

- [54] **AUTOMATIC DISH RINSING MACHINE
HAVING A CENTRIFUGAL FORCE
SEPARATOR**

Primary Examiner—Robert L. Bleutge
Attorney—Ernest F. Marmorek

- [75] Inventor: **Helmut Muller**, Meckenbeuren,
Germany

- [73] Assignee: **Karl Winterhalter KG,**
Meckenbeuren, Germany

- [22] Filed: Oct. 21, 1971

- [21] Appl. No.: 191,430

- [52] **U.S. Cl.**..... **134/109, 134/191**

- [51] **Int. Cl.**..... **B08b 3/02**

- [58] **Field of Search**..... 134/109, 191, 193

[56] **References Cited**

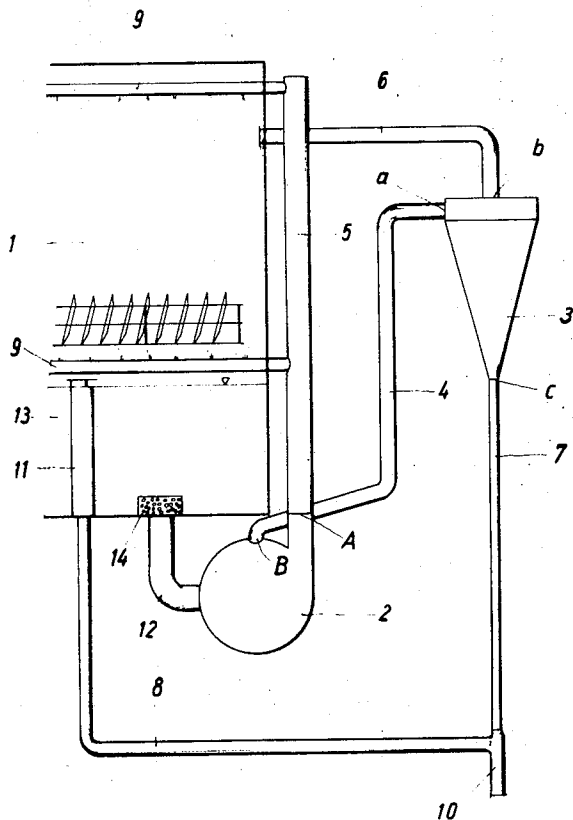
UNITED STATES PATENTS

- | | | | |
|-----------|---------|--------------------|------------|
| 3,313,311 | 4/1967 | Gilson..... | 134/109 |
| 3,378,018 | 4/1968 | Lawter..... | 134/109 |
| 3,003,347 | 10/1961 | Morris et al. | 134/109 UX |

[57] **ABSTRACT**

An automatic dish rinsing machine particularly for commercial purposes having a centrifugal force separator. A portion of the washing suds or detergent solution which is taken from the lower portion of the rinsing space is fed by means of a pump to the centrifugal separator in a tangential direction. The upper outlet of the separator which carries the cleaned detergent solution leads to the rinsing space above the level of the detergent solution. The pump generates a pressure of more than 2 kilograms per square centimeter above atmospheric pressure and has two outlets, one of which is connected to a tube having nozzles disposed in the rinsing space by means of a line carrying the detergent solution while the other one is connected by a line which carries a portion of the fluid to the tangentially extending inlet of the separator.

