

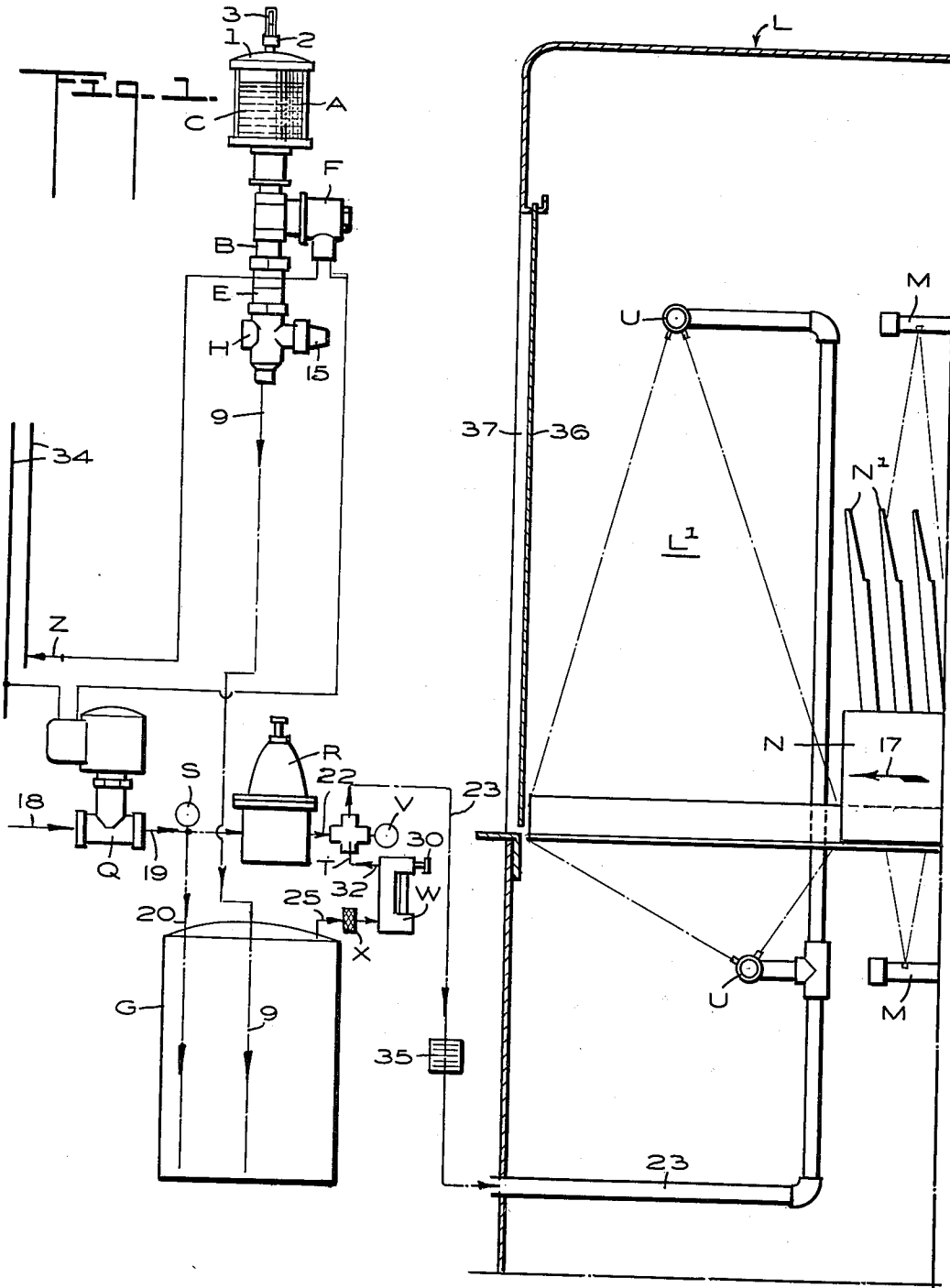
April 3, 1956

G. J. FEDERIGHI ET AL
APPARATUS FOR INJECTING DRYING
AGENT INTO RINSE SPRAY SYSTEM

2,740,415

