Feb. 8, 1955 C. HOLLERITH 2,701,574

DISHWASHER OR THE LIKE

Filed May 1, 1953 3 Sheets-Sheet 1

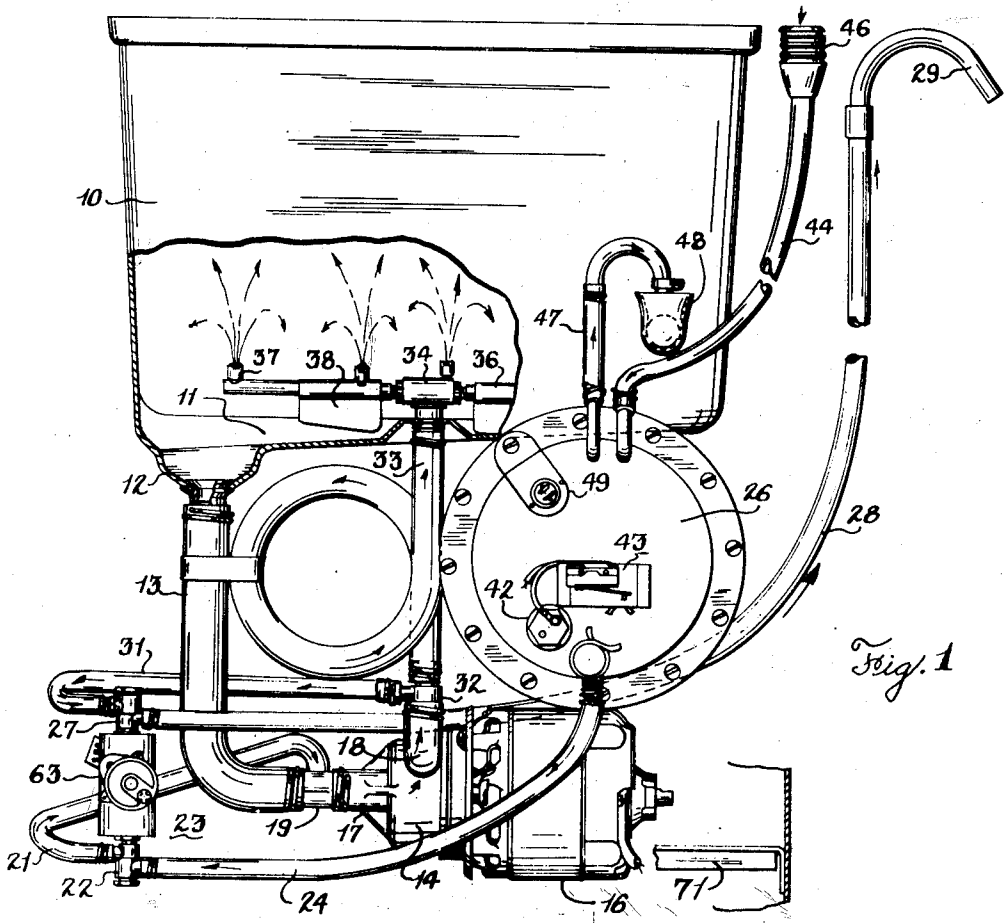


Fig. 1

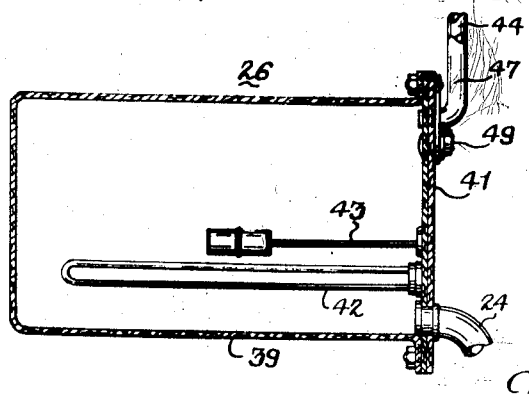


Fig. 2