5 Claims, 2 Drawing Figures



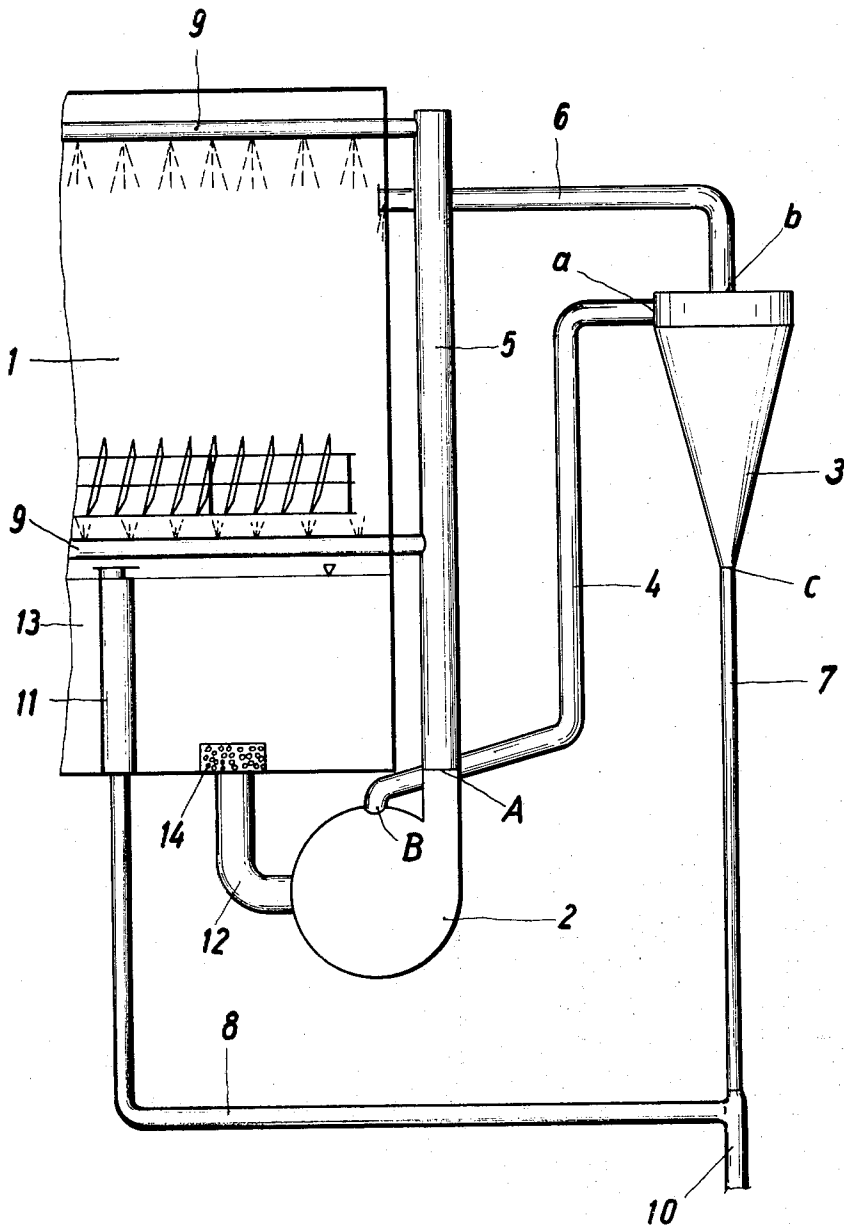


Fig. 1

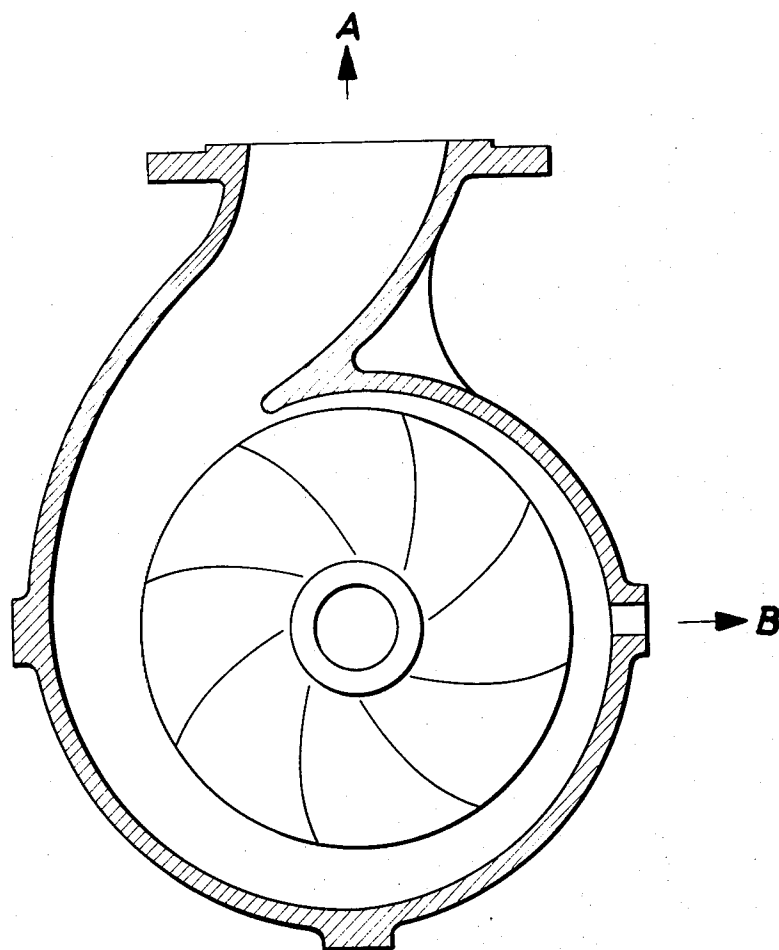


Fig. 2

AUTOMATIC DISH RINSING MACHINE HAVING A CENTRIFUGAL FORCE SEPARATOR

BACKGROUND OF THE INVENTION

This invention relates generally to automatic dish rinsing machines, and particularly to such an automatic dish washer having a centrifugal force separator.

Dish rinsing machines are known which include a centrifugal force separator. A portion of the washing or detergent solution is taken from the lower portion of the rinsing space and is actuated by means of a pump which may be disposed within or without this space; this washing solution is fed in a tangential direction into the separator. The separator has an upper outlet which carries the cleaned solution and which discharges the solution into the rinsing space at a point above the level of the washing solution.

In this known machine the washing solution is preferably branched off between the outlet of the washing solution pump and the washing system. However, this is a disadvantage concerning the overall cleaning effect on the washing solution. This is due to the fact that the concentration of the impurities or dirt in the branched-off washing solution is approximately or almost exactly the same as that of the entire remaining washing solution of the machine.

Furthermore, the provision of cleaning devices for the washing solution is up to this time only known in the overwhelming number of cases for home dish-rinsing machines. In that case the advantage of such a device is questionable. Furthermore, considerable provisions are necessary to guarantee the faultless operation of the machine and its washing solution cleaning device. This problem has been solved in a known machine in the following manner:

The washing and rinsing liquid is continuously circulated by means of a pump. A portion of the circulated total liquid is branched off from the main fluid circuit and fed by means of a line forming a shunt branch to the centrifugal force separator. After the liquid has traversed the centrifugal force separator, the cleaned washing liquid is discharged by means of a return line back into the rinsing space. The quite dirty liquid is discharged from the lower outlet of the liquid separator.

