

(12)

EUROPEAN PATENT APPLICATION

(43)

Date of publication:
 28.05.2008 Bulletin 2008/22

(51)

Int Cl.:
 D06F 37/10 (2006.01)

(21)

Application number: 06124769.8

(22)

Date of filing: 24.11.2006

<div>(84)</div> <div> 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 NL PL PT RO SE SI SK TR Designated Extension States: AL BA HR MK RS </div>	<div>(72)</div> <div> Inventor: Pezzutto, Alberto 31045, Motta di Livenza (TV) (IT) </div>
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(54)

Top-loading washing machine

(57)

Top-loading clothes washing machine including an outer cabinet (2) provided with a laundry loading/unloading port (3) formed through an upper portion thereof, a cabinet door (4) for opening and closing the laundry loading/unloading port (3), a washing tub (5) fixedly arranged within the outer cabinet (4), a perforated drum (6) rotatably installed in the tub (5) for containing the clothes (7) and provided with an opening (8) formed in the outer circumferential surface thereof so that the clothes (7) can be filled into and removed from the drum (6) through the opening (8), a drum door assembly (9) provided in connection with the opening (8) of the drum (6), automatic closing means for automatically actuating the drum door assembly (9) into a closed position, whereby said washing machine further comprises spraying means (10) fluidly connected to a water supply conduit (11) to sprinkle the clothes (7) loaded in the drum (6) for causing the thereby soaked clothes to sag and shrink together by gravity, so as to prevent the drum door assembly (9) from catching and entrapping the clothes (7) as it closes automatically.

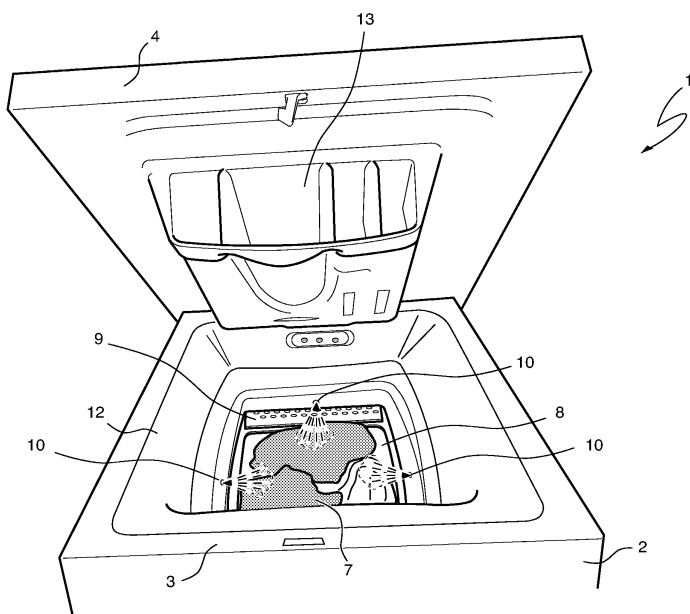


FIG. 2

Description

[0001] The present invention refers to a top-loading clothes washing machine.

[0002] Top-loading clothes washing machines generally include an outer casing, or cabinet, provided with a laundry loading/unloading port formed through an upper portion thereof, and a lid provided for opening and closing said laundry loading/unloading port. A wash tub is fixedly arranged within the outer casing and a perforated drum is rotatably installed in the tub for holding and agitating the clothes to be washed. The drum is in turn provided with an opening formed through the outer circumferential surface thereof for the laundry to be able to be introduced into and removed from the drum therethrough. A drum door or flap assembly is provided to open and close said opening of the drum accordingly.

[0003] Top-loading clothes washing machines are known in the art to be provided with automatic closing means for automatically actuating the drum flap assembly into a closed position, such as this is for instance disclosed in EP 1655403 and DE 10316696. These automatic closing means are operated by the control unit of the machine so as to guide and move the flap assembly into the closed position thereof without any need for a user or operator to do anything manually in view of having the flap closed in an appropriate manner.

[0004] This automatic closing arrangement for the drum flap assembly, however, typically arouses some problems connected with the fact that the clothes loaded in the rotating drum of the machine may interfere with the closing movement of the flap, i.e. it may stand in the way of the same flap as it follows its trajectory when moving into its closed position.

[0005] This problem is further aggravated in the case that the drum - as this may occur, actually - is completely filled or even overfilled with clothes.

[0006] As it moves into the closed position thereof, it may in fact occur that the drum flap assembly catches and drags some clothes, which can in this way ultimately remain trapped between the drum flap and the same drum, with the most risk of suffering irreparable damages.

[0007] The so trapped clothes may in fact suffer damages not only during the mechanical movement of the drum flap as it moves into closing, when the risk is that the fabrics of the same clothes may get torn and ripped, but also during the spin-extraction phases of the washing cycle, when the clothes, entrapped between the flap and the side surface of the drum without this necessarily causing them to suffer any damage, can be subject to severe tensile stresses due to centrifugal forces, thereby exposing the fabrics to damages.

[0008] In addition, another drawback derives from the fact that the clothes introduced in the drum may in any case be arranged there so as to hinder the flap from closing completely, thereby preventing the machine from starting the selected washing cycle.

[0009] It is therefore an object of the present invention

to solve the above-noted problems, thereby doing away with the drawbacks of the cited prior art.

[0010] According to the present invention, this aim, along with further ones that will become apparent from the following disclosure, is reached in a top-loading clothes washing machine incorporating the features as defined and recited in the claims appended hereto.

