March 3, 1970 J. A. DICKEN, JR 3,498,327

PUMP OUTLET VALVE MEANS

Filed March 13, 1968 2 Sheets-Sheet 1

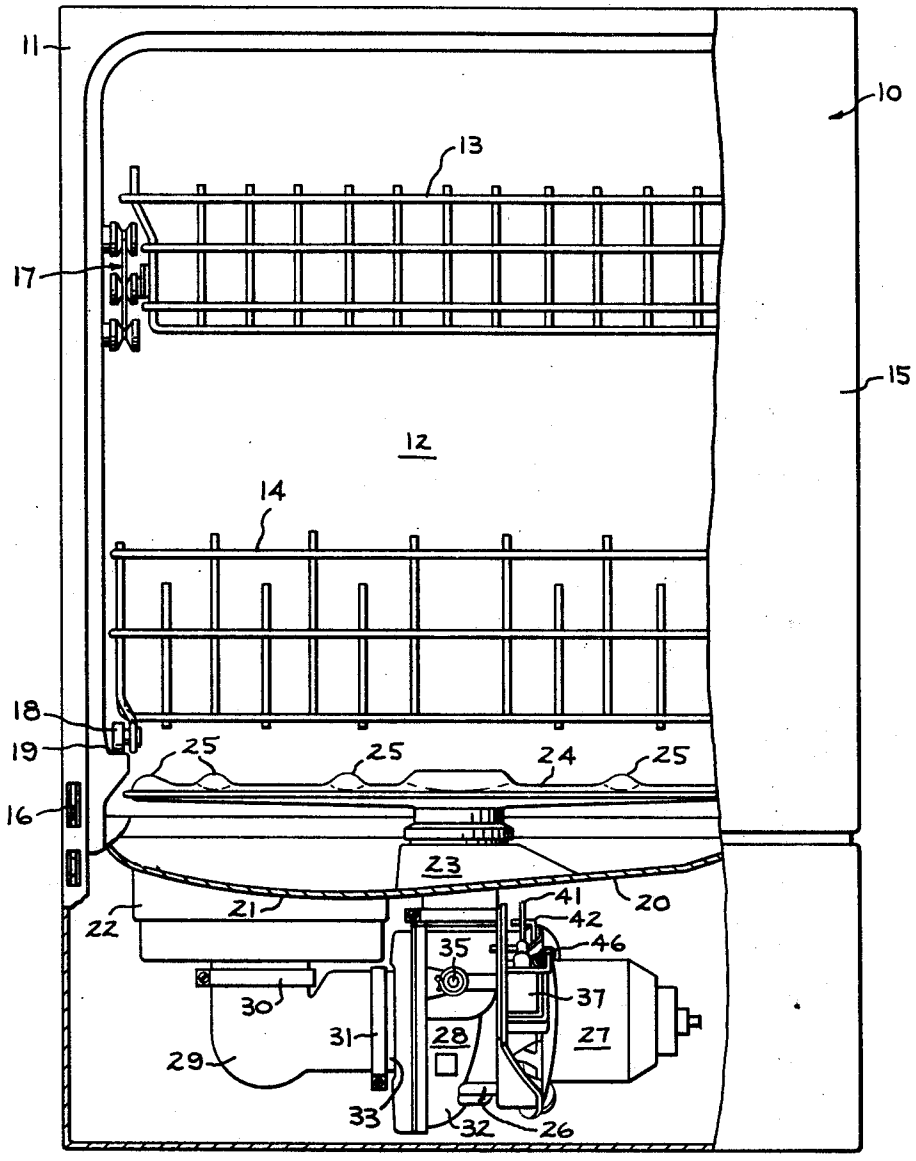


FIG. 1

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PUMP OUTLET VALVE MEANS

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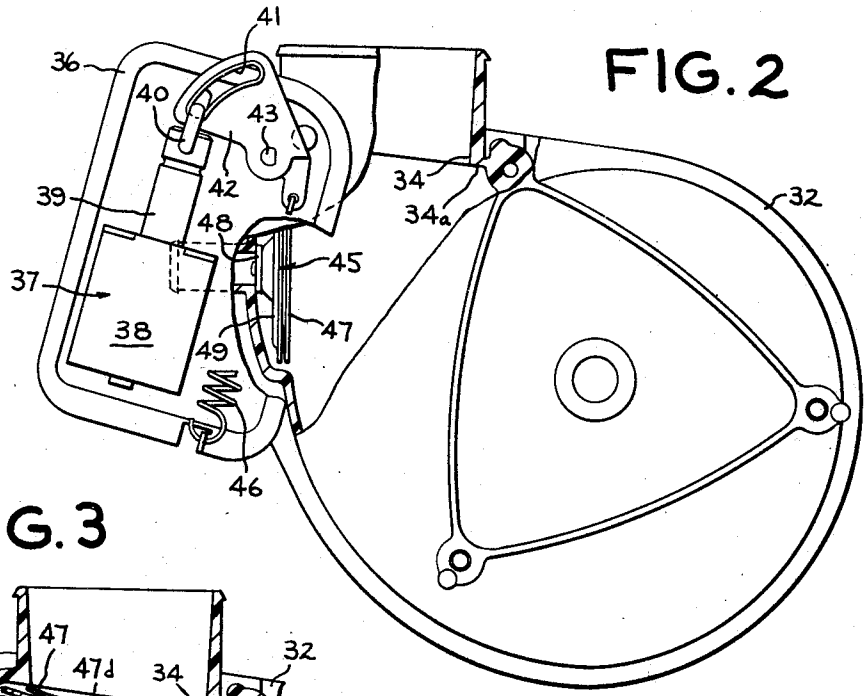


FIG. 2

FIG. 3

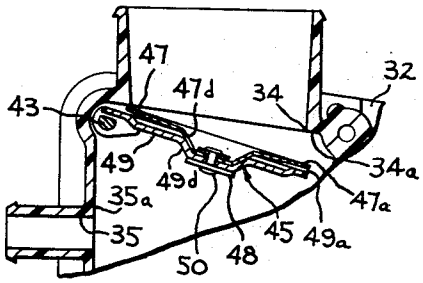


FIG. 4

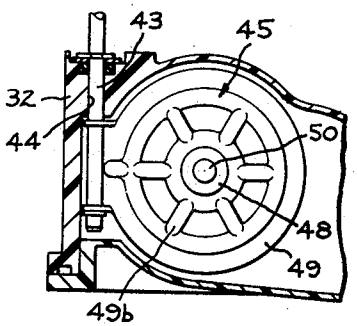
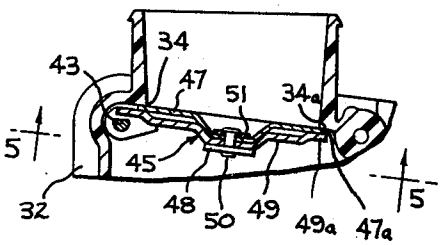


FIG. 5



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PUMP OUTLET VALVE MEANS

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ABSTRACT OF THE DISCLOSURE

Improved valve means for controlling the flow of pressurized fluid through a pump outlet. The pump housing has an outlet opening surrounded by a seat for a movable valve element that is movable between a first position uncovering and a second position covering the opening. The valve element is mounted within the housing upstream of the opening and comprises two generally circular discs fastened together adjacent their centers. One of the discs is stiffly resilient and has a concavo-convex portion adjacent its outer circumference, the concave side of which is aligned over the seat when the element is in the second position. The second disc is substantially rigid and has a generally flat surface adjacent its outer circumference that is spaced behind the convex side of the concavo-convex portion of the first disc. Pressure applied to the valve element by the flow of the fluid through the housing moves the element to its second position, initially causing the stiffly resilient disc portion to form a seal with the seat and subsequently compressing it between the seat and the rigid disc which then carries the fluid load and prevents deflection or bowing of the stiffly resilient disc into the opening.

BACKGROUND OF THE INVENTION

This invention relates to a pump which is particularly adapted for use in an automatic dishwasher, and, more specificially, to improved outlet valve means for such a pump.

