March 25, 1969 D. S. CUSHING ET AL 3,434,671

PUMP FOR DISHWASHER

Filed Jan. 13, 1966

Sheet 1 of 2

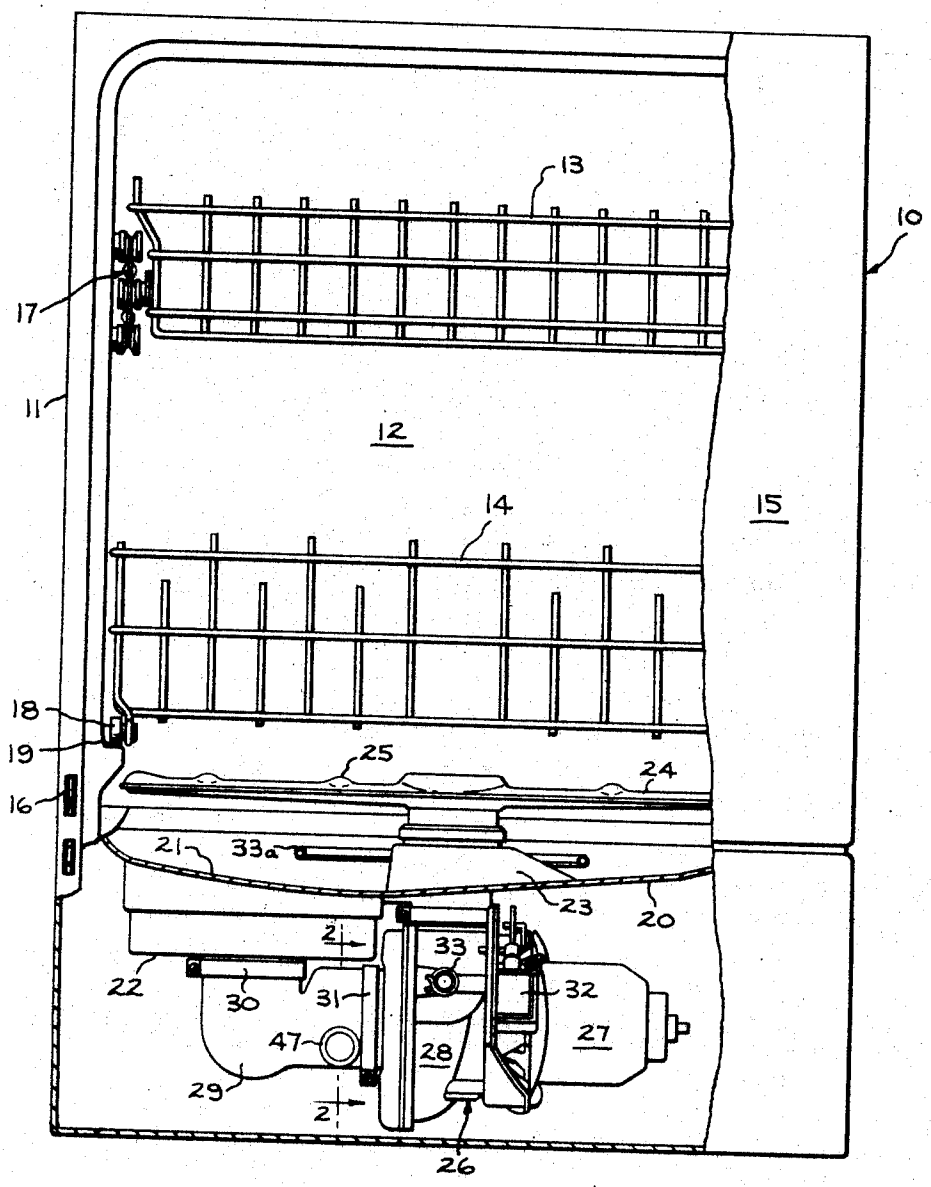

FIG. 1

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FIG. 2

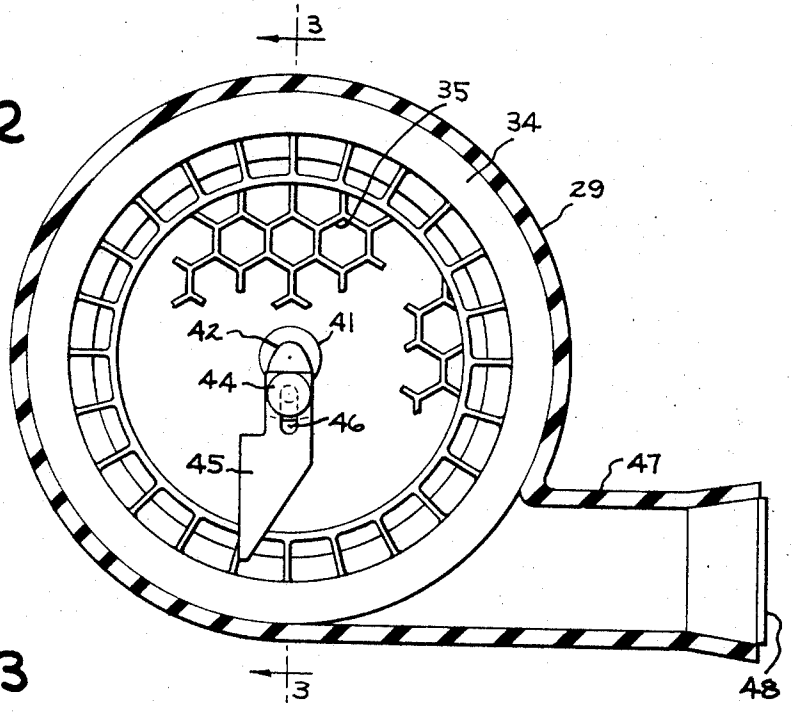
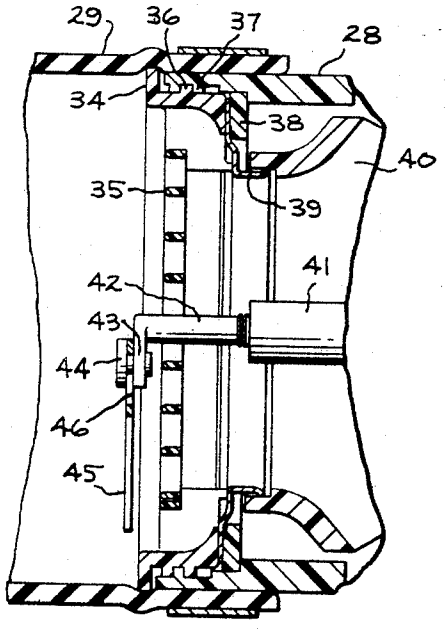


FIG. 3



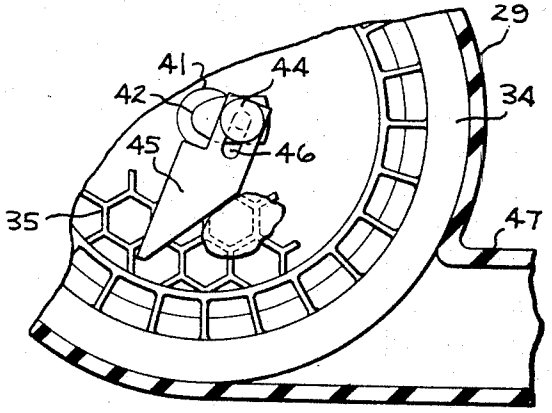


FIG. 4

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United States Patent Office 3,434,671 Patented Mar. 25, 1969

3,434,671

PUMP FOR DISHWASHER

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Filed Jan. 13, 1966, Ser. No. 520,388
Int. Cl. F04d 29/70; B02c 13/10, 19/00
U.S. Cl. 241—46
3 Claims

ABSTRACT OF THE DISCLOSURE

A rotary pump for circulating wash fluid through a dishwasher, wherein the pump is provided with macerating means which allow the pump to handle food soil and other foreign articles entrained in the wash fluid. The macerating means comprise a single blade pivotally secured on a short transverse projection provided on the pump's rotatable shaft closely upstream of a grid-like article grading element located across the pump inlet. Entrained articles larger than the element openings are stopped by the element. If macerable, they are macerated by the blade until small enough to pass through the openings. If unmacerable, they are batted from the element by the blades. Furthermore, should an unmacerable article become lodged in an element opening, the pivotal relationship between the blade and the shaft projection allows shaft rotation and pumping action to continue without damaging the pump.

This invention relates generally to a pump for moving wash fluid through a dishwasher and, more specifically, to a pump which can adequately handle food soil and other foreign articles entrained in the liquid being pumped.

