basket (5). 25
 8. The washer-drier machine (1) according to any preceding claim, comprising a control unit (34) which is configured such that, during at least one step of the drying cycle, the fluff-rinse flow is sequentially activated. 30
 9. The washer-drier machine (1) according to any preceding claim, wherein a control unit of the washer-drier machine is configured such that the fluff-rinse flow is only and automatically activated during the washing and/or rinse cycles. 35
 10. The washer-drier machine (1) according to any preceding claim, wherein the suction units (17, 18; 23, 24) for the drying flow (22) and cooling flow (26) can be independently operated and controlled such as to allow an independent variation in the flow rate of the individual flows (22, 26). 40
 11. The washer-drier machine (1) according to claim 10, wherein the control unit (34) of the washer-drier machine (1) is configured to adapt the flow rate of the drying flow (22) to the residual humidity of the laundry and/or the flow rate of the cooling flow (26) to the ambient temperature. 45
 12. The washer-drier machine (1) according to any preceding claim, wherein the control unit (34) is configured such as to control and adjust the flow rate of the drying flow (22) and/or the supply of the heating unit (21) as a function of the ambient temperature such as to adapt the drying flow (22) to the heat absorption capacity of the environment in which the washer-drier machine (1) is operating. 50
 13. The washer-drier machine (1) according to any preceding claim, wherein both electric motors (18, 24) of the two suction units (17, 18; 23, 24) are varying speed motors. 55
 14. The washer-drier machine (1) according to any preceding claim, wherein said second suction unit (23, 24) is connected to the heat exchanger (19, 20) by means of a diagonal tube (41) which has an opening section (42) facing a longitudinal side of the heat exchanger (19, 20) and extending along more than half the length of this longitudinal side, said diagonal tube (36) being inclined relative to the direction of the primary ducts (19) such that the cooling flow (26) blows the surfaces and/or ducts (20) of the heat exchanger (19, 20) in an inclined direction and countercurrently relative to the drying flows (22) in the primary ducts (19).
 15. The washer-drier machine (1) according to any preceding claim, wherein the whole drying circuit, including the first suction unit (17, 18), heating means (21) and air-to-air heat exchanger (19,20), and the second suction unit (23, 24) of the cooling circuit are connected to the tank-ballast unit, such as to move together with said tank-ballast unit.
 16. The washer-drier machine (1) according to any preceding claim, wherein said two electrovalves (6, 7) are arranged in parallel and supplied by means of a common inlet duct (36), each electrovalve (6, 7) having its own outlet duct (37, 38) connected with the detergent tray (12) and being capable of being controlled independently of each other, wherein said outlet ducts (37, 38) are configured such as to define an intersection point of the flows that are delivered from the first (37) and second (38) outlet ducts, such as to be capable of delivering the three separate flows, as follows:
 - a first individual flow in the direction of the first outlet duct (37);
 - a second individual flow in the direction of the second outlet duct (38);
 - a third crossed flow in a resulting direction of the first and second directions in the intersection point of the two individual flows to supply two compartments of the detergent tray (12) and the fluff-rinse duct (27) in a controlled and independ-

ent manner.

17. The washer-drier machine (1) according to any preceding claim, wherein a third compartment of the detergent tray (12) can be supplied simultaneously with the fluff-rinse duct (27). 5
18. The washer-drier machine (1) according to claim 17, wherein said third compartment (10) branches off from the fluff-rinse duct (27) or vice versa, or said third compartment (10) is arranged in series upstream of the fluff-rinse duct (27). 10
19. The washer-drier machine (1) according to claim 17, wherein said fluff-rinse duct (27) can be supplied by means of said crossed flow at both electrovalves 6, 7 opened, and the common inlet duct (36) has inlet passing means (39) defining the max flow rate value in this inlet duct (36) and each of the electrovalves (6, 7) comprises outlet passing means (40) defining the max flow rate value in each of these outlet ducts (37, 38), which is lower than the max inlet flow rate such that the flow rate of the fluff-rinse flow (28) is higher than the flow rate of the individual flow of each outlet duct (37, 38) with an individual electrovalve (6, 7) opened. 15 20 25