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4 Sheets-Sheet 1



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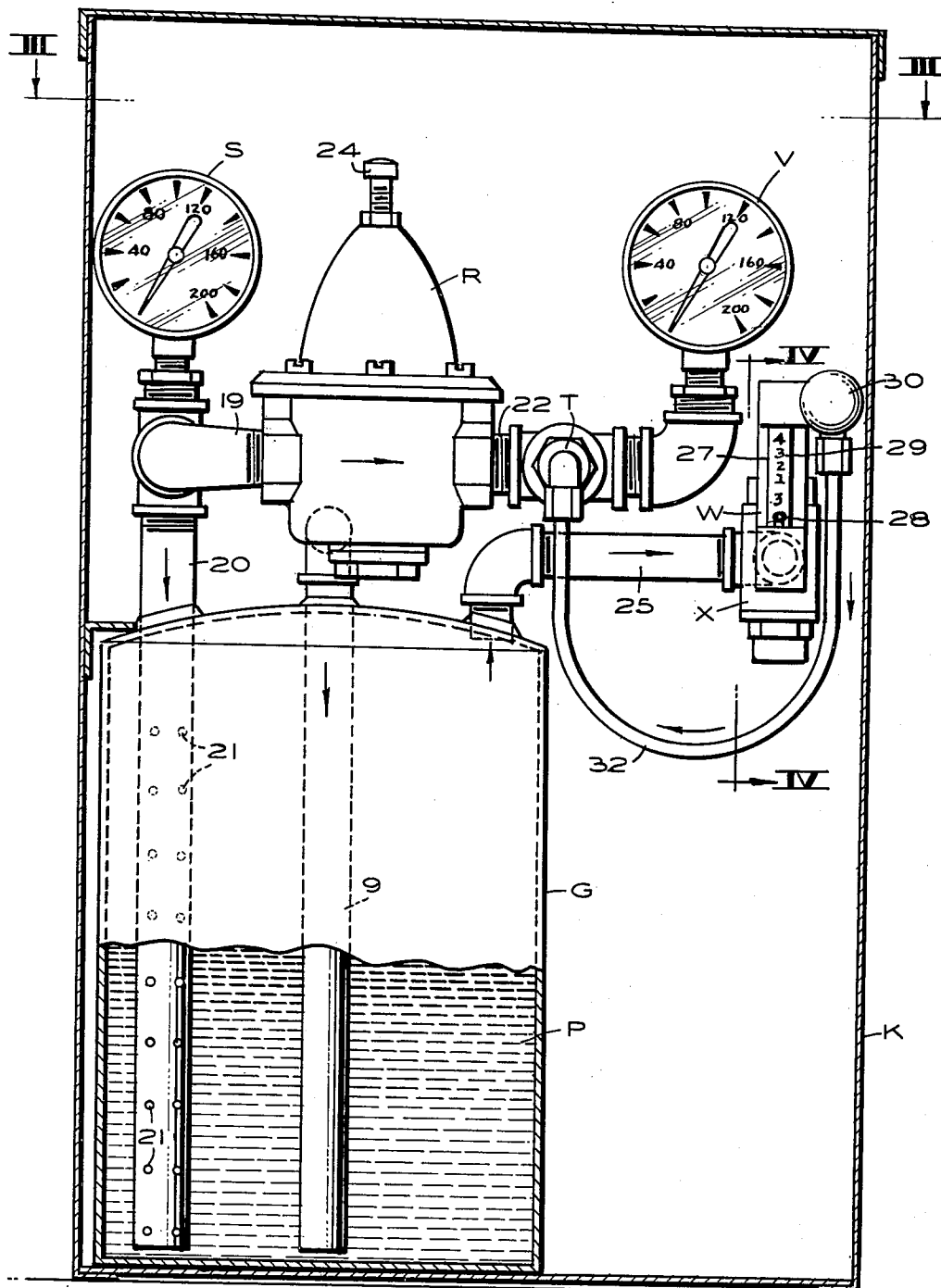


FIG. 2.