Dishes to be washed in an automatic dishwasher are often placed into the dishwasher with food particles adhering thereto. These food particles may include such things as kernels of corn, peas and watermelon seeds. Additionally, it is not uncommon for such foreign articles as tooth picks, bottle caps or similar small articles to be placed inadvertently into a dishwasher. Some years ago, it was conventional to provide a fine mesh screen over the inlet to the dishwasher pump to prevent all these articles from entering the pump and perhaps clogging or damaging it. It was necessary to remove the screen frequently, sometimes as often as once each use of the machine, to dispose of the entrapped food particles and other items. Later, systems were developed which would accommodate a reasonable amount of soft food particles, without a fine mesh screen, by macerating the food particles as they pass through the pump. Large particles were prevented from entering the pump by a large mesh screen which had to be cleaned only infrequently. These later systems proved advantageous compared with the fine mesh screen system; however, problems were still encountered in that large hard articles which were incapable of maceration would collect and either restrict flow through the pump or jam the macerating means.

Accordingly, it is an object of this invention to provide an improved pump for an automatic dishwasher.

It is another object of this invention to provide a pump for an automatic dishwasher wherein macerating means allow the pump to handle large and hard food particles without clogging the pump or jamming the macerating means.

Other objects will become evident as the description proceeds.

Briefly stated, in accordance with one aspect of the invention, there is provided in an automatic dishwasher a pump having a housing defining an inlet. A grading member including a grid-like element is disposed in the

inlet and rotatable means extend through the grid-like element. The rotatable means has a short transverse projection thereon upstream of the grid-like element. A blade is pivotally secured to the projection for normal orbital movement about the axis of the rotating means as the means rotate. With this arrangement, large articles are stopped by the grid-like element and the blade macerates the macerable articles until they are small enough to pass through openings in the element. The unmacerable articles are batted from the element by the blade. In a modified form of the present invention, a chamber is provided to collect the batted articles in a location at which they will not interfere with flow through the pump.

While the specification concludes with claims particularly pointing out and distinctly claiming the subject matter which is regarded as the invention, it is believed that 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, partly cut away to show details, of a dishwasher employing the present invention;

FIGURE 2 is a partial sectional view taken along line 2—2 of FIGURE 1;

FIGURE 3 is a fragmentary sectional view of the invention shown in FIGURE 2; and

FIGURE 4 is a view similar to FIGURE 2 but showing an article blocking the macerating blade.

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 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** at one side of the dishwasher. Disposed below 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 the wash fluid passing therethrough causes rotation of spray device **24**.

Wash fluid is propelled into spray device **24** by a motor-pump assembly **26** including 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**.

An electrically-operated solenoid **32** operates a valve (not shown) within the housing of pump **28** to selectivity direct the fluid pumped by pump **28** either up through spray device **24** or out through an effluent discharge conduit **33**. It is to be understood that a sequence control

means (not shown) is provided to energize motor 27 and a solenoid 32 at the appropriate times to effectuate a complete dishwasher cycle which may include several rinses, washes and a drying period during which an electrical resistance heating element 33*a* is energized.

Referring now to FIGURES 2 and 3, it can be seen that pump 28 has a housing defining an inlet within which is disposed a grading member 34 which includes a grid-like element 35 through which fluid entering pump 28 must pass. Grading member 34 is provided with an external screw thread 36 which cooperates with an internal screw thread 37 on the housing of pump 28. An annular member 38 is adapted to rest upon a shoulder formed on the housing of pump 28 as grading member 34 is screwed into the pumping housing. A sealing member 39 is clamped between member 38 and member 34 to provide a seal between pump impeller 40 and the housing of pump 28. A suitable sealing member is described and claimed in our U.S. application Ser. No. 510,505, filed November 30, 1965, now Patent No. 3,381,620, and assigned to the General Electric Company, assignee of the present invention. As will become evident as this description proceeds, the exact sealing member 39 employed is not critical to, and does not constitute a part of, the present invention.

Impeller 40 is supported by a shaft 41 and rotates therewith about an axis that is generally aligned with that of the housing inlet to pump fluid through pump 28. The end of shaft 41 is provided with internal screw threads which are adapted to receive, and cooperate with, external screw threads on member 42 which extends beyond the end of shaft 41 and in substantial axial alignment therewith. It is to be understood, of course, that shaft 41 could extend out beyond grid-like element 35 thereby obviating member 42. Member 42 has a short transverse projection 43 which receives a pin 44. Pin 44 pivotally supports a blade 45 by means of a slot 46 through which pin 44 passes. The leading edge of blade 45 is chamfered, or sloped rearwardly, as best seen in FIGURE 2, to minimize jamming of the blade as it encounters an obstruction as well as to reduce hydraulic losses. In other words, if the blade were not chamfered, it would present a large area to the fluid passing through pump 28 and would therefore create a greater restriction against flow.

