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

(57) Fluid circulation pump adapted to a household appliance, comprising a motor (2) that is attached to a motor body (15), a hydraulic body (10) that is fixed to the motor body (15), an impeller (6) operated by the motor (2) and which is housed inside the hydraulic body (10), and a heating device (8) for the incoming water, the heating device (8) comprising at least one heating element

(22) and a conducting element (23) in thermal contact with the heating element (22). The heating device (8) is arranged inserted in the inside of the hydraulic body (10). The fluid circulation pump (1) comprises a capsule (12) that is attached to the motor body (15) and which delimits along with the heating device (8), an impeller chamber (13), the impeller (6) being housed in the impeller chamber (13).

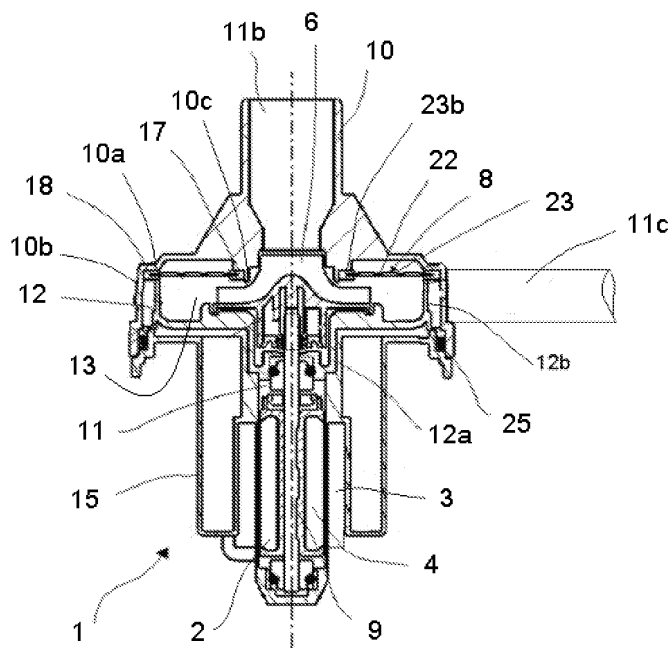


FIG. 1

Description

TECHNICAL FIELD

[0001] This invention relates to a fluid circulation pump adapted to a household appliance, such as a washing machine or a dishwasher, and which comprises a built-in heating device.

PRIOR ART

[0002] There are known fluid circulation pumps that include heating devices built into said circulation pumps. Known circulation pumps comprise a motor that is assembled on a motor body, a hydraulic body that is fixed to the motor body and which comprises a water inlet pipe and a water outlet pipe, an impeller operated by the motor, which is housed inside the hydraulic body, and a heating device that heats the water entering the fluid circulation pump.

[0003] In document US 6,736,598 B2, the hydraulic body, which is substantially cylindrical, has a first part through which water enters in its interior and a second part that is fixed to the motor body. In addition, the heating device is ring-shaped and forms part of the cylindrical wall of the hydraulic body, said heating device being fixed to one end of the first part and to one end of the second part of the hydraulic body.

[0004] Document GB 2427437 A describes a circulation pump in which the heating device is arranged on one end of the hydraulic body with the result that, at least partially, it closes the opening of said hydraulic body, with the heating device comprising a thick-film resistor plate in direct contact with the pumped water.

[0005] Finally, document ES 2217864 T3 discloses a device designed to heat the washing fluid of a dishwasher that comprises resistive heating elements that are positioned on the outside of the hydraulic body. The hydraulic body comprises a cover and a lower body, which are made of a plastic or metallic material in accordance with the arrangement of the resistive heating elements.

DISCLOSURE OF THE INVENTION

[0006] The object of the invention is to provide a fluid circulation pump adapted to a household appliance, such as a washing machine or a dishwasher, as defined in the claims.

