April 21, 1964 J. G. SCHMITT-MATZEN 3,129,711

DISHWASHER RECIRCULATING ASSEMBLY

Original Filed Sept. 29, 1960 2 Sheets-Sheet 1

FIG. 1

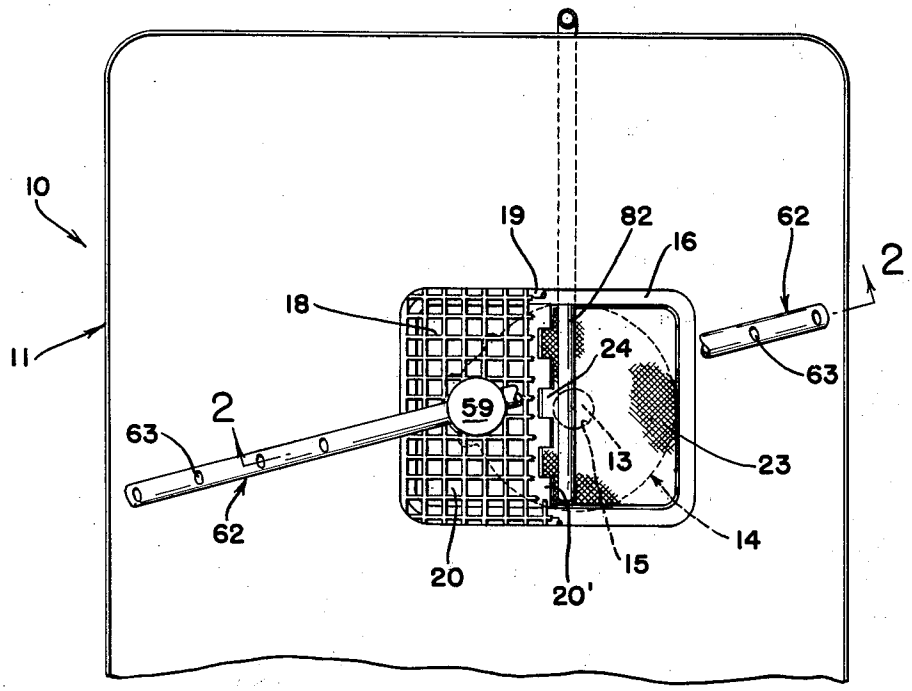

FIG. 3

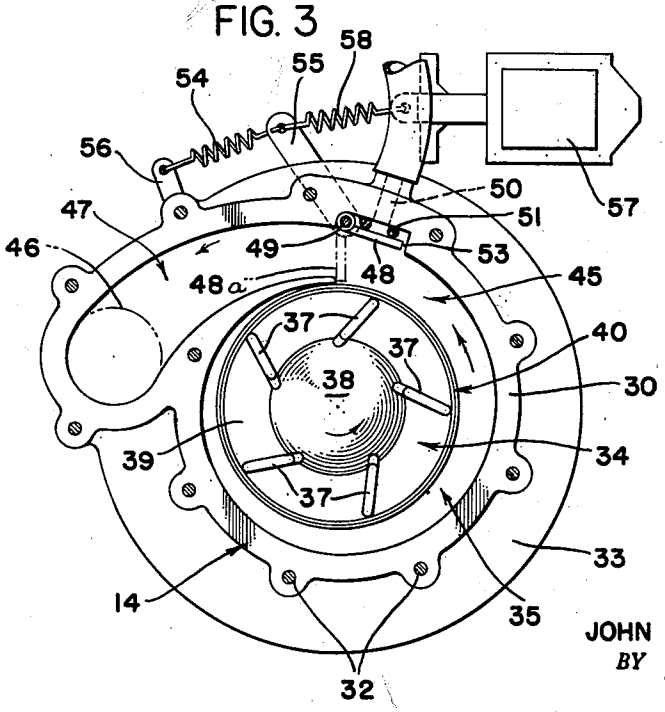

FIG. 4

