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(54) WASHING MACHINE PROVIDED WITH A RECIRCULATION CIRCUIT

(57) The present invention relates to a washing machine (1) comprising: a washing tub (10) wherein a rotatably drum (20) is mounted, adapted to contain garments to be washed, a washing fluid comprising water and one or more detergent substances to be delivered into the tub (10) and the drum (20); an outlet conduit (40) connected, through its end portion (50), to the tub (10) for conveying the washing fluid outside of the tub (10); a recirculation circuit (60) comprising a first conduit (61), a recirculation pump (62) and a second conduit (63). The first conduit (61) connects the end portion (50) of the outlet conduit (40) to the recirculation pump (62); the second conduit (63) allows a connection between the recirculation pump (62) and the tub (10); the recirculation pump (62) is configured to draw the fluid from the tub (10) through the first conduit (61) and to feed the fluid back in the tub (10) through the second conduit (63). According to the invention, the tub (10) has an integral connection collar at a bottom portion thereof, which is applied to an outer surface of the tub (10) for connection to the second conduit (63). The connection collar is originally blind. The blind bottom of the connection collar is adapted to be opened by boring, for providing fluid communication between the second conduit (63) and the interior of the tub (10).

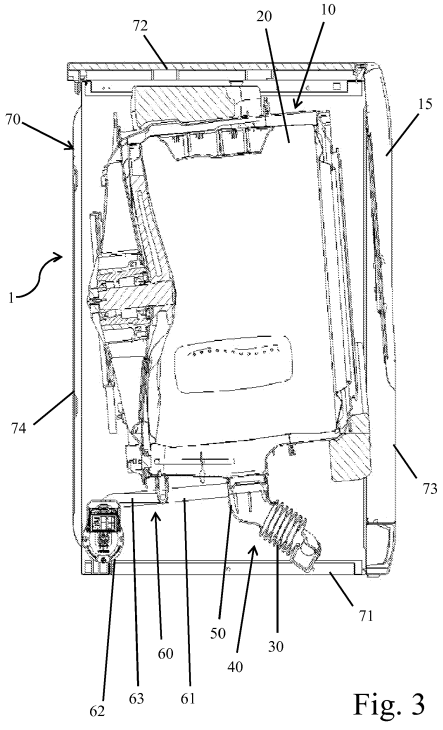

Fig. 3

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Description

[TECHNICAL FIELD]

[0001] The present invention refers to a washing machine provided with a recirculation circuit.

[BACKGROUND ART]

[0002] It is known that washing machines, and in particular washing-machines and washer-dryers, include a support frame, on which a washing tub is mounted, inside which rotates a drum, wherein the garments to be washed are placed.

[0003] The tub has an opening through which the access to the drum is possible and clothes can be placed inside the drum.

[0004] Such machines also comprise a controlled hydraulic system, which provides the water supply, suitably mixed with detergent substances, so that the garments are subjected to the washing process.

[0005] It is also provided a recirculation circuit, which has the aim to facilitate the dissolution of the detergent in the water and to promote the circulation of water and detergent into the tub.

[0006] Document EP 2267211 A1 discloses a washing machine having a recirculation conduit connected to a spray nozzle that is arranged in the upper section of tub.

[0007] Document DE 3437886 A1 discloses a washing machine having a pump for the recirculation of the suds to deliver the recirculated suds to the detergents drawer.

[0008] An exemplary recirculation circuit is disclosed in US 2005/0132758 A1. Referring to Figure 1 of that document, it should be noted the conduit 110, output from the washing tub, which conveys the water and the detergent to the pump 130. The latter provides to convey the water and the detergent towards the valve 150. Depending on the operative configuration of the valve 150, the washing fluid can be selectively inserted in the conduit 120, to then be distributed in a "rain mode" on the drum, or it can be diverted into the conduit 140, which brings it back to the pump 130 so as to define a closed circuit substantially outside the tub. The valve 140 is controlled on the basis of the fact that the detergent needs to be further dissolved in water (deviation inside the conduit 140), or on the basis of the fact that the washing-fluid should be distributed on the garments to be washed (forwarding to the conduit 120).

[0009] It should be noted that the solution disclosed in US 2005/0132758 A1 has evident structural drawbacks.

[0010] In fact, the washing machine described in this document is characterized by a considerable constructional complexity and consequent particularly significant difficulty of assembly.

[0011] It should be noted, by way of example only, how articulated are the structure configured to perform a recirculation entirely external to the washing tub, the structure configured to bring back the water and detergent at a height above the maximum height of the drum, as well as the control structure that is adapted, to the selective driving of the position of the valve 140.

[OBJECTIVES AND SUMMARY OF THE INVENTION]

[0012] The object of the present invention is to provide a washing machine having a simplified structure, which can be easily and quickly assembled.

[0013] Another object of the invention is to provide a washing-machine which has lower implementation costs.

[0014] Another object of the invention is to provide a washing machine able to optimize the cleaning action of the washing fluid by means of its recirculation circuit.

[0015] These and still other objects are substantially obtained by a washing machine provided with a recirculation circuit as described in the appended claims.

[0016] An idea underlying the invention provides for the arrangement, in a washing machine, of a recirculation circuit comprising a first conduit, a recirculation pump and a second conduit, wherein:

- the first conduit connects the end portion of an outlet conduit to the recirculation pump;
- the second conduit allows a connection between the pump and the tub;
- the pump is configured to draw the fluid, consisting of water and detergent from the tub through the first conduit and to feed said fluid back into the tub through the second conduit.

[0017] The Applicant believes that, in this way, a washing machine can be implemented wherein the recirculation circuit has a particularly simplified structure, easy to assemble and with a lower cost.

[0018] Preferably the second conduit allows a reintroduction of the fluid, into the tub through a lower surface of the tub itself.

[0019] Preferably, the end portion of the outlet conduit has a substantially cylindrical shape; the first conduit leads to a first radial opening of such an end portion.

[0020] Preferably the second conduit has a first end connected to the recirculation pump, and a second end leading to the tub.

[0021] Preferably, the second end of the second conduit leads to the tub in a different position, with respect to the end portion of the outlet conduit.

[0022] Preferably, the outlet conduit comprises a main body and the aforementioned end portion; the main body and the end portion being particularly formed enbloc, preferably of elastomeric material.

[0023] Preferably the second conduit has a first end connected to the recirculation pump and a second end leading to the end portion of the outlet conduit.