[0007] The circulation pump comprises a motor that is attached to a motor body, a hydraulic body that is fixed to the motor body and which comprises a water inlet pipe and a water outlet pipe, an impeller operated by the motor and which is housed, at least partially, inside the hydraulic body, and a heating device for the water entering the fluid circulation pump comprising at least one heating element and a conducting element in thermal contact with the heating element.

[0008] The heating device is arranged inserted inside

the hydraulic body, thereby simplifying the assembly, as said heating device is separated from the motor body.

[0009] In addition, the circulation pump comprises a capsule that is connected to the motor body, and which delimits, along with the heating device, an impeller chamber, the impeller being housed at least partially in the impeller chamber.

[0010] As a result, a compact circulation pump is obtained, the manufacture and assembly of which is simpler than known circulation pumps.

DESCRIPTION OF THE DRAWINGS

[0011]

Figure 1 is a longitudinal section of a first embodiment of a fluid circulation pump according to the invention.

Figure 2 is a longitudinal section of a second embodiment of a fluid circulation pump according to the invention.

Figure 3 is a longitudinal section of a third embodiment of a fluid circulation pump according to the invention.

DETAILED DISCLOSURE OF THE INVENTION

[0012] The fluid circulation pump 1 according to the invention shown in Figures 1 to 3, adapted to a household appliance such as a washing machine or a dishwasher, comprises a motor body 15 in which is assembled a synchronous electric motor 2 that comprises a stator 3 that is fixed to the outside of the motor body 15 and a permanent-magnet rotor 4 that is housed in a rotor chamber 11 of the motor body 15, said rotor 4 being attached to a drive shaft 9, an impeller 6 connected to the drive shaft 9, a substantially cylindrical and hollow hydraulic body 10, inside which is housed the impeller 6, and a heating device 8, housed inside the hydraulic body 10, which heats the water entering the fluid circulation pump 1.

[0013] The fluid circulation pump 1 comprises a substantially cylindrical and hollow capsule 12, which has a first part 12a that is attached tightly inside the motor body 15 and a second part 12b, coaxial and continuous to said first part 12a, which is housed inside the hydraulic body 10. The capsule 12 delimits, along with the heating device 8, an impeller chamber 13 inside of which the impeller 6 is housed at least partially, with said capsule 12 separating the impeller chamber 13 from the rotor chamber 11 of the motor body 15.

[0014] The hydraulic body 10 comprises an inlet pipe 11 b through which water enters the impeller chamber 13, and an outlet pipe 11 c through which the heated water exits the impeller chamber 13. Furthermore, the hydraulic body 10 is fixed to the motor body 15 through known fixing means such as bayonet clips or fasteners, a seal

25 being arranged between said hydraulic body 10 and the motor body 15.

[0015] In addition, the heating device 8 comprises at least one heating element 22, and a conducting element 23 in thermal contact with the heating element 22. The conducting element 23 is substantially flat, disc shaped, and is made of a heat-conducting material, mainly metallic, the conducting element 23 being fixed to the heating element 22 through known manufacturing methods. The heating element 22 is arranged substantially orthogonal to the impeller 6 and includes a central hole 23b that is partially passed through by said impeller 6. In the embodiments shown in Figures 1 to 3, the heating element 22 comprises a thick-film resistor that is deposited on the conducting element 23 by means of known techniques such as silkscreening. In other embodiments not shown in the figures, the heating element 22 may comprise a tubular resistor.

[0016] The hydraulic body 10 comprises a cylindrical outer wall 10b and a cylindrical ring-shaped projection 10c that extends axially in the interior, concentric to the outer wall 10b, from a bottom 10a of said hydraulic body 10. In addition, the heating device 8 is tightly inserted inside of the hydraulic body 10, between the outer wall 10b and the ring-shaped projection 10c, and supported on the bottom 10a, the heating element 22 being arranged facing said bottom 10a.

