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(54) **Washing machine with a door comprising a cavity adapted to house a load**

(57) Front-loading washing machine that comprises a support (4), a drum (6) adapted to house a load, the load being any laundry, an opening (2) included in the support (4) through which the load is introduced in or removed from the inside of the drum (6), and a door (3) adapted to close the opening (2), the door (3) comprising

a window (5) delimiting a cavity adapted to house at least part of the load. The front-loading washing machine comprises filling means (20) adapted to introduce a fluid into the cavity, and emptying means (30) adapted to empty the fluid housed in said cavity, so that the load housed in said cavity (13) is washed and/or treated.

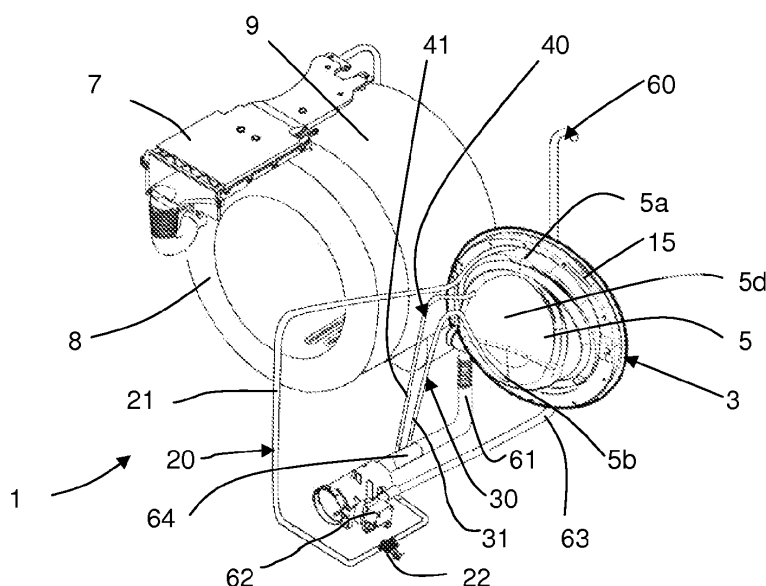


FIG. 3

Description

TECHNICAL FIELD

[0001] This invention relates to a front-loading washing machine.

PRIOR ART

[0002] There are known front-loading clothes washing machines that comprise a support, a drum adapted to house the clothes to be washed, a tub inside which is housed the drum, a cover tub arranged fixed to the tub, a trim arranged between the tub cover and a front surface of the support, through which water is introduced in the drum interior, and means for draining the fluid housed in the tub. The front-loading washing machine comprises an opening connected to the drum, arranged in a front support of said washing machine, which allows clothes to be introduced into or removed from the drum, and a door adapted to close said opening. The door also comprises a support structure and a window, which is substantially curved and which projects out in relation to the door, substantially orthogonal to it, and oriented towards the inside of the opening, as shown in DE102006029480B3 and DE102006050095A, through which the user may view the inside of the drum.

[0003] In documents US2008/0028804A1 and US2007/0125132A1, the door of the front-loading washing machine also comprises a transparent cover that totally covers the window.

[0004] On the other hand, there are known doors adapted to house detergent inside as disclosed in US2006/0053842A1 or DE1460888A1. In document US2006/0053842A1, the door comprises a detergent supply part, in order to save space, which contain detergent and supply it into the tub. The detergent supply part is accessed by the front side of the door, the outlet being formed on a rear side of the door. The detergent supply part comprises a detergent containing portion having a space defined to allow the detergent supplied through the inlet to be contained therein, and a siphon port through which the detergent is discharged from the detergent containing portion along with the supplied water to the outlet.

[0005] In document DE1460888A1, the door comprises partition walls which form two separate chambers with the window and the cover of the window. Each of these chambers has a filling opening through the detergent is introduced into the window when the door is open and the water is introduced via a nozzle when the door is closed, and one or more rinse openings communicated with the tub.

[0006] Finally, W02008/052984A1 discloses a washing machine wherein the door can rotate after opening, coming to a position almost parallel to the floor. The laundry can be removed from the drum and put it inside window which can be detached from the washing machine

in order to carry the laundry.

BRIEF DISCLOSURE OF THE INVENTION

[0007] The object of the invention is to provide a front-loading washing machine as defined in the claims.