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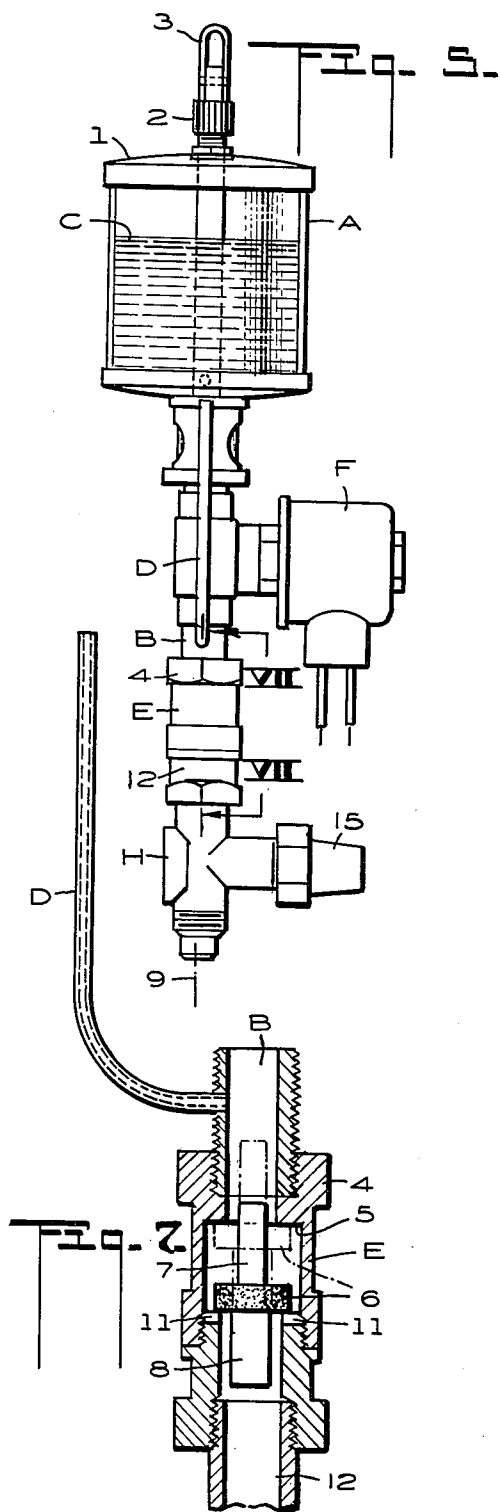
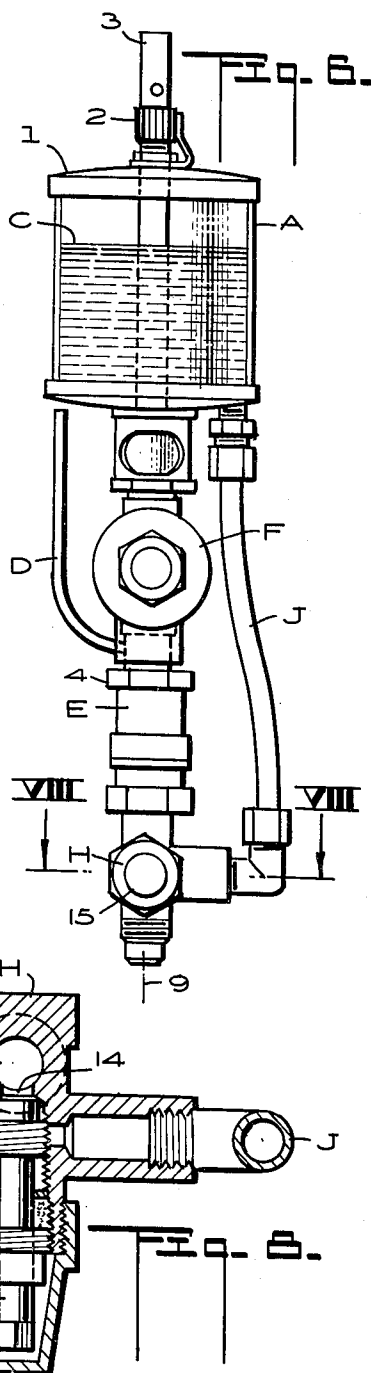
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APPARATUS FOR INJECTING DRYING AGENT INTO RINSE SPRAY SYSTEM

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Application January 24, 1955, Serial No. 483,654

7 Claims. (Cl. 134—58)

In the commercial washing of dishes, a rinse spray at a temperature of about 180° F., is applied to the washed dishes for rinsing and sterilizing the dishes, glasses, and silverware. The rinse water has a tendency to cling to the washed articles in small droplets which take from four to ten minutes to dry. When these droplets dry, they usually leave a white spot which is the alkaline in the water.

To prevent white spots from showing on the articles, an operator is employed for hand toweling the silverware and drying the glasses. If this is not done, there is an accumulation of alkaline deposits and the dishes, glasses and silverware will gradually have a white film form thereon.