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DISHWASHER OR THE LIKE

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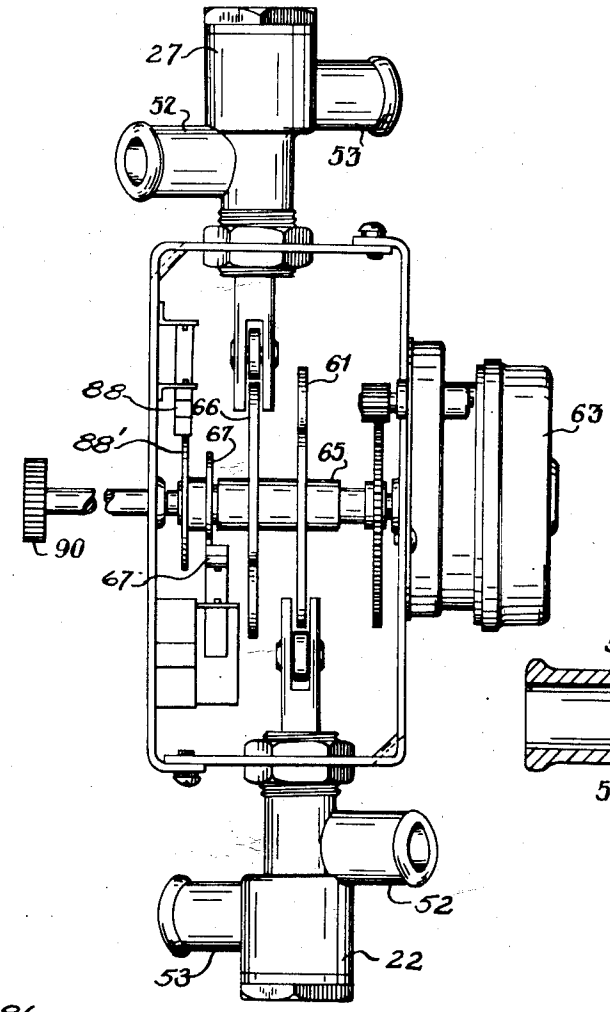


Fig. 4

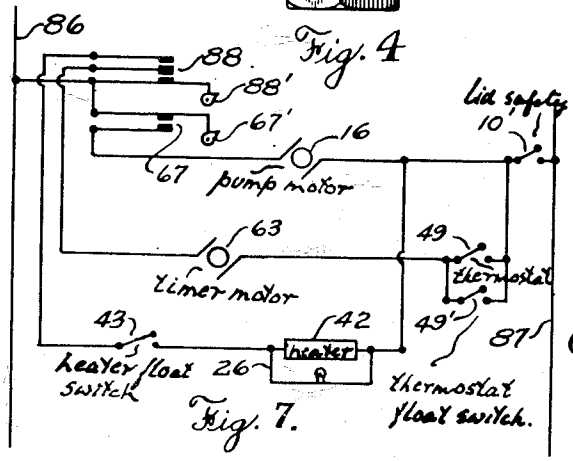


Fig. 7.