[0008] The front-loading washing machine comprises a support, a drum adapted to house a load, the load being any laundry, an opening included in the support through which the load is introduced in or removed from the inside of the drum, and a door adapted to close the opening, the door comprising a window delimiting a cavity adapted to house at least part of the load.

[0009] The front-loading washing machine comprises filling means adapted to introduce a fluid into the cavity and emptying means adapted to empty the fluid house in said cavity, so that the load housed in the cavity is washed and/or treated.

[0010] This way the load housed in the window can be independently treated and/or washed from the load housed in the drum.

[0011] A washing machine with an additional housing as well as the conventional drum for housing the load is thus obtained, the cavity comprised in the door being used as a housing.

[0012] These and other advantages and characteristics of the invention will be made evident in the light of the drawings and the detailed description thereof.

DESCRIPTION OF THE DRAWINGS

[0013]

Figure 1 shows a perspective view of a front-loading washing machine according to the invention.

Figure 2 shows a view of the door of the front-loading washing machine shown in Figure 1.

Figure 3 shows a view of a first example of a hydraulic system of the front-loading washing machine shown in Figure 1.

Figure 4 shows a view of a second example of a hydraulic system of the front-loading washing machine shown in Figure 1.

Figure 5 shows a view of a third example of a hydraulic system of the front-loading washing machine shown in Figure 1.

Figure 6 shows a view of a fourth example of a hydraulic system of the front-loading washing machine shown in Figure 1.

Figure 7 shows a view of a fifth example of a hydraulic system of the front-loading washing machine shown in Figure 1.

DETAILED DISCLOSURE OF THE INVENTION

[0014] The front-loading washing machine 1 according to the invention, shown in Figure 1, is a front-loading washing machine that comprises a support 4, a drum 6 adapted to house a load, the load being understood as any laundry or similar, a loading/unloading opening 2 included in a front wall 4a of the support 4 and connected to the drum 6 and through which the load is introduced in or removed from the inside of the drum 6, and a door 3 adapted to close the loading/unloading opening 2.

[0015] The front-loading washing machine 1 comprises a tub 9, shown in Figures 3 to 7, supported in the support 4, the drum 6 being arranged housed inside the tub 9, a tub cover 8, shown in Figures 3 to 7, arranged substantially concentric and fixed to the tub 9, and a trim, not shown in the Figures 3 to 7, arranged between the tub cover 8 and the front wall 4a of the support 4. The front-loading washing machine 1 comprises a hydraulic system that includes filling means, not shown in the Figures 3 to 7, through which water reaches the load, and drainage means 60 that drain the fluid housed in the tub 9 to the outside.

[0016] The front-loading washing machine 1 also comprises a tray 7, shown in Figures 3 to 7, in which the detergent and/or necessary additives are deposited, the tray 7 being arranged connected to the tub 9 by known means.

[0017] In addition, the fluid housed in the tub 9 preferably comprises a mixture of water and detergent and/or additives originating from the tray 7, although in other examples said fluid may only comprise water, gas or a mixture of both fluids with or without detergents and/or additives.

[0018] The drainage means 60 of the fluid housed inside the tub 9 comprise a drainage pump 62, a first drainage pipe 61 connected to the tub 9, in particular to the bottom part of said tub 9, and to said drainage pump 62, and a second drainage pipe 63, connected to the drainage pump 62, which takes the water to the front-loading washing machine 1 exterior.

[0019] Additionally, the door 3 comprises a support structure 15 and a window 5 fixed to said support structure 15. The window 5 has a convex structure protruding into the interior of the front-loading washing machine 1 and preferably, is made of a glass material through which the inside of the drum 6 is visible. The surfaces 5d that form said window 5 delimit a cavity 13, shown in Figure 2, which is adapted to house at least part of the load in its interior. The door 3 also comprises fastening means 12, shown in Figure 2, which help keep the at least part of load inside the cavity 13 without said load falling. The fastening means 12 comprise a limiting surface 12b, which, along with the surfaces 5d of the window 5, delimits the cavity 13.

[0020] The front-loading washing machine 1 also comprises access means 11 to said cavity 13. In the embodiment shown in Figure 2, the access means 11 are ar-

ranged inserted in the fastening means 12, accessible from the outside of the door 3, said access means 11 being capable of being arranged, in other embodiments not shown in the figures, inserted in surfaces 5d of the cavity 13, these being accessible either from the inside of the door 3, from the top part of the door 3 or from the bottom part of the door 3. The access means 11 shown in Figure 2 comprise a closing element 11 b adapted to open or close said access means 11.