An object of our invention is to provide a rinse injector that will deliver a predetermined quantity of any type of non-sudsing drying agent into the rinse spray automatically for breaking the surface tension of the rinse water that causes it to adhere to the washed articles. Any water drops left on tableware will flow into a thin sheet and will run off immediately, leaving the tableware dry and unspotted in a matter of seconds. Dishes will take on their original sheen and glasses will come beautifully clear and sparkling. The silverware will also shine and not have a single water spot left on it. No operator is necessary for drying the tableware and the articles will have a clean, fresh look.

The rinse injector operates by forcing a concentrated mix of the non-sudsing drying agent into the final rinse spray of the commercial dishwasher. The amount of the drying agent can be regulated according to the hardness of the water used in spraying the tableware. The device is automatic in operation and includes a pre-mixing tank that has a concentrated mix added thereto after each spraying cycle so that the tank will remain full at all times. Novel means are used for initially delivering a desired quantity of the drying agent to the tank of water prior to the start of the dishwashing operation so that the concentrated mixture will be prepared. An adjustable control valve can then be regulated and the mechanism includes automatic means for delivering the desired amount of concentrate to the rinse water during the operation of the dishwashing machine. The device dispenses the concentrate only for the length of time the rinse water is turned on. The device makes use of the water pressure in the rinse water for automatically operating it and this does away with the need for a pump or other power means.

Other objects and advantages will appear in the following specification, and the novel features of the device will be particularly pointed out in the appended claims.

Our invention is illustrated in the accompanying drawings forming a part of this application in which:

Figure 1 is a schematic view of the device in its relation to a dishwashing machine and a simple electrical circuit is shown;

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Figure 2 is a front elevation of the device, and illustrates the mixing chamber partly in section;

Figure 3 is a horizontal section taken along the line III—III of Figure 2;

Figure 4 is a vertical section taken along the line IV—IV of Figure 2, and shows the device for controlling the flow of the drying agent into the injector;

Figure 5 is a side elevation of the dispensing unit on a larger scale than that shown in Figure 1;

Figure 6 is a view of the same dispensing unit when looking from the righthand side of Figure 5;

Figure 7 is a vertical section on an enlarged scale of a check valve used in the device and is taken along the line VII—VII of Figure 5; and

Figure 8 is a horizontal section taken along the line VIII—VIII of Figure 6 and shows a fluid by-pass valve in section.

While we have shown only the preferred form of our invention, it should be understood that various changes or modifications may be made within the scope of the appended claims without departing from the spirit and scope of the invention.

In carrying out our invention, we will first describe the dispensing unit and will then describe the mixing chamber and its associated parts, after which we will set forth the device for delivering the drying agent to the injector and then will set forth the injecting nozzle. When these parts are described in detail, the operation of the entire apparatus will be given.

Dispensing unit

The dispensing unit is shown in detail in Figures 5–8 inclusive, and it comprises a glass container indicated generally at A in Figure 5. This container has a cover 1 and it may be filled with a non-sudsing drying agent such as "Rinse-Dry" which is composed of a non-ionic alkyl argl sulfonate wetting agent and alcoholic solvent for blending. The glass container A is provided with an adjusting screw 2 that permits a pre-determined quantity of liquid to be fed into a reservoir shown at B in Figure 7 and the feed is usually a drop at a time. In addition to the adjusting screw 2, there is provided the usual lever actuated valve 3, see Figure 6, that can be swung into the vertical position shown for permitting the liquid C in the container A to flow into the reservoir B in any desired quantity subject to control by a valve F.

We have shown a vent-tube D in Figure 7 leading from the reservoir B, and this tube is necessary to fulfill the function of permitting air to escape from the reservoir as the latter is filled with fluid C entering it from the container. Hereafter we will set forth how the vent-tube D performs the additional function of permitting the liquid in the reservoir B to drain therefrom, the tube admitting air to the reservoir to take the place of the dispensed liquid. It is best now to state that a check valve shown at E in Figure 7, is placed below the reservoir B for preventing any reverse flow of fluid entering the reservoir B and escaping through the vent D. The check valve comprises a casing 4 that is connected to the lower end of the reservoir B. The casing has a valve seat 5 that is designed to be closed by a free-moving valve body 6 when the body is in raised position. The check valve body 6 has an upwardly extending guide stem 7 that enters the lower end of the reservoir B, and a depending guide stem 8 that extends downwardly from the valve body disc 6. The two stems 7 and 8 have sufficient weight to hold the valve body 6 in its lowermost position as shown in Figure 7.

