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(54) **Fluid circulation pump adapted for a household appliance**

(57) The present invention is related to a circulation pump for a household appliance, comprising a motor body (1), a motor, a hydraulic body (3) attached to the motor body (1) and comprising an inlet (30) and an outlet (31), and closure means attached to the hydraulic body (3), a hydraulic chamber (6) where the fluid flows, which is delimited between the hydraulic body (3) and the closure means. The pump (100) comprises an impeller (4) housed in the hydraulic body (3) and rotating, causing a substantially circular flow of the fluid in the hydraulic chamber 6, and a stationary element adapted for aiding in discharging the fluid from the pump (100). The stationary element is attached to at least one of the elements delimiting the hydraulic chamber (6) and is arranged in the hydraulic chamber (6) such that it blocks or resists against the flow of the fluid.

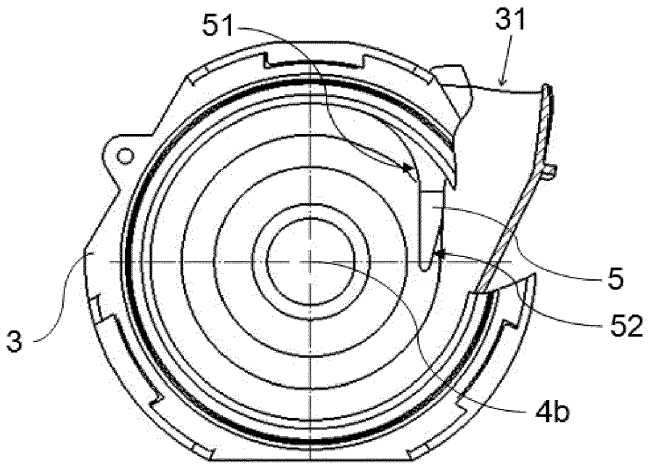

FIG. 3

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Description

TECHNICAL FIELD

[0001] The present invention is related to fluid circulation pumps adapted for a household appliance, in particular for a dishwasher.

PRIOR ART

[0002] Known circulation pumps comprise a motor assembled in a motor body, a hydraulic body fixed to the motor body and comprising a water inlet passage and a water outlet passage, and an impeller driven by the motor, which is housed inside the hydraulic body.

[0003] Known circulation pumps comprise a motor body, a hydraulic body, a motor and an impeller. The hydraulic body and the motor body are attached to one another, forming the body of the pump. The motor is housed in the motor body, and the impeller is arranged and centered on the base of the hydraulic body and is driven by the motor. The impeller rotates with respect to an axis of rotation when it is driven by the motor, and its rotation causes a substantially circular flow of the water inside the hydraulic body around the axis of the impeller, aiding in suitably discharging the water from the pump in a substantially tangential manner.

[0004] It has been seen in some pumps that when air together with the corresponding water or fluid gets in them, a circulation of air bubbles is generated due to the impeller. These bubbles are not always correctly discharged from the pump and form a type of circulation tube that significantly reduces pump efficiency, and can even cause the pump to be incapable of discharging the water it received.

[0005] Pumps in the state of the art are known to be designed to solve this problem. Document US 20120224957 A1 discloses a pump of this type. The pump comprises a circular guiding device arranged around the axis of rotation of the impeller, and the guiding device in turn comprises a plurality of blades distributed in a circular manner. The blades are elastic and deform a specific angle according to the force of the water that entered in the pump, thus improving the fluid circulation and discharge according to its characteristics.

[0006] Document US 5451139 A discloses a pump with a bladed impeller comprising a peripheral diffuser with a plurality of outlet ports and an interspace to convey the fluid from the outlet ports of the diffuser towards an outlet of the pump. The pump further comprises a curved member extending from the diffuser and arranged in the interspace such that it pushes the fluid upwards towards the outlet to discharge it from the pump.

[0007] Document US 20120224961 A1 discloses a pump with an impeller arranged at the base of the hydraulic body. The pump comprises a plurality of stationary blades which are arranged around the impeller, extending in a circular manner around the impeller and comprising a helicoidal shape. The blades are arranged in a carrier ring extending radially outside the impeller, surrounding said impeller, and are separated from one another by a specific distance in the rotating direction of the impeller.

DISCLOSURE OF THE INVENTION

[0008] The object of the invention is to provide a circulation pump as described in the claims.