[0021] In addition the front-loading washing machine 1 comprises filling means 20 adapted to introduce a fluid into the cavity 13, a fluid being understood as water, gas, or a mixture of water and/or detergent and/or additives, and emptying means 30 adapted to empty the cavity 13, so that the load housed in the cavity 13 is washed and/or treated. As a result, the type of clothes to be washed or treated may be separated in the drum 6 and in the cavity 13, either by the size of the clothes, by how dirty they are and their corresponding treatment, by their composition or by the need to use different whiteners or additives.

[0022] In the embodiments shown in Figures 3 to 7, the filling means 20 and the emptying means 30 are arranged connected to the cavity 13. The filling means 20 comprise a filling pipe 21 that is preferably arranged connected to a top part 5a of the window 5, although in other embodiments not shown in the figures the filling pipe 21 may be connected to another point of the window 5. In other embodiments not shown in the figures the filling means 20 may be manual, in other words the fluid is introduced manually directly in the cavity 13. In addition, the emptying means 30 comprise an emptying pipe 31, said emptying pipe 31 arranged connected to a bottom part 5b of the window 5.

[0023] In the first embodiment, shown in Figure 3, the filling pipe 21 is arranged connected to the drainage means 60, downstream from the drainage pump 62, while the emptying pipe 31 is arranged connected to the drainage means 60, in particular the first drainage pipe 61, upstream from the drainage pump 62. Furthermore the filling means 20 comprise an electrovalve 22 connected to the filling pipe 21, which closes or opens the passage of fluid flowing through the first drainage pipe 61 towards the cavity 13.

[0024] In addition, in the embodiments shown in Figures 4 to 7, the front-loading washing machine 1 comprises recirculation means 50, arranged connected to the drainage means 60, which recirculate at least part of the drained fluid towards the load housed in the drum 6 through the trim. The recirculation means 50 comprise a recirculation pump 52 arranged connected to the drainage means 60, in particular to the first drainage pipe 61, and a first recirculation pipe 51 connected to the recirculation pump 52.

[0025] In these embodiments shown in Figures 4 to 7, the filling means 20 are arranged connected to said recirculation means 50 of the fluid housed in the tub 9. The filling pipe 21 is thus arranged connected to the first re-

circulation pipe 51. Additionally, the recirculation means 50 comprise a second recirculation pipe 53 through which the first recirculation pipe 51 is connected to the trim, the second recirculation pipe 53 being arranged connected to said first recirculation pipe 51 and to the filling pipe 21. To achieve this, in the second embodiment shown in Figure 4, the second recirculation pipe 53 and the filling pipe 21 are arranged connected to the first recirculation pipe 51 by means of an electrovalve 55, with the result that when the electrovalve 55 is in a first position all the fluid pumped by the recirculation pump 52 is directed towards the trim through the second recirculation pipe 53. In contrast, when the electrovalve 55 is in a second position the fluid pumped by the recirculation pump 52 is directed to the cavity 13 through the filling pipe 21.

[0026] In other embodiments shown in Figures 5 and 6, the second recirculation pipe 53, the filling pipe 21 and the first recirculation pipe 51 are arranged connected to each other by means of a three-way connector 56, with the result that the fluid propelled by the recirculation pump 52 branches off in two, depending on the load losses of the filling pipe 21 and the second recirculation pipe 53, reaching the tub 9 and consequently the inside of the drum 6 through the trim and filling the cavity 13 of the door 3 respectively.

[0027] In the embodiment shown in Figure 7, the front-loading washing machine 1 comprises, in addition to the three-way connector 56, a two-way electrovalve 57 in the second recirculation pipe 53 upstream from said connector 56, with the result that when the two-way electrovalve 57 is open, the fluid flows through said second recirculation pipe 53, whereas if the electrovalve 57 is closed, the fluid flows through the filling pipe 21. From this position, when the electrovalve 57 is open again, the fluid flows respectively through the second recirculation pipe 53 towards the tub 9 and through the filling pipe 21 towards the cavity 13. In this embodiment the filling pipe 21 is designed so that it has greater load losses than the second recirculation pipe 53, with the result that when the electrovalve 57 is open the fluid tends to go through the second recirculation pipe 53.