For home rinsing machines it is conventional practice to rinse with comparatively little washing solution (about 10 to 15 liters) for a period of from 5 to 10 minutes. Now, it may happen that almost the entire washing solution discharges during the rinsing by way of the lower outlet of the centrifugal separator into the waste pipe. Since during the main rinsing cycle no fresh water is fed into the machine, it will be evident that eventually the pump can no longer pump any rinsing liquid. Accordingly, the machine can no longer operate correctly.

In the known machine this is avoided in that a so-called settling tank is provided for the very dirty washing solution downstream of the lower outlet of the centrifugal separator. This settling tank may be closed by means of a tube having a valve controlled in dependence upon the existing pumping pressure. Other devices for closing and opening the valve of the settling tank are known. This provision has the result that the withdrawal of the liquid is very much slowed down so that sometimes several minutes may be required to fill the settling tank.

However, impurities or dirt may enter the closed pressure chamber of the tube having a valve through the pump. In addition, this device is subject to failure in a high degree and therefore is quite unreliable.

It is accordingly an object of the present invention to provide an automatic dish rinsing machine which is not subject to the drawbacks of prior art machines.

Another object of the present invention is to provide an automatic dish rinsing machine of the type referred to which has an improved cleaning system for the washing solution.

A further object of the present invention is to provide an automatic dish rinsing machine, particularly for commercial purposes, where the amount of dirty washing solution which is permitted to leave the machine is precisely controlled.