[0009] The fluid circulation pump of the invention is adapted for a household appliance, mainly for a dishwasher. The pump comprises a motor body, a motor housed in the motor body, a hydraulic body that is attached to the motor body and comprising a fluid inlet passage and a fluid outlet passage, and closure means that are attached to the hydraulic body, a hydraulic chamber where the fluid flows inside the pump from the time it enters through the inlet passage until it exits through the outlet passage being delimited between the hydraulic body and the closure means.

[0010] The pump further comprises an impeller driven by the motor which is housed at least partially in the hydraulic body and which, when driven by the motor, rotates with respect to an axis of rotation, causing a substantially circular flow of the fluid in the hydraulic chamber, and a stationary element which is adapted for aiding in discharging the fluid flowing in the hydraulic chamber from the pump through the outlet passage of the hydraulic body.

[0011] The stationary element is attached to at least one of the elements delimiting the hydraulic chamber and is arranged in the hydraulic chamber such that it blocks or resists against the flow of the fluid. As a result of the resistance exerted by the stationary element turbulences are generated, said turbulences channeling the air that may be introduced together with the fluid in the hydraulic body in a simple and natural manner out of the pump, without having to additionally incorporate additional parts or elements for bearing the stationary element. This implies, for example, a simpler mounting of the pump and a lower cost for same.

[0012] These and other advantages and features of the invention will become evident in view the drawings and the detailed description of the invention.

DESCRIPTION OF THE DRAWINGS

[0013]

Figure 1 shows a preferred embodiment of the pump of the invention, where a section has been made in a hydraulic body of the pump.

Figure 2 shows schematically and by way of example closure means of the pump of the invention.

Figure 3 is a plan view of the hydraulic body of the

pump of Figure 1, where a stationary element is shown.

Figure 4 is a plan view of the hydraulic body of another embodiment of the pump of the invention, where a stationary element is shown.

DETAILED DISCLOSURE OF THE INVENTION

[0014] The fluid circulation pump 100 of the invention is adapted for a household appliance, mainly for a dishwasher. The fluid is preferably water, and this term will be used hereinafter for the sake of clarity but without being limiting, although if necessary it is evident that the pump 100 of the invention could be used with another type of fluid, preferably a liquid (although it could have solid or quasi-solid residues).

[0015] The pump 100 comprises a motor body 1, a motor housed in the motor body 1, a hydraulic body 3 attached to the motor body 1, and closure means that are attached to the hydraulic body 3, the closure means preferably being arranged between the motor body 1 and the hydraulic body 3 such that both bodies 1 and 3 are attached to one another by means of the closure means (although this is not mandatory, the bodies 1 and 3 being able to be attached directly to one another the closure means even being arranged between both bodies 1 and 3, being attached at their ends for example). Figure 1 shows a preferred embodiment of the pump 100 of the invention, where a section of the hydraulic body 3 has been made to show the pump 100 more clearly.

[0016] A hydraulic chamber 6 where the fluid flows inside the pump 100 is delimited between the hydraulic body 3 and the closure means, and the hydraulic body 3 comprises an inlet 30 through which water enters the hydraulic chamber 6 and an outlet 31 through which water exits the hydraulic chamber 6 and therefore the pump 100. The closure means can comprise, for example, a cover 7 and a sealing element 8 (a gasket for example) for the leak-tight sealing of the connection between the cover 7 and the hydraulic body 3, shown schematically and by way of example in Figure 2, the hydraulic chamber 6 being closed in a leak-tight manner except for the inlet 30 and the outlet 31.

[0017] The pump 100 further comprises an impeller 4 which is driven by the motor and is housed at least partially and with rotational freedom in the hydraulic chamber 6. When driven, the impeller 4 rotates with respect to an axis of rotation 4b, causing a substantially circular flow of the water in the hydraulic chamber 6, aiding in suitably discharging the water from the pump 100 through the outlet 31. The outlet 31 is preferably arranged such that the water is discharged from the pump 100 in a substantially tangential manner.

[0018] The axis of the inlet 30 preferably corresponds with the axis of rotation 4b of the impeller 4, whereas the outlet 31 comprises an axis in a different plan than the axis of the inlet 30, the outlet 31 preferably being arranged such that the water is discharged from the pump 100 in a substantially tangential manner. The water enters through the inlet 30, and exits through the outlet 31 driven by the impeller 4.