We will describe the means for operating the check valve as the specification proceeds. The dot-dash line position, shown in Figure 7, indicates the check valve body 6 in raised position and resting against the seat 5

for closing the lower end of the reservoir B. When the check valve body is in its raised position, an electrically operated valve indicated generally at F in Figure 5, will be opened, in a manner hereinafter described, and will permit the fluid in the container A to drip into the reservoir B. The electrical valve F is opened when the rinse water valve Q for the dishwasher L is turned on.

In certain instances, before the dishwashing operation is commenced, it is found advisable to deliver a pre-determined quantity of liquid C from the container A directly into a pipe shown at 9 and this pipe will convey the fluid into a mixing chamber indicated generally at G in Figure 1. A by-pass valve H is shown in Figures 5 and 6 and is illustrated in cross-section in Figure 8. This valve has a passage 10 therethrough through which the fluid C will flow from the reservoir B when the check valve E has its valve body 6 in its lowered position. It will be seen from Figure 7 that the valve body 6, when lowered, will rest upon spaced apart projections 11, and these projections provide a fluid passageway therebetween for the flow of fluid from the reservoir B into a pipe 12 that connects the check valve E to the valve H.

A by-pass pipe J, see Figure 6, connects directly with the base of the container A and leads to the by-pass valve H. A valve body 13, see Figure 8, normally closes an opening 14 that communicates with the passage 10, and therefore the flow of fluid through the by-pass J is prevented. Before the start of the dishwashing operation, the operator may wish to add a certain quantity of the liquid C to the water in the mixing chamber G and he does this by first removing a cap 15 from the valve housing H, see Figure 8, and then rotating a valve stem 16, by means of a wrench or other tool, for moving the valve body 13 away from the valve seat associated with the opening 14. Fluid can now flow directly from the container A and will pass through the by-pass pipe J and on into the valve H and thence through the pipe 9 to the mixing chamber G. The container A holds a predetermined quantity of the liquid and therefore any desired amount can be fed directly into the mixing chamber by keeping the valve H opened. When the desired quantity has been delivered, the valve H is closed and the cap 17 re-applied. All additional fluid C that will be fed to the mixing chamber G will be in direct proportion to the amount of fluid removed from the mixing chamber.

Mixing Chamber

The mixing chamber is shown diagrammatically at G in Figure 1, and it is shown in detail in Figures 2 and 3. The mixing chamber is preferably mounted in a cabinet K and the parts associated with the chamber are mounted in the same cabinet. The cabinet K is not shown in Figure 1, although the mixing chamber G is indicated. The cabinet K with its mechanism is preferably placed at the exit end of the dishwashing machine indicated generally at L in Figure 1. Only the rinsing compartment L¹ is indicated in the figure and a portion of the dishwashing nozzles M. A dish-containing basket N is also illustrated in Figure 1 and an arrow 17 indicates the movement of the basket with its dishes M¹ or other tableware. It is obvious that the basket N may carry glasses or silverware in place of the dishes illustrated. In fact, any washable article may be deposited in the basket.

Returning to the mixing chamber G, it will be seen that the pipe 9 that leads from the by-pass valve H in Figure 1, enters the top of the mixing chamber G and extends substantially to the bottom thereof. The mixing chamber contains water which has been delivered thereto by a means presently to be described and the addition of the fluid C to the water will form a mixture or emulsion indicated generally at P. The fluid C is added to the water at the bottom of the mixing chamber G so as to cause a complete mixing of the liquid C with the water. All parts of the mixture P will therefore have the same ratio of water and fluid C. The mixture P is in reality

a concentrate which will be injected into the rinse-spray water just prior to this water being sprayed upon the tableware carried by the basket N.