[0017] In order to obtain the fixing tightness between the heating device 8 and the hydraulic body 10, the fluid circulation pump 1 comprises an inner insulating ring 17 that fits between the hole 23b of the conducting element 23 and the ring-shaped projection 10c of the hydraulic body 10, and an outer insulating ring 18 that fits between the outer wall 10b of the hydraulic body 10 and the outer perimeter of the conducting element 23, thereby preventing the water entering the fluid circulation pump 1 from coming into contact with the heating element 22.

[0018] Furthermore, the heating element 22 has a maximum surface that allows it to be inserted in the inside of the hydraulic body 10 so that the water that enters through the inlet pipe 11 b and is forced towards the impeller chamber 13 by the impeller 6 is heated rapidly. The water housed in the impeller chamber 13 is thus able to rapidly absorb the heat transferred by the conducting element 23 and is hot when it exits through the outlet pipe 11c towards a corresponding washing chamber not shown in the figures, thereby preventing said water from boiling and the heating element 22 from overheating.

[0019] The heat exchange that takes place in the impeller chamber 13 may be altered by modifying the hydraulic characteristics of the fluid circulation pump 1 and/or by modifying the heat transmission surface of the heating device 8.

[0020] The hydraulic characteristics of the fluid circulation pump 1 are determined by the dimensions and/or the shape of the impeller chamber 13, with the result that by modifying the shape and/or the dimensions of the capsule 12 fluid circulation pumps 1 of different hydraulic

characteristics and adapted to the specific needs of each application may be obtained. As a result, fluid circulation pumps of different hydraulic characteristics may be obtained merely by changing the capsule 12.

5 [0021] In the second embodiment of the invention, shown in Figure 2, the capsule 12 therefore comprises a ring-shaped rib 40, concentric to the capsule 12, which extends axially, from a bottom surface 12c of said capsule 12, to the inside of the impeller chamber 13. The ring-shaped rib 40 changes the shape of the impeller chamber 13 and, therefore, the hydraulic characteristics of the fluid circulation pump 1. In other embodiments, not shown in the figure, the capsule may include other elements that modify its shape.

10 [0022] Figure 3 shows a third embodiment of the invention in which the effectiveness of the heat exchange between the pumped water and the heating device 8 is improved by modifying the hydraulic characteristics of the fluid circulation pump 1 and the heat transmission surface of the heating device 8. For this purpose the capsule 12 comprises an auxiliary conducting element 31 that is fixed inside the free end of the second part 12b of said capsule 12, with the ring-shaped auxiliary conducting element 31, which comprises a substantially C-shaped cross-section and is made of a heat-conducting material, being mainly metallic. Said auxiliary conducting element 31 modifies the hydraulic characteristics of the fluid circulation pump 1 insofar as the shape of the impeller chamber 13 is changed, and also comes into contact with the conducting element 23 of the heating device 8, thereby increasing the heat exchange surface.

30 [0023] The hydraulic body 10 and the capsule 12 are made of a plastic material, which allows a light and economical fluid circulation pump 1 to be obtained. The capsule 12 is also an interchangeable part, with the result that in order to obtain different fluid circulation pumps with the necessary hydraulic characteristics all that is required is to exchange said capsule 12.

35 [0024] The motor 2 may also be of any type known in the prior art and used in circulation pumps. In addition, said circulation pump 1 may include safety switches that prevent the water exiting the impeller chamber 13 from doing so at an excessively high temperature.

45 Claims

1. Fluid circulation pump adapted to a household appliance, mainly to a washing machine or dishwasher, which comprises a motor body (15), a motor (2) that is attached to the motor body (15), a hydraulic body (10) that is fixed to the motor body (15) and which comprises a water inlet pipe (11 b) and a water outlet pipe (11c), an impeller (6) operated by the motor (2) and which is housed, at least partially, in the inside of the hydraulic body (10), and a heating device (8) for the water entering the fluid circulation pump (1), comprising at least one heating element (22) and a