An automatic dishwasher conventionally has a complete cycle of operation which includes several admissions of water, each of which is followed by a wash or rinse operation wherein the water is recirculated through the wash chamber. After a suitable length of time, the recirculation is terminated and the water is discharged from the dishwasher into the household sewer system. Both the recirculation and the discharge of the water requires the use of pump.

Many dishwashers employ a single pump to function as both a recirculation pump and a discharge pump. Such a pump is described in detail in U.S. Patent No. 3,367,368, issued Feb. 6, 1968, to Thomas E. Jenkins, and assigned to the General Electric Company, assignee of the present invention. The pump has a housing defining an inlet which is connected to the bottom of the dishwasher wash chamber to receive fluid therefrom. Disposed within the housing is an impeller mounted for rotation to pump fluid through the housing. The housing is provided with a first or spray outlet opening, which connects the pump with a spray device located within the wash chamber and a second or drain outlet opening which connects the pump to a sewer system. An outlet valve mechanism is provided to selectively control through which of the outlets the fluid will egress from the pump housing. The valve mechanism comprises a valve element pivotally carried by the housing for movement therein between a first position, in which it covers the drain outlet opening and opens the spray outlet opening, and second position, in which it uncovers the drain outlet opening and covers the spray outlet opening. The valve element includes a sealing member which,

when the element is in the second position, engages a generally flat seat that surrounds the spray outlet opening. Heretofore, the spray outlet sealing member has been formed of generally circular resilient disc provided with a generally flat surface for engaging the spray outlet seat.

