Feb. 6, 1968 T. E. JENKINS 3,367,368

OUTLET VALVE FOR DISHWASHER PUMP

Filed May 12, 1966 2 Sheets-Sheet 1

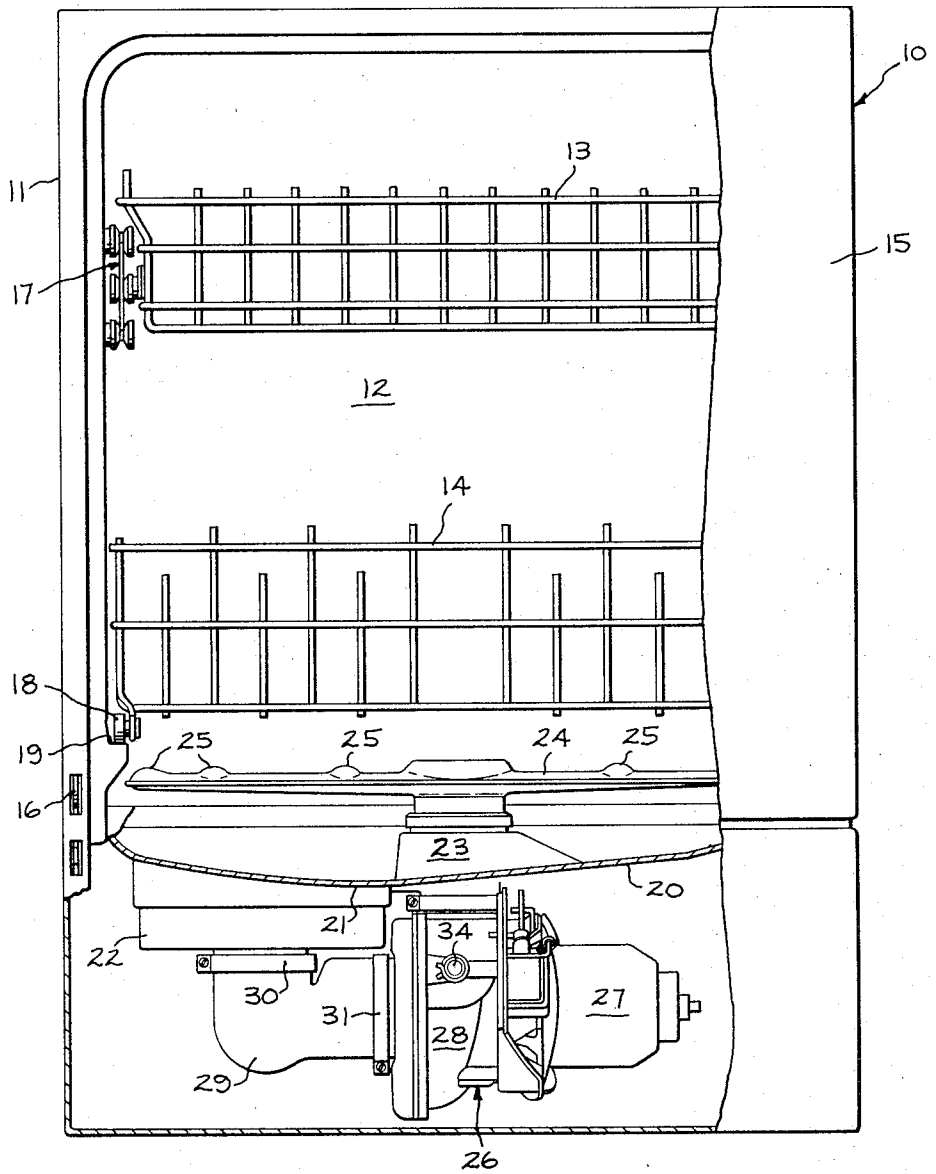


FIG. 1

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FIG. 2

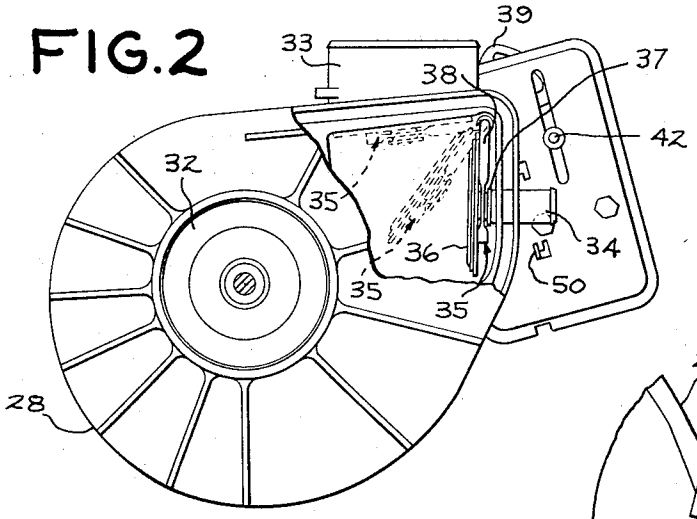


FIG. 4

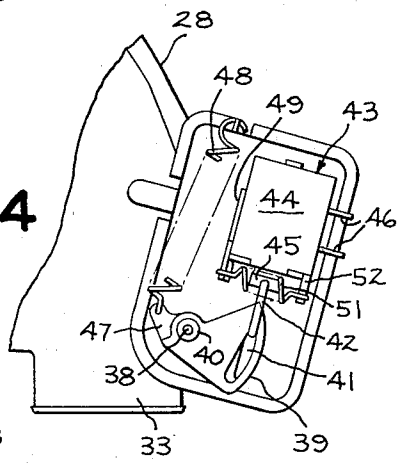


FIG. 3

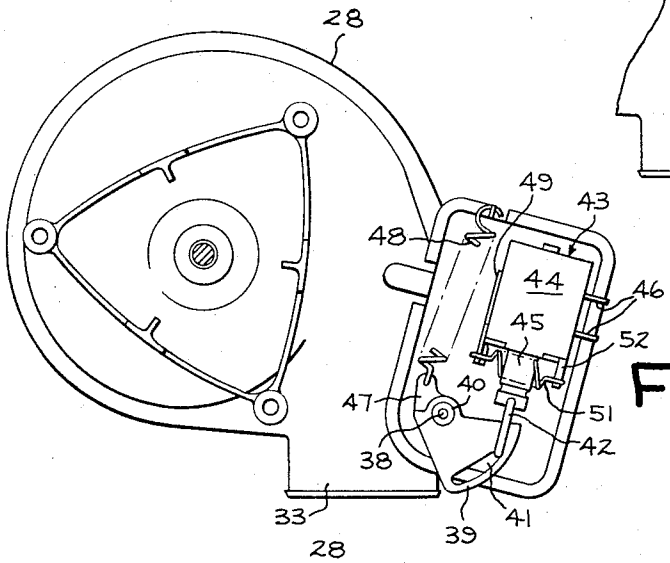
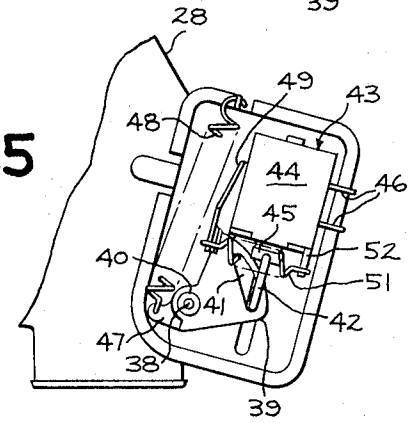


FIG. 5



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United States Patent Office 3,367,368
Patented Feb. 6, 1968

3,367,368

OUTLET VALVE FOR DISHWASHER PUMP

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Filed May 12, 1966, Ser. No. 549,675
7 Claims. (Cl. 137—625.44)

ABSTRACT OF THE DISCLOSURE

A valve for controlling the flow of pressurized fluid through an outlet in a pump housing. The valve includes a valve element pivoted to the housing adjacent the outlet for movement within the housing between a first position opening the outlet and a second position closing the outlet. Biasing means including a first spring normally bias the valve element toward the first position. Means comprising a short-travel solenoid move the valve element part of the way from the first toward the second position. Fluid flow through the housing moves the valve element the rest of the way to the second position. Energy storing means including a second spring energized by movement of the valve element from the first toward the second position are also provided to assist the biasing means in returning the valve element from the second to the first position upon termination of fluid flow through the housing.