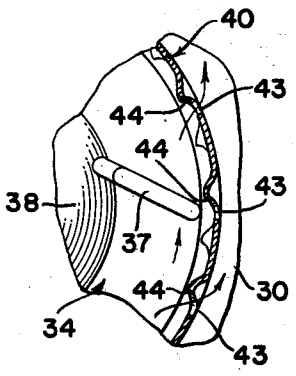

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FIG. 2

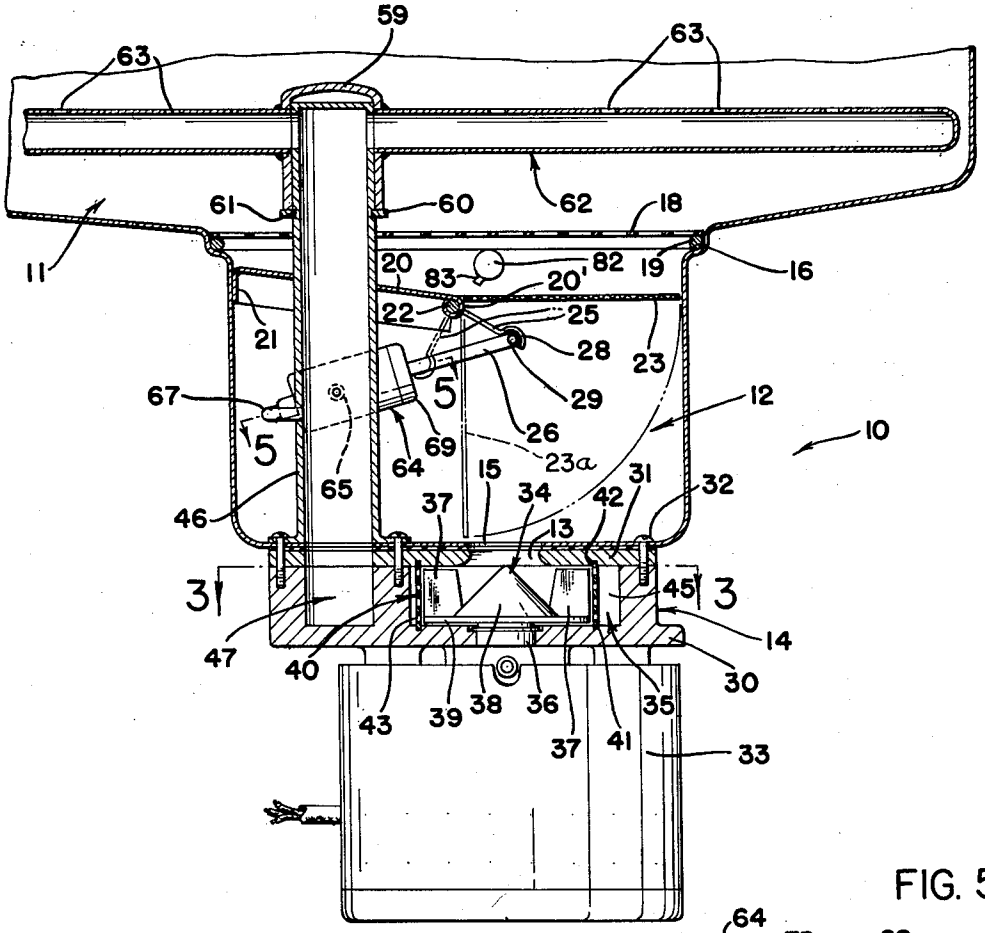


FIG. 5

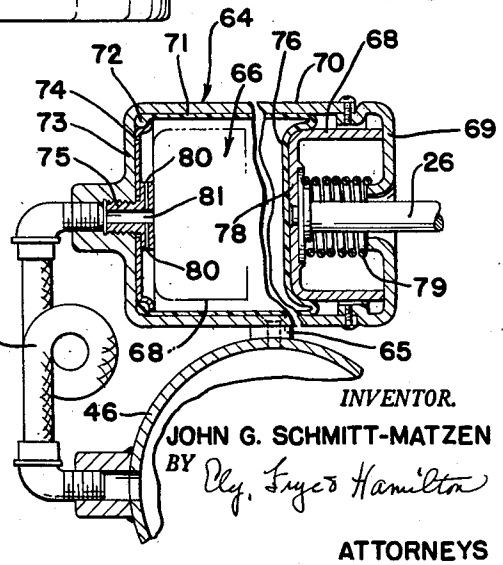
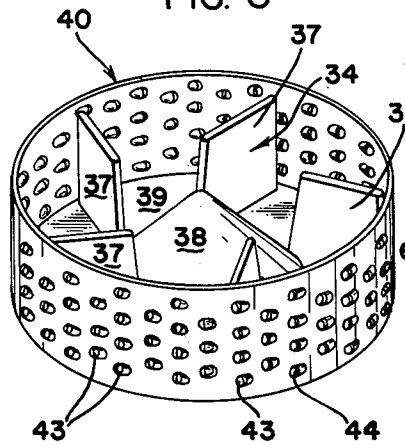