While the above-described conventional pump has been generally quite satisfactory, a problem has been encountered with the spray outlet sealing member becoming deflected or bowed into the spray outlet opening by pressure applied to it by the pump fluid. This bowing has caused its outer periphery to wrinkle and fail to tightly engage the sea, thus allowing seepage of fluid past it into the spray outlet.

The improved valve means of the present invention, though not limited in applicability thereto, is particularly useful in a pump of the aforedescribed type to overcome the previously noted problem.

SUMMARY OF THE INVENTION

The present invention provides improved valve means for controlling the flow of pressurized fluid through a housing outlet. In one presently preferred form of the present invention, the housing has an outlet opening surrounded by a seat for a movable valve element that is movable between a first position uncovering and a second position covering the opening. The valve element is mounted within the housing and comprises two generally circular discs fastened together adjacent their centers. A first of the two discs is stiffly resilient and has a generally concavo-convex portion adjacent its outer circumference, the concave side of which is aligned over the seat when the element is in the second position The second of the two discs is substantially rigid and has a generally flat surface adjacent its outer circumference spaced behind the convex side of the first disc. By describing the second of the two discs as being substantially rigid, it is meant that the disc should be constructed so as to be flex-resistant such that it will resist deformation of is shape during the performance of its intended function as hereafter described. Movement of the valve element in response to pressure applied to it by the flow of fluid through the housing first causes the concave side of the first disc portion to engage the seat to form a seal therewith and subsequently compresses it between the seat and the rigid disc which then carries the fluid load and prevents deflection or bowing of the resilient disc into the opening.

BRIEF DESCRIPTION OF THE DRAWING

FIGURE 1 is a front elevational view, partially cut away to show details, of an automatic dishwasher incorporating the present invention;

FIGURE 2 is a fragmentary view, partly cut away to show details, of the pump housing provided with the improved outlet valve means of the present invention employed in the dishwasher of FIGURE 1;

FIGURE 3 is a fragmentary elevational cross-sectional view of the improved outlet valve element of the present invention shown as its stiffly resilient sealing disc approaches engagement with the housing spray outlet opening seat;

FIGURE 4 is a view similar to FIGURE 3, but showing the stiffly resilient sealing disc subsequently compressed between the spray outlet opening seat and the substantially rigid backing disc of the valve element; and

FIGURE 5 is a sectional view taken along line 5—5 of FIGURE 4.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Turning now to the drawings and more particularly to FIGURE 1 thereof, there is illustrated an automatic dish-

washer 10 having an outer cabinet 11 defining therein a wash chamber 12. Disposed within the wash chamber 12 are dish supporting racks 13 and 14 which are adapted to receive and support dishes or other articles to be washed within the wash chamber 12. A closure member 15 is provided in one wall of cabinet 11, pivotal about hinge means 16, to provide access to the wash chamber 12. When the closure member 15 is pivoted downwardly, the rack 13 can be at least partially withdrawn from the wash chamber 12 by means of a slide and roller system 17 providing at each side of the rack 13 and slidably supporting the rack 13 from inner wall of the cabinet 11. Similarly the rack 14 can be at least partially withdrawn from the wash chamber 12 by means of a roller 18 which rides upon a surface 19 provided at each side of the cabinet 11.

The lower extremity of the wash chamber 12 is defined by a bottom wall 20 which gradually slopes to a low point 21 near the center of the dishwasher. Disposed below the low point 21 is a sump 22 which may be formed integrally with the bottom wall 20 or which may be a separate element secured to the bottom wall 20. Projecting upwardly from the bottom wall 20 near the center of the wash chamber 12 is a pedestal 23 which rotatably supports spray device 24. The spray device 24 has a plurality of orifices 25 through which wash fluid is ejected to effectuate a wash action upon articles supported by the racks 13 and 14.

At least one of the orifices 25 is directed such that a reaction force is created by wash fluid passing therethrough causes rotation of the spray device 24.

