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[54] **LIQUID CIRCULATION APPARATUS WITH
 SUBMERSIBLE PUMP AND MOTOR**
 5 Claims, 4 Drawing Figs.

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 B08b 3/00

[50] Field of Search 103/5, 3, 2;
 134/186, 188; 417/366, 423, 424; 310/63

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ABSTRACT: A liquid circulation apparatus such as a pump for circulating washing and rinsing liquid in a dishwasher comprising a sump for retaining a body of the liquid, a motor housing located in the sump for immersion in the liquid therein, a motor comprising a rotor and a surrounding stator in the housing, liquid flow passage means through the housing having an entrance connecting with the sump and an exit for discharge of the liquid and liquid impeller means on the rotor within the submersible housing for drawing liquid in through the entrance, forcing it through the passage means and under pressure from the exit.

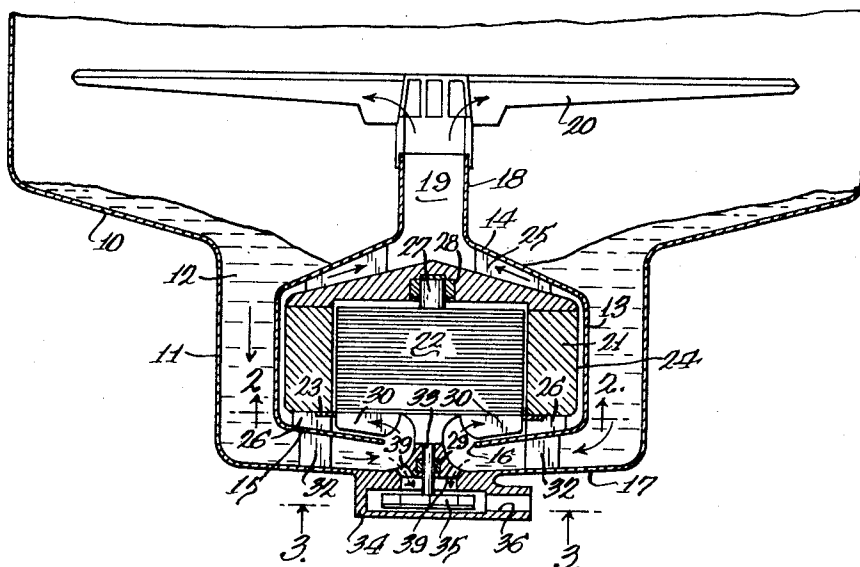


Fig. 1.

