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PUMP, PARTICULARLY FOR CARBONATED BEVERAGES AND THE LIKE

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5 Claims. (Cl. 138—96)

This invention relates to pumps and carbonated beverage assemblies which include pumps, and more in particular to an improved assembly for pumping carbonated water or the like.

An object of this invention is to provide an improved pump for carbonated beverages. Another object is to provide an improved pump assembly which may be operated continuously to maintain a continuous supply of liquid under pressure even though the demand is intermittent or variable. Another object is to provide a carbonated water supply which maintains a substantially constant head-pressure with wide variations in the demand or rate of flow. A further object is to provide structures of the above character which are sturdy, dependable, trouble-free, efficient, compact, light in weight, inexpensive to manufacture and maintain, and which are adaptable to various conditions of operation and use. These and other objects will be in part obvious and in part pointed out below.

Referring to the drawings:

FIGURES 1 and 2 are end and side views, respectively, of one embodiment of the invention which comprises an electric motor and a carbonator pump.

FIGURE 3 is an enlarged view on the lines 3—3 of FIGURE 2;

FIGURE 4 is an enlarged view on the line 4—4 of FIGURE 1;

FIGURE 5 is a sectional view on the line 5—5 of FIGURE 4;

FIGURE 6 is an enlarged vertical section of the impeller;

FIGURE 7 is a side elevation of the central portion of FIGURE 6 with parts broken away; and

FIGURE 8 is a fragmentary view representing a portion of the periphery of the impeller.

Referring to FIGURES 1 and 2 of the drawings, a motor 4 and a pump 6 mounted upon the end of the motor casing. The entire unit is supported by the base 8 of the motor casing. Referring to FIGURE 4, pump 4 has a main pump housing or casing 10 and a removable casing or cover 11. Cover 11 is clamped to casing 10 by six cap screws 13 (see also FIGURE 1), and the casing is sealed by a O-ring 15 in an annular slot in casing 10. Casing 10 provides the end casing for the motor, and the motor shaft 12 projects into casing 10 through a shaft seal assembly 14. Seal assembly 14 has a stationary portion 16 and a rotating portion 18 which are held together by a spring 20. Spring 20 rests against rotor portion 18, and is held under compression at the right by a spring washer 22 and a nut 24 threaded upon the reduced end portion 26 of shaft 12. Mounted upon nut 24 is a pump impeller 28 which is in the form of a plastic disc 27 of molded "Delrin" having a center brass insert 30 (see also FIGURE 7).

Nut 24 has its corners cut away to a fixed radius from the axis of the motor shaft. Insert 30 is a flat square plate with a central opening which snugly receives the square nut 24. At each of the four corners of the opening in insert 30, the insert is cut away to provide a semi-cylindrical recess at 32, and the plastic is molded upon the opposite sides of the insert and in these recesses so that the integral plastic structure locks the insert securely in the disc. The plastic disc has a central bore 33 which fits snugly over the reduced radius corners of nut 24, and each of the flat side surfaces 36 of the nut is engaged by an inner flat edge surface 34 of the insert. In this way the impeller is driven positively by the nut, and yet the impeller may slide axially without modifying or changing the driving relationship. Casings 10 and 11 provide a central pump chamber 40, which encloses the end of the motor shaft and the shaft seal and the central portion of the impeller. There is also an annular chamber 42 in which the outer portion of the impeller is positioned, and having parallel, annular side-wall surfaces which are spaced apart slightly greater than the thickness of the impeller disc 27. Chamber 42 is enlarged at the periphery of the impeller to form a fluid-pump passageway 44 which extends (see FIGURE 3) from a liquid inlet passageway 46 clockwise around the periphery of the impeller to a liquid outlet passageway 48.

Impeller 28 has notches 51 around its periphery (see also FIGURES 6 and 8) to provide a large number of impeller fins 50 upon the opposite sides of the impeller. Notches 51 upon the opposite sides of the impeller are staggered so that each fin is directly opposite the center of a notch upon the other side of the impeller. Referring to FIGURE 5, inlet passageway 46 connects with a right-angle passageway 52 to which the threaded end of a supply pipe or tube may be connected. Similarly, outlet passageway 48 connects with right-angle passageway 54 to which the threaded end of a discharge pipe or tube may be connected. Interconnecting passageway 46 and 48 is a bypass formed by a bore 56 at the left and a larger bore 57 at the right with a valve seat 62 where the bores join. This bypass is normally closed by a relief valve 58 which is adapted to open automatically when the difference between the inlet and outlet pressures exceed a predetermined value. Relief valve 58 has a valve disc 60 which normally rests in the closed-valve position against valve seat 62, and the valve disc has a valve stem 64. The right hand of valve stem 64 is slidably positioned in a bore 66 in an adjusting screw 68, which is threaded in a bore in casing 10. Positioned around valve stem 64 is a compression spring 70 which rests against adjusting screw 68 and urges the valve plate to the closed-valve position. However, when the pressure in the outlet passageway 48 becomes sufficient to overcome the pressure of spring 70, the valve opens automatically so that the outlet passageway 48 is connected directly to the inlet passageway 46. The pressure of spring 70 and therefore the pressure at which the relief valve will open is adjusted by turning adjusting screw 68 with a screwdriver.