Wash fluid is propelled into the spray device 24 by a motor-pump assembly 26 which includes an electric motor 27 and a pump 28. A flexible boot or conduit 29 interconnects the sump 22 with the inlet of the pump 28. The boot 29 is secured to the sump 22 by means of a clamp 30 which is secured to the inlet of the pump 28 generally by means of a clamp 31. The motor-pump assembly 26 is suitably supported on the bottom wall 20.

Referring now to FIGURES 2–5, it can be seen that the pump 28 has a housing 32 defining an inlet 33 which receives from the conduit 29. Disposed within the housing 32 is an impeller (not shown) mounted for rotation to pump fluid through the housing. The housing 32 further defines a first or spray outlet opening 34 which interconnects the pump 28 with the spray device 24, and also defines a second outlet opening 35 which interconnects the pump 28 with a sewer system (not shown). Thus, water, or other liquid, entering the pump through the inlet 33 will be pumped either into the spray device 24 through the first or spray outlet opening 34 or discharged from the dishwasher 10 through the second or drain outlet opening 35.

An outlet valve mechanism is provided to selectively control through which of the outlets 34 or 35 the fluid will egress from the housing 32. As best shown in FIGURE 2, the outlet valve mechanism includes a frame 36 suitably secured to the exterior of the housing 32. The frame 36 carries an electrically-operated solenoid 37 having a stator 38 and a movable armature 39. The armature 39 has a link 40 attached to it which passes through a slot 41 provided in a crank plate 42 that is fixed to the outer end of a crank shaft 43 which extends through an aperture 44 in the housing 32. The inner end of the crank shaft 43 mounts a valve element 45, which will be described in detail hereinafter, for pivotal movement therewith between a first position, wherein the valve element 45 covers the drain outlet opening 35 and uncovers the spray outlet opening 34 (FIGURE 2), and a second position, wherein the valve element 45 uncovers the drain outlet opening 35 and covers the spray outlet opening 34 (FIGURE 4).

A spring 46 is secured at one end to the frame 36 and at its other end to the crank plate 42 to normally urge the crank plate 42 and shaft 43 to rotate in a a direction to position the valve element 45 in the first position (FIGURE 2). When the solenoid is energized, it overcomes the force of the spring 46 and moves the crank plate 42 and, consequently, the valve element 45 toward the position. When the solenoid is energized, the valve element 45 is moved part way toward the second position, and, when the pump 28 is operating and fluid is passing through the housing 32, the pressure of the fluid will move the valve element 45 the rest of the way into the second position (FIGURE 4). The fluid pressure will maintain the valve element 45 in the second position (FIGURE 4) until substantially all of the fluid has been pumped out through the drain outlet opening 35, whereupon pressure within the housing 32 will drop and the spring 46 will return the valve element 45 to the first position (FIGURE 2), wherein the spray outlet opening 34 is open and the drain outlet opening 35 is closed.

The foregoing arrangement is generally similar to that described in detail in the aroremention U.S. Patent No. 3,367,368, with the exception of the construction of the movable valve element 45 and its connection to the crank plate 42.

In accordance with the form of the present invention illustrated in the drawings, the valve element 45 includes a first sealing member 47 which, when the element 45 is in the second position (FIGURE 4), engages a generally flat seat 34*a* that surrounds the spray outlet opening 34, and a second sealing member 48 which, when the element 45 is in the first position (FIGURE 2), engages a generally flat seat 35*a* that surrounds the drain outlet opening 35. As illustrated the seats 34*a* and 35*a* are integrally formed with the housing 32, which is molded of a substantially rigid plastic material.

The two sealing members 47 and 48 are carried by a backing member 49 which comprises a substantially rigid, generally circular disc that is fixed to the inner end of the crank shaft 43 for pivotal movement therewith. The first sealing member 47 comprises a stiffly resilient, generally circular disc, which may be formed of metal, such as stainless steel or the like. The two discs 47 and 49 are fastened together adjacent their centers by suitable fastening means, such as a rivet 50. Of course, suitable sealing means, such as a gasket 51, are provided to prevent leakage of fluid between the rivet 50 and the discs 47 and 49. The stiffly resilient disc 47 has a concavo-convex portion 47*a* adjacent its outer circumference, the concave side of which is aligned over the spray outlet opening seat 34*a* as the valve element 45 approaches the second position (FIGURE 3).

The substantially rigid backing member or disc 49 has a generally flat surface 49*a* adjacent its outer circumference, which is spaced behind the convex side of the concavo-convex portion 47*a* of the resilient disc 47. As illustrated, the backing disc 49 is formed with a plurality of stiffening ribs 49*b* and the discs 47 and 49 are respectively provided with complementary dimpled portions 47*d* and 49*d* adjacent their centers. The rear face of the dimpled portion 49*d* of the substantially rigid disc 49 provides a backing surface for the second sealing member 48 which is also fastened thereto by the rivet 50. The second sealing member 48 typically comprises a resilient washer which may be formed of a soft plastic or an elastomeric material.

