Dec. 16, 1941. D. P. HUNTER 2,266,205

CLEANING APPARATUS

Filed Oct. 5, 1938 2 Sheets-Sheet 1

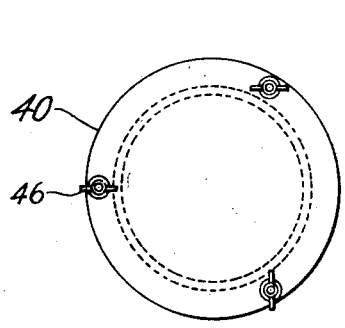
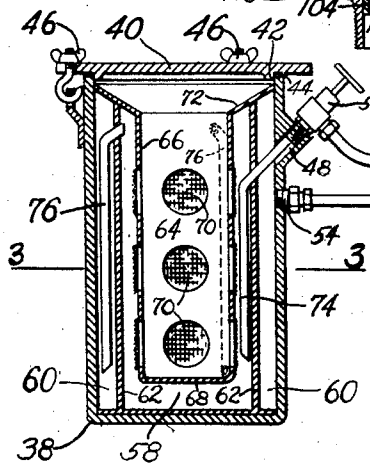


Fig. 2

Fig. 1

Fig. 4



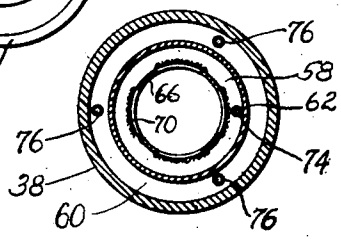


Fig. 3

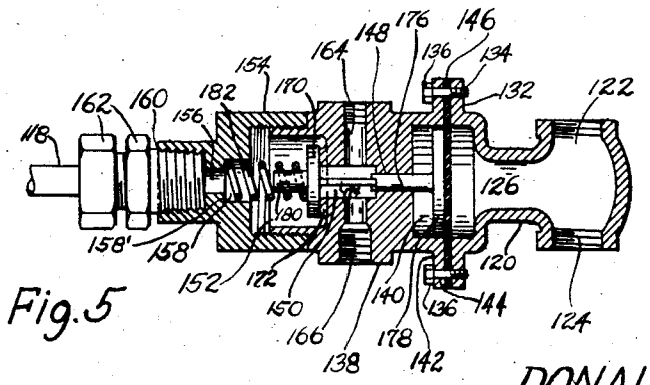


Fig. 5

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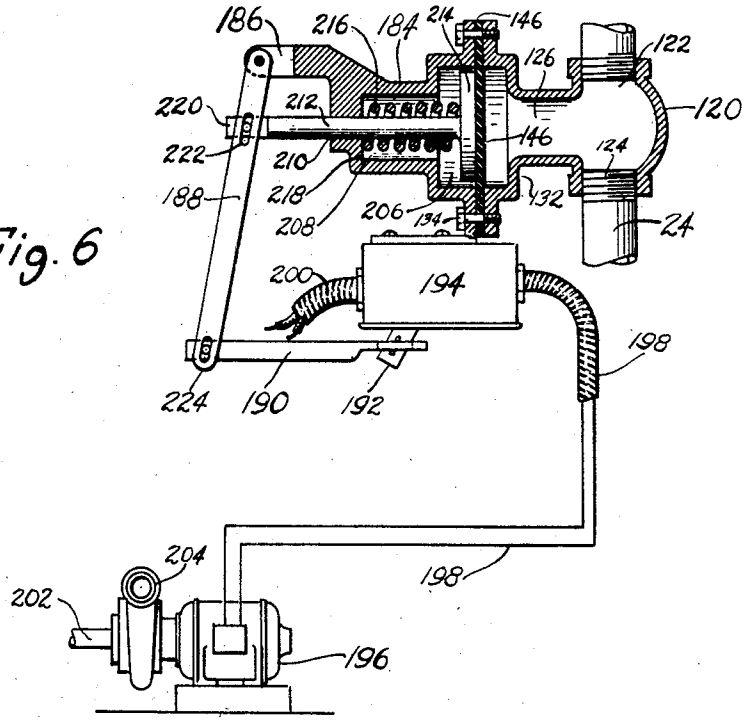
Fig. 6



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UNITED STATES PATENT OFFICE

2,266,205

CLEANING APPARATUS

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Application October 5, 1938, Serial No. 233,447

2 Claims. (Cl. 141—9)

This invention relates to improvements in cleaning apparatus, and particularly special purpose cleaning machines such as dish-washing machines of the type now in use by many restaurant establishments for cleaning large quantities of dishes, wherein a dish cleaning chamber is provided and the dishes washed and rinsed therein by means of water circulatory systems having as a necessary adjunct an apparatus for supplying both water containing a cleaning compound for dissolving and removing grease, food particles, etc., from the dishes, and also including means for replenishing any amounts of such cleaning compound lost or weakened by dilution during a cleaning operation, so as to keep such solution at proper strength at all times.

The principal object of my invention is to provide a combination of associated essential elements comprising a complete apparatus which shall fully and satisfactorily meet the present-day requirements of devices for the above-mentioned purposes, and which apparatus shall at the same time be a great improvement over similar devices heretofore used, both from the standpoint of original cost and maintenance expense, as well as subsequent economy of operation.

Another important object of the invention is to provide a cleaning apparatus equipped with a special type of dispenser or mixing and storage supply tank for concentrated cleaning material solutions or the like, which apparatus shall be of simple construction and positive and efficient of operation, composed of a minimum of parts, and less likely to get out of order than devices heretofore used for this purpose.