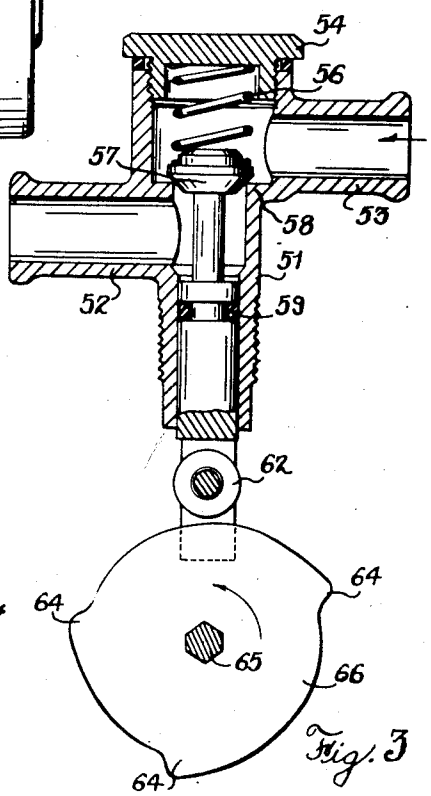


Fig. 3

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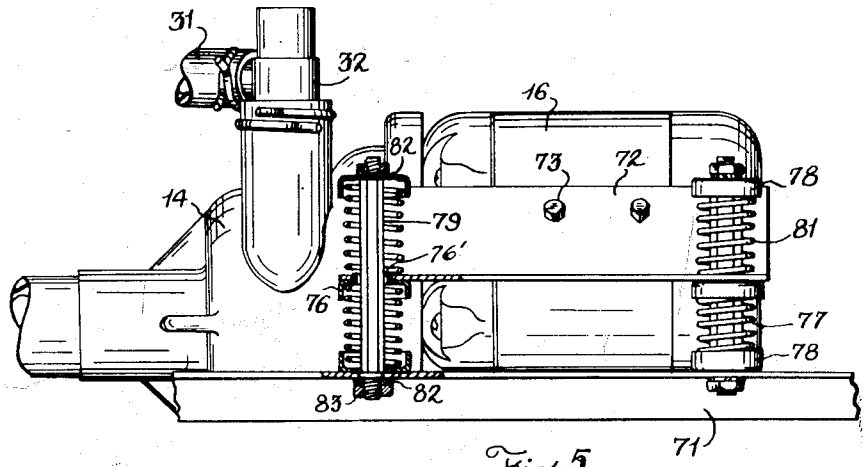


Fig. 5

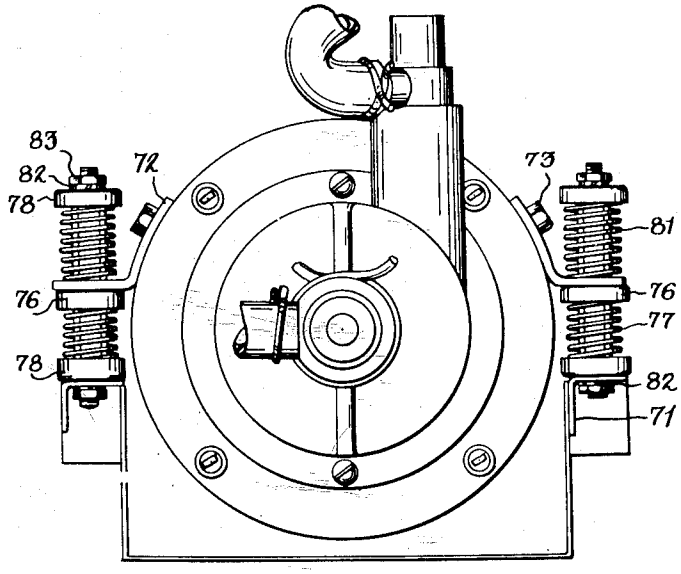


Fig. 6

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United States Patent Office 2,701,574
Patented Feb. 8, 1955

2,701,574

DISHWASHER OR THE LIKE

Charles Hollerith, Jackson, Mich., assignor, by mesne assignments, to The Apex Electrical Manufacturing Company, Cleveland, Ohio, a corporation of Ohio

Application May 1, 1953, Serial No. 352,347

2 Claims. (Cl. 134—57)

This invention relates to dishwashing machines and the like, and more particularly to an improved liquid circulating system for machines of this type including a relatively quiet operating motor-pump unit.

The invention has particular application to a dish washing machine of the type having a rotatable arm operable by the reaction of water jets, preferably having a built-in heater tank, and will be illustrated and described in connection with a machine of this type.

According to the invention, a dishwashing machine of the type having a motor-pump unit and a liquid circulating system for delivering liquid to the machine vat under pressure and returning said liquid to the pump for recirculation is provided with means for minimizing noise created by liquid pulsations emanating from the pump and vibrations, primarily torsional, occurring in the motor-pump unit. It is well known that in dish washing machines of the above type, the pump creates liquid pulsations in the conduit extending from the pump to the vat, and since the vat acts like a sounding board to some degree, considerable undesirable noise is created. I provide a relatively long conduit or hose formed of soft rubber and extending between the pump and vat, and the expansion and contraction of the hose largely damps or smoothes out the pulsations before reaching the vat. Further, vibrations, primarily torsional, occur in the motor-pump unit and if such vibrations are directly transmitted to the machine, the noise level is substantially increased. I provide a resilient mounting for the motor-pump unit and have found that this type mounting coupled with the long and expansible water passage between the pump and vat results in a relatively quiet operating dishwasher.