[0011] Features and advantages of the present invention will anyway be more readily understood from the description that is given below by way of nonlimiting example with reference to the accompanying drawings, in which:

- Figure 1 is a cross-sectional view of a top-loading clothes washing machine according to the prior art;
- Figure 2 is a perspective top view of a top-loading clothes washing machine according to the present invention;
- Figure 3 is a perspective top view of a top-loading clothes washing machine according to another embodiment of the present invention;
- Figures 4 and 4a are respective side cross-sectional views of a top-loading clothes washing machine according to a further embodiment of the present invention, illustrating an initial moment and a final moment of the spraying phase, respectively;
- Figures 5 and 5a are respective side cross-sectional views of the top-loading clothes washing machine of Figure 2, illustrating an initial moment and a final moment of the spraying phase, respectively;
- Figure 6 is a perspective top view of a top-loading clothes washing machine according to the present invention.

[0012] With reference to the above-cited Figures, the top-loading clothes washing machine, as generally indicated with the reference numeral 1, comprises an outer cabinet 2 provided with a laundry loading/unloading port 3 formed through an upper portion thereof, a cabinet door 4 provided for opening and closing said laundry loading/unloading port 3, a washing tub 5 fixedly arranged within the outer cabinet 2, a perforated drum 6 rotatably installed in the tub 5 for holding the clothes 7 and provided with an opening 8 formed through the outer circumferential surface thereof for the clothes 7 to be able to be introduced in and removed from the interior of the drum 6 therethrough, a drum door assembly 9 provided in connection with the opening 8 of the drum 6, automatic closing means for automatically actuating the drum door assembly 9 into a closed position.

[0013] The machine also comprises spraying means 10 fluidly connected to a water supply line 11 to sprinkle the clothes 7 loaded in the drum 6, so as to cause the

water-laden clothes to sink, i.e. move downwards into the drum by gravity, thereby preventing them from being caught by the drum door assembly 9 as it is automatically moved into closing.

[0014] The outer cabinet 2 forms the external appearance of, i.e. the outer casing enclosing the washing machine. The cabinet door 4 enables access to be gained to and through the loading/unloading port 3, which is delimited by a hopper assembly 12 to appropriately convey the clothes to be washed towards the opening 8 of the drum 6. On the inner side thereof, the cabinet door 4 is further provided with a dispenser 13 for the washing products, such as detergents, rinsing aids and the like, to be introduced in the drum 6. The tub 5 is adapted to contain process liquor for washing and rinsing the laundry 7. A plurality of through-holes, i.e. perforations adapted to let process liquor therethrough are formed in the side walls of the drum 6 and the drum door 9, and the drum 6 is rotated by a driving unit.

[0015] The spraying means 10 are adapted to spray water onto the clothes loaded in the drum 6 prior to the automatic closing means being operated to actuate the drum door 9 into automatically closing the drum opening 8 and, therefore, prior to the operation provided for moving the drum door 9 into the closed position thereof being actually started.

[0016] The clothes in the drum 6, as made heavier by the water sprayed thereonto, are caused to sag by gravity, thereby moving away from both the opening 8 of the drum 6 and the related closing drum door 9. In other words, the soaked clothes shrink together, i.e. reduce their volume, so as to clear the region around the opening 8 and avoid interfering with the closing movement of the drum door 9, as illustrated in Figures 4, 4a and 5, 5a. This is effective in preventing any clothes from possibly being trapped between the drum door 9 and the drum 6, when the drum door 9 is moved to close the drum opening.

[0017] In practice, once the user has selected a given washing cycle for the washing machine to carry out, the operating programme of the machine is so set as to in any case start with an initial spraying step, in which a pre-established amount of water is sprayed onto the clothes 7 in view of reducing the volume thereof. At the end of this initial spraying step, i.e. when the clothes 7 have in this way been caused to shrink together into the drum 6, the operating programme of the machine goes on by energizing the automatic closing means, so as to cause the drum door 9 to automatically move into closing the drum opening 8. Then, the actual washing cycle is started in a per se known manner.

[0018] In an advantageous manner, the spraying means 10 are provided so as to ensure that the sprayed water jets are aimed at directly hitting the clothes 7, without having to pass through the perforations in the walls of the drum 6, so that it will only take a modest amount of water to cause the clothes 7 to sag and shrink together.

[0019] In particular, the spraying means 10 are situat-

ed in correspondence to the laundry loading/unloading port 3, so as to be able to direct the water jets through the opening 8 of the drum 6.

[0020] Alternatively, or as an addition thereto, the spraying means 10 are associated to the hub 14 of the drum 6, i.e. the central portion of the drum 6 that is rotatably coupled to the driving shaft thereof, so as to sprinkle and soak the clothes 7 directly from the interior of the drum 6.

[0021] The spraying means 10 are connected to a water supply conduit 11 that is fluidly connected to the main water supply line. In an advantageous manner, this water supply conduit 11 may be connected to the water supply circuit of the washing machine, in which case it may therefore form a branch of such circuit. At least an electromagnetic valve is provided to control water inlet into the water supply conduit 11 and, as a result, the spraying means 10.

[0022] The spraying means 10 may for instance comprise one or several nozzles.

[0023] The spraying means 10 may further be associated to the hopper assembly 12 so as to direct the water jets through the opening 8 of the drum 6, as illustrated in Figures 2, 5, 5a. Appropriate receptacles are provided in the hopper assembly 12 for the spraying means 10 to be accommodated and integrated there as fluidly connected with the water supply conduit 11. In an advantageous manner, the spraying means 10 are arranged on each side of the opening 8 of the drum 6 along the hopper assembly 12, so as to cover the same opening 8 of the drum 6 from substantially 360°.

[0024] In a further embodiment of the present invention, as illustrated in Figure 3, the spraying means 10 are provided on a movable arm 15 adapted to reach out towards the opening 8 of the drum 6 so as to position the spraying means 10 centrally above the same opening 8 of the drum 6.