FIG. 6



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DISHWASHER RECIRCULATING ASSEMBLY

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Original application Sept. 29, 1960, Ser. No. 59,295, now Patent No. 3,103,225, dated Sept. 10, 1963. Divided and this application May 1, 1963, Ser. No. 280,186

8 Claims. (Cl. 134—56)

The present invention relates generally to washwater circulating systems for automatic dishwasher assemblies and, more particularly, an automatic dishwasher assembly which recirculates the washwater, mechanically macerates food particles, strains the recirculating water and self-cleans the strainer. This application is a division of application Serial No. 59,295, filed September 29, 1960, now Patent No. 3,103,225.

Although the time and labor saving automatic dishwashers found in most modern kitchens provide an adequate mechanical substitute for manually washing and drying the dishes, the dishes must be scraped and rinsed before they are put in the washers. This pre-removal of the food particles is particularly required when the dishwasher is the type employing a spray discharge to impinge the washwater on the dishes, because the food particles would otherwise clog the jets as the washwater is circulated. Even the type of dishwashers which use an impeller for throwing the water against the dishes requires a pre-removal of the food particles to prevent clogging of the drain.

It is, therefore, the primary object of the present invention to provide an automatic dishwasher assembly having a circulating system which allows placing dishes in the dishwasher without first scraping and rinsing off the food particles, even when the dishwasher is the type employing a spray discharge to impinge water against the dishes.

It is a further object of the present invention to provide a dishwasher assembly having a circulating system which requires only one pump for recirculating the water during the washing or rinsing cycles and for pumping out the waste water during the drain cycles.

It is a still further object of the present invention to provide a dishwasher assembly having a circulating system in which an automatic screening mechanism selectively strains the washwater while it is being circulated through the spray jets, and which cleans itself during the drain cycle.

It is a still further object of the present invention to provide a dishwasher assembly having a circulating system in which any food particles carried in the water passing through the pump are mechanically macerated.

These and other objects which will become apparent from the following specification are accomplished by the novel and improved means hereinafter described and claimed.

A preferred embodiment is shown by way of example in the accompanying drawings and hereinafter described in detail without attempting to show all the various forms and modifications in which the invention might be embodied; the invention being measured by the appended claims and not by the details of the specification.

In the present invention a single pump drains the water out of the dishwasher and discharges it through a volute passage in communication with the spray jets which impinge the water upon the dishes. A grille, or coarse mesh screen, is positioned in advance of the pump inlet to prevent silverware or other material, which would be deleterious to the pump or macerating ring, from being drawn into the pump. A fine mesh screen is positioned between the grille and the pump to prevent food particles above

a certain size from being drawn into the pump while the washwater is being circulated. This screen is preferably of such a gauge that particles normally passing therethrough will not clog the jets.

A solenoid-operated flap valve is positioned selectively to direct the flow of washwater through the volute passage to the spray jets or drain in timed sequence. Hydraulic pressure in the passageway between the flap valve and the spray jets operates a mechanism which selectively controls the flow either through the fine mesh screen to filter the circulating water or across the screen to clean it during the drain cycle.

The food particles washed from the screen during the drain cycle are reduced in size by a macerating ring so that they can be safely discharged with the waste water into a domestic sanitary system without clogging the pipes.

Referring to the drawings:

FIG. 1 is a partial top plan view of a dishwasher according to the present invention;

FIG. 2 is a partial cross section taken substantially along line 2—2 of FIG. 1;

FIG. 3 is a horizontal section taken substantially on line 3—3 of FIG. 2 showing the interior of the circulating pump in plan;

FIG. 4 is an enlarged fragmentary area of FIG. 3 showing the macerating ring in cross section;

FIG. 5 is a cross section taken substantially on line 5—5 of FIG. 2; and

FIG. 6 is a perspective view of the macerating ring used in the present invention and also showing generally how it circumscribes the pump impeller unit.

Referring now to FIGS. 1 and 2, a dishwasher, identified generally by the numeral **10**, includes a cabinet section **11** adapted to receive a dish basket (not shown). A sump section **12** is disposed beneath cabinet **11** and communicates with the inlet **13** of a pump **14** through passage **15** in the lowest portion of sump **12**.