- conducting element (23) in thermal contact with the heating element (22), **characterized in that** the heating device (8) is arranged inserted inside the hydraulic body (10), the fluid circulation pump (1) comprising a capsule (12) that is attached to the motor body (15) and which delimits, along with the heating device (8), an impeller chamber (13), the impeller (6) being housed at least partially in the impeller chamber (13).
2. Circulation pump according to the preceding claim, **characterized in that** the capsule (12) is interchangeable.
3. Circulation pump according to any of the preceding claims, **characterized in that** the heating device (8) has a disc shape, and is arranged substantially orthogonal to the impeller (6).
4. Circulation pump according to any of the preceding claims, **characterized in that** the heating device (8) is arranged supported on a bottom (10a) of the hydraulic body (10), inserted between an outer wall (10b) and a ring-shaped projection (10c) inside said hydraulic body (10).
5. Circulation pump according to the preceding claim, **characterized in that** it comprises tight fixing means of the heating device (8) to the hydraulic body (10).
6. Fluid circulation pump according to the preceding claim, **characterized in that** the tight fixing means comprise an outer insulating ring (18) that fixes tightly the heating device (8) to the outer wall (10b) and an inner insulating ring (17) that fixes tightly the heating device (8) to the ring-shaped projection (10c).
7. Circulation pump according to any of claims 4 to 6, **characterized in that** the heating element (22) is arranged facing the bottom (10a) of the hydraulic body (10).
8. Circulation pump according to any of the preceding claims, **characterized in that** the capsule (12) comprises at least one rib (40) that extends towards the inside of the impeller chamber (13).
9. Circulation pump according to the preceding claim, **characterized in that** the rib (40) is a ring-shaped rib, substantially concentric to the capsule (12).
10. Circulation pump according to any of the preceding claims, **characterized in that** the capsule (12) comprises at least one auxiliary conducting element (31) fixed inside said capsule (12).
11. Circulation pump according to the preceding claim, **characterized in that** the auxiliary conducting element (31) is arranged in contact with the conducting element (23) of the heating device (8).
12. Circulation pump according to any of claims 10 or 11, **characterized in that** the auxiliary conducting element (31) is a metallic ring.
13. Circulation pump according to any of the preceding claims, **characterized in that** the heating element (22) comprises at least one thick-film resistor that is deposited on the conducting element (23).
14. Circulation pump according to any of claims 1 to 12, **characterized in that** the heating element (22) comprises at least one tubular resistor.
15. Circulation pump according to any of the preceding claims, **characterized in that** the hydraulic body (10) and the capsule (12) are made of a plastic material.