This invention relates generally to a pump mechanism particularly adapted for use in an automatic dishwasher and, more specifically, to an outlet valve for such pump mechanism.

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 a 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 a pump. In some dishwashers two separate pumps, each driven by its own motor, are used, one for recirculation and the other for discharge. Other dishwashers provide two separate pumps, both driven by the same motor with the most common arrangement involving an electrically-reversible motor wherein the recirculation pump is effective in one direction of rotation and the discharge pump is effective in the other direction of rotation. Although the latter arrangement is more economical than the former since it omits the second motor, it is still more expensive than the arrangement contemplated by the present invention since it still necessitates two separate pumps and, additionally, an electrically-reversible motor is obviously more expensive than a single directional motor.

The present invention contemplates a single pump to function as both a recirculation pump and a discharge pump but still requiring operation in only one direction of rotation. Thus the arrangement contemplated involves only a single pump and a single motor. This dual function pump is achieved by providing two outlets with a valve mechanism to control flow through the outlets. The disadvantage heretofore in such arrangement is that the cost of the valve mechanism often substantially offset the savings realized by employing a single pump, single motor system. The present invention provides an improved valve mechanism which is reliable in operation but relatively inexpensive to manufacture thus retaining all of the advantages of a single pump, single motor system without the heretofore attendant disadvantageous cost aspects of the necessary valve mechanism.

Accordingly, it is an object of this invention to provide an improved outlet valve arrangement for a diswasher pump.

It is another object of this invention to provide an improved outlet valve arrangement for a dishwasher pump having two outlets.

Briefly stated, in accordance with one aspect of the present invention, there is provided in combination a housing having an outlet to allow fluid under pressure to egress from the housing. A valve element is provided to selectively open and close the outlet. There are means provided to normally bias the valve element toward a first position wherein the valve element opens the outlet. Means are also provided to move the valve element toward a second position wherein the valve element closes the outlet. Energy storing means are provided and are energized by movement of the valve element into its second position to initially move the valve element from its second position toward its first position when the pressure of the fluid within the housing drops below a predetermined value.

While the specification concludes with claims particularly pointing out and distinctly claiming the subject matter which is regarded as the invention, it is believed the invention will be better understood from the following description taken in connection with the accompanying drawings, in which:

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

FIGURE 2 is a fragmentary view, partially cut away to show details, of the pump and valve arrangement employed in the dishwasher of FIGURE 1;

FIGURE 3 is a view of the present invention with the valve in the position shown in solid lines in FIGURE 2;

FIGURE 4 is a fragmentary view similar to FIGURE 3 but showing the invention with the valve in an intermediate position; and

FIGURE 5 is a fragmentary view similar to FIGURE 4 but showing the invention with the valve in yet another position.

Referring now to the drawings, and more particularly to FIGURE 1 thereof, there is illustrated an automatic dishwasher **10** having an outer cabinet **11** defining therein a wash chamber **12**. Disposed within 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 wash chamber **12**. A closure member **15** is provided in one wall of cabinet **11**, pivotal about a hinge means **16**, to provide access to the wash chamber **12**. When closure member **15** is pivoted downwardly, rack **13** can be at least partially withdrawn from wash chamber **12** by means of a slide and roller system **17** provided at each side of rack **13** and slidably supporting rack **13** from the inner wall of cabinet **11**. Similarly, rack **14** can be at least partially withdrawn from wash chamber **12** by means of a roller **18** which rides upon a surface **19** provided at each side of cabinet **11**.

The lower extremity of 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 bottom wall **20** or which may be a separate element secured to bottom wall **20**. Projecting upwardly from bottom wall **20** near the center of wash chamber **12** is a pedestal **23** which rotatably supports a reaction type spray device **24**. Spray device **24** has a plurality of orifices **25** through which wash fluid is ejected to effectuate a wash action upon articles supported by racks **13** and **14**. At least one of the orifices **25** is directed such that the

reaction force created by wash fluid passing therethrough causes rotation of spray device **24**.