A shouldered recess **16** is preferably provided at the juncture of cabinet **11** and sump **12**. A grille, or large mesh screen, **18** secured to frame **19** is removably seated in recess **16** to prevent utensils or excessively large bones or food particles from inadvertently entering pump **14**.

Spaced vertically beneath grille **18** is a deflection plate **20**. A flange **21** extends along the three sides of plate **20** adjacent the side walls of sump **12** and is secured thereto by welding or other means not shown. The fourth side of plate **20** is secured at spaced portions **20'** to a hinge pin **22**, the terminal ends of which are in turn secured to the side walls of sump **12**. Plate **20** is preferably inclined downwardly toward pin **22** to provide a convergent channel toward a fine mesh gate screen **23** which is selectively positionable transversely across the flow path through sump **12**. Gate screen **23** is swingably mounted on pin **22**, as by a plurality of flaps **24** which rotatably engage pin **22** between portions **20'** of plate **20**.

An actuating arm **25** may be attached to, or be an extension of, a flap **24** to pivot gate screen **23** in response to the displacement of an actuating rod **26**, as will be more fully hereinafter described. Rod **26** is preferably connected to the dished end **28** of arm **25**, as by a pin **29**.

The housing **30** and housing cover plate **31** of pump **14** may be attached beneath sump **12**, as by a plurality of bolts **32** threaded into housing **30**. A motor **33** is adapted to provide the motive power required to rotate the impeller unit **34** within pump cavity **35**, as by non-rotatably connecting motor shaft **36** to the unit **34**. Referring also to FIGS. 3 and 6, circumferentially spaced impeller blades **37** extend angularly outwardly from and are attached to the hub **38**. Further rigidity is preferably imparted to blades **37** by also securing them to base plate **39**. Of course, blades **37**, hub **38** and base plate **39** may be integrally formed.

An annular macerating ring, or cutting ring diffuser 40 encircles the radially outermost ends of blades 37 and is fixedly received in opposed annular grooves 41 and 42 in the housing 30 and housing cover plate 31, respectively. The grater-like macerating ring 40, as best shown in FIG. 4, is perforated by multitudinous apertures 43. A portion of the ring 40 adjacent each aperture 43 is inwardly depressed to present an offset cutting or grating edge 44 in opposition to the direction of rotation of blades 37. Outwardly of ring 40 the pump cavity 35 comprises a volute passage 45 which spirals outwardly into housing 30 as a divergent discharge passageway 47 and communicates at its outer end with vertical feed pipe 46.

A flap valve 48 is swung by rotation of shaft 49 selectively to position transversely of volute passage 45 or drain 50 which communicates with volute passage 45. A resilient sealing element 51 is positioned around the mouth of drain 50 against which flap valve 48 seats, and is held by a sleeve extension fitting within the drain. Shaft 49 is preferably positioned within a drain recess 53 in the outer surface of volute passage 45 to minimize the obstruction to flow through volute passage 45. Flap valve 48 is normally seated against sealing element 51 by the action of a spring 54, one end of which is attached to the outer end of a crank arm 55 secured to shaft 48. The other end is fastened to an anchor bar 56. Flap valve 48 is selectively rotated to position transversely of passage 45, indicated as chain line position 48*a*, by a solenoid 57 which may be resiliently connected to crank-arm 55, as by a relatively strong spring 58. The strength of solenoid 57 required to turn flap valve 48 to position 48*a* to shut off the flow to feed pipe 46 is minimized by placing valve 48 in the volute passage 45 at the beginning of the divergent discharge passageway 47, because at this point the velocity head of the liquid being pumped is not yet fully converted to positive pressure head. In other words, the flap valve is positioned at the point where there is the least resistance to turning it by the solenoid.

A cap 59 is removably slid over the upper end of feed pipe 46 and rests on a spring clip 60 seated within an annular groove 61 in the outer surface of pipe 46. Lateral spray tubes 62, which are fixed to and extend radially outwardly of cap 59, communicate with feed pipe 46. The top surfaces of spray tubes 62 are provided with a series of discharge orifices 63 by which jets of washing fluid may be impingingly directed onto the dishes.