It is a primary object of the invention to provide in a dishwashing machine having a liquid circulating system, including a pump, means for minimizing transmission of vibration and resultant noise during circulation of liquid.

Another object of the invention is to provide in a dishwashing machine of the above type having a built-in heater tank, a relatively simple liquid supply, circulating and drainage system.

Another object of the invention is to provide a dishwashing machine of the above type having a built-in heater tank disposed beneath the article receiving vat adapted to be gravity filled and having associated means for lifting the water from the heater tank into the article receiving vat.

Other objects of the invention and the invention itself will become increasingly apparent from a consideration of the following description and drawings, wherein:

Figure 1 is an elevational view, partially in section, and with parts omitted for clearness of illustration, of a dishwashing machine embodying the invention;

Figure 2 is a longitudinal, sectional view of a heater tank I may employ;

Figure 3 is a sectional view of a cam operated valve means I may employ;

Figure 4 is a view of a timer and valve means I may employ;

Figure 5 is a side elevational view showing the mounting means for the motor-pump unit;

Figure 6 is an end elevational view of the unit shown in Fig. 5; and

Figure 7 is a wiring diagram showing a preferred electrical hook-up for the dishwasher.

Referring now to the drawings, and particularly Figure 1, I have indicated the dishwasher vat or tub at **10**.

The vat or tub **10** has a hinged lid (not shown) with an associated safety switch **10'** (Figure 7). The vat base **11** is formed to drain to a sump **12** which through a conduit **13** connects with a pump **14** driven by an electric motor **16**. The pump is preferably of the type having a two-bladed impeller working in a water-tight chamber wherein liquid is received through an axial inlet **17** and discharged under pressure from a tangential outlet **18**. A Venturi fitting **19** connects conduit **13** and pump inlet **17**, the Venturi fitting having a relatively reduced lateral inlet port communicating with a conduit **21** extending from an inlet valve **22** which forms part of a timer and valve assembly generally indicated at **23**.

A second conduit **24** extends to the inlet valve from a heater tank **26**. At the opposite or upper end of assembly **23** is a drain valve **27** having a relatively long drain hose **28** terminating in a hook portion **29** adapted to be hooked over the edge of a sink, set tub or the like. A conduit **31** also extends from the drain valve to a **T** fitting **32** connected to the outlet **18** of the pump. A relatively long and preferably looped conduit **33** formed of relatively soft rubber extends from fitting **32** to a fitting **34** sealed to the base of vat **10** and forming a swivel mounting for a spinner arm **36** within the vat. Arm **36** is provided with a plurality of jet nozzles **37** whereby when water is supplied under pressure to arm **36**, the arm will be caused to rotate by the reaction of water jets issuing from the nozzles. Depending blades **38** limit the speed of rotation of arm **36** when operating in liquid.

The heater tank **26**, suitably insulated, has a cup form body **39** and a head **41** sealingly secured thereto. A **U** form electric immersion heater **42** is adapted to heat or maintain liquid in the tank at a predetermined temperature and a float type safety switch **43** is adapted to prevent the heater circuit from being energized unless there is water in the tank to a predetermined level. The tank is filled through a hose **44** having a bulb type connector **46** for engagement with a faucet. The connector **46** is forced over the faucet spout and is resilient to be adaptable to various shapes of faucet spouts, and since the tank is filled by gravity, there is little pressure at the faucet connection. When the tank is filled, water overflows through a conduit **47** into a cup **48** encasing an opening in the vat side wall whereby water flowing into the vat **10** indicates that the heater tank **26** is filled. This arrangement provides a vacuum break preventing reverse flow of water from the vat back into the tank. A thermostat **49** is mounted in the top zone of tank **26** for a purpose to be described. Thermostat **49** is connected with a float switch **49'** (Figure 7) operating in the heater tank **26** and the purpose of which float switch is to close the timer motor circuit when the water level in the heater tank falls to a predetermined level.