Wash fluid is propelled into 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 sump **22** with the inlet of pump **28**. Boot **29** is secured to sump **22** by means of a clamp **30** and is secured to pump **28** similarly by means of a clamp **31**. Motor-pump assembly **26** is suitably supported from bottom wall **20**.

Referring now to FIGURES 2–5, it can be seen that pump **28** has a housing defining as inlet **32** which receives fluid from conduit **29**. Disposed within housing **28** is an impeller (not shown) mounted for rotation to pump fluid through the housing. A first outlet **33** interconnects pump **28** with spray device **24** while a second outlet **34** interconnects pump **28** with a sewer system (not shown). Thus, water, or other liquid, entering pump **28** through inlet **32** will be pumped either into spray device **24** through outlet **33** or discharged from the dishwasher **10** through outlet **34**. The present invention is primarily concerned with the outlet valve mechanism to selectively control through which of the outlets **33** or **34** the fluid will egress from pump **28**.

The valve mechanism of the present invention includes a valve element **35** pivotally caried by the housing of pump **28**. Valve element **35** comprises a first sealing member **36** which, when valve element **35** is properly oriented, closes outlet **33** and a second sealing member **37** which, when valve element **35** is properly oriented, closes outlet **34**. Sealing members **36** and **37** are carried by a pivotal arm **38** which, in turn, is pivotally carried by the housing of pump **28**. Arm **38** has a 90° bend in it adjacent its connection to the housing of pump **28**. Arm **38** extends through the housing and terminates, as shown in FIGURES 3–5, at a pivotal plate **39**. Plate **39** is rigidly secured to arm **38** by means of a clip **40** so that plate **39** and arm **38** move as a unit. Plate **39** is provided with a slot **41** which receives a link **42**.

An electrically-operated solenoid **43**, having a stator **44** and an armature **45**, is mechanically connected to link **42** so that movement of armature **45** results in movement of link **42**. Electrical terminals **46** are provided so that solenoid **43** may be electrically connected to a suitable power source (not shown). Plate **39** has an extension **47** connected to one end of a spring **48**. The other end of spring **48** is secured to the rigid support upon which solenoid **43** is mounted. Thus, when solenoid **43** is energized and armature **45** pivots plate **39** to move valve element **35**, spring **48** is elongated and serves to bias the assembly in the opposite direction so that when solenoid **43** is de-energized, armature **45** will be withdrawn from stator **44**.

With the aforedescribed arrangement, spring **48** maintains, through plate **39** and arm **38**, sealing member **37** in engagement with outlet **34** so that outlet **34** is closed. If pump **28** is energized under these conditions, water will be pumped out through outlet **33** thereby creating recirculation of the water through spray device **24** and returning to pump **28** through conduit **29**. This condition of the arrangement is illustrated in FIGURE 3 and in solid lines in FIGURE 2. When it is desired to discharge the water from dishwasher **10**, solenoid **43** is energized which results in the arrangement assuming the position illustrated in FIGURE 4 and the intermediate position in dashed lines in FIGURE 2. Because pump **28** is creating a pressure, as well as a dynamic flow of fluid out through outlet **33**, when the arrangement reaches the condition of FIGURE 4, the forces created by the pressure and flow of fluid will carry valve element **35** into the position illustrated in FIGURE 5 which results in sealing member **36** closing outlet **33** (also shown in dashed lines in FIGURE 2). This latter position will be maintained as long as pressure is maintained within pump **28**. As soon as all the water is discharged through outlet **34**, the pressure within pump **28** will drop off and no longer serve to maintain sealing member **36** in a position wherein it closes outlet **33**.