[0028] Additionally, in the embodiments shown in Figures 3 to 7, the emptying pipe 31 is arranged connected to the first drainage pipe 61 by means of a connector 64, although in other embodiments said emptying pipe 31 may be connected directly to the drainage pump 62. In the embodiments shown in Figures 3, 4, 5 and 7, the emptying of said cavity 13 is performed by mechanical means, particularly as a result of the siphon effect, by means of which the emptying pipe 31 follows a trajectory that is substantially an inverted U shape, whereas in the embodiment shown in Figure 6, said emptying of the cavity 13 is performed by electro-mechanical means. As a result, in the embodiment shown in Figure 6, the emptying means 30 comprise an emptying pump 35 through which the emptying pipe 31 is connected to the drainage pipe 61.

[0029] Furthermore, in the second embodiment shown

in Figure 4, the emptying means 30 also comprise an electrovalve 32 that ensures the cavity 13 is emptied completely, even when the cavity 13 has a minimum amount of fluid. To achieve this the electrovalve 32 is arranged in the emptying pipe 31 upstream from the U-shaped trajectory of said emptying pipe 31, with the result that when the electrovalve 32 is closed the fluid housed in the emptying pipe 31 upstream from the electrovalve 32 does not allow air to enter said emptying pipe 31, thereby enabling the siphon effect to occur.

[0030] In addition, in the embodiments shown in Figures 3 to 7, the front-loading washing machine 1 comprises safety means 40 arranged connected to the window 5, which ensure that the level of fluid comprised in the cavity 13 does not exceed a maximum preset level, the fluid running off towards the drainage means 60 in the event that said maximum level is reached due to the fact that the emptying means 30 are not operating correctly, for example because the emptying pipe 31 is blocked. The safety means 40 thus comprise a safety pipe 41 that is arranged connected to the first drainage pipe 61 through the connector 64, although in other embodiments it may be connected directly to the drainage pump 62. In the embodiments shown in Figures 3 to 7, the safety pipe 41 is arranged connected to the window 5, preferably beneath opening/closing means of the door 3, not shown in the figures.

[0031] Furthermore, in other embodiments not shown in the figures, the emptying means 30 and filling means 20 of the cavity 13 may be independent of the recirculation means 50 and the drainage means 60 of the tub 9, in other words the emptying means 30 may comprise an emptying pump connected to the emptying pipe 31, independent of the drainage pump 62 of the tub 9, as well as a filling pump that takes the fluid from the emptying pipe to the cavity 13 by means of the filling pipe 21. In the event that the cavity 13 is to be filled manually, said filling pump is not required.

[0032] Additionally, in all the embodiments shown the filling pipe 21, the emptying pipe 31 and the safety pipe 41 pass through the support 4 of the front-loading washing machine 1 towards the door 3 through a hinge 10, shown in Figure 1.

Claims

1. Front-loading washing machine that comprises a support (4), a drum (6) adapted to house a load, the load being any laundry, an opening (2) included in the support (4) through which the load is introduced in or removed from the inside of the drum (6), and a door (3) adapted to close the opening (2), the door (3) comprising a window (5) delimiting a cavity (13) adapted to house at least part of the load, **characterised in that** it comprises filling means (20) adapted to introduce a fluid into the cavity (13), and emptying means (30) adapted to empty the fluid housed