The grid-like element 35 defines a plurality of hexagonal openings through which the fluid passes. Moreover, grading member 34 further includes a group of substantially square openings peripherally spaced about the hexagonal openings defined by grid-like element 35. All fluid passing through pump 28 must pass through either the hexagonal openings or the substantially square openings. The size of these openings are related to the size of orifices 25 in spray device 24 so that any particle passing through an opening into pump 28 will be assured of passing through any of the orifices 25 without clogging or blocking the orifices.

With the foregoing arrangement, if a macerable food particle is trapped by grading member 34, blade 45, which rotates continuously with pump 28 and motor 27 in close spaced relationship to grading member 34, will macerate the article until it is small enough to pass through an opening whereupon it will pass through pump 28 and up through spray device 24. If the article is not macerable, but partially enters one of the openings and becomes lodged therein, the pivotal relationship between blade 45 and projection 43 will allow shaft 41 and projection 43 to rotate, without damage to either, while blade 45 rides against the obstruction in a reciprocating manner as shown in FIGURE 4. It is to be understood that such solid objects will very infrequently find their way through boot 29 but, when one does find its way through boot 29 and becomes lodged in grading member 34, serious damage would result to shaft 41 if it were not for the pivotal relationship between blade 45 and projection 43 as described above. The elongated slot 46, as opposed to a small circular hole, further minimizes the possibility of blade 45 jamming due to a hard object lodged in one of the openings.

For those hard objects which find their way through boot 29 but which are too large to become lodged within the openings described by either grading member 34 or grid-like element 35, blade 45 will bat the article around within boot 29. In accordance with the present invention, means are provided to receive and collect such items as they are struck by blade 45. This means includes a chamber 47 which is associated with boot 29 in alignment with the plane of rotation of the blade 45. Chamber 47 may be formed integrally with boot 29 or it may be a separate piece suitably secured to boot 29. Chamber 47 has an open end which is closed by means of a plug 48. Plug 48 may be provided with screw threads to cooperate with threads provided in chamber 47 or, alternatively, plug 48 may be sized to provide an interference fit with the internal periphery of chamber 47. With the foregoing chamber and plug, as a large hard article passes through boot 29 and reaches grading member 34, blade 45 will strike it and will continue to strike it until the article finds its way into chamber 47 whereupon it will come to rest and remain until the operator of the dishwasher removes plug 48 to clean chamber 47. It should be understood, of course, that it will not be necessary for the operator of the machine to remove plug 48 after each use of the machine but only periodically.

If desired, in practicing the present invention one may sharpen the leading edge of blade 45; however, in the preferred embodiment of the present invention, the leading edge is not sharpened but a thin stainless steel material is used having an approximate thickness of .036 inch which presents an edge sufficiently fine to macerate most of the food particles which will find their way into the boot 29. It should be noted that in the present invention, the blade is positioned upstream of pump impeller 40 and, therefore, the blade is located on the low pressure side of the pump. It has been found in practice that by positioning blade 45 on the low pressure side, only two to four watts of power is required to drive the blade but when the blade is positioned on the high pressure side of impeller 41, approximately twenty to forty watts of power is required to drive the blade. Accordingly, by positioning the blade on the lower pressure side of the impeller 40, significant power is conserved.

As will be evident from the foregoing description, certain aspects of the invention are not limited to the particular details of the 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 we claim as new and desire to secure by Letters Patent of the United States is:

1. A pump for use with a dishwasher, comprising:
   (a) a housing having an inlet and an outlet;
   (b) a rotatable shaft carrying an impeller for rotation with it within and relative to said housing about an axis generally aligned with that of said inlet to pump fluid entering said inlet toward said outlet;
   (c) a grid-like article grading element disposed across said inlet and having a plurality of openings through which all fluid entering said inlet must pass to reach said impeller;
   (d) a short transverse projection provided on said shaft closely upstream of said element; and
   (e) a single blade pivotally secured to said projection for orbital movement about said axis unless said orbital movement be blocked by an unmacerable article lodged in one of said openings and for reciprocating movement transverse to said axis and said openings when said blade is so blocked.

2. The invention of claim 1 wherein said blade is provided with an elongated slot which receives a pin extending from said projection whereby said blade may slide relative to said projection to the extent of said elongated slot.

3. The invention of claim 1 further comprising a conduit connected to said inlet and extending upstream therefrom, and a chamber supported by said conduit radially outward from said blade to collect unmacerable articles batted from said element by said blade.

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U.S. Cl. X.R.

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