[0019] In some cases, generally due to a low level water at its source (generally a suction tank), the water can enter the pump 100 being mixed with air. In these cases, a circulation of air bubbles is generated in the hydraulic chamber 6, and these bubbles cannot always be correctly discharged from the pump 100, forming a type of circulation tube in the hydraulic chamber 6 that significantly reduces the efficiency of the pump 100 and in some cases can even cause the pump 100 to be incapable of discharging the water it received.

[0020] The pump 100 further comprises a stationary element 5 which is adapted for aiding in discharging the water circulating in the hydraulic chamber 6 from the pump 100 through the outlet passage 31, so that the pump 100 is capable of discharging the water even when it is mixed with air. The stationary element 5 is attached to at least one of the elements demarcating the hydraulic chamber 3, i.e., to the hydraulic body 3, or to one of the elements forming the closure means, or it can even be integrated in said element, being part of it. In the preferred embodiment, the stationary element 5 is integrated in the hydraulic body 3, being part of the hydraulic body 3, as can be seen in Figure 3. In other embodiments, the stationary element 5 could be attached to the hydraulic body without being integrated in it, or it could even be attached to (or integrated in) the cover 7 or it could be attached to the sealing element 8 (or integrated in the sealing element 8).

[0021] The stationary element 5 is arranged in the hydraulic chamber 6 such that it blocks or resists against the flow of the water when said water is circulating in the hydraulic chamber 6, and extends at least partially along the width of the hydraulic chamber 6, although it could also extend along the entire width of the hydraulic chamber 6. As a result of the resistance exerted by the stationary element 5, turbulences are generated, said turbulences channeling the air that may be introduced in the hydraulic chamber 6 in a simple and natural manner out the pump 100, without having to additionally incorporate additional parts or elements for bearing the stationary element, and without the normal operation of the pump 100 (without the presence of air) being significantly affected.

[0022] The stationary element 5 acts like a wall for the water, blocking or resisting against its flow, generating a difference in pressures between two adjacent zones of the hydraulic chamber 6, each of the two zones corresponding with a zone on each side of the stationary element 5. The difference in pressure between both zones next to the stationary element 5 creates a zone with kinetic turbulence energy or favors turbulent flow, which in turn favors the rapid transition of air towards the outlet 31 through which it is discharged from the pump 100, the pump 100 significantly maintaining its efficiency even in

response to the presence of air inside it (in the hydraulic chamber 6).

[0023] The stationary element 5 comprises a corresponding side surface 51 and 52 facing each side zone between which the difference in pressure is generated, and both side surfaces 51 and 52 can be parallel straight surfaces, as shown by way of example in Figure 4, wedge-shaped straight surfaces or even inverted wedge-shaped straight surfaces.

[0024] The water flows in a substantially circular manner around the axis of rotation 4b of the impeller 4 in the hydraulic chamber 6 due to the action of the impeller 4, until leaving the hydraulic chamber 6 through the outlet 31. In the preferred embodiment of the invention, the stationary element 5 is arranged in the zone of the hydraulic chamber 6 closest to the outlet 31, and particularly after the outlet 31 in relation to the direction of the flow of the fluid. In other embodiments of the pump 100, the stationary element 5 can be arranged in other positions inside the hydraulic chamber 6, but its efficiency drops as it moves away from this preferred position.

[0025] The stationary element 5 can be attached at a first end to a wall of the corresponding element delimiting the hydraulic chamber 6, as occurs in the preferred embodiment where said element further corresponds with the hydraulic body 3. Said wall corresponds with the wall farthest from the impeller 4 delimiting the hydraulic chamber 6, and the stationary element 5 extends towards the inside of the hydraulic chamber 6 to block or resist against the flow of water. The second end of the stationary element 5 opposite the first end is the point of the stationary element 5 closest to the impeller 4. The stationary element 5 can extend inwardly into the radial hydraulic chamber 6 with respect to the axis of rotation 4b of the impeller 4, but it does not necessarily have to. In fact, in the preferred embodiment this does not occur, as shown by way of example in Figure 3, for example.

Claims

1. Fluid circulation pump adapted for a household appliance, in particular for a dishwasher, comprising a motor body (1), a motor housed in the motor body (1), a hydraulic body (3) attached to the motor body (1) and comprising a fluid inlet (30) and a fluid outlet (31), an impeller (4) which, driven by the motor, rotates with respect to an axis of rotation (4b), and a stationary element (5) which is adapted for aiding in discharging the fluid circulating in the hydraulic chamber (6) from the pump (100) through the outlet (31), **characterized in that** it comprises closure means that are attached to the hydraulic body (3), a hydraulic chamber (6) where the fluid flows inside the pump (100), which is delimited between the hydraulic body (3) and the closure means, the impeller (4) being housed at least partially in the hydraulic chamber (6) with rotational freedom, causing a substantially circular flow of the fluid in the hydraulic chamber (6) when it rotates, and the stationary element (5) being arranged in the hydraulic chamber (6) such that it blocks or resists against the flow of the fluid and being attached to at least one of the elements delimiting the hydraulic chamber (6).