[0024] Preferably, the outlet conduit comprises a main body and the aforementioned end portion; the main body

and the end portion being particularly distinct pieces and fluid tightly assembled together to define the outlet conduit.

[0025] Preferably, the tub and the main body are associated with respective longitudinal ends of the aforementioned end portion having a cylindrical shape, preferably the second conduit pertains to a second radial opening of such an end portion.

[0026] Preferably the angular distance between the first radial opening and the second radial opening ranges from 30° to 100°.

[0027] Preferably, the end portion has a connection member formed so as to convey toward the inside of the washing tub the washing fluid coming out from the second conduit.

[0028] Preferably the connection member is substantially "L shaped".

[0029] Preferably the washing machine according to the invention also comprises a substantially box-like support structure, having a bottom surface, a top surface, a front surface and a back surface, and a pair of opposed lateral surfaces; preferably the recirculation pump is mounted close to a corner defined, by the back surface and the bottom surface.

[0030] Preferably, the recirculation pump has an inlet connected to the first conduit and an outlet connected to the second conduit.

[0031] Preferably the inlet or the recirculation pump is to a lesser extent compared to the outlet of the pump itself.

[0032] Preferably the inlet of the recirculation pump is extends in a direction substantially parallel to a bottom surface of the washing machine; and preferably the outlet of the recirculating pump extends in a direction transverse, preferably substantially orthogonal with respect to the bottom surface.

[0033] Preferably the first and/or second conduit have a corrugated shape, at least at a substantially middle portion thereof.

[0034] Preferably, the recirculation circuit further includes a removable insert mounted at the second end of the second conduit; particularly said insert is such as to divert the flow of the fluid coming out from the second conduit by substantially 90° and make the same flow substantially parallel to the bottom the tub.

[0035] Preferably, the recirculation pump comprises a volute formed enbloc with a protective element or cover, the latter being adapted to protect said recirculation pump from any water leakage.

[0036] The tub has, in a lower portion thereof, a connection collar molded to an outer surface of the tub itself for a connection with said second conduit, particularly the collar connection is natively blind, and the blind end of such a connection collar is adapted to be opened by a boring operation for providing fluid communication between the second conduit and the interior of the tub.

[0037] Further characteristics and advantages will become more apparent from the detailed description of a preferred but not exclusive embodiment of the invention. This description is provided below with reference to the accompanying drawings, illustrated by way of non limiting example.

[BRIEF DESCRIPTION OF THE DRAWINGS]

[0038]

Figure 1 shows a perspective view of a first embodiment of a washing-machine according to the invention, with some parts removed, to better illustrate others.

Figure 2 shows a detail of the washing machine of Figure 1.

Figure 3 shows a side view of the washing machine of Figure 1.

Figure 4 shows a detail of the washing machine of Figure 1.

Figure 5 shows an exploded view of the detail of Figure 4.

Figure 6 shows a perspective view of a second embodiment of a washing machine in accordance with the invention, in which some parts have been removed to better illustrate others.

Figure 7 shows a detail of Figure 6.

Figure 8 shows a plan view of the detail of Figure 7.

[0039] The figures show different aspects and embodiments of the present invention and, where appropriate, structures, components, materials and/or similar elements in different figures are indicated by identical reference numerals.

[DETAILED DESCRIPTION OF THE INVENTION]

[0040] With reference to the accompanying Figures, 1 denotes in its entirety a washing machine in accordance with the present invention.

[0041] The washing machine 1 is preferably a washing machine or a washer-dryer.

[0042] For example, the washing machine 1 may be a front loading washing machine or, alternatively, a top-loading washing machine.

[0043] Preferably the washing machine 1 comprises a support structure 70 (Figures 1, 3, 6) being substantially box-like, for example substantially parallelepiped.

[0044] The support structure 70 has a bottom surface 71, a top surface 72, a front surface 73, a back surface 74, and a pair of opposed lateral surfaces 75, 76.

[0045] Inside the support structure 70 is arranged a

washing tub 10, wherein a drum 20 is rotatably mounted.

[0046] The tub 10 has a loading opening, through which the garments to be washed can be placed.

[0047] The load opening is closed by a door 15 (Figure 3). The door 15 may comprise a transparent porthole, which allows the user to observe the internal portion of the drum 20 and the garments placed therein. In different embodiments, the door 15 is entirely opaque and does not allow such observation.

[0048] The drum 20 is rotatably driven by suitable actuators, known per se and therefore not described in detail below.

[0049] In use, inside the drum 20 garments to be washed are placed.

[0050] Inside the tub 10 and the drum 20 is provided a fluid which, depending on the single washing step, can include only water, or water mixed with one or more detergents.

[0051] An outlet conduit 40 is connected, to the tub 10 for conveying the fluid out of the tub 10 itself; the outlet conduit 40, also called exhaust bellows, is connected to a drain pump (not shown) in turn connected to a further outflow conduit (also not shown), so as to exhaust the fluid, at the end of predetermined washing or rinsing steps.

[0052] Preferably the outlet conduit 40 comprises a main body 30 and an end portion 50.

[0053] The main body 30 can be made of elastomeric material and is provided with a portion "bellows-shaped", schematically illustrated, for example in Figures 3-5 and 7-8.

[0054] The end portion 50 preferably has a substantially cylindrical shape.

[0055] In a first embodiment (Figures 1-5) the main body 30 and the end portion 50 are formed enbloc.

[0056] In this first embodiment, therefore, also the end portion 50 is made of elastomeric material.

[0057] In a second embodiment (Figures 6-8) the mam body 30 and the end portion 50 are made as distinct pieces, fluid-tightly assembled together so as to enable a correct outflow of fluid coming out from the tub 10.

[0058] In this second embodiment, the end portion 50 can be made of different material (e.g. a plastic material) with respect to the main body 30.

[0059] In accordance with the invention, the washing machine 1 also comprises a recirculation circuit 60.

[0060] The recirculation circuit 60 in turn comprises a first conduit 61, a recirculation pump 62 and a second conduit 63.

[0061] The first conduit 61 connects the end portion 50 of the outlet conduit 40 to the recirculation pump 62. The second conduit 63 allows a connection between the recirculation pump 62 and the tub 10. As will be more clear in the following, the characteristics of this connection will be different depending on the embodiment of the washing-machine 1.

[0062] The recirculation pump 62 is configured to draw the fluid from the tub 10 through the first conduit 61 and to feed said fluid back into the tub 10 through the second conduit 63.