[0025] Advantageously, the arm 15 is hinged on to the hopper assembly 12 so as to be able to rotate between an inoperative position, in which the arm 15 is located adjacent to the contour of the hopper assembly 12 to keep the laundry loading/unloading port 3 duly clear, and a spraying position, in which the arm 15 is rotated to protrude from the hopper assembly 12 so that the free end 16 thereof is located centrally above the opening 8 of the drum 6. The arm 15 is adapted to preferably rotate along a horizontal plane and, moreover, the spraying means 10 are preferably provided at or close to such free end 16 of the arm 15.

[0026] The hopper assembly 12 may comprise an appropriately shaped receptacle or recess adapted to receive and accommodate the movable arm 15 when the latter is in the inoperative position thereof, so that the same arm 15 is positively prevented from being of hindrance to the loading of the clothes 7 through the opening 8 of the drum 6.

[0027] An appropriate drive unit - as operated by the control unit of the machine - is provided to rotatably move

the arm 15 between said inoperative position and said spraying position thereof.

[0028] In a yet further embodiment of the present invention, as illustrated in Figures 4, 4a, the spraying means 10 are provided on the rotation hub portion 14 of the drum 6 for them to be able to spray the water towards the clothes 7 from the interior of the drum 6. In other words, the spraying means 10 are provided on the central portion of the drum 6 that rotatably engages the driving shaft, i.e. the axis of rotation about which the drum 6 is adapted to rotate. The water supply conduit 11 supplying water to the spraying means 10 is provided through such hub portion 14, wherein the spraying means 10 themselves are provided on the side of the hub portion 14 that faces the interior of the drum 6.

[0029] As described hereinbefore, the water supply conduit 11 may be directly connected to the water supply line via at least an electromagnetic valve controlling the flow of the water; in this case, the pressure of the water jets would solely be determined by the water supply line pressure. Therefore, the water supply conduit 11 may advantageously include pumping means aimed at boosting the pressure of the water being sprayed onto the clothes 7, so as to increase the spraying efficiency of the spraying means 10, thereby reducing the amount of water that has to be used and the time needed to complete the initial spraying step.

[0030] Furthermore, mixing means may be provided as an alternative to the above-cited pumping means to mix compressed air into the water supply conduit 11 so as to deliver a water/air mixture under pressure to the spraying means 10.

[0031] The operating method of the clothes washing machine according to the present invention includes a spraying step, in which water jets are delivered onto the clothes 7 to cause them to reduce their volume, i.e. to sag and shrink together by gravity following the same clothes 7 soaking up the water being sprayed thereupon and - as a result - increasing their weight. In this way, the clothes are caused to settle downwards in the drum 6, thereby moving away from and clearing the region close to the opening 8 of the drum 6, as illustrated schematically in the sequences shown in Figures 4, 4a and 5, 5a. The clothes themselves are no longer able to interfere with the drum door 9, i.e. do not stand in the way of the same drum door as it follows its trajectory when moved into closing the opening 8 of the drum 6. The drum door 9 itself may therefore be closed automatically without this implying any risk for any laundry item to be caught and dragged by the same drum door 9 or any laundry item to remain entrapped between the drum door 9 and the drum 6.

[0032] The spraying step is started automatically by the control unit of the washing machine before operating the automatic closing means and, therefore, prior to the automatic closing procedure of the drum door 9 is started.

[0033] Preferably, the spraying step is provided to be started as soon as the user has closed the cabinet door

4 and after a washing cycle has been selected for the washing machine to carry out.

[0034] In practice, the user loads the clothes 7 to be washed into the drum 6, closes the cabinet door 4 and selects an appropriate washing cycle. At this point, the control unit of the washing machine starts the spraying step by operating the electromagnetic valve, in view of allowing water to flow through the water supply conduit 11 and reach the spraying means 10, and possibly operating the pumping or mixing means, if any, as described hereinbefore.

[0035] The control unit is programmed and pre-set to deliver a pre-established amount of water - as determined experimentally - to the spraying means 10. At the end of this spraying step, the control unit energizes the automatic closing means to close the drum door 9. Once the drum door 9 is duly closed automatically by said means, the control unit goes on by starting the regular sequences of the washing cycle selected by the user.

[0036] It can be easily appreciated that the present invention is also applicable to a top loading machine having a slightly inclined access to the drum as it is shown in figure 6.

[0037] Advantageously, the water sprayed onto the clothes in the drum may then be further used as process water, so that the control unit will in this case cause an overall amount of water to be filled into the washing tub of the machine, which duly allows for the amount of water that has been used to initially spray the clothes and is still present in the tub.

[0038] Conclusively, it can therefore be stated that the spraying means and the spraying step provided in the top-loading clothes washing machine according to the present invention are fully effective in solving the drawbacks connected with prior-art machines in a simple manner.

Claims

1. Top-loading clothes washing machine including an outer cabinet (2) provided with a laundry loading/unloading port (3) formed through an upper portion thereof, a cabinet door (4) for opening and closing said laundry loading/unloading port (3), a washing tub (5) fixedly arranged within the outer cabinet (4), a perforated drum (6) rotatably installed in the tub (5) for containing the clothes (7) and provided with an opening (8) formed in the outer circumferential surface thereof so that the clothes (7) can be filled into and removed from the drum (6) through said opening (8), a drum door assembly (9) provided in connection with said opening (8) of the drum (6), automatic closing means for automatically actuating the drum door assembly (9) into a closed position, **characterized in that** it further comprises spraying means (10) fluidly connected to a water supply conduit (11) to sprinkle the clothes (7) loaded in the drum