30

35

40

45

50

55

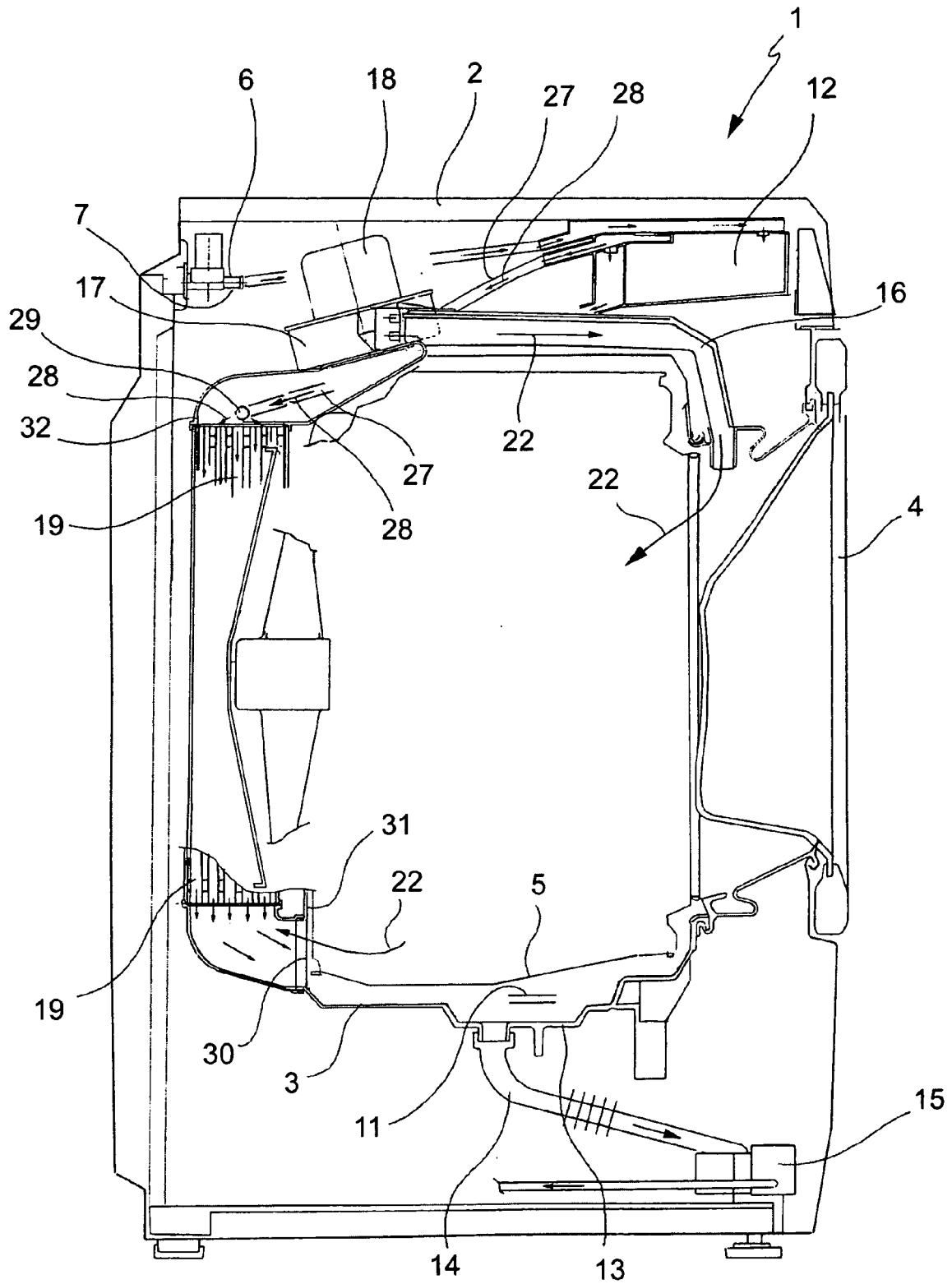


FIG. 1

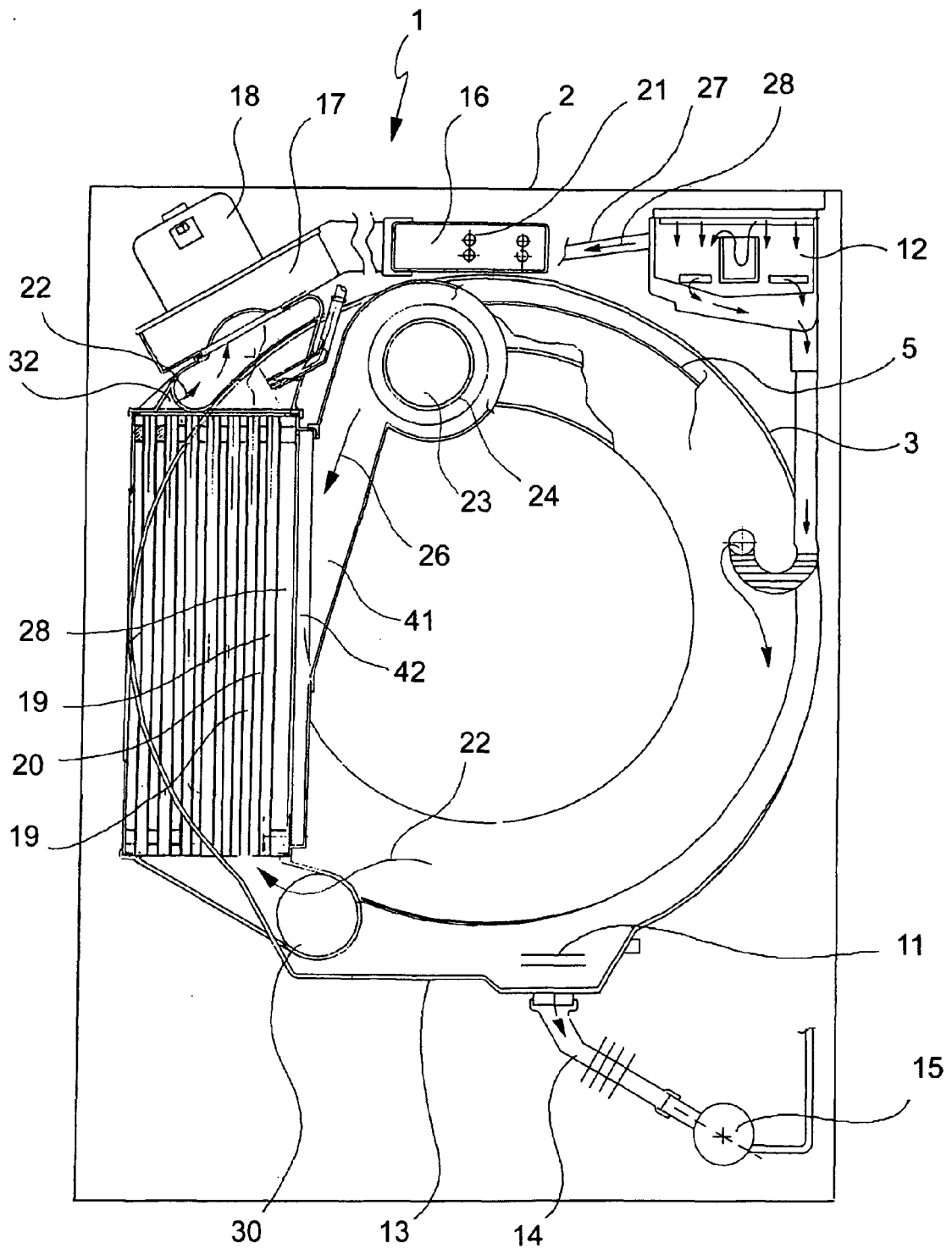


FIG. 2

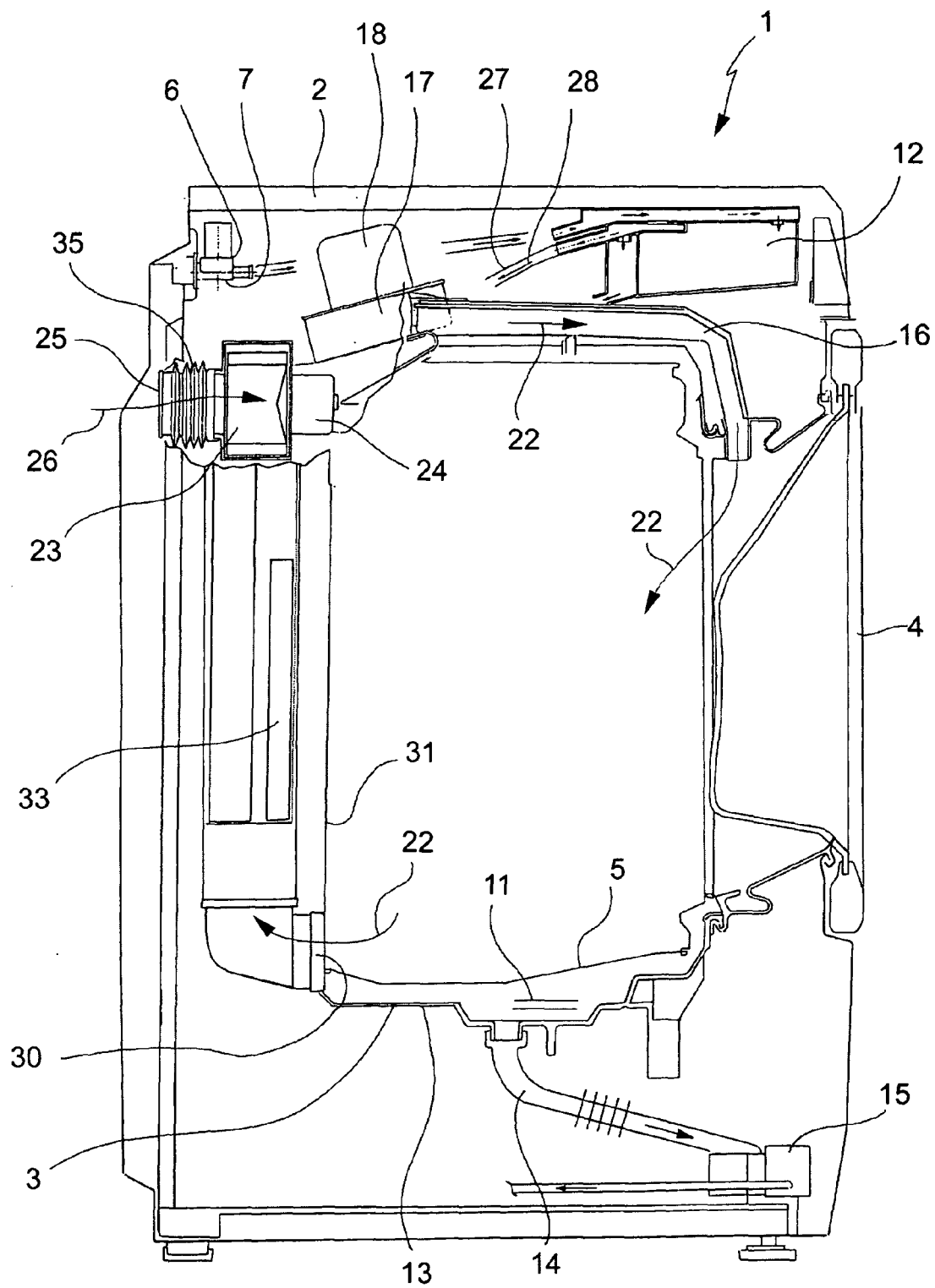


FIG. 3

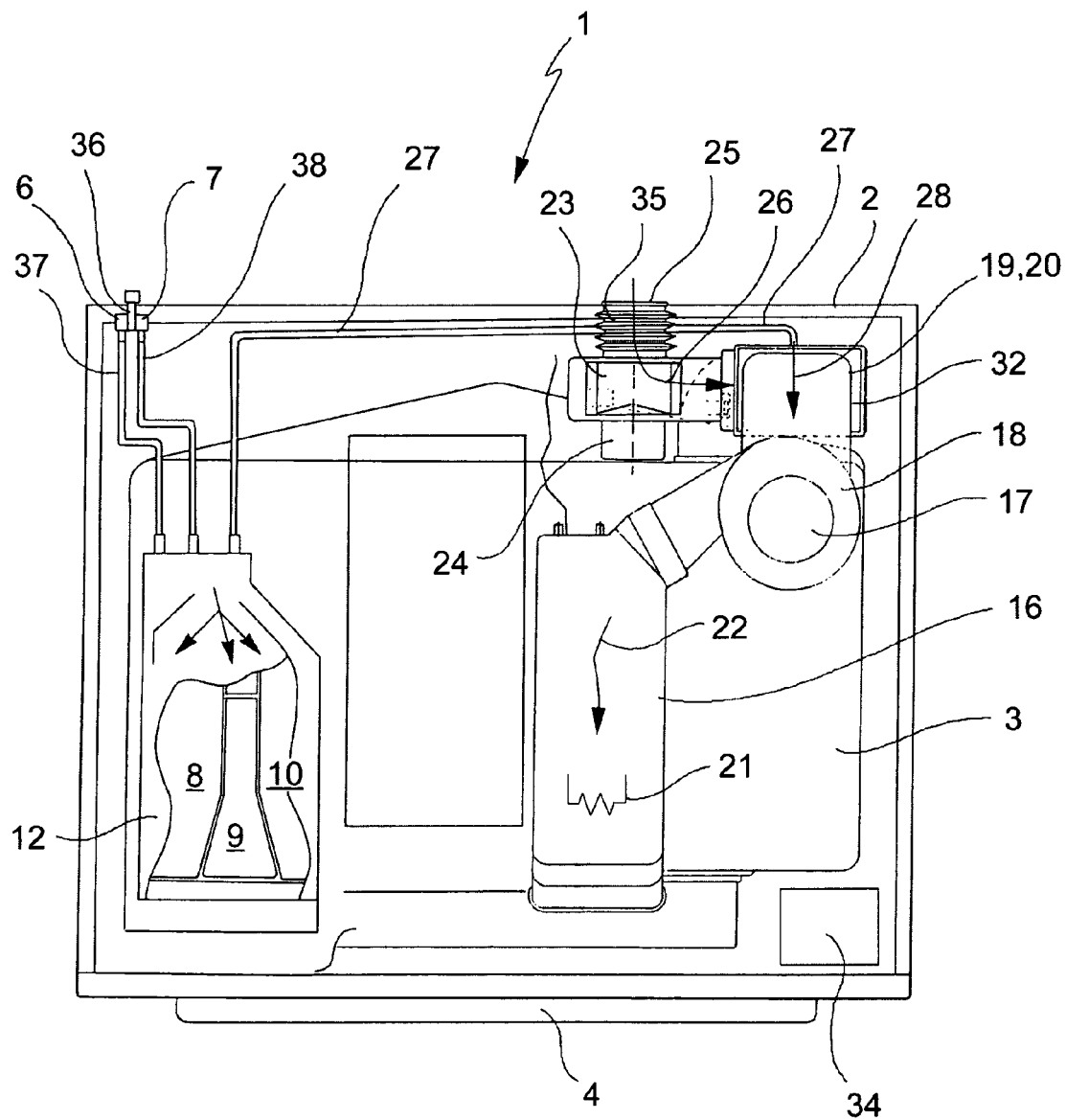


FIG. 4

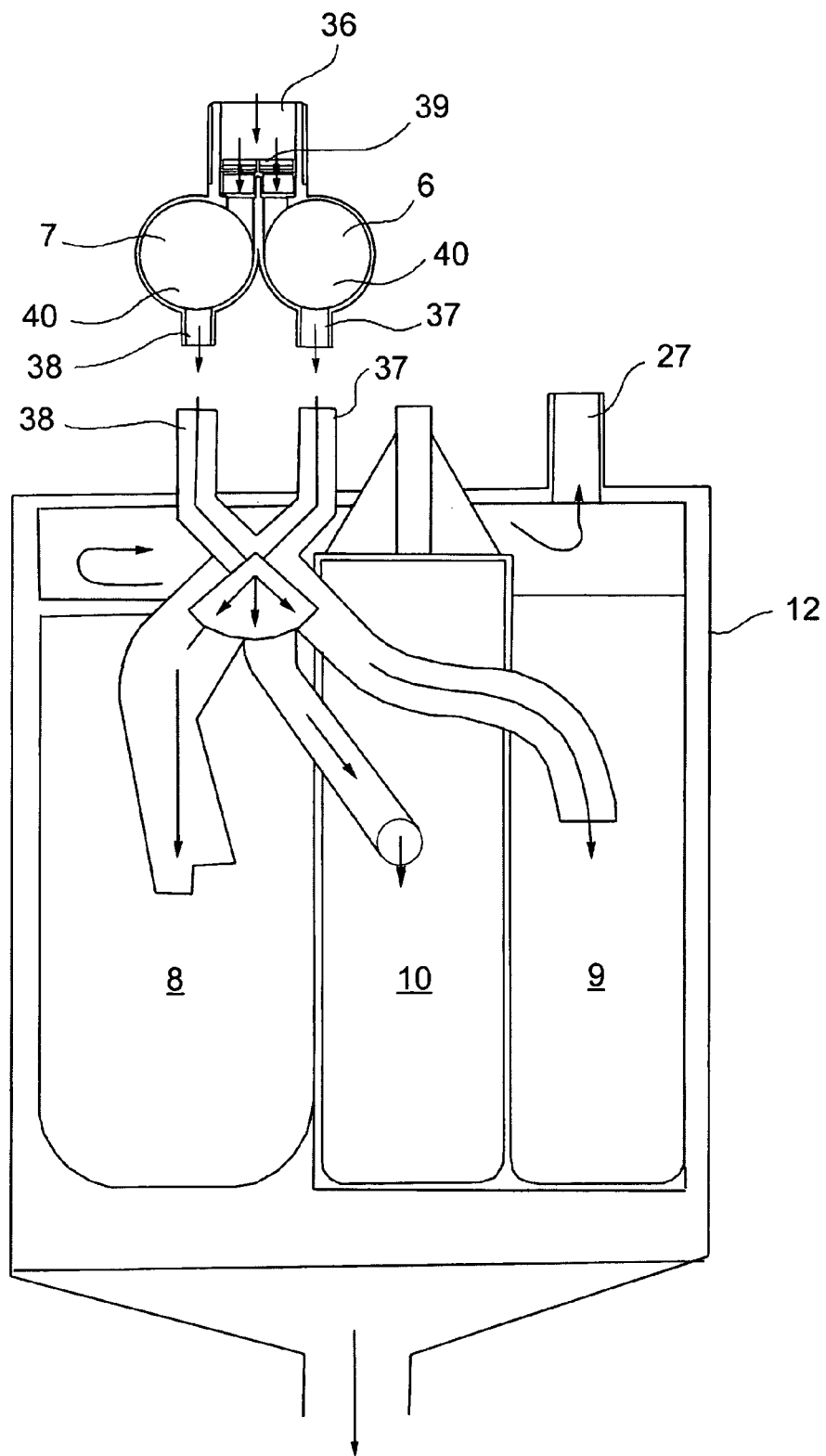


FIG. 5

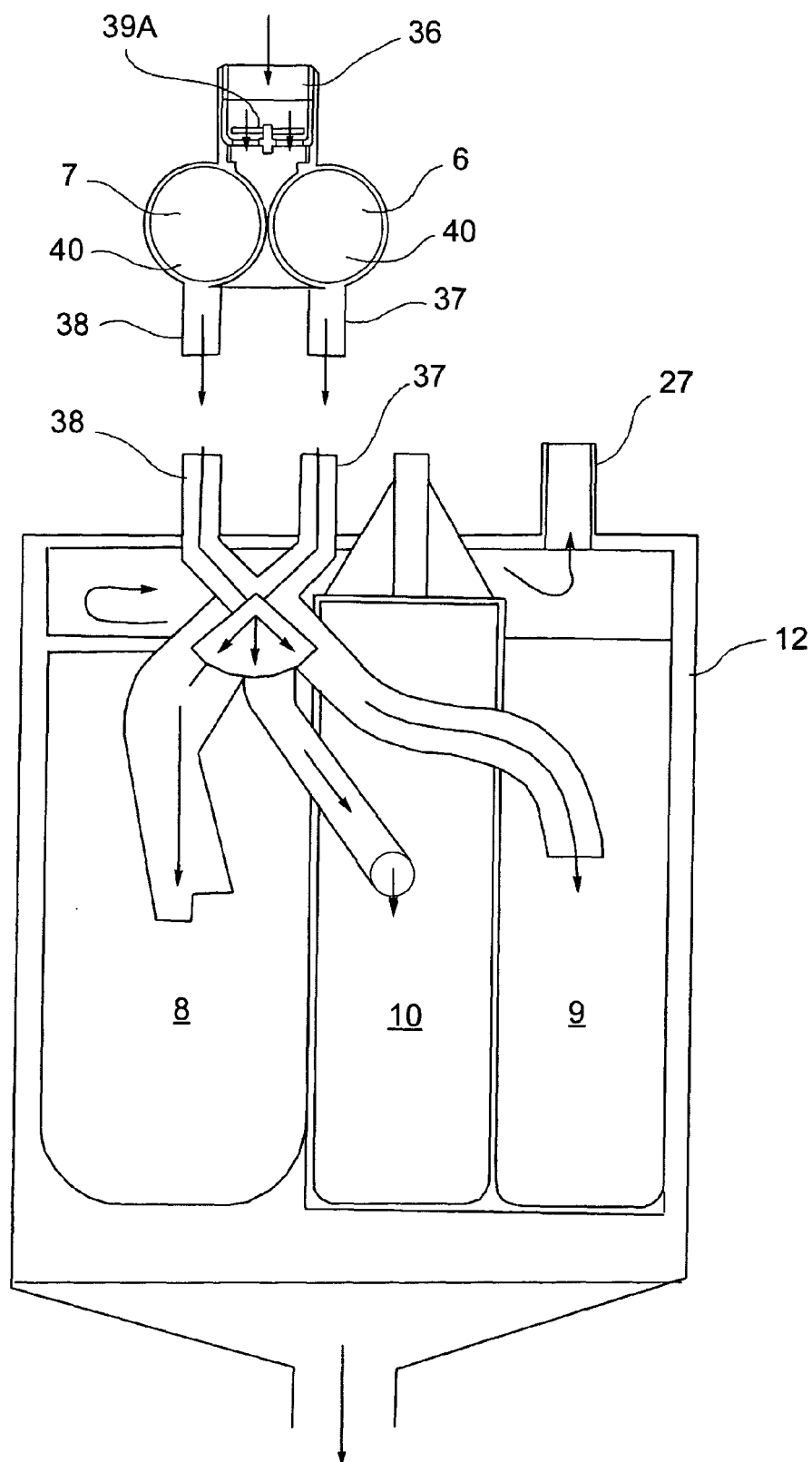


FIG. 6

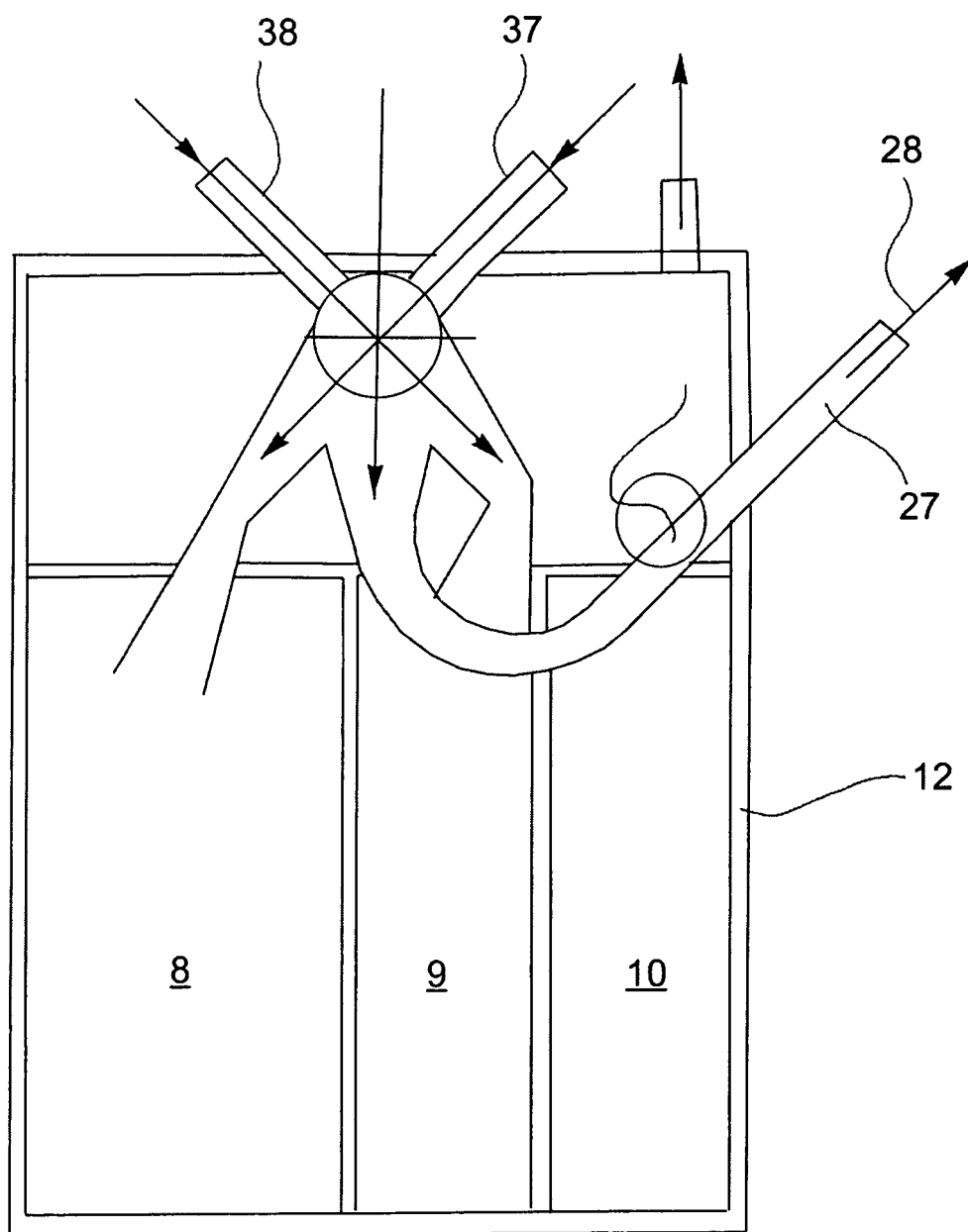


FIG. 7