SUMMARY OF THE INVENTION

The present invention accordingly offers a much simpler and yet safer solution of the previously described problem. It relates to an automatic dish rinsing machine particularly for commercial purposes having a centrifugal force separator. A portion of the washing or detergent solution is taken from the lower portion of the rinsing space or chamber and is fed by means of a pump in a tangential direction to the centrifugal separator. The pump may be disposed within or without the rinsing space. The upper outlet of the separator carries the cleaned washing solution which is discharged above the level of the washing solution into the rinsing space.

A feature of the invention consists in that the pump generates a pressure of more than 2 kilograms per square centimeter above atmospheric pressure and has two outlets. One of the outlets is connected by a line carrying the washing solution to a tube having nozzles disposed in the rinsing space. The other outlet is connected by a line which carries a portion of the liquid to the tangential inlet of the centrifugal force separator. The delivery or output of the pump amounts suitably to several hundred, for example, to 600 liters per minute.

The second outlet of the pump, which is preferably a centrifugal pump, is disposed in a region of the pump having a high or the highest centrifugal action or force. In this manner it is achieved that due to the centrifugal action within the pump a partial stream of the washing or rinsing solution is fed to the centrifugal force separator which has a higher concentration of dirt as does the remaining rinsing solution.

Furthermore, the cross-sections of the second outlet of the pump, of the line which connects the second outlet to the centrifugal separator and of the tangential inlet of the centrifugal separator are preferably so proportioned that only about 5 percent to about 10 percent of the washing solution flowing through the pump is fed to the centrifugal force separator. Further, the velocity of the liquid flowing into the separator is more than about 6 meters per second.

It is now possible to connect the outlet of the centrifugal separator, which carries the cleaned washing solution, by means of a pipe directly into the rinsing chamber. At the same time the lower outlet of the centrifugal separator which carries the discharged dirt or impurities may be directly connected with the discharge or water line, that is without utilizing a settling tank and its discharge regulator.

The novel features that are considered characteristic of this invention are set forth with particularity in the

appended claims. The invention itself, however, both as to its organization and method of operation, as well as additional objects and advantages thereof, will best be understood from the following description when read in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic representation, partly in longitudinal section, of an entire dish washer including its pump, centrifugal force separator and fluid connections; and

FIG. 2 is a cross-sectional view of the pump forming part of the machine of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to FIG. 1 there is illustrated a dish rinsing machine including a rinsing space or chamber 1. Outside of the chamber 1 there is provided a pump 2 connected by a line or conduit 4 with a centrifugal force separator 3. The upper portion of the conduit 4 leads tangentially at *a* into the separator 3. By means of a further conduit 5 the pump 2 is connected with one or more tubes 9 having nozzles as shown which spray the washing solution onto the dishes or the like situated in the chamber 1. The outlet *b* of the separator 3 discharges the cleaned liquid and is connected with a conduit 6 which extends freely into the rinsing chamber 1 above the level of the washing solution.

The lower outlet *c* of the centrifugal separator 3 is connected by means of a conduit 7 with the waste water discharge 10. The discharge 10 is also connected by a connecting tube 8 with an overflow tube 11 extending from below into the rinsing space 1 so that its open end is disposed above the washing solution level.

A tube 12 is connected in a known manner to the bottom of the rinsing space 1 and is provided with a dirt screen 14 disposed between the tube 12 and the washing solution.

In accordance with the invention the pump 2 has two separate exits A and B. The first exit A is connected by means of the conduit 5 with the tubes 9 provided with spray nozzles. The second exit B is connected with the conduit 4 connected in turn at *a* to the centrifugal separator 3. The exit A is connected in the usual manner tangentially to the housing of the pump 2 which is preferably a centrifugal pump. The exit B is disposed at a point of the centrifugal pump housing where a suitably high centrifugal action or force prevails.

FIG. 2 shows on enlarged scale the arrangement of the two exits A and B of the centrifugal pump 2. In particular, FIG. 2 illustrates that the exit B has a considerably smaller cross-section than does the exit A. The dimensions should be such that the cross-sections of the tubes connected to the exit A on the one hand and to the exit B on the other hand as well as the cross-section of the exits A and B are so related that only about 5 percent to about 10 percent of the total circulated liquid is fed to the centrifugal force separator 3. The velocity with which the washing liquid enters the inlet *a* of the centrifugal force separator 3 should be more than about 6 meters per second.