[0063] As shown by way of example in Figure 3 and in Figure 6, the recirculation pump 62 may be mounted within the support structure 70 close to a corner defined by the back surface 74 and by the bottom surface 71 of the structure 70 itself.

[0064] In this way, the available space within the support structure 70 is exploited in an optimal way.

[0065] Advantageously, the volute 62c, wherein the impeller of the recirculation pump 62 is mounted, is formed enbloc with a protective element or cover 62d, which protects the circulation pump 62 itself from any water leakage, and therefore assigns particular safety to the washing machine 1.

[0066] The recirculation pump 62 has an inlet 62a and an outlet 62b (Figure 5). The inlet 62a is connected to the first conduit 61, while the output 62b is connected to the second conduit 63, and in particular at a first end 63a of the latter.

[0067] It should be noted that the inlet 62a of the recirculation pump 62 is located at a lower height than the outlet 62b of the pump 62 itself.

[0068] Particularly, the inlet 62a extending in a direction substantially parallel to the bottom surface 71, and the output 62b extending in a transverse direction, and preferably substantially orthogonal, with respect to the bottom surface 71 thereof.

[0069] In practice, the inlet 62a extending in a substantially horizontal direction (i.e. parallel to the ground), while the outlet 62b extending in a substantially vertical direction (Figures 1 and 6).

[0070] In use, the bottom of the tub 10 accumulates a. quantity of fluid which, as aforementioned, can be constituted by a mixture of water and detergent. Thanks to the recirculation circuit 60, and in particular to the defined path, in succession, by the first conduit 61, the circulation pump 62 and the second conduit 63, it is possible to feed back into the tub 10 the cleaning fluid, optimizing the dissolution of the detergent in water and reusing the fluid until the conclusion of the washing phase provided.

[0071] As shown in Figure 1, the second conduit allows a reintroduction of the fluid into the tub 10 through a lower surface 10a of the latter. Therefore the recirculation circuit 60 having an extremely simple structure and easy to assemble, as well as having particularly reduced overall dimensions.

[0072] Preferably the first conduit 61 leads to a first radial opening 51 of the end portion 50. The first radial opening 51 may be associated with a fitting, so as to facilitate the connection with the first conduit 61.

[0073] Preferably, in correspondence with the first radial opening 51, there are one or more fins, which serve as a reference during assembly: the first conduit 61, in correspondence of its end adapted to be coupled to the first radial opening 51, has in turn appropriate signs or reference marks which must be properly aligned to the aforementioned fins for a correct mutual orientation of

the various parts.

[0074] In practice, while the tub 10 and the main body 30 are associated with respective axial ends of the substantially cylindrical shape of the end portion 50, the first conduit 61 is connected to an opening formed in the lateral surface of said cylindrical shape (Figures 4-5).

[0075] The second conduit 63 has a first and a second end 63a, 63b.

[0076] In the first embodiment shown in Figures 1-5, the first end 63a is connected to the recirculation pump 62 (in particular the outlet 62b of the same), while the second end 63b leads to the tub 10.

[0077] Preferably, the second end 63b is connected to a lower surface of the tub 10 itself.

[0078] In particular the second, end 63b of the second conduit 63 pertains to the tub 10 in a different position with respect to the end portion 50 of the outlet conduit 40.

[0079] In fact, as shown by way of example in Figure 3, the end portion 50 of the outlet conduit 40 is connected to the tub 10 in a position closer to the front surface 73, while the second end 63b of the second conduit is connected to the tub 10 in a position closer to the back surface 74.

[0080] Preferably, in correspondence of the second end 63b of the second conduit 63, a removable insert is mounted, which diverts the fluid substantially by 90° and makes it substantially parallel to the bottom of the tub 10, so that any detergent accumulated on the bottom of the tub 10 itself may be hit by this flow and be then reactivated.

[0081] In correspondence of the bottom of the tub 10, there is provided a collar co-molded with the outer surface of the tub 10 itself. Natively this collar is blind, i.e. is defined by a substantially cylindrical element extending from the outer surface of the tub 10, but is separated from the inside of the tub 10 by the outer surface of the latter. In the washing machines wherein the system according to the invention is actually applied (such as the washing machine 1 described and claimed herein), via a boring operation of the bottom of said cylindrical element will be possible to realize the connection with the second conduit 63.

[0082] In this way, significant advantages in terms of standardization are obtained, since it can be made substantially identical tubs for all washing machines, as mentioned, it is therefore sufficient to perform a simple boring operation to make such tubs suitable to the application of the present invention.

[0083] In the second embodiment shown in Figures 6-8, the first end 63a of the second conduit 63 is connected to the recirculation pump 62 (similarly to the first embodiment), while a second end 63b of the second conduit 63 itself leads to the end portion 50 of the outlet conduit 40.

[0084] In greater detail, the tub 10 and the main body 30 are associated with respective longitudinal ends 50a, 50b of the end portion 50, while the second conduit 63 leads to a second radial opening 52 formed in the lateral surface of the end portion 50 thereof.

[0085] As mentioned, also the first conduit 61 is associated with a respective first radial opening 51 formed in the lateral surface of the end portion 50.

[0086] In a preferred embodiment, the angular distance between the first radial opening 51 and the second radial opening 52 ranges from 80° to 100°. By way of example, this angular distance may be substantially equal to approximately 90°, as shown in Figure 8.

[0087] Figures 7-8 show a connection member 53, forming part of the end portion 50 of the outlet conduit 40.

[0088] The connection member 53 is shaped so as to convey the fluid coming out from the second, conduit 63 toward the interior of the tub 10.

[0089] By way of example, the connection member 53 is substantially "L-shaped", preferably having a first portion substantially aligned with the second end 63b of the second conduit 63, and a second portion substantially orthogonal to the first portion and leading towards the interior of the washing tub 10.

[0090] In practice, the connection member 53 has the task of facilitating the flow towards the interior of the tub 10 of the fluid that has flown inside the recirculation circuit 60.

[0091] Both in the first, and in the second embodiment, the first and/or second conduit 61, 63 are formed enbloc with two different materials.

[0092] Preferably the first and/or second conduit 61, 63 are substantially transparent.

[0093] At least a substantially central portion of the first and/or second conduit 61, 63 may advantageously have a corrugated shape, so as to increase the turbulence of the fluid, flowing inside and facilitate the activation of the detergent.

[0094] Preferably, within the second conduit 63 is mounted a switch (not shown), comprising for example a solenoid or a thermal actuator.