- (6) for causing the thereby soaked clothes to sag and shrink together by gravity, so as to prevent the drum door assembly (9) from catching and entrapping the clothes (7) as it closes automatically.
2. Machine according to claim 1, wherein said spraying means (10) are arranged so that the water jets directly hit the clothes (7) without having to pass through the perforations of the drum (6).
 3. Machine according to claim 2, wherein said spraying means (10) are arranged in correspondence to the laundry loading/unloading port (3) so as to be able to direct the water jets through the opening (8) of the drum (6).
 4. Machine according to claim 2, wherein said spraying means (10) are associated to the hub (14) of the drum (6), i.e. the central portion of the drum (6) that is rotatably coupled to the drum driving shaft, so as to sprinkle the clothes (7) directly from the interior of the drum (6).
 5. Machine according to claim 3, wherein said spraying means (10) are associated to a hopper assembly (12) that delimitates said laundry loading/unloading port (3).
 6. Machine according to claim 3, wherein said spraying means (10) are provided on a movable arm (15) adapted to reach out towards the opening (8) of the drum (6), so as to position the spraying means (10) centrally above the same opening (8) of the drum (6).
 7. Machine according to claim 6, wherein said movable arm (15) is hinged on to the hopper assembly (12) so as to be able to rotate between an inoperative position, in which the arm (15) is located adjacent to the contour of the hopper assembly (12) to keep the laundry loading/unloading port (3) duly clear, and a spraying position, in which the arm (15) is rotated to protrude from the hopper assembly (12) so that the free end (16) thereof is located centrally above the opening (8) of the drum (6).
 8. Machine according to claim 4, wherein said water supply conduit (11) is provided through said hub (14).
 9. Machine according to any of the preceding claims, wherein said spraying means (10) comprise one or more nozzles.
 10. Machine according to any of the preceding claims, wherein mixing means are provided to mix compressed air with the water flowing through said water supply conduit (11), so as to deliver a water/air mixture under pressure to the spraying means (10).
 11. Machine according to any of the preceding claims, wherein said water supply conduit (11) is connected to the water supply circuit of the washing machine and at least an electromagnetic valve is provided to control water inlet in the water supply conduit (11).
 12. Operating method of a top-loading clothes washing machine including an outer cabinet (2) provided with a laundry loading/unloading port (3) formed through an upper portion thereof, a cabinet door (4) for opening and closing said laundry loading/unloading port (3), a washing tub (5) fixedly arranged within the outer cabinet (4), a perforated drum (6) rotatably installed in the tub (5) for containing the clothes (7) and provided with an opening (8) formed in the outer circumferential surface thereof for the clothes (7) to be able to be filled in and removed from the drum (6) through said opening (8), a drum door assembly (9) provided in connection with said opening (8) of the drum (6), automatic closing means for automatically actuating the drum door assembly (9) into a closed position, **characterized in that** it comprises the steps of:
 - spraying a pre-established amount of water onto the clothes loaded in drum (6) to cause the thereby soaked, heavier clothes to sag and shrink together by gravity, so as to cause them to move away from the opening (8) of the drum (6),
 - energizing the automatic closing means to drive the drum door assembly (9) into the closed position thereof,
 - starting the regular washing cycle selected by the user.