Under ideal conditions, spring **48** will return valve element **35** into the position wherein sealing member **37** closes outlet **34**; however, under normal conditions of use there is a residual pressure present within pump **28** after all the water has been discharged such that spring **48** cannot break sealing member **36** away from outlet **33**. This could be overcome by increasing the force of spring **48**; however, this would in turn necessitate a larger and more expensive solenoid **43** since solenoid **43** must stretch spring **48** as it moves plate **39** from the position illustrated in FIGURE 3 to the position illustrated in FIGURE 4. The present invention contemplates an energy storing means which will effectuate an initial breakaway of sealing member **36** from outlet **33**. This energy storing means includes a pivotal plate **49** which has lugs **50** (FIGURE 2) extending through the member which supports solenoid **43** so that plate **49** is pivotal with respect thereto. A spring **51** is attached at one end to the distal end of plate **49** and at the other end to a projection **52** rigid with stator **44** of solenoid **43**. As can be seen in FIGURE 5, as plate **39** pivots into the position it assumes when sealing member **36** closes outlet **33**, it engages plate **49** and pivots it in a manner whereby spring **51** is elongated. Thus, when the pressure within pump **28** drops, both spring **48** and spring **51** exert an initial force upon plate **39** to pivot valve element **35** toward its normal position wherein outlet **34** is closed.

The present invention allows the use of a relatively inexpensive solenoid since, on the other hand, only a short travel solenoid is required due to the fact that the flow of fluid moves the valve element throughout a substantial portion of its travel and, on the other hand, a relatively weak solenoid may be employed since the solenoid must overcome only the spring force created by spring **48** during the time that it is moving valve element **35**.

As will be evident from the foregoing description, certain aspects of the invention are not limited to the particular details of construction of the example illustrated, and it is contemplated that various other modifications or applications will occur to those skilled in the art. It is therefore intended that the appended claims shall cover such modifications and applications as do not depart from the true spirit and scope of the invention.

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

1. In combination:

(a) a pump housing,

(b) an outlet in said housing to allow fluid under pressure to egress from said housing,

(c) a valve element to selectively open and close said outlet,

(d) biasing means normally biasing said valve element toward a first position wherein said valve element opens said outlet,

(e) means to move said valve element toward a second position wherein said valve element closes said outlet, and

(f) energy storing means other than said biasing means energized by movement of said valve element into said second position to initially move said valve element from said second position toward said first position.

2. The invention of claim **1** wherein said means to move said valve element comprises an electrically-operated solenoid and a member with an elongated slot whereby said solenoid moves said valve element only part of the distance toward said second position and said elongated slot allows said valve element to travel therebeyond fully to said second position without further movement of said solenoid.

3. The invention of claim **1** further comprising a second outlet in said housing adjacent to said first-mentioned

outlet, said valve element closing said second outlet when in its said first position.

4. The invention of claim 1 wherein said energy storing means comprises a pivotal plate spring-biased to a first position and said valve element has associated therewith a member movable with said valve element to engage and move said pivotal plate against its spring bias as said valve element moves fully into its said second position.

5. The invention of claim 1 wherein said valve element is positioned relative to the flow of fluid through said housing so that the fluid urges said valve element fully into said second position.

6. The invention of claim 5 wherein said energy storing means and said means normally biasing said valve element toward said first position have a combined total force insufficient to overcome the force applied against said valve element by the fluid passing through said housing and said combined total force is sufficient to move said valve element toward said first position upon termination of fluid flow through said housing.

7. In a pump for use in an automatic dishwasher:

(a) a pump housing,

(b) a first outlet in said housing,

(c) a second outlet in said housing,

(d) said first outlet and said second outlet being located adjacent to each other,

(e) a valve element pivotal between a first position wherein it closes said first outlet and a second position wherein it closes said second outlet,

(f) a first spring normally biasing said valve element toward said first position,

(g) an electrically-operated solenoid to move said valve element part of the way to said second position from said first position,

(h) said first outlet being positioned relative to the flow of fluid through said housing so that the fluid tends to urge said valve element fully into said second position,

(i) a pivotal plate,

(j) a second spring to bias said pivotal plate toward a first position, and

(k) a member secured to said valve element and adapted to engage and pivot said pivotal plate as said valve element moves into its said second position,

(l) said second spring being of sufficient strength to move said valve element away from its said second position upon termination of the flow of fluid through said housing.

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