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WINDSCREEN WASHER PUMPS

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Fig-1

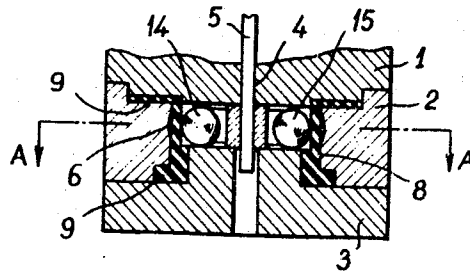


Fig-2

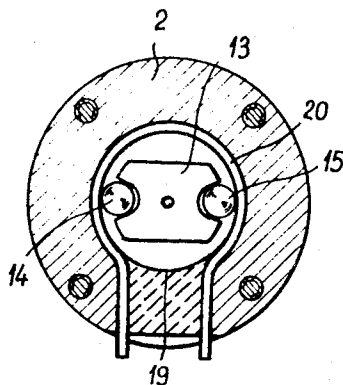
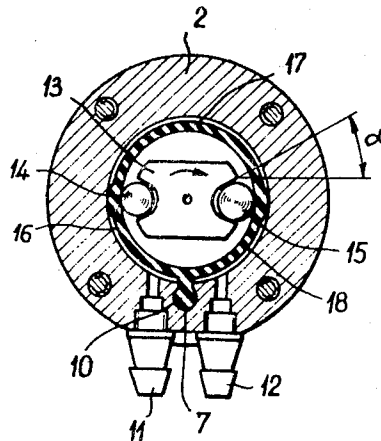


Fig-3

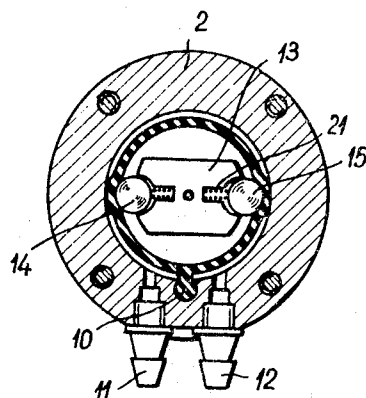


Fig-4

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WINDSCREEN WASHER PUMPS

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2 Claims

ABSTRACT OF THE DISCLOSURE

A pump applicable more particularly to windscreen washers of automotive vehicles, characterized in that the variable-volume capacities of the pump are created in an annular chamber having at least one elastic wall adapted to be engaged by members carried by the pump rotor and responsive to the centrifugal force so as to locally close an annular chamber and thus create two variable-volume capacities connected the one to the suction port and the other to the delivery port of the pump.

This invention relates to windscreen washer pumps and has specific reference to means for cleaning windcreens of automotive vehicles.

The pump according to this invention is adapted to be driven from a rotary electric motor energized from the storage battery of the vehicle through switch means controlled by the driver of the vehicle, so as to suck up water or a detergent solution kept in a reservoir and force this fluid towards nozzles or any other means provided for projecting it against the windscreen of the vehicle so as to clean same in conjunction with the windscreen wiper.

To obtain a satisfactory suction, irrespective of the relative level of the motor and pump unit and of the liquid in the reservoir, a self-priming pump must be used, i.e. a pump comprising a suction cycle during its rotation in order to create a cavity of gradually increasing volume or capacity which is connected to a reservoir at atmospheric or higher pressure.

In order to obtain a sufficient delivery pressure the above defined capacity is isolated from the reservoir and connected to the delivery port, and its volume is reduced to force the liquid towards the delivery port. This method is used in pumps of known type (whether of the gear, piston, radial blades or other types). Due to the variable-volume cavities available for the liquid, these pumps are objectionable in that when the liquid is solidified by frost they become locked and this may obviously prove detrimental to the windings of the driving motor, on account of the over-current developing therein as a consequence of the locked rotor. Besides, most of these pumps require a fluid-tight bearing for isolating the motor from the fluid contained in the pump, and thus prevent this fluid from leaking outside.

The pump according to this invention comprises, as a variable-volume capacity, an annular chamber having at least one elastic wall. In fact, during the rotation of the rotor, the centrifugal force is exerted against a plurality of members carried by the rotor and rolling on the deformable membrane; thus, these members close locally the annular chamber. Their movement along the wall of the annular chamber will thus create two variable-volume capacities connected to the pump suction and exhaust ports, respectively.

In the attached drawing:

FIG. 1 is a sectional view of the pump, the plane of the section containing the pump axis;

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FIG. 2 is a section taken along the line A—A of FIG. 1;

FIGS. 3 and 4 are views similar to FIG. 2 but showing different forms of embodiment.