In Figure 1, we show a solenoid operated inlet valve Q and this valve controls the flow of hot rinse water from an inlet pipe 18. A pipe 19 leads from the inlet valve Q to a pressure regulator indicated generally at R. A branch pipe 20 communicates with the pipe 19, between the valve Q and the pressure regulator R, and this pipe enters the mixing chamber G and extends almost to the bottom thereof. Figure 2 illustrates the portion of the branch pipe disclosed within the mixing chamber as having a plurality of openings 21 and the water issues from these openings with sufficient force to cause a churning action to take place in the fluid within the mixing chamber. The churning action will mix the water with the fluid C that flows from the container A. A pressure gauge S, communicating with the pipe 19, will indicate the pressure of the rinse water. Usually this pressure is around forty pounds, although we do not wish to be limited to any definite pressure. The rinse water pipe 18 communicates with a source of hot rinse water, not shown, and the temperature of this water is usually maintained between 175 to 180° F.

Figure 3 shows the pipe 19 leading to the pressure regulator R and Figure 2 shows a pipe 22 leading from the pressure regulator. The pipe 22 communicates with an injector T, see Figures 2 and 3. A pipe 23 leads from the injector T to the rinse-spray nozzles U indicated in Figure 1. A second pressure gauge V communicates with the injector T and indicates the water pressure after the water has passed through the pressure regulator R. A pressure-regulating screw 24, see Figure 2, for the pressure regulator R, determines the difference in pressure between the hot water passing through the pipe 19 and the water passing through the pipe 22. This pressure differential approximates two pounds, although we do not wish to be limited to any definite amount. The pressure differential is sufficient to cause a portion of the water flowing through the pipe 19 to be diverted into the mixing chamber G by means of the branch pipe 20, and the water flowing into the mixing chamber will have sufficient force to cause a churning action as the water issues from the openings 21 and the pipe 20. The mixing chamber G will be kept filled with water and with a predetermined quantity of fluid C at all times.

Referring again to Figures 2 and 3, it will be seen that an outlet pipe 25 communicates with the top of the mixing chamber G and this pipe leads to a device indicated at W in Figures 2 and 4, for controlling the flow of the drying agent into the injector T. Before the mixture P, in flowing through the outlet pipe, reaches the flow regulator W, it passes through a filtering member indicated generally at X in Figure 4. The screened mixture P will then pass through a reservoir 26 of the flow regulator W and will flow upwardly through a transparent tube 27. A metal ball 28 is placed in the tube 27, and as the flow of the mixture P passes up through the tube, the ball will be raised in direct proportion to the speed of the flow of the mixture. Figure 2 illustrates how the tube is graduated on its outer surface as at 29. The operator can control the quantity of the mixture P, passing through the flow regulator, by adjusting a valve handle 30, see Figure 4, and determining the amount of opening that the valve 31 will make into a pipe 32. Figure 3 shows how the pipe 32 communicates with an injector nozzle 33, and this nozzle is placed in the injector T in a position where the desired quantity of the mixture P will be delivered to the rinse water as it passes from the injector T into the pipe 23. The greater the flow of the mixture through the tube 27, the higher the metal ball 28 will be raised in the tube.

Operation

In Figure 1, we show the relation of our apparatus to the dishwashing machine L. Before the dishwasher is

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started in its operation, the mixing chamber G is substantially filled with water and then the by-pass valve H is opened for by-passing a desired quantity of the fluid C from the glass container A to the mixing chamber G. The fluid will flow through the by-pass J and then on through the valve H and the pipe 9 and into the mixing chamber G.

The valve H is now closed and the device is ready for automatic operation. The dishwashing machine is started in its operation and the tableware N¹, carried by the basket N, will move through the dishwasher in the direction of the arrow 17 shown in Figure 1. We do not wish to be confined to a carrier or basket N for the tableware N¹, since it is possible to have an endless conveyor, not shown, for moving the tableware through the dishwashing machine. When the basket N is used, it will strike an arm in the rinse compartment L¹, not shown, but of the type described and claimed in our patent on a magnetic mechanism for controlling the flow of rinse water in dishwashing machines, Patent No. 2,668,548, issued February 9, 1954, and this arm actuates an electric switch shown at Z in Figure 1. The closing of the switch-arm Z connects the electric valve F and the inlet valve Q with an electric circuit indicated by the two power lines 34. A current will flow through the solenoids of both valves F and Q, and will open them. The hot rinse water from the line 18 will then flow through the open valve Q and will pass through the pressure regulator R. The pressure regulator has been adjusted by means of the screw 24 to create sufficient back pressure for causing a portion of the hot rinse water to flow into the pipe 26 and enter the mixing chamber through the openings 21. A churning action of the contents in the mixing chamber will result and a thorough mixing of the fluid C with the water will take place.