- in said cavity (13), so that the load housed in said cavity (13) is washed and/or treated.
2. Front-loading washing machine according to the preceding claim, comprising fastening means (12) that keep the load inside the cavity (13). 5
 3. Front-loading washing machine according to the preceding claim, wherein the fastening means (12) comprise at least one limiting surface (12b) that delimits the cavity (13). 10
 4. Front-loading washing machine according to any of preceding claims, wherein the emptying means (30) are arranged connected to a lower part (5b) of the window (5). 15
 5. Front-loading washing machine according to any of preceding claims, wherein the emptying means (30) comprise an electrovalve (32) that ensures the cavity (13) is emptied completely. 20
 6. Front-loading washing machine according to any of preceding claims, comprising a tub (9) and drainage means (60) that remove the fluid housed in the tub (9), the filling means (20) of the cavity (13) comprising at least one filling pipe (21) that is arranged connected to the drainage means (60). 25
 7. Front-loading washing machine according to any of claims 1 to 5, wherein it comprises a tub (9), a tub cover (8), a trim connected to the tub cover (8), drainage means (60) that remove the fluid housed in the tub (9) and recirculation means (50), arranged connected to the drainage means (60), which recirculate at least part of the drained fluid towards the trim, wherein the filling means (20) of the cavity (13) are arranged connected to the recirculation means (50) of the fluid housed in the tub (9). 30
35
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 8. Front-loading washing machine according to the preceding claim, wherein the recirculation means (50) of the fluid housed in the tub (9) comprise at least one recirculation pump (52) arranged connected to the drainage means (60) of said fluid and at least one first recirculation pipe (51) connected to the recirculation pump (52), and the filling means (20) of the cavity (13) comprise at least one filling pipe (21) that is arranged connected to the first recirculation pipe (51). 45
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 9. Front-loading washing machine according to the preceding claim, wherein the recirculation means (50) of the fluid housed in the tub (9) comprise a second recirculation pipe (53) that is arranged connected to the first recirculation pipe (51) and to the filling pipe (21) of the cavity (13). 55
 10. Front-loading washing machine according to the preceding claim, wherein the first recirculation pipe (51), the second recirculation pipe (53) and the filling pipe (21) of the cavity (13) are arranged connected to each other by means of an electrovalve (55).
 11. Front-loading washing machine according to any of claims 6 to 10, wherein the drainage means (60) of the fluid housed in the tub (9) comprise at least one drainage pump (62), and a first drainage pipe (61) that connects the tub (9) to the drainage pump (62), and the emptying means (30) of the cavity (13) comprise an emptying pipe (31) that is arranged connected to the first drainage pipe (61).
 12. Front-loading washing machine according to any of claims 6 to 11, wherein it comprises safety means (40) that drain said cavity (13) when a maximum level of fluid is reached in said cavity (13).
 13. Front-loading washing machine according to the preceding claim, wherein the safety means (40) comprise at least one safety pipe (41) that is arranged connected to the drainage means (60).