The drain valve **27** is best illustrated in Figure 3 and comprises a cast metal housing **51** having a lateral extension or sleeve **52** for connection with drain hose **28** and a second sleeve **53** for connection with conduit **31**. The upper portion of the housing is sealed by a removable plug **54** which forms a seat for one end of a compression spring **56**, the lower or other end of the spring bearing against the stem of a valve **57** and tends to hold the valve against the seat **58**. The lower portion of the valve stem is slidable in the vertical portion of the housing **51** and an **O** ring type seal **59** prevents leakage therebetween. The valve stem at its lower portion is forked to ride at either side of a cam disc **66** and to receive a cam roller **62**. A conventional timer electric motor **63** rotates the cam shaft **65** whereby when the lift portion **64** of the cam engages roller **62**, the valve **57** will be lifted from its seat **58** permitting water to flow from conduit **31** to drain hose **28**. The inlet valve **22** is similarly constructed and is operated by a second cam **61** whereby when this valve is open water will flow from conduit **24** to conduit **21**. A third cam **67** is adapted to break the circuit to the timer motor at the completion of the cycle.

The manual control knob, indicated at **90** in Fig. 4, can be operated to rotate cam **88'** which will close switch **88** and condition the circuits of the timer motor **63** and heater **42** for energization. Thereafter if the lid safety switch **10** is closed the timer motor will operate if either the thermostatic switch **49** or the thermostat float switch

49' is closed and the heater 42 will be energized if the heater float switch 43 is closed, assuming the timer motor is operating due to closure of switch 49 and the pump is operating to draw water from heater tank 26. Under these conditions if the thermostat should cool or switch 49 should open for any reason the circuit to the timer motor 63 would be broken and the machine would continue to operate indefinitely, unless some arrangement is provided for having the timer complete the cycle. The float switch 49' accomplishes this result since when a predetermined low water level in the heater tank 26 is reached, switch 49' closes to place the timer motor in circuit to complete the cycle.

Referring now to Figures 5 and 6, the manner in which the motor-pump unit is mounted will now be explained. The parts illustrated in Figure 1 are encased in a cabinet (not shown) and a pair of angle members 71 are secured in any suitable manner to the cabinet frame structure to provide a rigid support. A pair of L section plates 72 are secured to the housing of motor 16 by bolts 73. The plates 72 have an upper portion conforming in contour to the motor housing and a horizontally extending portion provided with spaced holes. Step form, perforated, cup shaped elements 76 have the section of reduced diameter projected through the holes and the enlarged lower portion which abuts plates 72 forms a seat for the upper end of springs 77. Cup members 78, which rest on members 71, form seats for the lower ends of springs 77. Rods 79, preferably formed of hexagonal stock, have a reduced threaded section at each end forming shoulders against which lower cup members 78 and similar upper cup members abut. Upper springs 81 encircle rods 79 with the lower ends of the springs seating on the horizontal portion of plates 72 and the reduced diameter section of cup elements 76 projecting upwardly within the lower convolutions of springs 81 to limit lateral movement of the springs. Lock washers 82 and nuts 83 threaded to rods 79 hold the lower ends of the rods and lower cup members 78 in firm engagement with members 71 and the upper cup members 78 in firm engagement with the upper end of the rods. The lower springs 77 which take the load of the motor-pump unit have a higher rating or are relatively stronger than the upper springs 81 which serve to dampen vibrations. The hexagonal rods 79 pass through openings 76' in reduced upper portions of the cup elements 76 with all round clearance, whereby to permit the motor-pump unit to partake of limited horizontal floating movement. It will be noted that the springs are outboard of the motor or spaced some distance from the vertical center line of the motor which increases their effectiveness in damping torsional vibration. For example, if the motor tends to rotate in a given direction, this tendency is yieldingly resisted by one lower spring 77 and the opposite upper spring 81. It is desirable that the lower springs 77 have as low a rating as possible consistent with their ability to support the motor-pump unit.