The force of the fluid entering the mixing chamber G through the pipe 20 will cause a back pressure to be exerted in the pipe 9, and this back pressure is sufficiently strong to force fluid from the chamber up through this pipe and the fluid will lift the valve body 6 in the check valve E against the seat 5. Figure 7 shows the valve body 6 in dot-dash line position, seated against the valve seat 5 and closing the lower end of the reservoir B. We have already stated that the closing of the switch Z by the basket N will cause the valve F to open and this will permit fluid C to drip from the container A and pass into the reservoir B. The amount of fluid thus flowing is regulated by the adjusting screw 2 and the lever 3. The air vent D, shown in Figure 7, will permit the fluid to drip into the reservoir B, because the air displaced by the fluid will escape through the vent. The valve body 6 of the check valve E will not only close the lower end of the reservoir B so that the fluid C will be accumulated therein but, in addition, it will prevent the fluid from the mixing chamber G from flowing past the check valve E and spewing out through the air vent D.

The valve F will remain open so long as the switch Z is closed and this switch in turn is held closed by the basket N moving through the rinsing compartment L¹. Therefore the quantity of fluid C, caught by the reservoir B, will be in direct proportion to the amount of fluid removed from the mixing chamber G with the water during the spraying of the dishes in the compartment L¹. We have already set forth how the pressure regulator R is for the sole purpose of creating sufficient back pressure to cause some of the rinse water to enter the mixing chamber G through the pipe 20. The two pressure gauges S and V will indicate the pressure differential. The additional rinse water flowing into the mixing chamber G, during the spraying operation, will cause a like quantity of the blended mixture P to leave the chamber through the pipe 25 and this will pass through the filtering screen X and then will flow through the flow regulator W.

The knob 30 on this flow regulator can be adjusted to

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regulate the amount of the mixture P that flows into the pipe 32, see Figure 4, and out through the nozzle 33, see Figure 3, to mix with the rinse water C that is passing through the injector T. The mixture P in the mixing chamber might be regarded as a concentrated mixture and the right proportion of this is added to the rinse water by the injector T to provide a rinse water which will not remain on the tableware in the form of droplets. The mixture P will flow through a blender 35, illustrated diagrammatically in Figure 1. This blender may consist of a plurality of screens and, as the mixture P flows therethrough, a perfect blending results. The rinse water with its concentrate in a perfectly blended form will issue from the spray nozzles U and will be applied to the top and bottom of the tableware as the basket N moves through the rinse compartment. Usually the rinsing operation consumes about ten seconds of time, although we do not wish to be confined to any particular time period.

The rinsed tableware in the basket N will move past the curtain 36 in Figure 1 which normally closes the exit opening 37 in the dishwashing machine. The complete passing of the basket N through the rinsing compartment will permit the switch C to open at the end of the rinsing operation and this will close the valves F and Q. The rinse water is now shut off and the valve F will prevent any further drip of the fluid C from the container A into the reservoir B.

The stopping of the rinsing operation will relieve any back pressure in the pipe 9 and therefore the valve body 6 in the check valve E will drop by gravity into the full-line position shown in Figure 7. The lugs 11 will prevent the valve body from closing off the pipe 12 and therefore the fluid C will pass from the reservoir B into this pipe and be conducted past the by-pass valve H and on through the pipe 9 and into the mixing chamber G. The quantity of fluid added to the mixing chamber will be equal to the fluid removed during the previous rinse operation.

It should be noted that the additional fluid C will be added to the bottom of the mixing chamber fluid. Therefore during the next rinsing operation, the incoming rinse water from the pipe 20 will agitate this fluid and the water in the chamber for providing a perfect mixture. This takes place before the mixture P or emulsion flows from the chamber G through the pipe 25 to be mixed with the hot rinse water.

The device is automatically operated by water pressure and no motor or other power source is needed. The check valve E is hydraulically operated, although it may be electrically operated. The mixture P is removed from the top of the chamber G in order to prevent any air collecting at the top of the chamber.

The fluid C added to the water will soften it, as well as cause the surface tension to be removed. The rinse water will form in a thin film on the tableware rather than in droplets, and the thin film will either flow off or dry rapidly in just a few seconds.