2. Pump according to claim 1, wherein the stationary element (5) acts like a wall for the fluid, blocking or resisting against the flow of the fluid, generating a difference in pressures between two adjacent zones of the hydraulic chamber (6), each of the two zones corresponding with one side of the stationary element (5).

3. Pump according to claim 1 or 2, wherein the fluid flows in a substantially circular manner around an axis of rotation (4b) of the impeller (4) in the hydraulic chamber (6) until leaving the hydraulic chamber (6) through the outlet (31), the stationary element (5) being arranged in the zone of the hydraulic chamber (6) closest to the outlet (31).

4. Pump according to claim 3, wherein the stationary element (5) is arranged in the hydraulic chamber (6) after the outlet (31) in relation to the direction of the flow of the fluid.

5. Pump according to any of the preceding claims, wherein the stationary element (5) is integrated in the corresponding element delimiting the hydraulic chamber (6), being part of said element.

6. Pump according to any of the preceding claims, wherein the closure means comprise a cover (7) that is attached to the hydraulic body (3) and a sealing element (8) for the leak-tight sealing of the connection between the cover (7) and the hydraulic body (3), the hydraulic chamber (6) being closed in a leak-tight manner except for the inlet (30) and the outlet (31).

7. Pump according to claim 6, wherein the stationary element (5) is attached to the cover (7).

8. Pump according to claim 6, wherein the stationary element (5) is attached to the sealing element (8).

9. Pump according to any of claims 1 to 6, wherein the stationary element (5) is attached to the hydraulic body (3).

10. Pump according to any of the preceding claims, wherein the stationary element (5) is attached at a first end to a wall of the corresponding element demarcating the hydraulic chamber (6), said wall corresponding with the wall of the hydraulic chamber (6) farthest from the impeller (4), the stationary ele-

ment (5) extending towards the inside of the hydraulic chamber (6).

11. Pump according to the preceding claim, wherein a second end of the stationary element (5) opposite the first end is the point of the stationary element (5) closest to the impeller (4).

12. Pump according to any of the preceding claims, wherein the stationary element (5) extends at least partially along the width of the hydraulic chamber (6).

13. Pump according to the preceding claim, wherein the stationary element (5) extends along the entire width of the hydraulic chamber (6).