[0095] This diverter can be driven in at least two operating configurations: in a first configuration, it allows a flow of fluid within the second conduit 63 (from the recirculation pump 62 to the tub 10), while in the second configuration it diverts the flow to an auxiliary conduit (not shown), which carries the fluid, up to an upper end of the tub 10. In this way the fluid can be sprayed, inside the tub by a different position, for example in the vicinity of the upper portion of the gasket surrounding the porthole.

[0096] The diverter is suitably driven by the electronic control system of the washing machine 1, for example time-based or depending on the measurements performed by a sensor capable of generating signals representative of the level of water inside the tub.

[0097] Preferably, the control technique provides that a limited amount of water should be retained in the lower part of the tub 10 (in correspondence of a resistor, used to heat water); when the existing water exceeds a predetermined threshold, the diverter is controlled so as to interrupt the recirculation (that through the second conduit 63 enters again the fluid in the lower part of the tub

10), and to divert the flow toward said auxiliary conduit.

[0098] In this way a "staging" load of the liquid into the tub is implemented.

[0099] It is also obtained a significant advantage in terms of simplicity and economy, since with a single pump, i.e. the recirculation pump 62, two different hydraulic circuits are managed.

[0100] In light of the above, the operation of the washing machine 1 according to the invention can be summarized as follows.

[0101] The washing fluid is inserted into the tub 10 and the drum 20, comprising water and one or more detergent substances.

[0102] Such fluid tends to accumulate on the bottom of the tub 10, in particular near said back surface 10a of the tub 10 itself.

[0103] If the washing phase provided has ended, the fluid is made to slide in the outlet conduit 40 and, via the drain pump, sent outside of the washing machine 1.

[0104] Conversely, if the washing phase provided has not yet ended, the fluid is made to slide in the recirculation circuit 60, by means of the first conduit 61, the recirculation pump 62 and the second conduit 63.

[0105] In this way the fluid can be reused up to completion of the operations envisaged.

[0106] In more detail, the activation of the recirculation pump 62 for each cycle occurs after about 5 minutes, during which a water heating step is carried out; and the pump 62 is activated when it reaches a predetermined target temperature. The recirculation pump 62 then remains active for the next 15-20 minutes. Thereafter, it is activated for about 30 seconds at regular intervals of about 10 minutes, until the conclusion of the mechanical washing. It should be noted that the periods can vary slightly depending on the cycle run.

[0107] Advantageously, the recirculation circuit 60 is also active during the rinsing phases: in particular for a time of about 30 seconds during the exchange time of each rinsing, and at the end of the final spin during unloading.

[0108] In this way both an optimal cleaning of the circuit, and a resuspension of any amount of detergent existing in the water and on the bottom of the tub are guaranteed, so that the detergent itself can be eliminated more easily, avoiding to settle onto the load.

[0109] The invention achieves important advantages.

[0110] First of all, the washing machine according to the invention has a simplified structure, which can be easily and quickly assembled.

[0111] Another advantage is found in the fact that the washing machine in accordance with the invention has lower implementation costs.

[0112] A further advantage consists in the fact that the washing machine according to the invention is able to optimize the cleaning action of the washing fluid by means of its recirculation circuit, since it obtains a premature mixing in the water of the washing agent, so that it can be effective in a quicker time.

Claims

1. A washing machine (1), comprising:

a washing tub (10), for a washing fluid comprising water and one or more detergent substances to be delivered in said tub (10);
an outlet conduit (40) connected by an end portion (50) to the tub (10), for conveying said washing fluid out of said washing machine (1);
a recirculation circuit (60) comprising a first conduit (61), a recirculation pump (62) and a second conduit (63), wherein:

- said first conduit (61) connects said outlet conduit (40), particularly said end portion (50) of said outlet conduit (40), to said recirculation pump (62);
- said second conduit (63) allows connection between said recirculation pump (62) and said tub (10);
- said recirculation pump (62) is designed to draw said fluid from said tub (10) through said first conduit (61) and to feed said fluid back into said tub (10) through said second conduit (63),

characterised in that said tub (10) has an integral connection collar at a bottom portion thereof, which is applied to an outer surface of said tub (10) for connection to said second conduit (63), said connection collar being originally blind, the blind bottom of said connection collar being adapted to be opened by boring, for providing fluid communication between said second conduit (63) and the interior of said tub (10).

2. A washing machine (1) as claimed in claim 1, wherein said second conduit (63) allows said fluid to be fed back into the tub (10) through a lower surface (10a) of said tub (10).

3. A washing machine (1) as claimed in claim 1 or 2, wherein the end portion (50) of said outlet conduit (40) has a cylindrical shape, with said first conduit (61) leading to a first radial opening (51) of said end portion (50).

4. A washing machine (1) as claimed in any preceding claim, wherein said second conduit (63) has a first end (63a) connected to said recirculation pump (62), and a second end (63b) leading to said tub (10), wherein in particular the second end (63b) of said second conduit (63) leads to said tub (10) in a position other than that of the end portion (50) of said outlet conduit (40).

5. A washing machine (1) as claimed in any preceding

claim, wherein said outlet conduit (40) comprises a main body (30) and said end portion (50), wherein said main body (30) and said end portion (50) are formed enbloc, preferably of elastomeric material.

6. A washing machine (1) as claimed in any claim from 1 to 3, wherein said second conduit (63) has a first end (63a) connected to said recirculation pump (62), and a second end (63b) leading to the end portion (50) of said outlet conduit (40), wherein in particular said outlet conduit (40) comprises a main body (30) and said end portion (50), wherein said main body (30) and said end portion (50) are distinct pieces, fluid-tightly assembled together to define said outlet conduit (40).

7. A washing machine (1) as claimed in claim 6, when dependent on claim 3, wherein said tub (10) and said main body (30) are associated with respective longitudinal ends (50a, 50b) of said cylindrical shape, and said second conduit (63) leads to a second radial opening (52) of said end portion (50), wherein in particular an angular distance between said first radial opening (51) and said second radial opening (52) ranges from 60° to 150°, particularly from 80° to 100°.

8. A washing machine (1) as claimed in claim 6 or 7, wherein said end portion (50) has a connection member (53) which is shaped to convey the fluid that comes out from said second conduit (63) into said tub (10), wherein in particular said connection member (53) is "L-shaped".

9. A washing machine (1) as claimed in any preceding claim, further comprising a box-like support structure (70) having a bottom surface (71), a top surface (72), a front surface (73), a back surface (74) and a pair of opposed lateral surfaces (75, 76), wherein said recirculation pump (62) is mounted in said support structure (70) close to a corner defined by said back surface (74) and said bottom surface (71).