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 07 42 5580

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y,D	EP 0 816 549 A (CANDY SPA [IT]) 7 January 1998 (1998-01-07) * column 3, lines 6-41 * * column 4, lines 4-55 * * column 5, lines 6-17 * * column 6, lines 44-56 * * figures 1,2 * -----	1-19	INV. D06F25/00 D06F39/08 D06F58/22
Y	EP 0 719 884 A (BOSCH SIEMENS HAUSGERAETE [DE] BSH BOSCH SIEMENS HAUSGERAETE [DE]) 3 July 1996 (1996-07-03) * column 2, line 28 - column 2, line 37 * * column 2, line 53 - column 4, line 41 * * figures 1-4 * -----	1-19	
A	DE 195 04 034 A1 (MIELE & CIE [DE]) 7 September 1995 (1995-09-07) * column 1, lines 23-31 * * column 2, lines 3-51 * * figures 1-3 * -----	1-19	
A	EP 1 669 487 A (LG ELECTRONICS INC [KR]) 14 June 2006 (2006-06-14) * paragraphs [0007], [0010] - [0014] * * paragraphs [0017], [0020] * * paragraphs [0031] - [0037] * * paragraphs [0045], [0059] - [0063] * * figures 1-5 * -----	1-19	TECHNICAL FIELDS SEARCHED (IPC) D06F
A	EP 1 055 767 A (BSH BOSCH SIEMENS HAUSGERAETE [DE]) 29 November 2000 (2000-11-29) * paragraphs [0024] - [0026] * * paragraphs [0007] - [0013] * * paragraphs [0002], [0003] * * figures 1-3 * -----	1	