The advantageous operation of the arrangement in accordance with the invention is due to the fact that during the cleaning operation of the centrifugal force separator 3 and in view of the liquid pressure of more than 2 kilograms per square centimeter above atmo-

spheric delivered by the pump 2, no more rinsing liquid and dirt or impurities can discharge through the pipe 7 than the amount of fresh water brought into the rinsing chamber 1 during the after rinsing cycle following the main washing cycle. This rinsing or fresh water is fed into the rinsing chamber 1 in a known manner by means of a boiler, not illustrated.

Optimum operation of the machine is obtained under the following conditions:

Assuming that the amount of water present in the rinsing chamber 1 may amount to more than about 30 liters, then at the most about 50 times rinsing is feasible. In this case the washing solution may remain in the machine during the entire rinsing cycle, that is for several hours. The rinsing of a charge may take only about 120 seconds. The pump and the centrifugal force separator operate during each rinsing cycle for about 105 seconds.

Assuming now that the pump 2 generates a pressure of more than 2 kilograms per square centimeter above atmospheric and circulates an amount of washing solution of about 600 liters per minute of which about 5 percent is fed into the centrifugal force separator 3. In that case the outlet *c* of the separator 3 operates as a throttle with respect to the liquid solution which flows towards it with a high peripheral velocity. Accordingly, the stream of liquid is forced to return and to discharge at the out *b* of the separator 3. During the rinsing period of a charge about 50 liters of washing solution flows through the centrifugal force separator 3 of which 1 to 1.5 liters of solution with dirt and impurities are discharged.

Since after the main washing cycle an after rinsing process takes place whereby at least 2.5 liters of fresh water are fed into the rinsing chamber it is made certain that the machine during its operation can never automatically empty itself by means of the centrifugal force separator 3.

According to a further embodiment of the invention it is feasible that instead of connecting a second pump outlet B with the entrance of the centrifugal force separator, a second pump may be provided. The second pump feeds the separator 3 and generates a higher pressure than the pump 2 provided in a conventional manner between the rinsing liquid and the spraying tubes 9.

What is claimed is:

1. Automatic dish rinsing machine particularly suitable for commercial purposes, said machine comprising:

- a. a rinsing chamber in said machine and containing a washing liquid;
- b. a centrifugal force separator having a tangentially extending inlet;
- c. a centrifugal pump disposed outside of said rinsing chamber, said pump generating a fluid pressure of more than 2 kilograms per square centimeter above atmospheric pressure and having a first and a second outlet;
- d. said second outlet being arranged in a region having a stronger centrifugal effect than said first outlet;
- e. a tube having nozzles disposed in said rinsing chamber;
- f. a first conduit connecting said first outlet to said tube having nozzles for conveying the washing liquid; and

5

g. a second conduit connecting said second outlet of said pump with said tangentially extending inlet of said separator, said second conduit being so proportioned as to carry a fraction of the liquid flowing through said pump.

2. Dish rinsing machine as defined in claim 1 wherein the cross-sections of said second outlet, of said second conduit and of said tangentially extending inlet of said separator are so proportioned that about 5 percent to about 10 percent of the washing liquid flowing through said pump is fed to said separator, and wherein said pump is so constructed that the entrance velocity of the liquid into said separator is more than about 6 meters per second.

3. Dish rinsing machine as defined in claim 1 wherein said centrifugal force separator is provided with a first outlet carrying the cleaned liquid, and a third conduit

6

connecting said first outlet of said separator to said rinsing chamber, said separator being provided with a lower second outlet carrying a liquid enriched by impurities, and a fourth conduit connecting said second outlet of said separator with a waste pipe.

4. Dish rinsing machine as defined in claim 3 wherein an automatic rinsing cycle is so arranged that during the washing liquid cleaning process the amount of rinsing liquid and impurities which are permitted to discharge through said fourth conduit is no more than the amount of fresh water fed into said rinsing chamber during the after rinsing cycle.

5. Dish rinsing machine as defined in claim 1 wherein said tangentially extending inlet of said separator is disposed above the washing liquid level in said rinsing chamber.

* * * * *

20

25

30

35

40

45

50

55

60

65