As the improved valve element 45 of the present invention is pivoted toward the second position by the energization of the solenoid 37, when the pump 28 is in operation and fluid is passing through the housing 32, the pressure that is applied to the valve element 45 by the fluid to move it toward the second position initially causes the concavo-convex portion 47*a* of the stiffly resilient disc 47 to engage the spray outlet opening seat 34*a* to

form a seal therewith, and subsequently compresses it between the seat **34***a* and the surface **49***a* of the substantially rigid backing member or disc **49**, which then carries the fluid load and prevents deflection or bowing of the stiffly resilient first sealing member or disc **47** into the spray outlet opening **34** (FIGURE 4).

From the foregoing description, it can be seen that the present invention provides improved valve means for controlling the flow of pressurized fluid through an outlet opening in a housing in which the fluid flows. The improved valve means includes an improved movable valve element for selectively opening and closing the outlet opening in response to pressure applied to it by the fluid. The movable valve element includes stiffly resilient means to provide a seal between the element and the opening which is protected by substantially rigid backing means from being distorted or bowed into the opening by the fluid pressure.

As will be evident from the claims appended hereto, it is not intended that the invention be limited specifically to the form of embodiment described heretofore or to the particular details of the examples illustrated in the accompanying drawings.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. In a pump housing having an outlet opening surrounded by a valve seat for cooperating with a movable valve element to control a flow of pressurized fluid through the outlet opening, wherein the valve element is mounted within the housing upstream of the outlet opening for movement between a first position away from the opening and a second position covering the opening, an improved valve element comprising:

(a) first and second generally circular discs fastened together adjacent their centers,

(b) said first disc being stiffly resilient and having a generally concavo-convex peripheral portion adjacent its outer circumference and having the concave side thereof aligned over the seat when the element is in the second position,

(c) said second disc being substantially rigid and having a generally flat surface adjacent its outer circumference and spaced behind the convex side of said portion of said disc, and

(d) the valve element comprising said discs being responsive to the flow of the pressurized fluid whereby said portion of said first disc is first engaged with the seat and is subsequently compressed between the seat and said second disc.

2. The invention of claim **1**, further including means for mounting the valve element on the housing for pivotal movement between said first and second positions.

3. The invention of claim **1**, wherein said first disc is formed of metal.

4. The invention of claim **1**, wherein said first disc is formed of stainless steel.

5. The invention of claim **1**, wherein the housing and seat are integrally formed of a rigid plastic material.

6. In a washing appliance, such as an automatic dishwasher or the like, having a cabinet defining a washing chamber and a pump for supplying a flow of pressurized fluid to the chamber, wherein the pump includes a valve element pivotally mounted within a housing for movement between a first position where it uncovers an outlet opening in the housing communicating with the chamber and a second position where it covers the outlet opening, and a valve seat integral to the housing circumjacent the outlet opening, an improved valve means therefor, comprising:

(a) a pair of generally circular discs fastened together adjacent their centers and serving as the valve element.

(b) the first of said discs being disposed toward the valve seat and having a stiffly-resilient body with an outer edge peripheral portion capable of flexing to conformably seal against the valve seat,

(c) the second of said discs being flex-resistant relative to said first disc and having a generally flat surface circumjacent its outer edge and disposed adjacent said outer edge peripheral portion of said first disc,

(d) the valve element being disposed to respond to the flow of the pressurized fluid flow within the housing whereby the element will pivot to the second position and cover the outlet opening, and

(e) said first disc being formed so that there is a space between said outer peripheral portion and said generally flat surface of said second disc when the valve element is in the first position whereby movement of the valve element to the second position will cause said outer edge peripheral portion to flex and be comformably engaged between said flat surface and the valve seat.

7. The combination set forth in claim **6** wherein the valve element further includes a sealing member disposed on the side of said second disc that faces away from said first disc for closing over a drain opening when the valve element is in the first position.

8. The combination set forth in claim **7** including means linked to the valve element for pivoting it to the first position.

9. The combination set forth in claim **7** including means linked to the valve element for placing the valve element in an intermediate position between the first and second positions whereby the valve element becomes responsive to the pressure of the fluid flow.

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HENRY T. KLINKSIEK, Primary Examiner

U.S. Cl. X.R.

251—86, 334