As indicated above, impeller 28 is rotated by the operation of motor 4 through nut 24, but the impeller is free to slide axially. Hence, the impeller takes the position for free movement between the adjacent casing surfaces, particularly the parallel annular surfaces 41 along the sides of the impeller. Chamber 40 and the annular space 42, including passageway 44, are all filled with liquid which acts as a lubricating fluid and forms protective films or layers between surfaces 41 and the sides of the impeller. The vanes 50 upon the impeller impart movement to the liquid in the pumping passageway 44 and causes the liquid to move with the impeller from the inlet passageway 46 to the outlet passageway 48. The uniform cross-section of passageway 44 insures a uniform rate of movement, and there are no pockets or protrusions such as would tend to create variations in the fluid pressure. It has been indicated above that the impeller is free to move axially and that during rotation it assumes a central position between the casing surfaces 41. The impeller disc 27 has four holes or openings 43 therethrough which permit free passage of the liquid from one side of the disc.
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3. To the other. Hence, the liquid does not interfere with the axial movement of the impeller.

The relief valve arrangement is also very important in the pumping of water at a high pressure to a carbonator for carbonated beverages where the demand may vary so that the pump is turned off and on frequently. With such systems the pump may be operated when there is a partial or complete stoppage at the outlet or in the water supply. The pump herein disclosed will supply water at any rate from the maximum down to a condition where there is no flow. The valve moves from the fully-closed position to and from any position required to pass the amount of liquid which is not being discharged. The action of the valve is rapid, and the opening and closing of the valve causes no objectionable change in the action of the pump. Also, if the pump is operated when the water supply has been shut off, the pump is not damaged.

In the illustrative embodiment, the impeller is substantially three inches in diameter and the impeller disc is of the order of .13 inch in thickness. The notches 51 are formed by surfaces which are segments of a cylinder, with a maximum depth of the notch at the periphery of the disc being .05 inch and with the notches terminating substantially .25 inch from the periphery. In the drawings, the other dimensions correspond to those given.

As many possible embodiments may be made of the apparatus of the above invention and as the art herein described might be varied in various parts, all without departing from the scope of the invention, it is to be understood that all matter hereabove set forth, or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. In a pump construction, the combination of, a casing construction which provides a closed central chamber and an arcuate liquid pumping passageway and also provides an inlet passageway and an outlet passageway connected respectively to the ends of said liquid pumping passageway, a driving shaft assembly positioned within said chamber and having its axis concentric with the axis of said liquid pumping passageway, said casing construction being formed with an arcuate slot extending radially outwardly from said central chamber to said pumping passageway, and a flat plastic disc impeller mounted upon said shaft assembly and having a portion adjacent its periphery extending through said arcuate slot and its entire periphery positioned to move during rotation of the impeller along said liquid pumping passageway in the direction from said inlet passageway to said outlet passageway, said impeller having a central metal portion with a center opening which presents mounting and driving surfaces surrounding said axis, and having a maximum dimension along said axis which is less than the width of said arcuate slot, said shaft assembly having a coupling portion which presents driving and mounting surfaces mating with said mounting and driving surfaces of said metal portion and with the same circumferential contour thereof, said driving and mounting surfaces including substantially flat surfaces which are parallel to said axis and tangential with respect to a circle of the minimum radius of said coupling portion, the dimensions of said center opening and circumferential contour being such that said impeller slides freely along said axis and said mounting and driving surfaces providing a driving metal-to-metal relationship between said coupling portion and said metal portion of said impeller, whereby said impeller assumes a position in said arcuate slot under the influence of the surface of fluid along its opposite sides.

2. The construction as described in claim 1 wherein said impeller is formed by a plastic disc and said central metal portion is a metal plate insert imbedded in the central portion of said plastic disc and has a peripheral contour which is a polygon and has straight portions lacking the insert in the plastic disc.

3. A construction as described in claim 2 wherein said plastic disc has integral portions connecting its side portions together through said metal plate insert adjacent said substantially flat surfaces.

4. The construction as described in claim 1 wherein said impeller has a plurality of radial fins at its periphery which impart arcuate movement to the liquid within said liquid pumping passageway.

5. The construction as described in claim 4 wherein said fins are in planes which intersect said axis and are staggered upon the opposite sides of the center of said impeller.

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