10. A washing machine (1) as claimed in any preceding claim, wherein said recirculation pump (62) has an inlet (62a) connected to said first conduit (61) and an outlet (62b) connected to said second conduit (63).

11. A washing machine (1) as claimed in claim 10, wherein said inlet (62a) is at a lower height than said outlet (62b).

12. A washing machine (1) as claimed in claim 10 or 11, wherein said inlet (62a) extends in a direction parallel to a bottom surface (71) of said washing machine (1), and said outlet (62b) extends in a direction transverse, preferably orthogonal, to said bottom surface (71).

13. A washing machine (1) as claimed in any preceding claim, wherein said first and/or second conduits (61, 63) have a corrugated shape, at least at a middle portion thereof.

14. A washing machine (1) as claimed in claim 4, wherein said recirculation circuit (60) further comprises a removable insert, which is mounted at the second end (63b) of said second conduit (63), said insert being designed to divert the fluid flow that comes out of the second conduit (63) by 90°, and to convey the flow parallel to the bottom of the tub (10).

15. A washing machine (1) as claimed in any preceding claim, wherein said recirculation pump (62) comprises a volute (62c) formed enbloc with a protective element or cover (62d), the latter being adapted to protect said recirculation pump (62) from any water leakage.

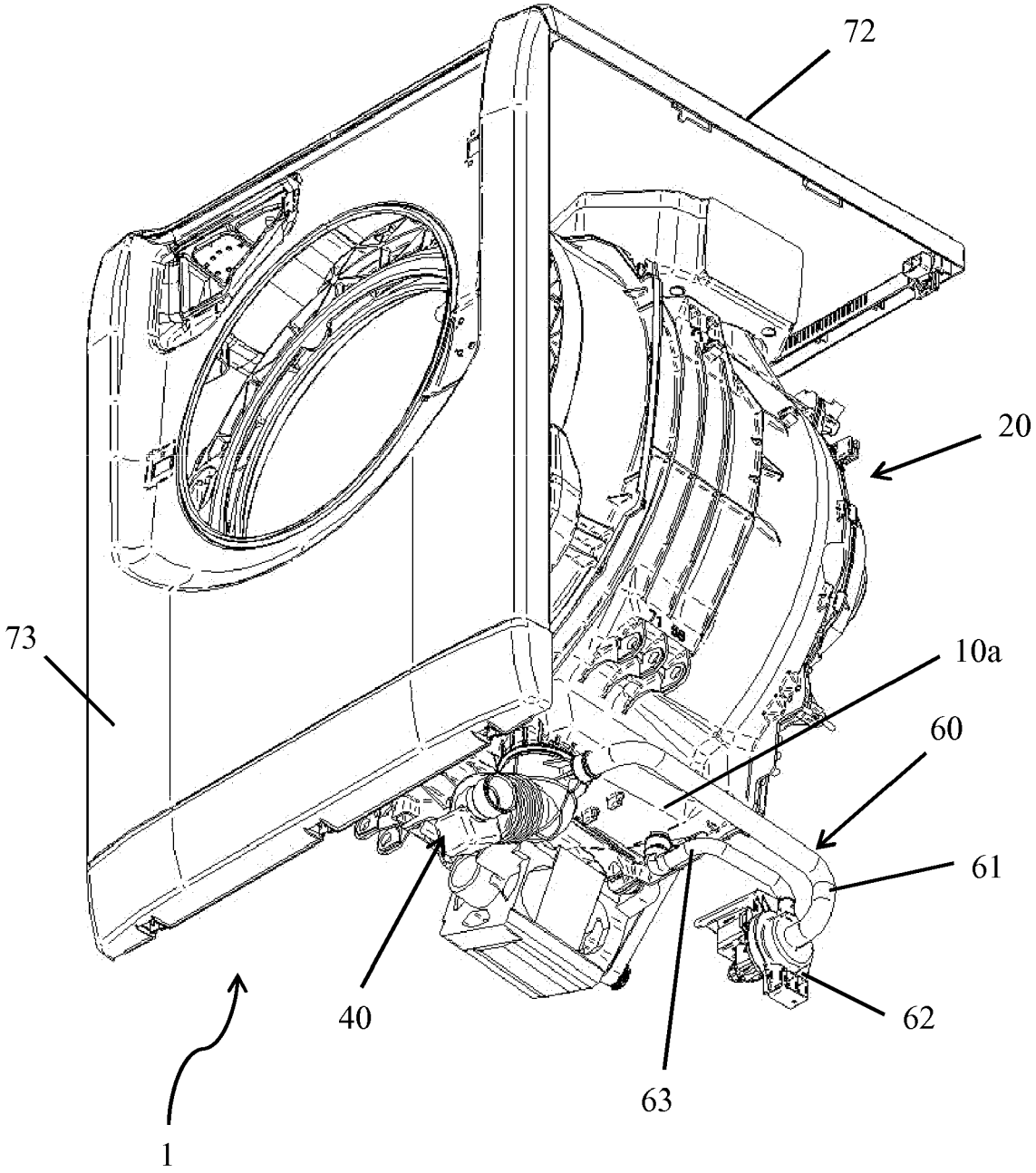

Fig. 1

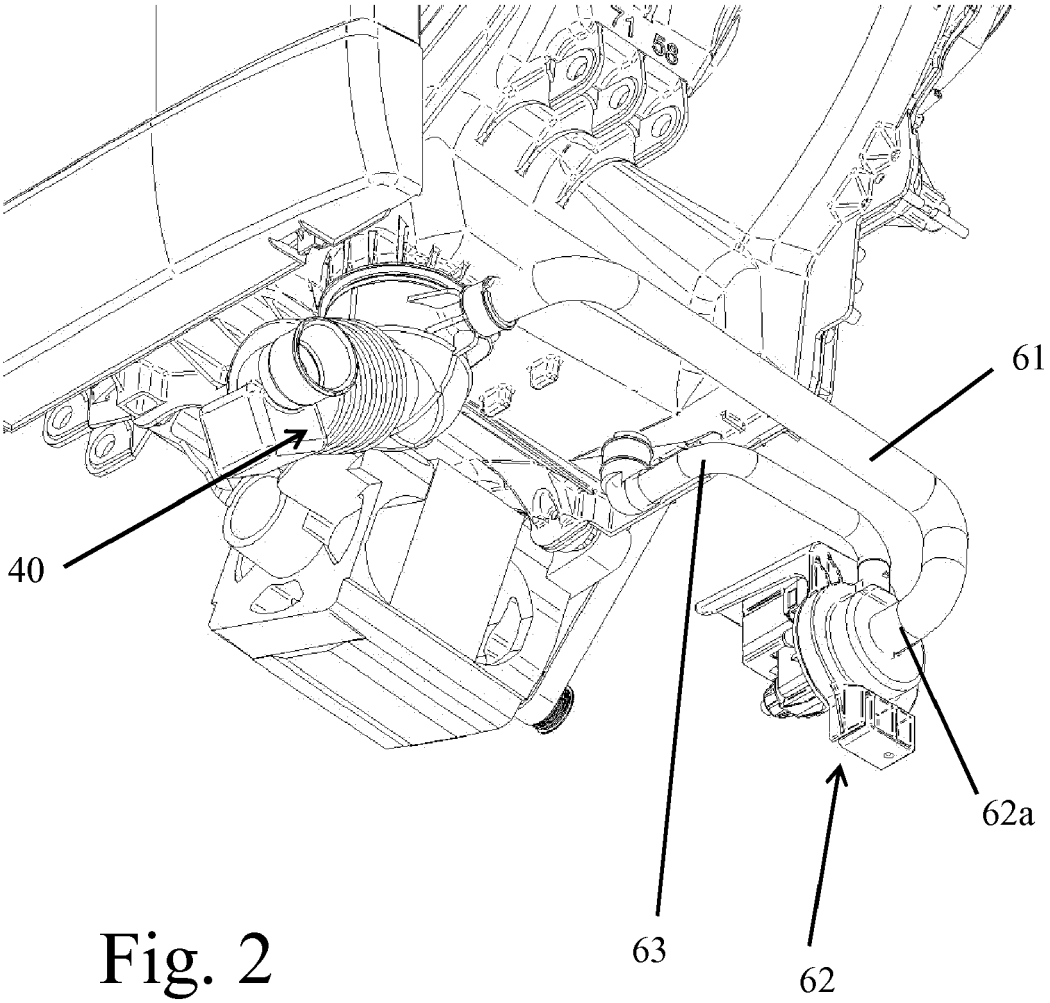

Fig. 2

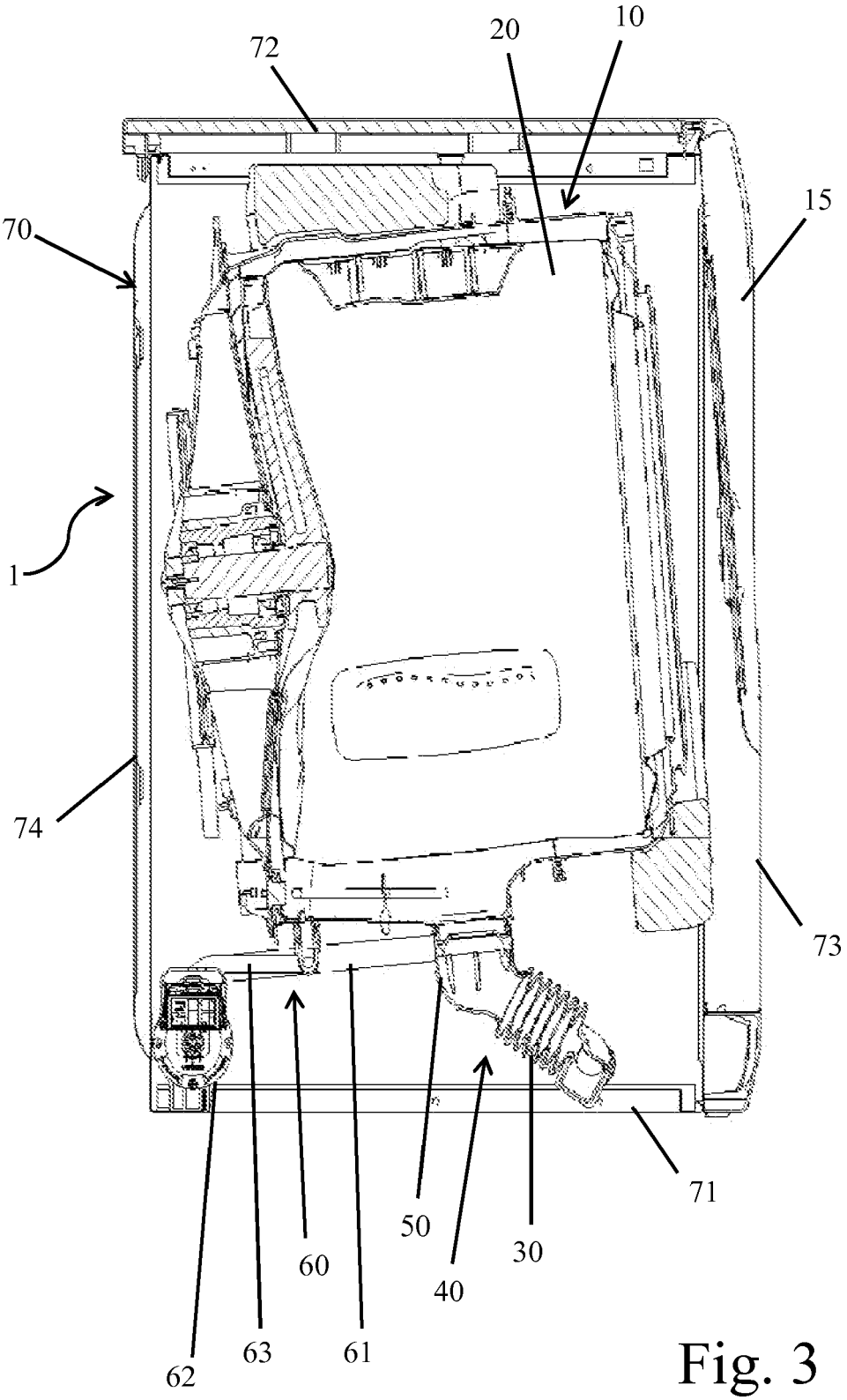

Fig. 3