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 14 February 2008	Examiner Weinberg, Ekkehard
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			

1
EPO FORM 1503 03/82 (P04C01)

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

EP 07 42 5580

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.

14-02-2008

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 0816549	A	07-01-1998	DE 69712267 D1	06-06-2002
			DE 69712267 T2	19-12-2002
			IT MI961295 A1	29-12-1997

EP 0719884	A	03-07-1996	AT 195357 T	15-08-2000
			BR 9506116 A	23-12-1997
			CN 1132808 A	09-10-1996
			DE 4447160 A1	04-07-1996
			ES 2149910 T3	16-11-2000
			GB 2296507 A	03-07-1996
			HK 115997 A	05-09-1997
			PL 312068 A1	08-07-1996
			TR 960642 A2	21-07-1996
			US 5884506 A	23-03-1999

DE 19504034	A1	07-09-1995	FR 2716903 A1	08-09-1995
			GB 2287476 A	20-09-1995
			IT MI950385 A1	01-09-1995

EP 1669487	A	14-06-2006	AU 2005203176 A1	29-06-2006
			CN 1786328 A	14-06-2006
			KR 20060065266 A	14-06-2006
			US 2006123854 A1	15-06-2006

EP 1055767	A	29-11-2000	AT 247735 T	15-09-2003

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 0816549 A1 [0014] [0020]