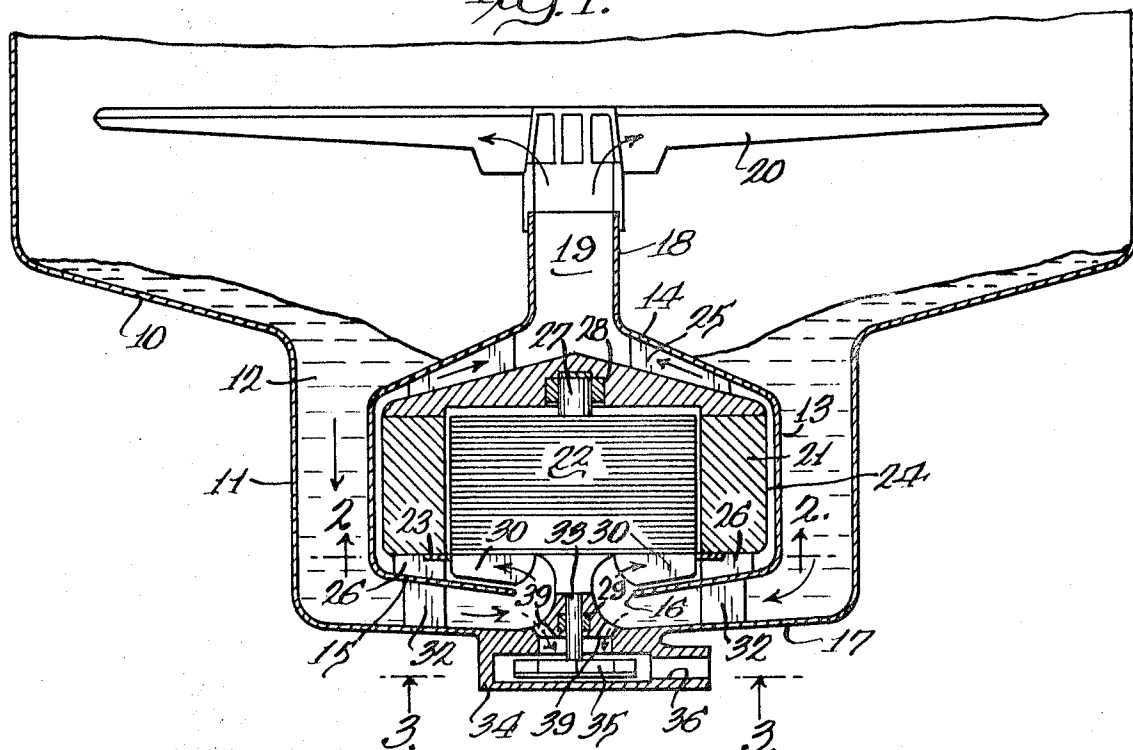


Fig. 2.

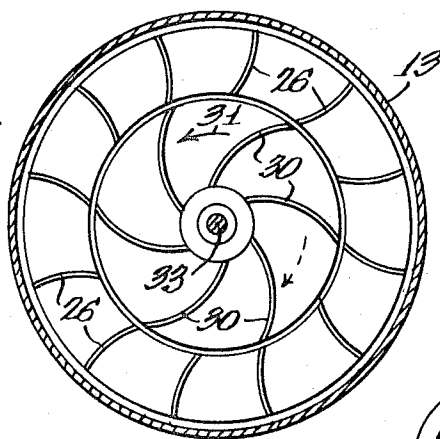


Fig. 3.

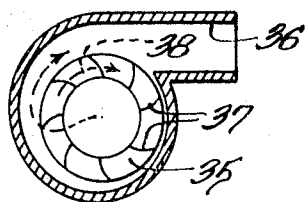
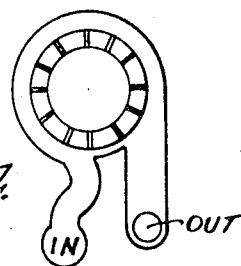


Fig. 4.



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LIQUID CIRCULATION APPARATUS WITH SUBMERSIBLE PUMP AND MOTOR

The apparatus of this invention permits locating the rotor, stator and liquid impeller within a submersible housing that may be located, for example, in the liquid sump of a household dishwasher so that the entire pump unit is submerged when in use with the result that this unit occupies very little space and the pumped liquid may be directed in cooling contact with the parts of the motor.

The invention will be described as related to the embodiment shown in the accompanying drawings. Of the drawings:

FIG. 1 is a sectional view through the bottom of a dishwasher tub and is a vertical sectional view through the apparatus of this invention.

FIG. 2 is a transverse sectional view taken substantially along line 2-2 of FIG. 1.

FIG. 3 is a horizontal sectional view taken substantially along line 3-3 of FIG. 1.

FIG. 4 is a horizontal sectional view, similar to FIG. 3, illustrating another form of drain pump that may be employed in conjunction with this invention.

In the illustrated embodiments the liquid circulation apparatus is illustrated in a household dishwasher. This dishwasher comprises a tub 10 including a customary bottom sump 11 for receiving the dishwashing liquid 12 which at different times in the washing cycle will be detergent liquid or rinsing liquid.

Located in this sump 11 so as to be submerged in the liquid 12 is a generally cylindrical motor housing 13 having an upwardly tapered top 14 and a downwardly tapered bottom 15. The motor housing 13 has an opening 16 at its lower end adjacent the bottom 17 of the casing 13 and a tubular upper end 18 having an internal passage 19 therein leading to a usual spray arm 20 of the dishwasher.

Located within the housing 13 is a stator 21 and a contained rotor 22 of the motor. The spacing between the stator and rotor is sealed by any means desired such as the seal 23 to prevent entry of liquid therebetween.

The outer surface of the stator 21 is spaced inwardly of the inner surface of the motor housing 13 to provide a liquid passage 24 along its inner surface having its entrance at the bottom opening 16 and its exit at 19.

The stator 21 is mounted within the housing 13 on spaced top supports 25 and spaced bottom support legs 32 so that the liquid can flow between the supports into, through and from the liquid passage 24.