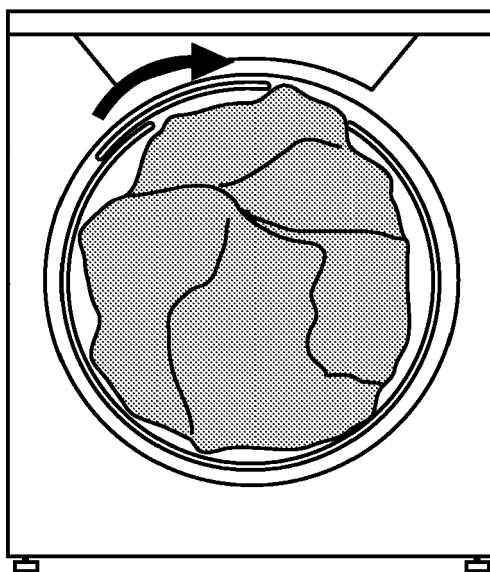


FIG. 1

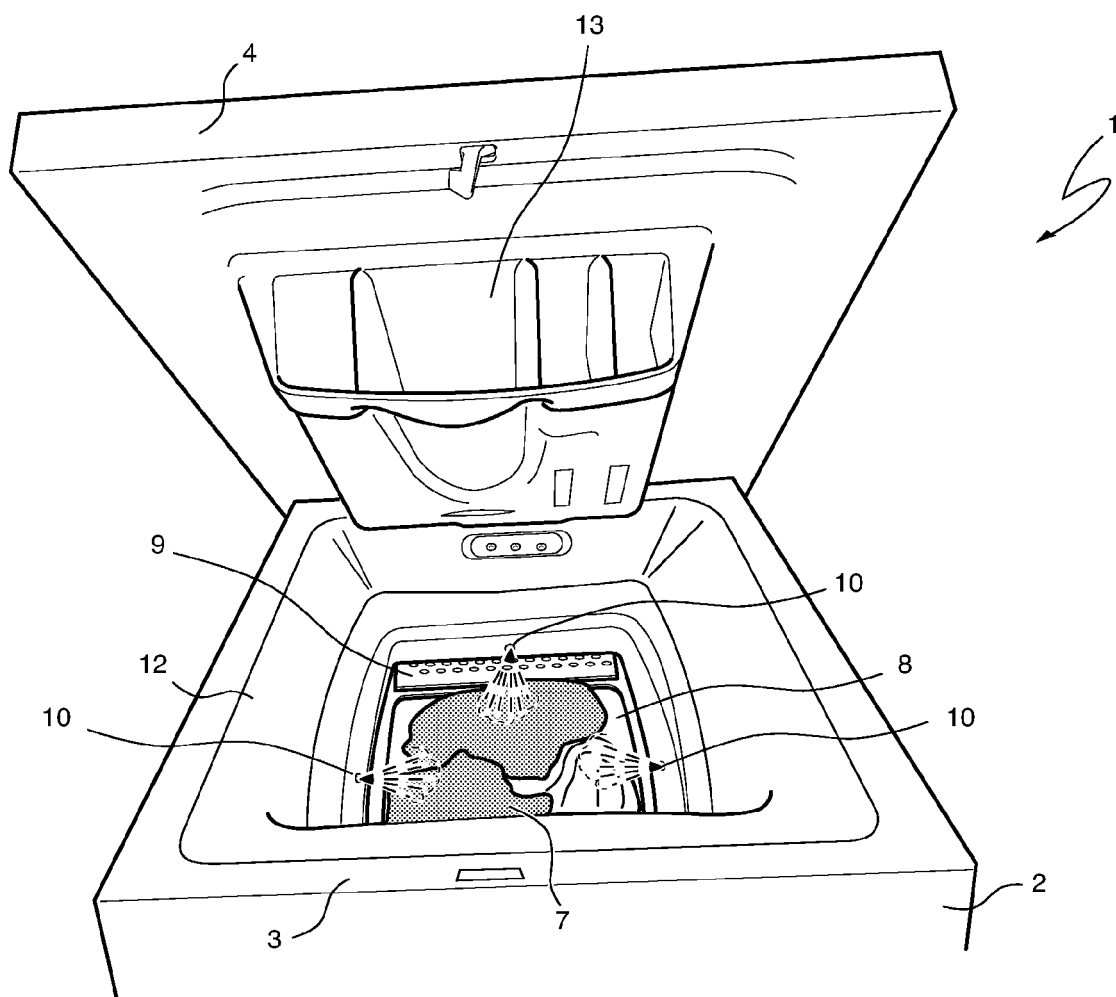


FIG. 2

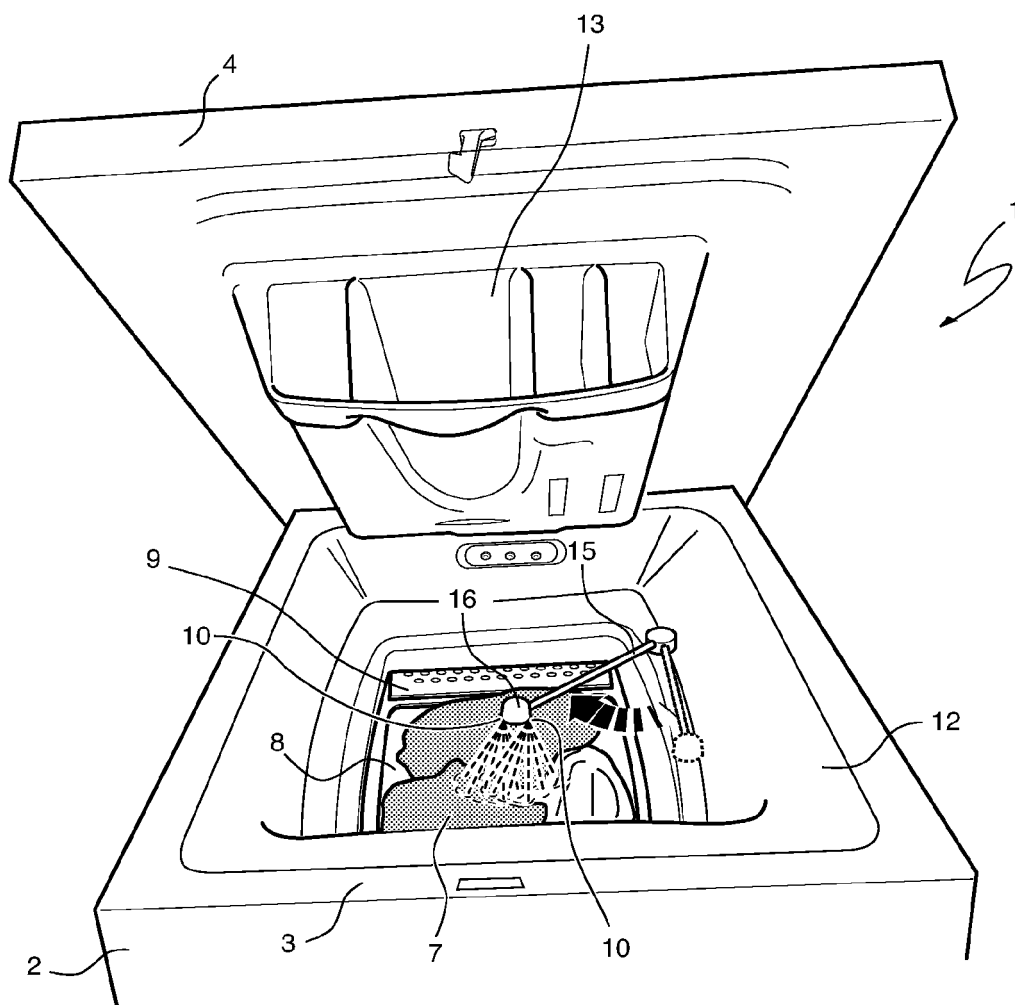


FIG. 3