The operation of the dishwashing machine will now be described with reference to the wiring diagram illustrated in Figure 7. The bulb connector 46 is secured to the spout of a house hot water faucet, and when the faucet is turned on, hot water flows into heater tank 26 until it overflows into vat 10 indicating the heater tank is full. Power leads are indicated at 86 and 87. With the lid safety switch 10' closed, if switch 88 is closed by rotating cam 88' through manual control knob 90 the heater 42 is energized and timer motor 63 is placed in circuit with the thermostat 49 and float switch 49'. When the temperature of the water in heater tank 26 reaches a predetermined temperature thermostat 49 closes and the timer motor is energized. Thereafter the cam 67' will operate to close switch 67 and thus energize the pump motor 16. If there is insufficient water in the heater tank 26 to close the float switch 43 the heater 42 (and lamp) will not be energized. After the timer motor starts operating the first rise 64 of the cam disc lifts valve 57 of inlet valve 22, permitting water to flow to pump 14 and thence through conduit or hose 33 to rotary arm 36. It will be noted that hose 33 is relatively long and the hose is formed of relatively soft rubber whereby the hose may readily expand and contract to dampen or smooth out liquid pulsations emanating from the pump before the pulsations reach vat 10. Water discharged into the vat from jet nozzles 37 is returned to the pump for recirculation. The Venturi fitting 19 creates a drop in pressure insuring flow of water to the pump from inlet valve 22 through conduit 21, against the head of water in conduit 13. During the commencement of the washing period the inlet valve 22 is opened but is closed for the remainder of the washing period, the drain valve 27 being opened at the end of the washing period, whereby the pump discharges wash water through drain hole 28 to a sink or the like.

In a dishwasher having a recirculating liquid system as described, it is desirable to use an impeller type pump and preferably having impeller blades formed of rubber or the like to be sufficiently flexible to pass food particles and the like removed from articles being washed without danger of clogging the pump. This results in a pulsating action as water is picked up at the axial inlet of the pump, whirled towards the periphery of the pump casing, and is discharged to hose 33 through the tangential outlet for the pump. Since water is relatively incompressible, this would result in successive impacts or vibrations which would be directly transmitted to the machine if the motor were rigidly mounted or if a conduit of short length or relatively rigid material leading to vat 10 were used, since, to some degree, the vat acts as a sounding board. This would result in highly objectionable noise. I have found that by providing a resilient or limited floating mounting for the motor-pump unit, plus providing a relatively long conduit formed of relatively soft rubber and extending from the pump outlet to the vat, the noise is very substantially reduced. In effect, the soft rubber hose expands and contracts tending to smooth out or dampen the pulsations before they reach the vat. These pulsations will occur to a greater or less degree regardless of the type pump used.

I have described the invention in connection with a dishwashing machine having a built-in storage tank adapted to be gravity filled, but it is understood that the invention is equally adaptable to a machine having a tank permanently connected to a water supply line or a machine not equipped with a built-in tank, but requiring a water circulating system of the general type described. In other words, the wash and rinse water could be directly introduced into vat 10.

I wish it to be understood that I do not desire to be limited to the exact details of construction shown and described for obvious modifications will occur to a person skilled in the art.

What I claim is:

1. In a dishwashing machine, the combination of a vat, a motor-pump unit mounted beneath the vat, and a liquid circulating system for delivering water to the vat under pressure and returning liquid from the vat to the pump, said circulating system comprising a built-in heater tank adapted to receive liquid for washing and rinsing operations, an inlet valve, a drain valve, timer means for operating said valves in sequence, conduit means extending from the tank to the inlet valve, a continuously open conduit extending from the vat to the pump, communicating means between the inlet valve and pump, and communicating means between the drain valve and pump whereby when the inlet valve is opened for a predetermined period liquid from the tank will be delivered to the liquid circulating system for recirculation through the vat by the pump and when the drain valve is open liquid from the vat will be discharged.

2. The combination as described in claim 1, and wherein the heater tank is adapted to be gravity filled, an electrically energizable heater is disposed in the tank, a float switch prevents energization of said heater until a predetermined level of liquid is attained in the tank, and a thermostatic switch controlling the timer motor is maintained open until a predetermined temperature is attained in the tank.

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