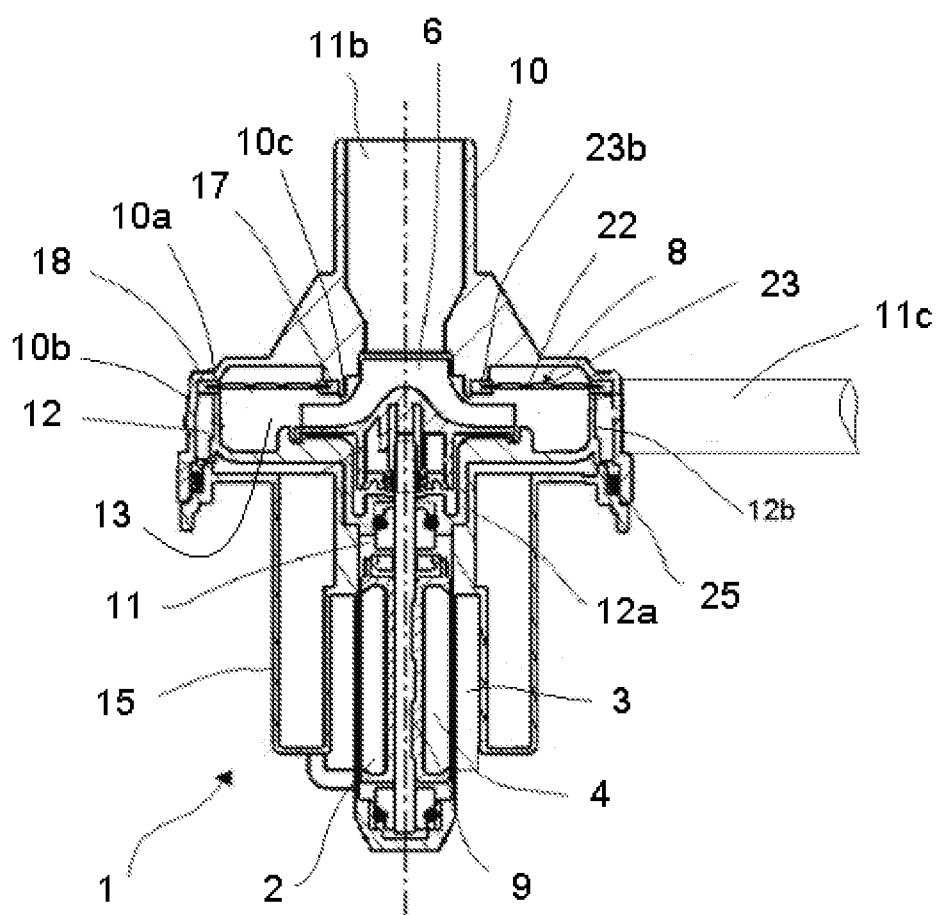


FIG. 1

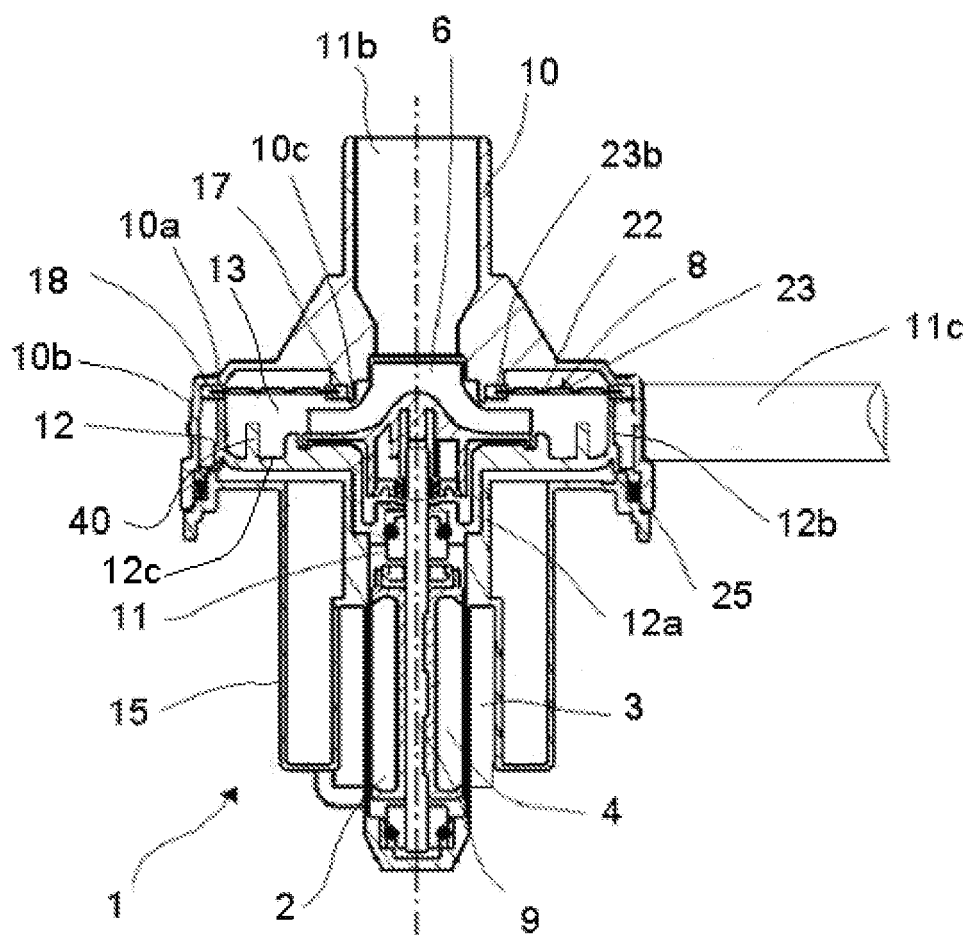


FIG. 2

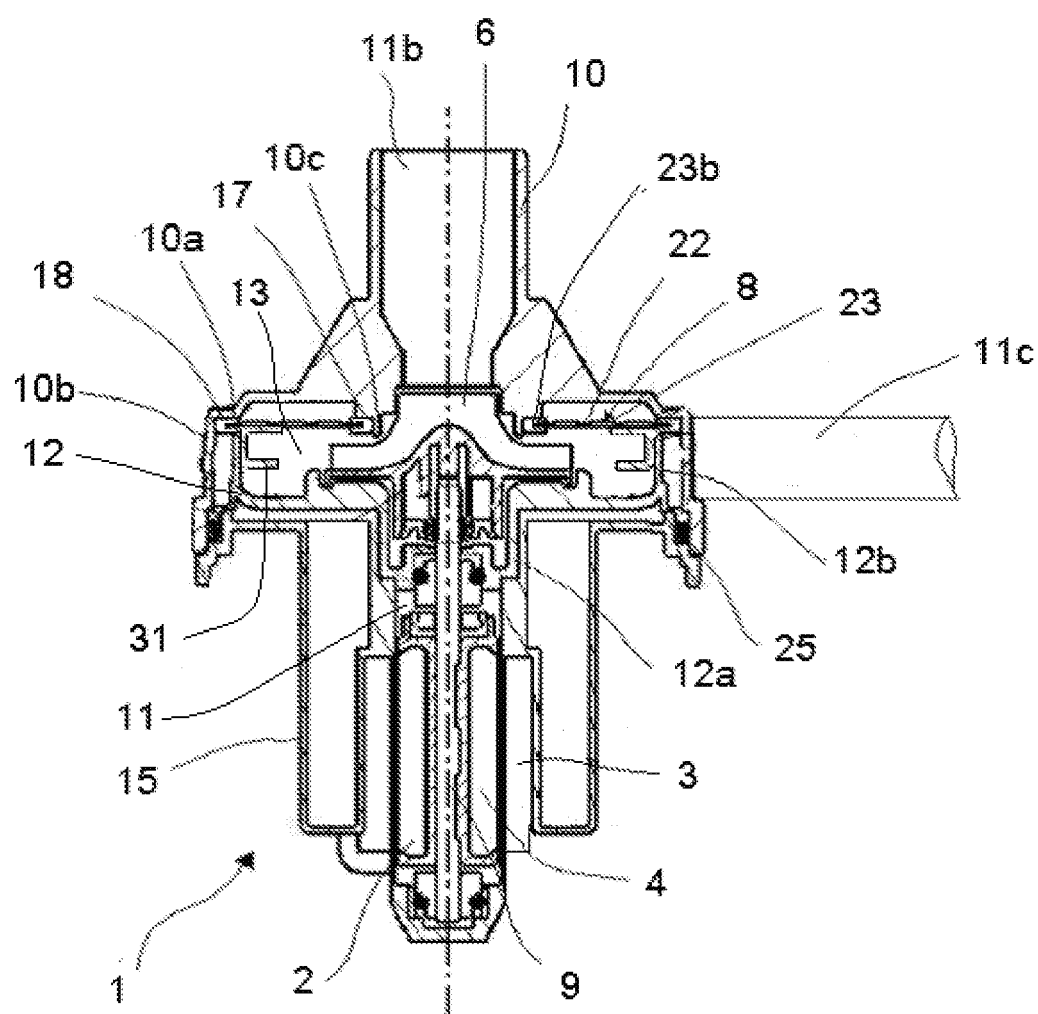


FIG. 3

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 6736598 B2 [0003]
- GB 2427437 A [0004]
- ES 2217864 T3 [0005]