The pump illustrated in FIGS. 1 and 2 of the drawing comprises a stator 2 and a pair of end covers or flanges 1 and 3. In the cover 1 which if desired may be an integral part of the driving motor (not shown) a central orifice 4 is formed to constitute a bearing for the driving shaft 5.

The stator 2 comprises an annular channel 6 and a longitudinal groove 7 formed in the inner cylindrical portion.

A cylindrical resilient membrane or sleeve 8 corresponding in shape to the cylindrical portion of the stator comprises two annular end flanges 9 adapted to retain the membrane in position and seal the assembly by being clamped between the stator 2 and the end covers 1 and 3 respectively.

This membrane 9 further comprises a longitudinal bead 10 interconnecting the annular end flanges 9 and fitting in said longitudinal stator groove 7 so as to create a fluid-tight joint or break in the annular chamber formed by the stator channel 6 between said stator 2 and membrane 8.

On either side of this fluid-tight bead 10 a suction port 11 and a delivery port 12 are formed through the wall of said stator, respectively, as shown.

Rotatably mounted in the central chamber of the stator is a rotor 13 rotatably rigid with the motor-driven shaft 5 and formed with at least two cavities extending parallel to the axis of rotation. The function of these rotor cavities is to receive balls 14 and 15 therein. The shape and dimensions of these cavities are such that the balls 14, 15 are carried along by the rotor but can move radially so as to leave the membrane unstressed in their inoperative condition.

Thus, when the rotor 13 is driven from the motor (not shown) in the direction of the arrow of FIG. 2, this rotor carries along the balls 14, 15 and beyond a certain speed these balls are urged by the centrifugal force against the membrane. As the membrane is made of elastic material the force exerted thereagainst by the balls will press the membrane against the bottom of the annular channel 6, thus creating a local fluid-tight joint and forming at least three fluid-tight chambers 16, 17 and 18 in the annular channel, i.e. chamber 16 communicating with port 11, chamber 18 with port 12, chamber 17 being isolated.

During the movement of rotation of the rotor in the direction of the arrow it will be seen that the volume of chamber 16 increases, thus producing a suction through port 11, chamber 17 having a constant volume and chamber 18 a decreasing volume, thus causing a delivery of fluid through port 17. This cycle will provide the desired pumping effect.

The cavities of rotor 13 are shaped as illustrated in FIG. 2 so that the ball-driving torque creates a radial component adding itself to the centrifugal force, as shown diagrammatically by the angle α of FIG. 2.

It is also possible to create an annular chamber in a cylindrical stator without channel by properly shaping the membrane, this membrane being urged against the stator wall by the rolling members such as balls, rollers or needles.

FIG. 3 shows a modified form of embodiment in which the annular chamber is formed by a tubular member 20 having resilient walls. In this case the balls may also be replaced by rollers or needles. During their movement of rotation the rolling members leave the tube 20 in an area 19 in which an elastic pad of the same

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material as the tube may be fitted to avoid any discontinuity in the nature of the annular track followed by the rolling members.

FIG. 4 illustrates a modified arrangement applicable to both of the preceding examples and wherein the radial force urging the rolling members against the resilient annular track is supplemented by a spring 21 or any other suitable resilient means, thus cutting off the fluid communication between the suction and delivery ports when the motor is not energized.

It is clear that in any one of the pump constructions described herein when the liquid contained in the annular chamber is frozen and thus solidified, the radial clearance of the rolling member in its cavity permit nevertheless the rotation of the rotor without any abnormal reaction torque and without any risk of damaging the driving motor.

What is claimed is:

1. A pump particularly applicable to windscreen washers, comprising a stator having central chamber and a suction port and a delivery port communicating with said central chamber, at least one elastic wall member mounted in said chamber of the stator and connected to said ports to define an annular chamber between said wall member and said stator, a rotor rotatably mounted in said central chamber coaxially with said stator, at least two diametrically opposed radial cavities in said stator parallel to the axis of rotation and which cavities have their largest dimension at their radially outermost end, ball means in

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each of said cavities and being urged against said elastic wall by centrifugal force when said rotor is rotated to form at least two variable volume capacities in said annular chamber, one of which is connected to the suction port and another of which is connected to the delivery port, the shape of said cavities being such that the ball-driving torque during the rotor rotation creates a radial component adding to the centrifugal force.

2. A pump according to claim 1, wherein said elastic wall member comprises a cylindrical sleeve with annular end flanges, a longitudinal groove formed in said stator between said ports, a longitudinal bead formed on said sleeve and engaging in said groove in a fluid-tight manner, and end plate sealing said stator in a fluid-tight manner.

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