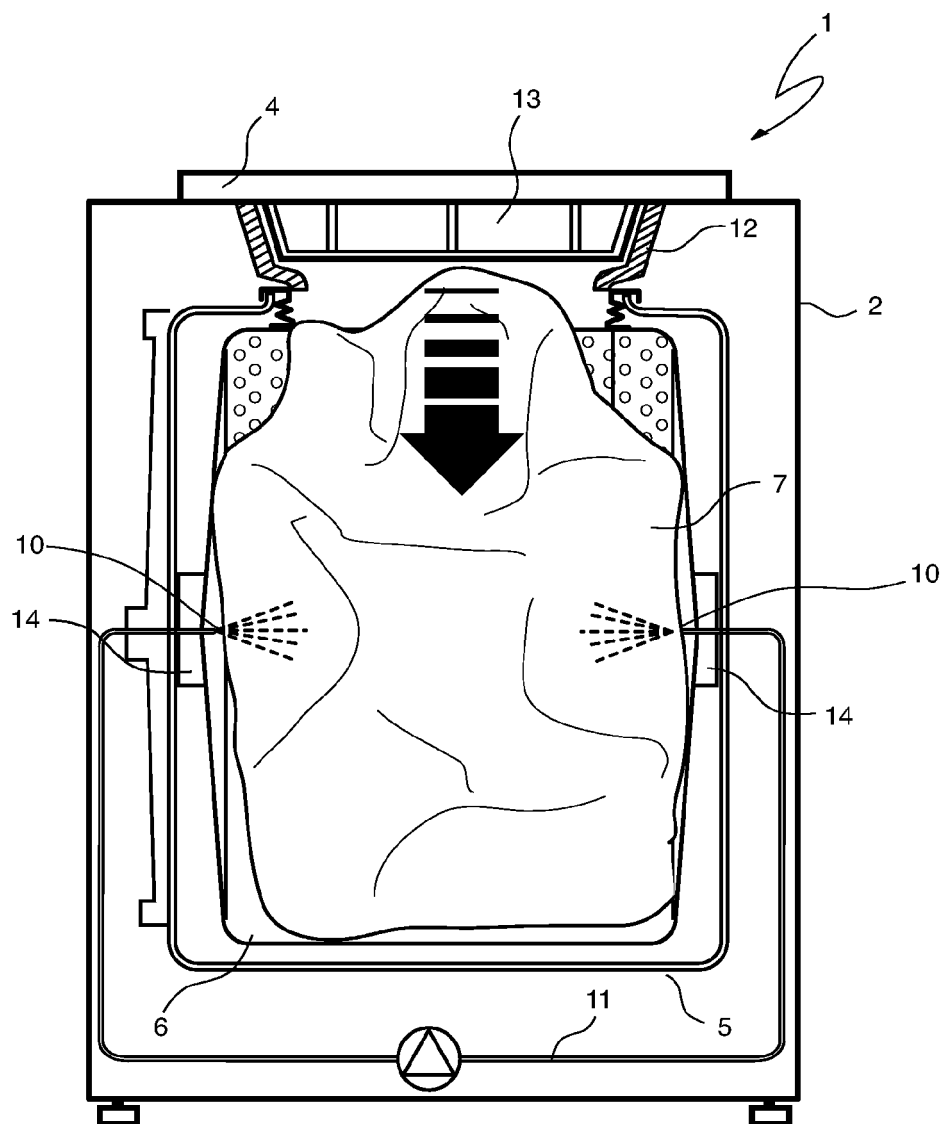


FIG. 4

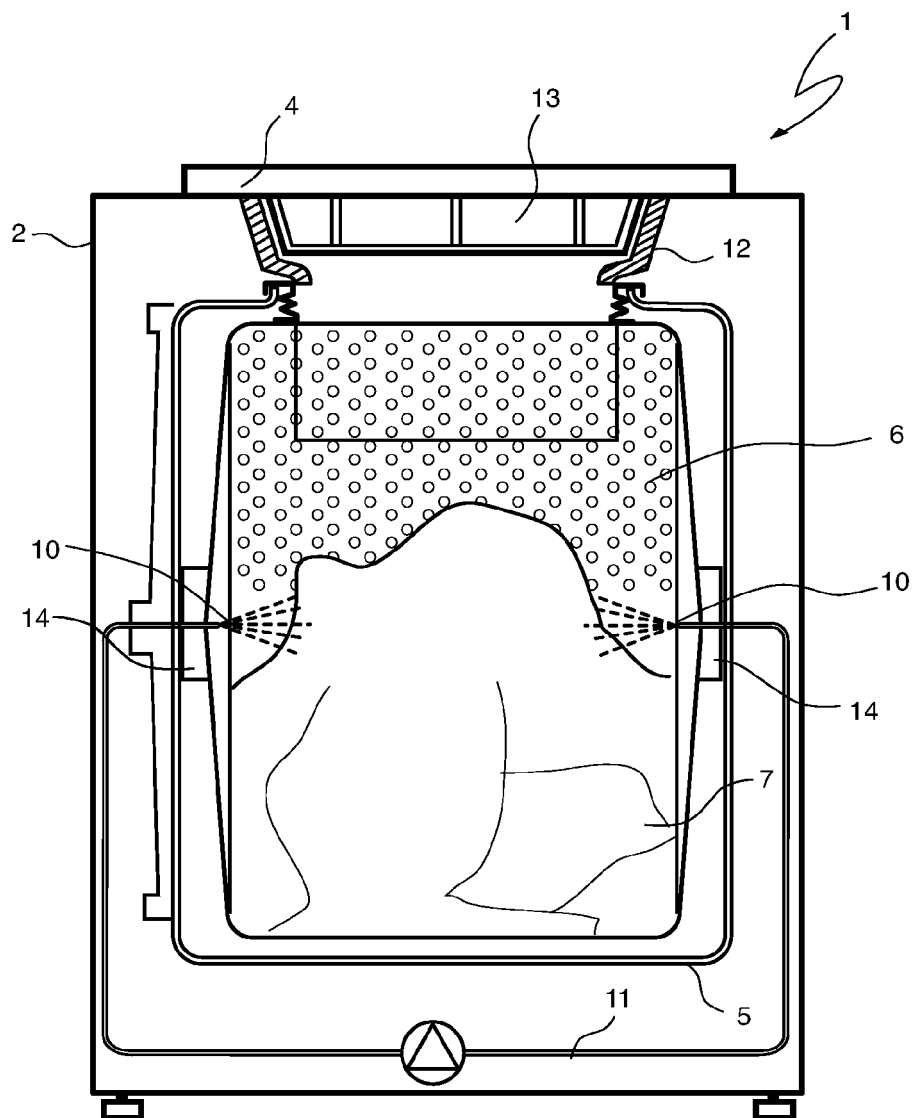


FIG. 4a

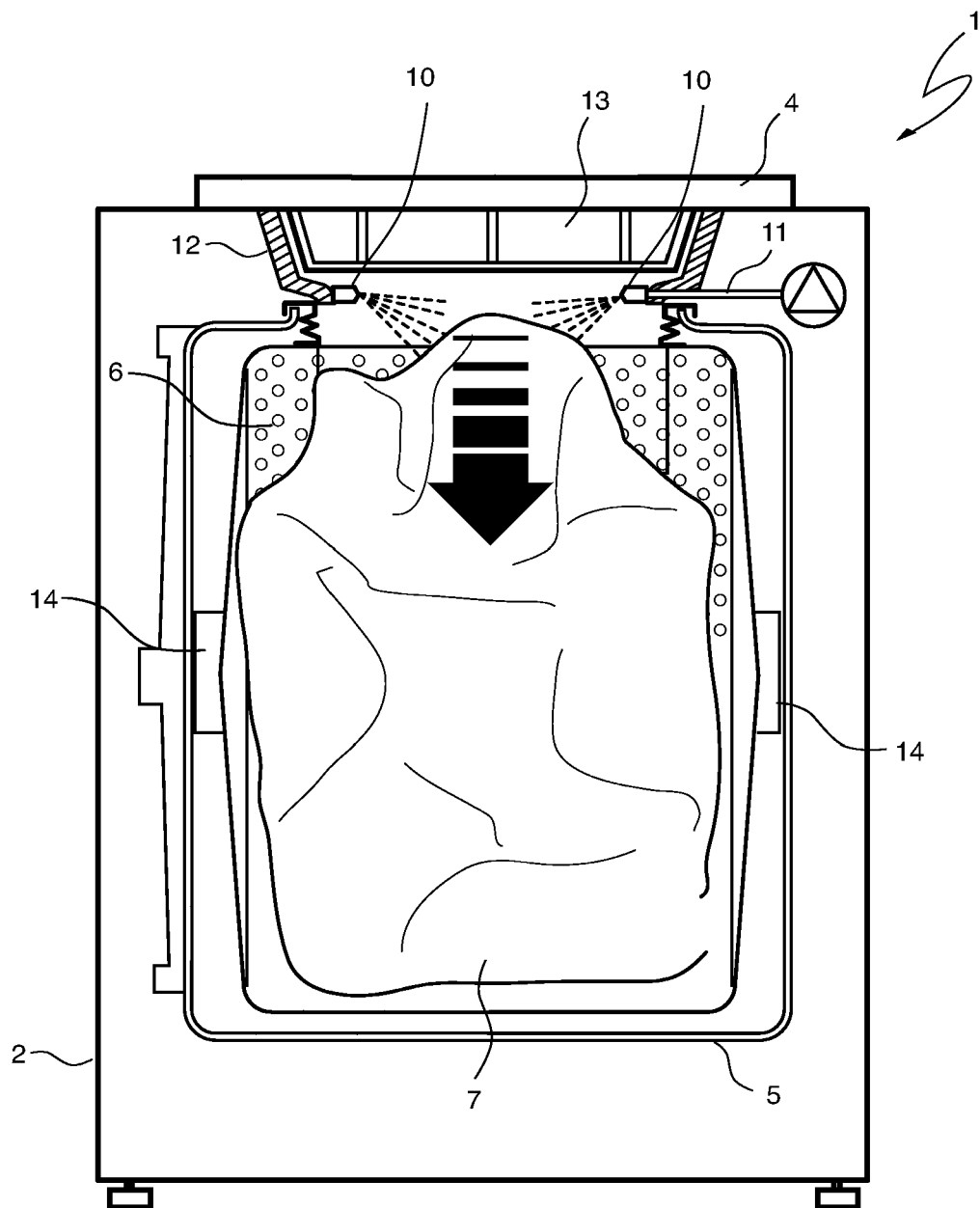


FIG. 5

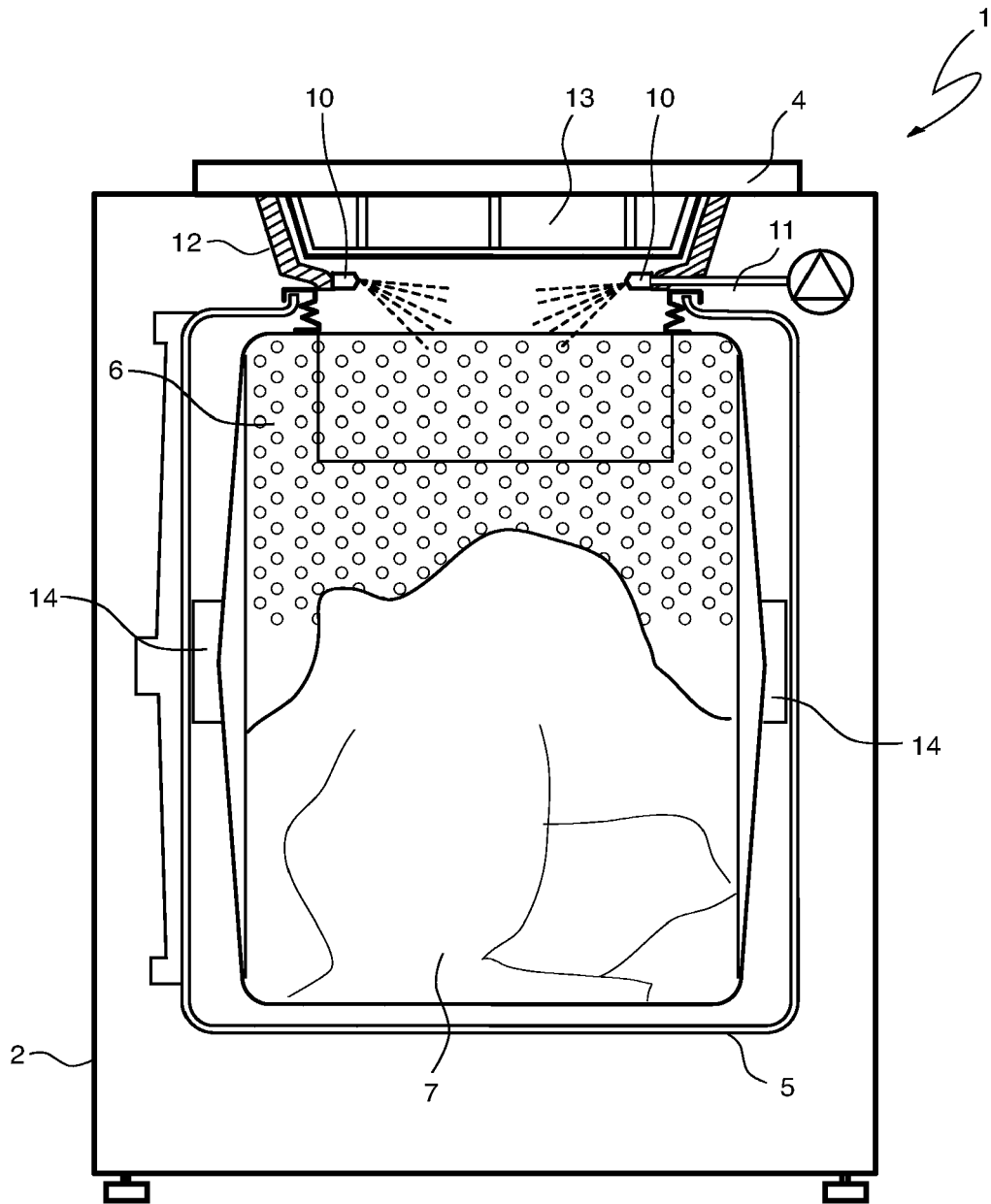