Referring now to FIGS. 2 and 5, a pressure responsive unit 64 is rockingly secured to the feed pipe 46 by stud 65. The unit 64 encloses a chamber 66 which communicates with the interior of feed pipe 46, as by flexible tubing 67. A piston 68 freely floats within chamber 66 and is secured to the actuating rod 26 which freely reciprocates through cap 69 of unit 64. The outside diameter of piston 68 is sufficiently smaller than the inside diameter of chamber 66 to eliminate the frictional resistance of the piston 68 sliding against the wall 70 of chamber 66.

Pressure loss past piston 68 is prevented by a generally cylindrical flexible bladder 71 having one open and one closed end. A peripheral bead 72 around the open end is sealed against the base 73 of chamber 66 by a flanged plate 74 which is tightened against the base 73 by a T-nozzle 75. The closed end 76 of bladder 71 contacts the head 78 of piston 68 and confines any pressure within chamber 66 to that portion between base 73 and the head 78 or piston 68 enclosed within bladder 71.

A helical spring 79 encompasses rod 26 between piston 68 and cap 69. The spring 79 continually urges the piston 68 normally to bottom in chamber 66 against T-nozzle 75. The lateral passages 80 in T-nozzle 75 assure communication of pressure against a more effective area of piston head 78 even when it has bottomed against the orifice of axial passage 81 in T-nozzle 75 (as represented in phantom).

In actual operation a standard timing mechanism, not shown, regulates a cyclic operation of the automatic dishwasher. When the wash cycle begins, the washing fluid, which enters in response to the timing mechanism, by means not shown, enters the inlet 13 of pump 14 by gravity from sump 12. At the same time the motor 33 is rotating the impeller unit 34 to pump the washing fluid out through the perforations 43, by the rotation of blades 37, into the volute passage 45. Because the flap valve 48 is normally maintained across drain 50 by the action of spring 54, the flow through passage 45 continues through vertical feed pipe 46. The pressure under which the fluid is pumped through pipe 46 communicates through flexible tubing 67 into the chamber 66 defined within bladder 71 in pressure responsive unit 64. This pressure causes the piston 68 to move from its bottomed position against T-nozzle 75, as indicated by the chain lines in FIG. 5, by the outwardly rolling of the bladder 71 from its normal unfolded position.

The displacement of piston 68 axially displaces rod 26 against actuating arm 25 to position screen 23 across the flow path through sump 12. The rockable mounting of unit 64 on stud 65 allows the rod 26 to continuously engage the dished end 28 as the arm 25 swings on its arc.

The washing fluid being pumped through feed pipe 46 also flows through the lateral spray tubes 62 and is forced out through the discharge orifices 63 to impinge upon the dishes in cabinet 11. The food particles are thereby washed from the dishes and carried with the wash fluid through grille 18, the openings of which are of such a size as to retain utensils which might accidentally find their way to the bottom of cabinet 11. The fluid and food particles flowing through grille 18 are channeled across deflection plate 20 onto screen 23, which has a mesh size that retains the food particles which would be large enough to clog orifices 62. The fluid passing through screen 23 re-enters inlet 13 of pump 14 and is recirculated. This recirculation continues through the wash cycle. Of course, any pre-wash rinse or post-wash rinse cycles would recirculate in the same manner.

It should be noted that any food particles which do penetrate screen 23 will be mechanically macerated by cutting edges 44 on ring 40 as the carrying fluid passes through perforations 43.

At the end of any recirculating cycle, the timing mechanism causes the solenoid 57 to energize, which institutes the drain cycle. Specifically, energizing the solenoid in turn rotates shaft 49 to place flap valve 48 across volute passage 45 (as represented by the chain position 48*a* in FIG. 3). The drain 50 thereby communicates with the pump cavity 35. As the valve 48 closes the flow through passage 45 to feed pipe 46 the pressure in responsive unit 64 is correspondingly reduced. This permits spring 79, assisted by the weight of screen 23 and the food particles thereon, to move the piston 68 toward base 73. Retraction of rod 26 as piston 68 moves toward base 73 swings the screen downwardly to the chain line position 23*a* in FIG. 2. In this position the flow of the washing fluid across the face of the screen 23 washes the food particles therefrom to be carried into this inlet 13 of pump 14.

At the beginning of the drain cycle, fresh water may enter through pipe 82 which is provided with a series of nozzles 83 directed to impinge the water substantially across the face of screen 23*a* to assist in removal of the food particles retained thereon.