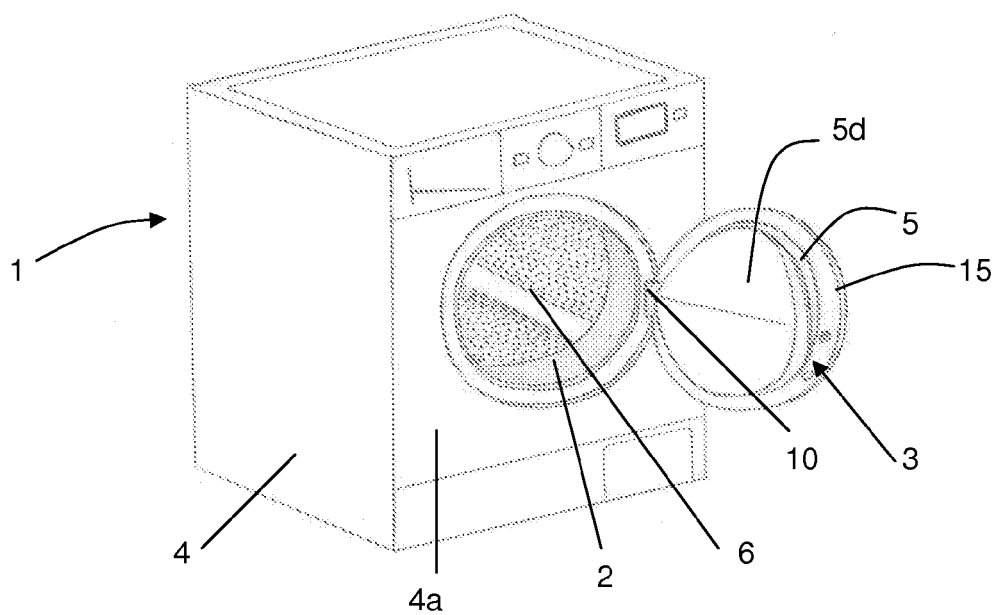


FIG. 1

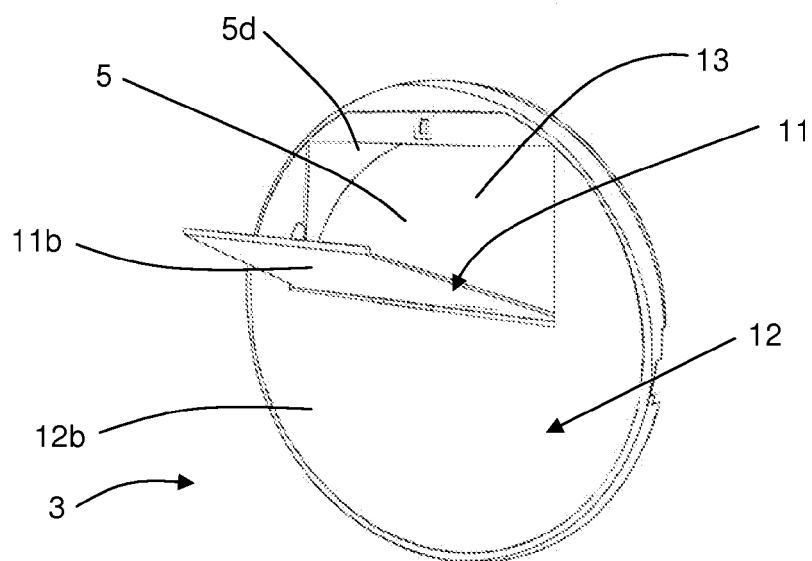


FIG. 2

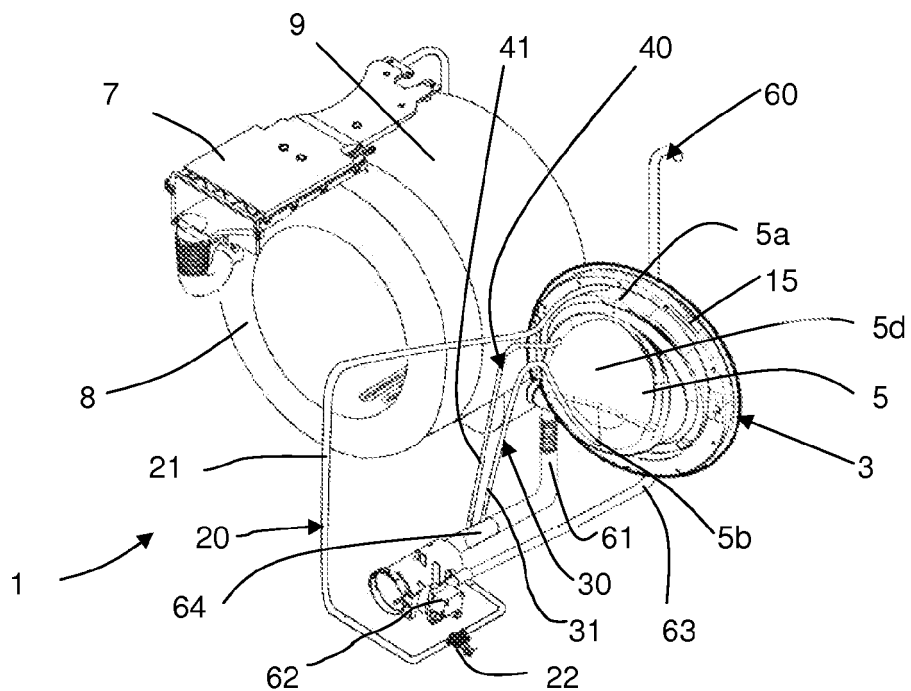


FIG. 3

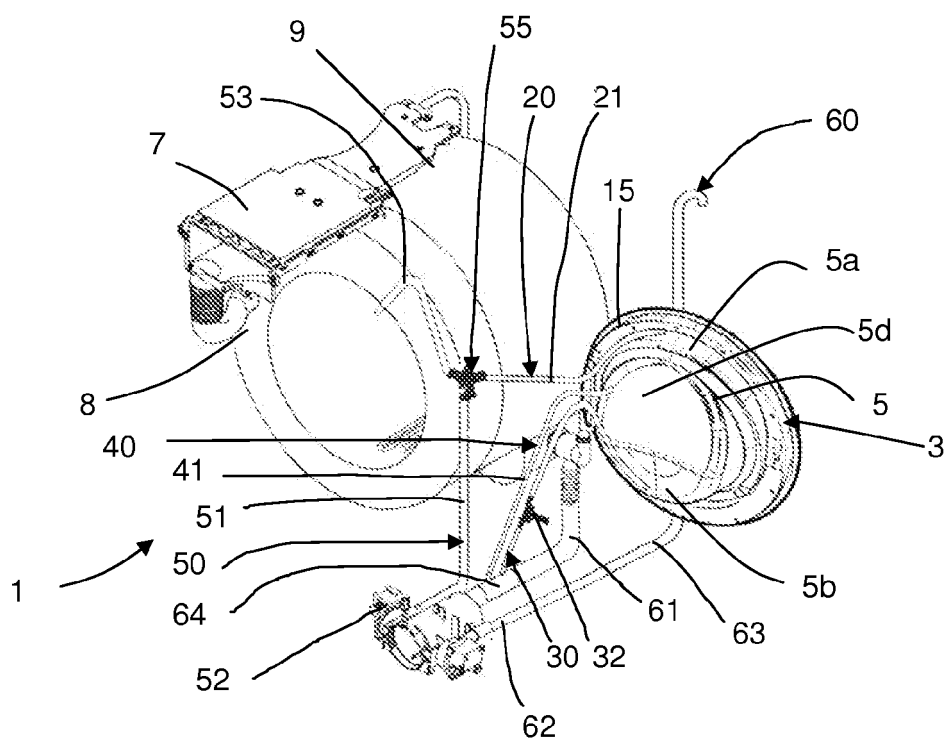


FIG. 4

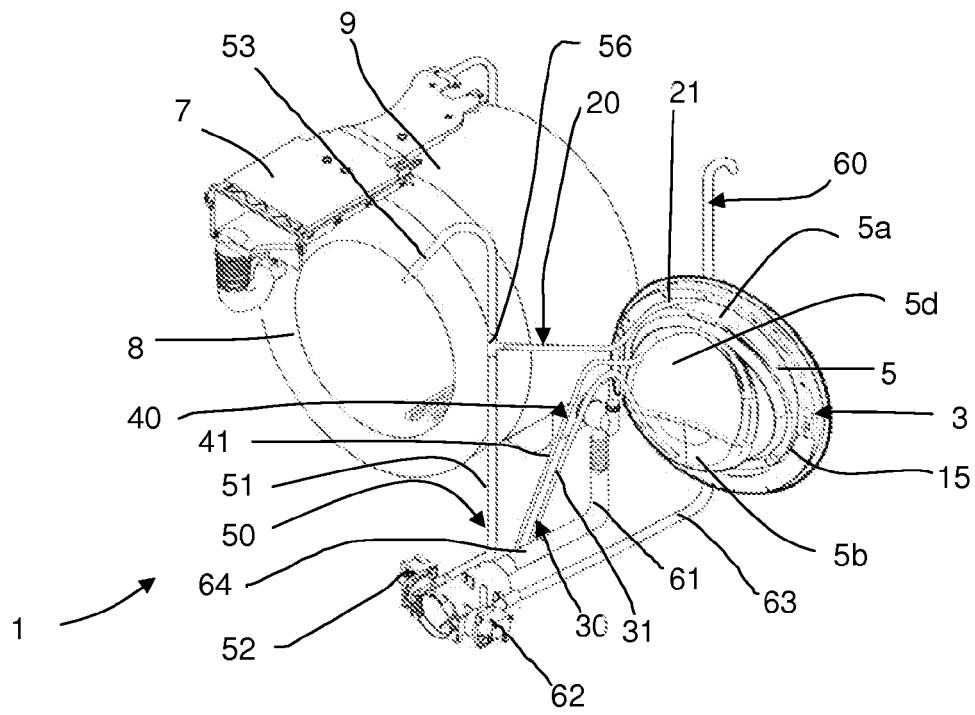


FIG. 5

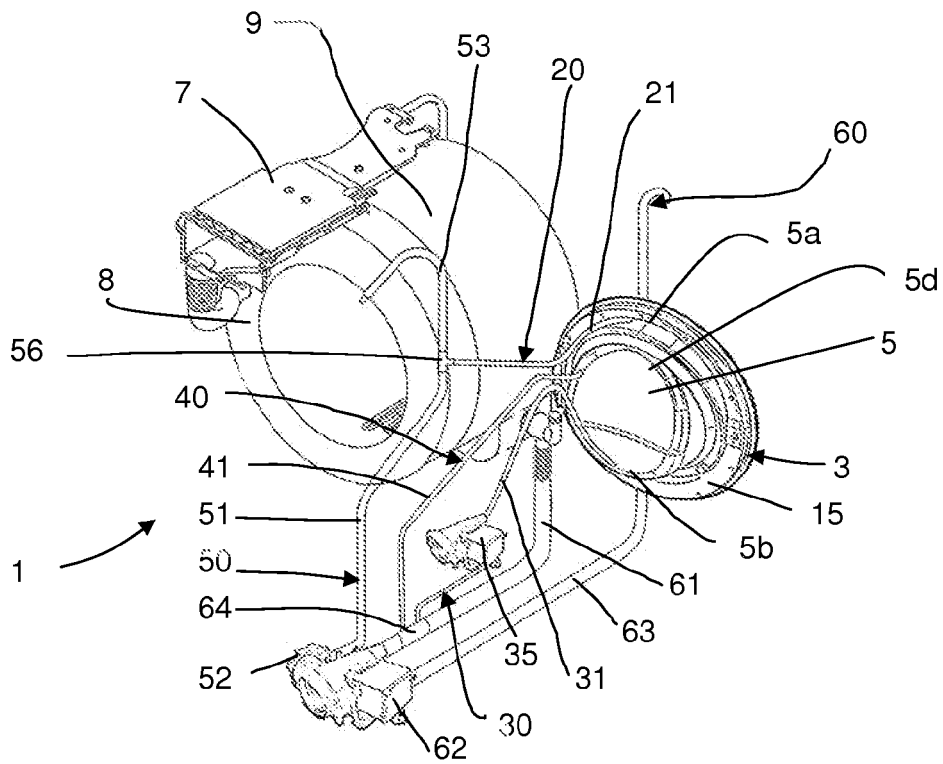


FIG. 6