FIG. 5a

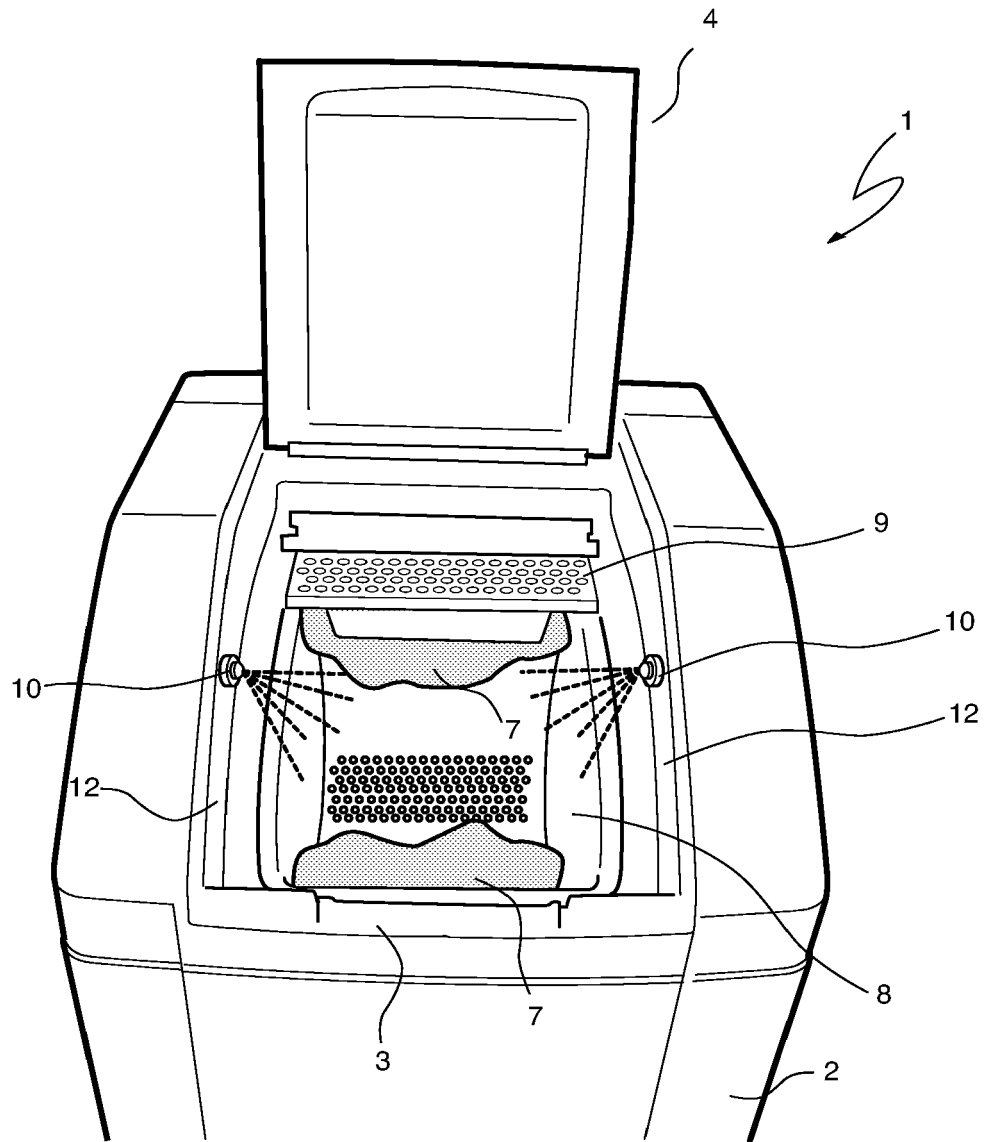


FIG. 6



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 06 12 4769

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Place of search Munich		Date of completion of the search 25 April 2007	Examiner Clivio, Eugenio
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