These food particles are mechanically macerated against the cutting edges 44 of the ring 40 to a sufficiently small size to prevent clogging of the drain, or the sanitary system to which the drain is connected, as the fluid is evacuated from the dishwasher 10.

The above described operation is repeated through any number of wash or rinse cycles and provides a dishwasher in which the dishes can be placed without the necessity of tedious pre-removal of the food particles.

What is claimed is:

1. An automatic dishwasher having a washwater circulating cycle and a drain cycle comprising, a dish-

receiving cabinet having a sump section, a drain, means to spray said washwater into said cabinet, a pump having an inlet communicating with the base of said sump section and a pump outlet passage, means to macerate the food particles entering said pump, valves means selectively to connect the outlet of said pump to the washwater spray means during the circulating cycle and to said drain during said drain cycle, movable screening means in advance of said pump inlet, pressure responsive means operatively connected to said movable screening means to position said screening means to remove the food particles from said washwater during the circulating cycle and to displace said screening means to release the retained food particles into said pump inlet during said drain cycle, and means for communicating the pressure of the washwater in said spray means with said pressure responsive unit.

2. An automatic dishwasher having a washwater circulating cycle and a drain cycle comprising, a dish-receiving cabinet having a sump section, a drain, means to spray said washwater into said cabinet, a pump having an inlet communicating with the base of said sump and a pump outlet passage, means to macerate the food particles entering said pump, valve means selectively to connect the outlet of said pump to the washwater spray means during the circulating cycle and to said drain passage during said drain cycle, a pivotable screen above said pump inlet, an actuating arm on said screen, a pressure responsive unit, said unit having a reciprocable actuating rod operatively engaging said actuating arm, means to extend and retract said rod in response to the pressure of the washwater in said spray means, pressure of the washwater in the spray means during said circulating cycle extending said rod to position said screen to remove food particles from said washwater, the pressure of the washwater in the spray means during said drain cycle retracting said rod to pivot said screen and release the food particles into said pump inlet.

3. An automatic dishwasher having a washwater circulating cycle and a drain cycle comprising, a dish-receiving cabinet having a sump section, a drain, a pump having an inlet communicating with the base of said sump, a pump outlet passage, discharge means to spray said washwater into said cabinet, a feed pipe connecting said pump outlet passage to said discharge means, valve means selectively to connect the outlet passage of said pump to said feed pipe during the circulating cycle and to said drain during said drain cycle, means to macerate the food particles entering said pump, a pivotable screen in advance of said pump inlet, an actuating arm on said screen, a pressure actuating unit, said unit having a reciprocable actuating rod operatively engaging said actuating arm, a pressure chamber in said unit, piston means responsive to the pressure in said chamber, said rod extensible and retractable by said piston means, said pressure chamber communicating with said feed pipe, the pressure of the washwater in the feed pipe during said circulating cycle extending said rod to position said screen to remove food particles from washwater entering said pump inlet, the pressure of the washwater in the feed pipe during the drain cycle retracting said rod to pivot said screen and release the food particles into said pump inlet.

4. An automatic dishwasher having a washwater circulating cycle and a drain cycle comprising, a dish-receiving cabinet having a sump section, a drain, a pump having an inlet communicating with the base of said sump section, a pump outlet passage, means to macerate the food particles entering said pump, discharge means to spray said washwater into said dish-receiving cabinet, a feed pipe connecting said pump outlet passage to said discharge means, valve means selectively to connect said pump outlet passage to said feed pipe during the circulating cycle and to said drain during said drain cycle, a pivotable screen, an actuating arm on said screen, a rockably mounted pressure responsive unit, said unit enclosing a piston chamber, a piston in said chamber, the outer diameter of said piston being smaller than the inner diameter of said chamber, one end of an actuating rod connected to said piston, the other end of said actuating rod operatively engaging said actuating arm, a flexible bladder within said piston chamber enclosing a pressure chamber, resilient means to maintain said piston against said bladder, conduit means connecting said feed pipe to the pressure chamber enclosed within said bladder, the pressure of the washwater in the feed pipe during said circulating cycle extending said rod to position said screen to remove food particles from washwater entering said pump inlet, the pressure of the washwater in the feed pipe during the drain cycle allowing retraction of said rod to pivot said screen and release the food particles into said pump inlet.