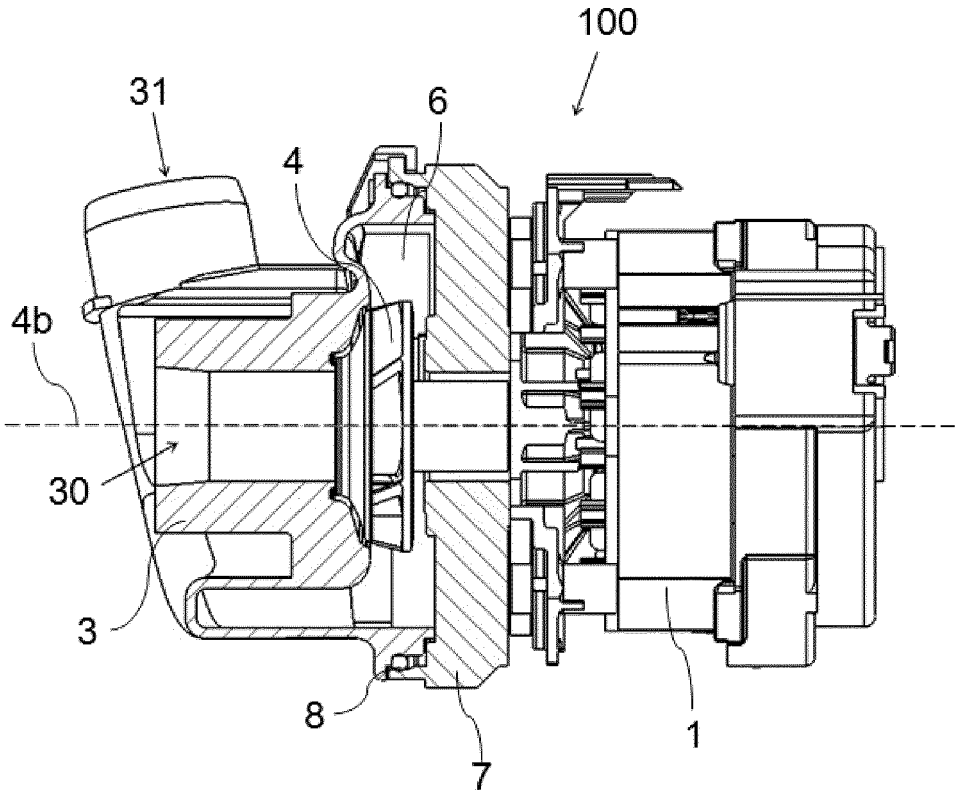

FIG. 1

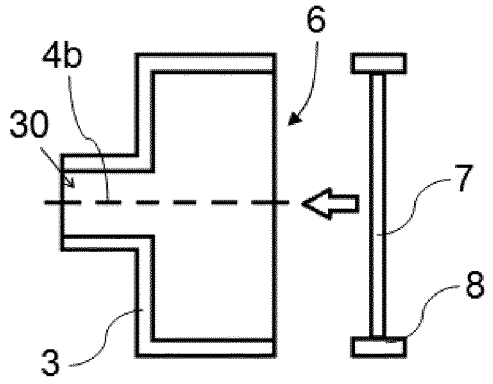

FIG. 2

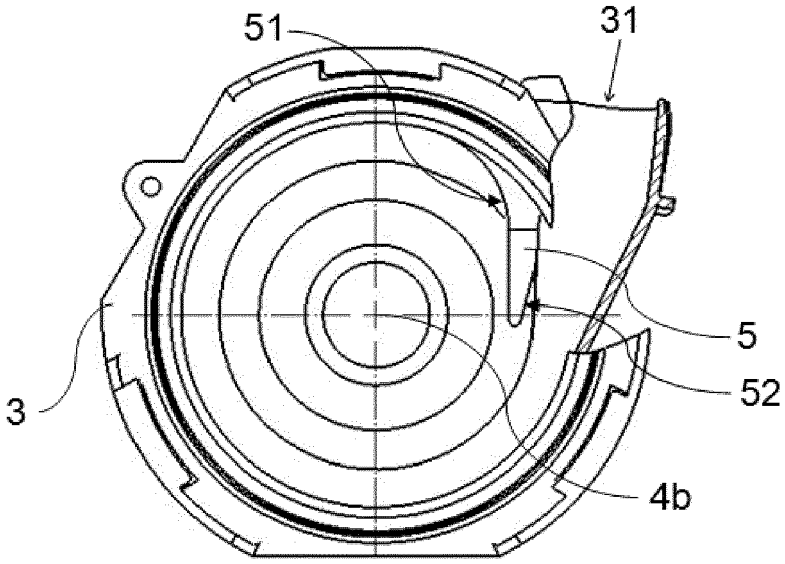

FIG. 3

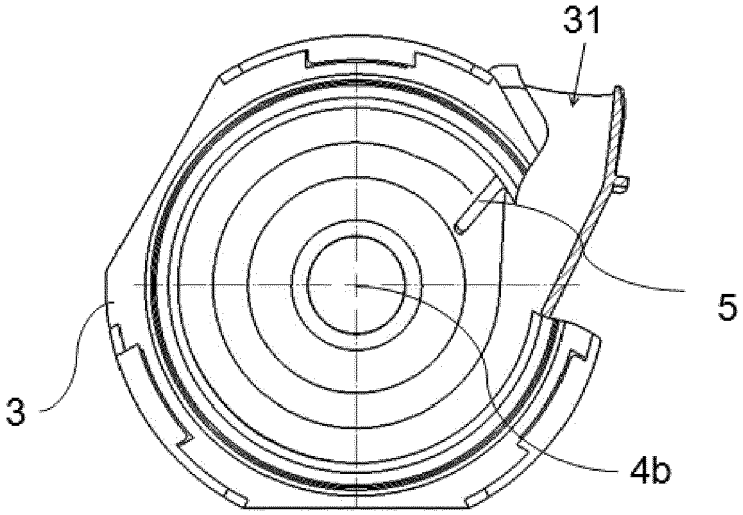

FIG. 4

REFERENCES CITED IN THE DESCRIPTION

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