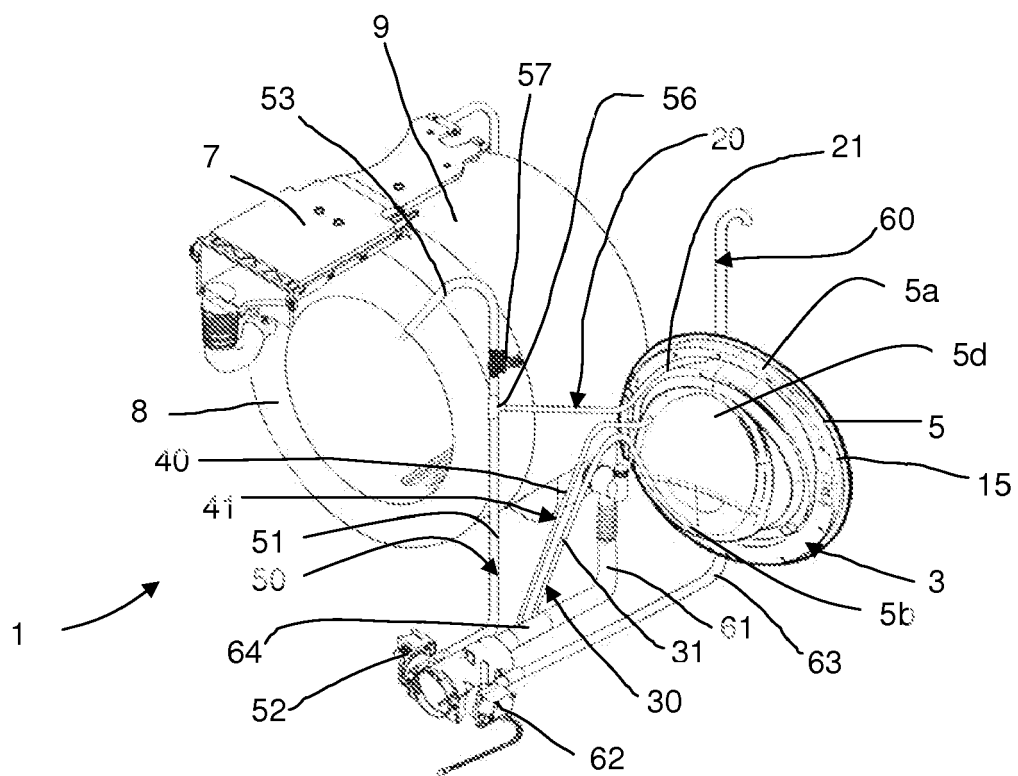


FIG. 7



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Application Number
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Place of search Munich		Date of completion of the search 7 November 2011	Examiner Prosig, Christina
<p>CATEGORY OF CITED DOCUMENTS</p> <p>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</p> <p>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</p>			

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EPO FORM 1503 03/02 (P04C01)



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**ANNEX TO THE EUROPEAN SEARCH REPORT
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