5. An automatic dishwasher having a washwater circulating cycle and a drain cycle comprising a dish-receiving cabinet having a sump section, a drain, a pump having an inlet communicating with the base of said sump section, said pump having an impeller unit, a perforated macerating ring circumscribing said impeller unit, a pump outlet passage exteriorly of said macerating ring, discharge means to spray said washwater into said dish-receiving cabinet, a feed pipe connecting said pump outlet passage to said discharge means, valve means selectively to connect said pump outlet to said feed pipe during the circulating cycle into said drain during said drain cycle, a pivotable screen, an actuating arm on said screen, a pressure responsive unit, said unit having a reciprocable actuating rod operatively engaging said actuating arm, means urging said rod to retracted position, and means to extend said rod in response to the pressure of the washwater in said feed pipe during said circulating cycle to position said screen to remove food particles from washwater entering said pump inlet, the reduced pressure of the washwater in the feed pipe during said drain cycle allowing retraction of said rod to pivot said screen and release the food particles into said pump inlet.

6. An automatic dishwasher having a washwater circulating cycle and a drain cycle comprising, a dish-receiving cabinet having a sump section, a pump having an inlet communicating with the base of said sump section, said pump inlet opening into a pump cavity, an impeller unit within said cavity, a perforated macerating ring circumscribing said impeller unit, a volute passage leading outwardly of said macerating ring, a drain communicating with said volute passage, discharge means to spray said washwater into said dish-receiving cabinet, a feed pipe connecting said volute passage to said discharge means, valve means selectively to connect said volute passage to said feed pipe during said circulating cycle and to said drain during said drain cycle, a pivotable screen, an actuating arm on said screen, a pressure responsive unit, said unit having a reciprocable actuating rod operatively engaging said actuating arm, means urging said rod to retracted position, and means to extend said rod in response to the pressure of the washwater in said feed pipe during said circulating cycle to position said screen to remove food particles from washwater entering said pump inlet, the reduced pressure of the washwater in the feed pipe during said drain cycle allowing retraction of said rod to pivot said screen and release the food particles into said pump inlet.

7. An automatic dishwasher having a washwater circulating cycle and a drain cycle comprising, a dish-receiving cabinet having a sump section, a drain, a pump having an inlet communicating with the base of said sump section, a pump outlet passage, means to macerate the food particles entering said pump, discharge means to spray said washwater into said dish-receiving cabinet, a feed pipe connecting said pump outlet to said discharge means, a valve shaft, a flap valve mounted on said shaft and adapted selectively to direct flow through said drain or said feed pipe, resilient means normally positioning said valve to direct flow through said feed pipe, a solenoid operatively connected to rotate said shaft, actuation of said solenoid

positioning said valve to direct flow through said drain, a pivotable screen, an actuating arm on said screen, a pressure responsive unit, said unit having a reciprocable actuating rod operatively engaging said actuating arm, means urging said rod to retracted position, and means to extend said rod in response to the pressure of the washwater in said feed pipe during said circulating cycle to position said screen to remove food particles from washwater entering said feed pipe, the reduced pressure in the feed pipe during said drain cycle allowing retraction of said rod to pivot said screen and release the food particles into said pump inlet.

8. An automatic dishwasher having a washwater circulating cycle and a drain cycle comprising, a dish-receiving cabinet having a sump section, a pump having an inlet communicating with the base of said sump section, said pump inlet opening into a pump cavity, an impeller unit within said cavity, a perforated macerating ring circumscribing said impeller unit, a volute passage leading outwardly of said macerating ring, a drain communicating with said volute passage, discharge means to spray said washwater into said dish-receiving cabinet, a feed pipe connecting said volute passage to said discharge means, a valve shaft, a flap valve mounted on said shaft and adapted

selectively to direct flow through said drain or said feed pipe, resilient means normally positioning said valve to direct flow through said feed pipe, a solenoid operatively connected to rotate said shaft, actuation of said solenoid positioning said valve to direct flow through said drain, said solenoid being actuated during said drain cycle, a pivotable screen, an actuating arm on said screen, a pressure responsive unit, said unit having a reciprocable actuating rod operatively engaging said actuating arm, means urging said rod to retracted position, and means to extend said rod in response to the pressure of the washwater in said feed pipe during said circulating cycle to position said screen to remove food particles from washwater entering said pump inlet, the reduced pressure of the washwater in the feed pipe during said drain cycle allowing retraction of said rod to pivot said screen and to release the food particles into said pump inlet.

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