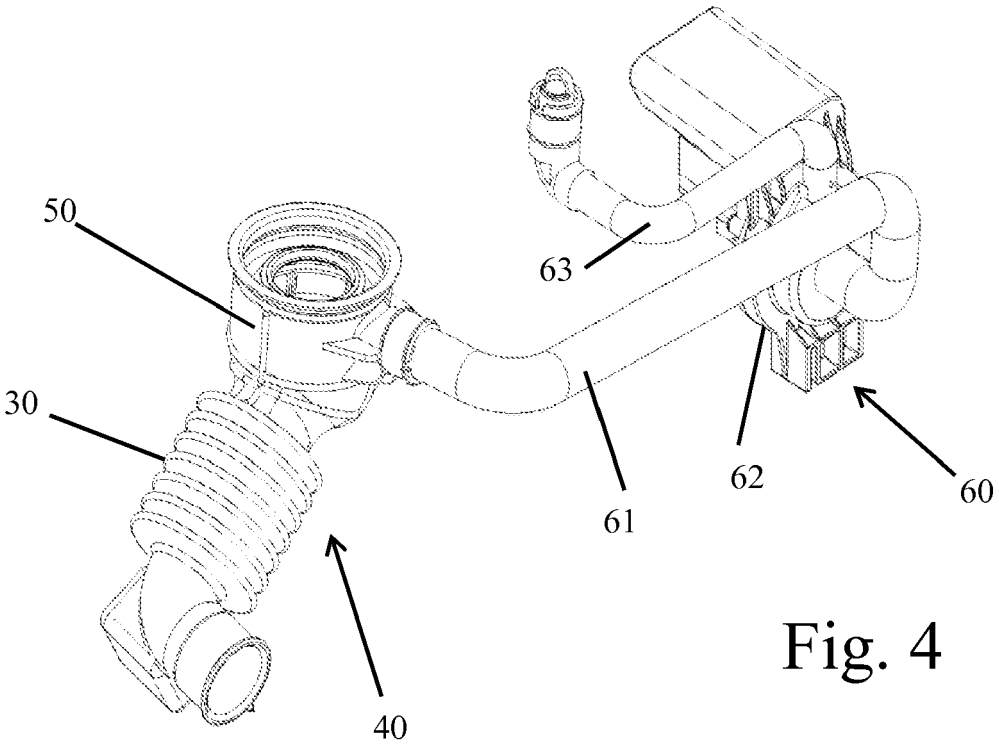

Fig. 4

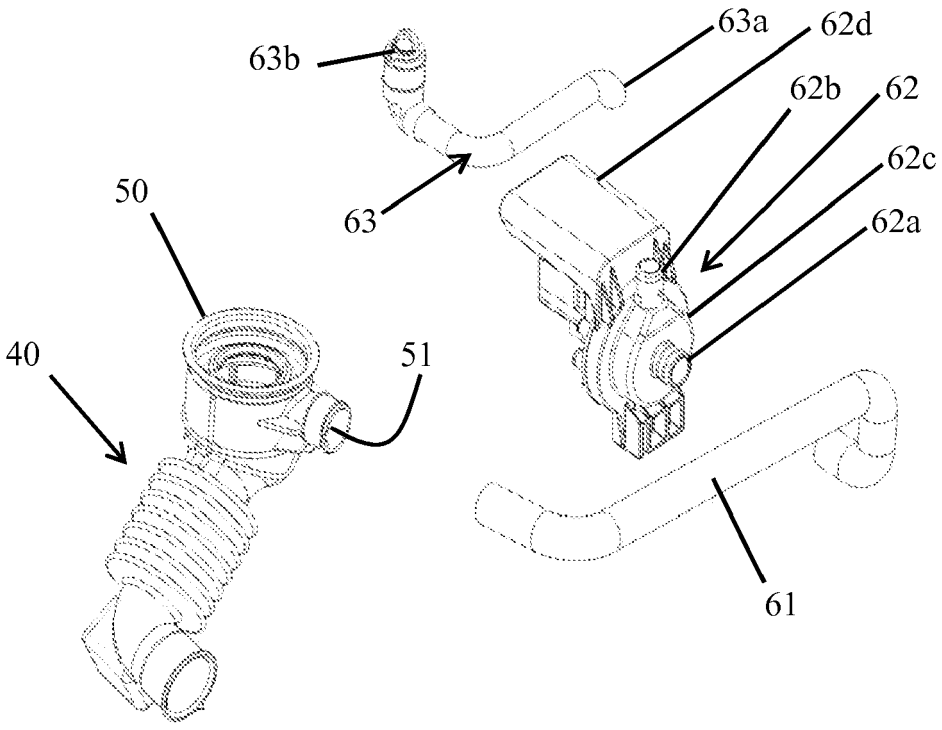

Fig. 5

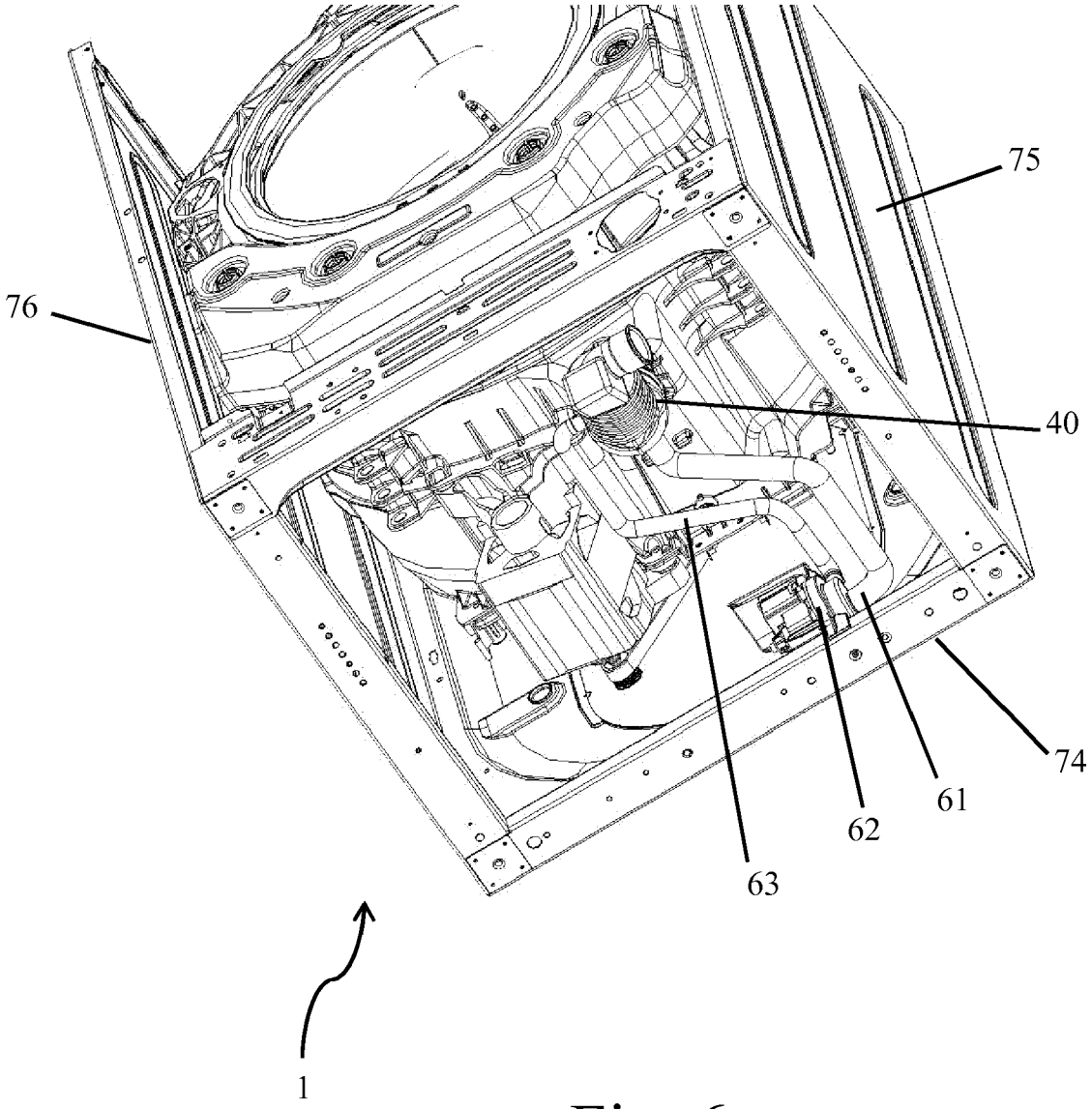

Fig. 6

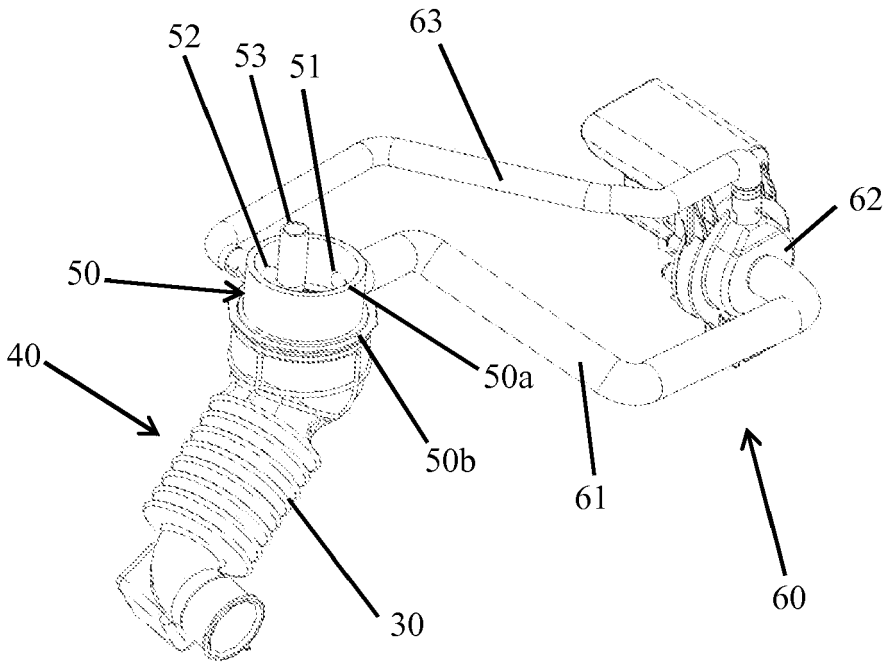

Fig. 7

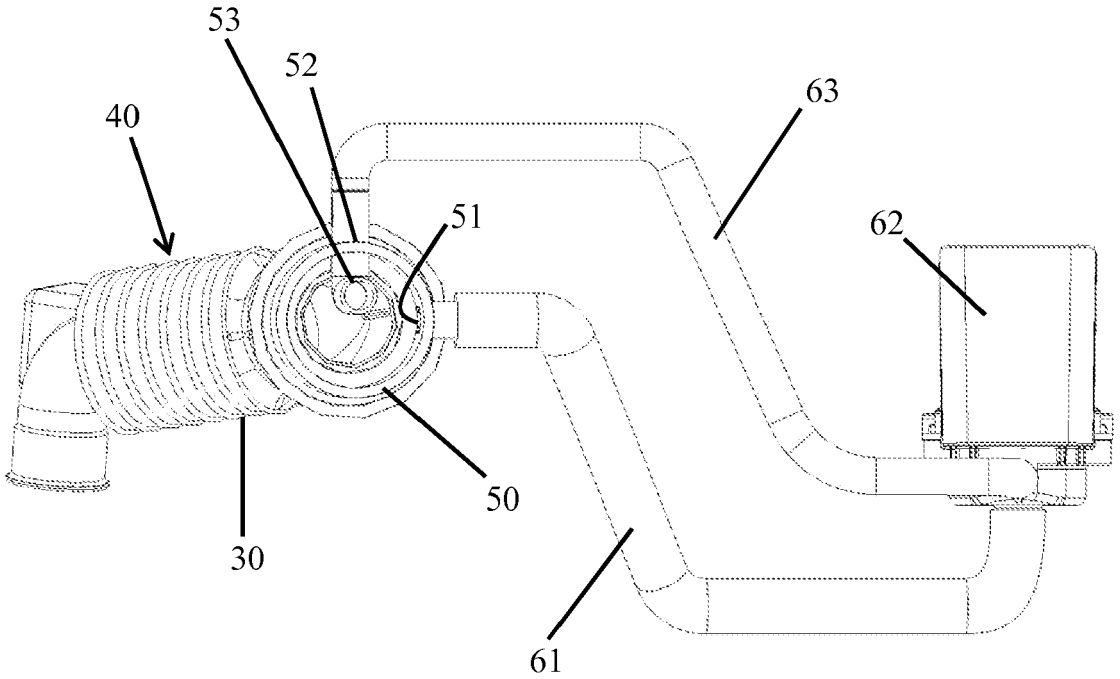

Fig. 8

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Application Number
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Place of search	Date of completion of the search	Examiner
Munich	6 June 2019	Weinberg, Ekkehard

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