We claim:

1. The combination with a dishwashing machine including a rinsing compartment; rinse nozzles positioned in said compartment; and a pipe for conveying rinse water under pressure to said nozzles: of an electric valve and a pressure regulator placed in the pipe for the rinse water to pass therethrough when the valve is opened; a mixing chamber; a branch pipe communicating with said first named pipe between the valve and regulator and extending into the chamber for delivering some of the rinse water thereto; means for delivering a fluid to the chamber to be mixed with the water therein for forming a mixture; an injector communicating with the chamber for receiving the mixture therefrom and having a nozzle for spraying a quantity of the mixture into the rinse water prior to the water reaching the rinse nozzle; said injector operating each time the valve is opened.

2. The combination as set forth in claim 1: and in which the means for delivering fluid to the chamber includes a source of fluid supply; a reservoir for receiving fluid from the source and having an outlet; a second electric valve opened when the first electric valve is opened and permitting fluid to pass into the reservoir; a check valve adapted to close the reservoir outlet; a conduit leading from the check valve to the mixing chamber; said check valve closing the reservoir outlet when the first electric valve is opened and some rinse water enters the chamber; and a vent for the reservoir for permitting fluid from the source to enter the reservoir; said vent permitting the fluid to flow into the chamber when both electric valves are closed and the check valve opens the reservoir outlet.

3. The combination as set forth in claim 2: and in which a valve-controlled by-pass places the fluid source directly in communication with the conduit leading to the chamber for delivering fluid directly to the chamber when the by-pass valve is opened.

4. The combination with a dishwashing machine including a rinsing compartment; rinse nozzles positioned in said compartment; and a pipe for conveying rinse water under pressure to said nozzles; of an electric valve and a pressure regulator placed in the pipe for the rinse water to pass therethrough when the valve is opened; a mixing chamber; a branch pipe communicating with said first-named pipe between the valve and regulator and extending into the chamber for delivering some of the rinse water thereto; means for delivering a fluid to the chamber to be mixed with the water therein for forming a mixture; an injector; a conduit placing the injector in communication with the chamber for receiving the mixture therefrom and having a nozzle for spraying a quantity of the mixture into the rinse water prior to the rinse water reaching the rinse nozzles; and means placed in the conduit for controlling the amount of the mixture flowing from the chamber to the injector.

5. The combination as set forth in claim 4: and in which the means for delivering fluid to the chamber includes a source of fluid supply; a reservoir for receiving fluid from the source and having an outlet; a second electric valve opened when the first electric valve is opened and permitting fluid to pass into the reservoir; a check valve adapted to close the reservoir outlet; a conduit leading from the check valve to the mixing chamber; said check valve closing the reservoir outlet when the first

electric valve is opened and some rinse water enters the chamber; and a vent for the reservoir for permitting fluid from the source to enter the reservoir; said vent permitting the fluid to flow into the chamber when both electric valves are closed and the check valve opens the reservoir outlet.

6. The combination as set forth in claim 5: and in which a valve-controlled by-pass places the fluid source directly in communication with the conduit leading to the chamber for delivering fluid directly to the chamber when the by-pass valve is opened.

7. In combination: a mixing chamber; a source of fluid supply; a reservoir for receiving fluid from the source and having an outlet; an electric valve controlling the flow of fluid from the source into the reservoir; a vent for the reservoir for permitting fluid to flow thereinto when the valve is opened; a check valve communicating with the reservoir outlet and, when in normal position, permitting the reservoir outlet to remain open; a conduit leading from the check valve to the mixing chamber; a pipe communicating with a source of rinse water under pressure; a second electric valve and a pressure regulator placed in the pipe for the rinse water to pass therethrough when the valve is opened; a branch pipe communicating with said rinse-water pipe between the valve and the regulator and extending into the chamber for delivering some of the rinse water thereto; the portion of the branch pipe received in the chamber having openings therein for the water to issue therefrom and create a stirring action of water within the chamber; means connecting both of said electric valves to a source of current for opening them; whereby water will be delivered to the chamber and some will force up through the conduit for causing the check valve to close the outlet to the check valve; whereby fluid will be retained in the reservoir that feeds from the fluid supply source; an injector communicating with the top of the chamber for receiving a mixture therefrom and having a nozzle for spraying a quantity of the mixture into the rinse water after the water leaves the regulator; spray nozzles for receiving the rinse water and mixture and for spraying it onto objects; said check valve opening the reservoir outlet when the two electric valves are closed and said vent permitting the fluid to flow from the reservoir and into the mixing chamber.

No references cited.