The rotor 22 is mounted for rotation on a vertical shaft 27 held in a top bearing 28 and a bottom bearing 29. The rotatable rotor carries on its lower surface impeller vanes 30 which cooperate with the bottom supports 26 which are also shaped as vanes to pump liquid through the liquid passage 24 on rotation of the motor 22 in a counterclockwise direction as viewed in FIG. 2 and as indicated by the arrow 31.

In order to support the motor housing 13 and the contained motor and pump parts within the sump 11 the bottom of the casing 13 is mounted on spaced support legs 32.

The motor shaft 27 may have a lower end 33 extending down through the bottom of the sump 11 into a second pump housing 34 which contains a drain impeller 35 therein. From this drain impeller 35 the pump housing 34 contains an exit means in the form of an exit passage 36 leading to a place of disposal (not shown).

The invention is not limited to the centrifugal drain pump shown in FIG. 3 and may be employed, for example, in conjunction with a turbine or regenerative type of drain pump such as illustrated in FIG. 4.

The drain impeller 35 as shown in FIG. 3 is provided with impelling vanes 37 for exhausting liquid from within the dishwasher tub 10 through the exit passage 36. This pump-out action occurs when the drain impeller 35 is rotated in a

clockwise direction as viewed in FIG. 3 and as indicated by the arrow 38. Thus, when the motor rotor 22 is rotated in the recirculation direction 31 the liquid 12 is recirculated through the dishwasher and the drain impeller 35 becomes ineffective.

When, however, the rotor 22 is rotated in the opposite direction, as indicated by the arrow 38 in FIG. 3 the recirculation impeller 30 becomes ineffective and the drain impeller 35 is activated to pump liquid from the tub 10 by way of the bottom sump 11. These two pumps become ineffectual under the conditions indicated by permitting them to rotate but they perform substantially no pumping action in the direction indicated. Thus, when the pump 30 is rotated opposite to the direction of the arrow 31 it performs substantially no pumping action. When the impeller 35 is rotated opposite to the direction 38 it likewise performs substantially no pumping action.

In order to provide access to the drain pump housing 34 there are a plurality of drain passages 39.

In the drawings the recirculation operation of the apparatus during the dishwashing function is shown by the solid line arrows. The opposite drain function is indicated by the dotted lines.

In the liquid circulation apparatus of this invention the liquid flow passage 24 operates as liquid flow means through the housing and this has the entrance 16 at the bottom and the exit 19 at the top. The motor and pump housing 13 is mounted in position to receive liquid through the entrance 16 by the support legs 32 that provide for liquid flow therebetween into this entrance. The liquid impeller means or vanes 30 that are rotated by the rotor 22 comprise the pumping vanes 30 shown most clearly in FIG. 2.

The sump may be provided with the usual filter screen to separate solids from the liquid during recirculation and remove them from the liquid during draining.

Having described my invention as related to the embodiment shown in the accompanying drawings, it is my intention that the invention be not limited by any of the details of description, unless otherwise specified.

I claim:

1. In a household dishwasher, liquid circulation apparatus, comprising: sump means for retaining a body of liquid; a motor housing in the sump means and including a support forming a part of said sump means; a motor comprising a rotor and a surrounding stator in said housing; liquid flow means through said housing and in contact with the stator having an entrance from said sump and an exit; means for mounting said housing and the motor therein in position to receive liquid through said entrance from said sump means; and liquid impeller means mounted directly on said rotor and within said housing and in said liquid flow means for forcing said liquid from said entrance through said exit.

2. The apparatus of claim 1 wherein said liquid flow means comprises means spacing said rotor and stator from said housing to provide a liquid passage between the rotor-stator and the housing.

3. The apparatus of claim 1 wherein there are provided a second housing adjacent said motor housing, a drain impeller therein, entrance means from said sump means to said drain impeller housing, exit means therefrom to a place of disposal and means operated by said rotor for rotating said drain impeller.

4. The apparatus of claim 3 wherein said rotor is mounted on an axial shaft and there are provided means on said shaft for mounting the drain impeller, first guide means in said housing for directing liquid through said liquid flow means when said rotor is rotated in one direction and second guide means in said second housing for directing liquid therethrough when said rotor is rotated in the opposite direction.

5. The apparatus of claim 4 wherein said first guide means also comprise support means for supporting said motor in said housing.