A further important object of the invention is to provide a cleaning apparatus composed of a number of associated elements which are readily detachable and capable of application to many other standard or special type cleaning devices, and certain of which are readily adaptable for use in connection with many other types of equipment, such as dish washing machines, laundry machines, automotive parts, cleaning equipment, bottle washing machinery, and many other devices, as well as liquid and air and other supply lines and circulatory systems in general.

Another and further object of the invention is to provide an apparatus having as an essential element thereof a storage supply container for concentrated cleaning solution, which container shall also perform the function of mixing the cleaning solution and dispensing the same, and which may be positioned either adjacent to, distant from, above, or below the plane of the other units of the apparatus to which it is connected, as for purposes of convenience or accessibility, without impairing the efficient operation of the apparatus as a whole or any individual unit thereof.

A still further important object of the invention is to provide, in combination with a water or other supply line or circulatory system of the general type above referred to, a novel flow control mechanism for automatically controlling the flow of a given element from point to point in a supply line or circulatory system where such flow is desired simultaneously and in coordination with the flow of a second supply or circulating medium, but entirely separate and independent of contact therewith.

Another and still further important object of the invention is to provide a flow control mechanism of novel construction designed primarily for use in connection with water circulatory systems or the like, but which shall be equally well adapted for use with any supply lines carrying air, gas, liquid, steam, or other elements or combinations thereof, and which mechanism shall be outstandingly efficient when used in connection with apparatus requiring an accurately measured flow of a given element which must be automatically controlled and maintained constant throughout long operating periods without adjustment.

A further object of the invention is to provide a circulating or dispensing apparatus utilizing liquid or other substances or elements as the medium circulated or dispensed, wherein such substances are treated or mixed with other substances, and wherein the treating medium is drawn from a combination mixer and supply tank and carried therefrom by means of water, air, or other elements, the source of the carrying agent being separate and distinct from that of the supply line or other apparatus to which it is related or connected, and wherein the flow of the substance through the mixing and supply tank is controlled automatically by means of a simple, readily attachable device.

Other and further objects of the invention will be apparent from the disclosure in the accompanying drawings and following specification.

The invention, in a preferred form, is illustrated in the drawings and hereinafter more fully described.

In the drawings:

Figure 1 is a vertical sectional view through a dish cleaning apparatus embodying my invention.

Figure 2 is a top plan view of a solution mixing

and storage supply container forming a part thereof.

Figure 3 is a sectional view taken on the line 3—3 of Figure 1.

Figure 4 is an enlarged longitudinal section through a flow control valve forming part of my invention.

Figure 5 is an enlarged longitudinal section through a flow control mechanism forming part of my invention.

Figure 6 is an enlarged vertical section of another flow control mechanism of my invention, illustrating the same as associated with an electric motor.

As shown in the drawings:

The reference numeral 10 indicates generally the main body portion of a dish washing machine, which device I have chosen to best illustrate certain portions of my invention. This machine consists of the usual side walls 12, bottom 14, and top 16, arranged to form a dish-cleaning chamber 18 having a built-in reservoir 20 opening therefrom for containing a solution of some suitable liquid cleaning material, such as soap-water or the like, the reservoir 20 being provided with a screened overflow pipe 22 for controlling the level of the liquid contained therein.

Machines of this type are ordinarily equipped with a system of pipes comprising standard conduits with spray-heads, which are for the purpose of forcing the contents of the reservoir 20 upward by pumping or the like for spraying the dishes or other objects contained in the chamber 18 with cleaning solution, thus removing any grease, food particles, or other matter from the surface of the dishes, the solution so used then gravitating back into the reservoir 20 for re-use or ultimate disposal through the overflow pipe 22 or in some other manner. A circulating device suitable for this purpose is shown at A in Figure 1.

Additionally there is provided a spray line which is also positioned interiorly of the device, for the purpose of spraying clear rinse water over the dishes in the chamber 18 following the initial cleaning operation above described.

Referring now to Figure 1, such spray line usually consists of an ordinary water supply pipe 24 having a manually operable shut-off valve 26 preferably located exteriorly of the machine, the pipe being introduced interiorly of the machine as shown at 28 and terminating in a spray-head 30 having a series of jets 32 through which a spray of clear rinse water may be directed downwardly over the surface of the dishes as the second step of the cleaning process, such rinse water then passing by gravity into the reservoir 20, where it comes into contact with the cleaning solution, normally diluting the same and causing a portion thereof to overflow through the pipe 22 and escape through a waste-pipe 34. A water pressure indicator 36 may be mounted at a suitable location along the rinse line 24 to determine the water pressure.

Since most machines of this type provide for gravitation of the rinse water into the solution reservoir 20 during the rinsing operation, thus diluting and weakening the cleaning solution contained in said reservoir at each operation of the rinse line and causing a portion of the diluted solution to escape, it becomes necessary to restore the cleaning solution to its original strength by adding thereto after each rinsing operation, or after like intervals, an amount of concentrated cleaning compound equal to that lost in the process of dilution above referred to, so as to maintain the cleaning solution circulated through the machine at the required strength to perform the cleaning task efficiently at all times.

This adding of cleaning compound is customarily done between primary cleaning operations. Sometimes the operator simply pours an additional amount of detergent powder or similar material directly into the reservoir 20. In other installations a supply of highly concentrated cleaning solution is brought from a nearby tank through some kind of a conduit and the flow therethrough controlled by means of a manually operable valve or the like. However, such practices have been found to be very unsatisfactory, principally for the reason that the amounts thus added are seldom accurately measured by the operator, and usually result in either too weak a cleaning solution if too little is added, or a waste of the concentrate if too much is added. Again, it sometimes happens that the time allowed for performing this task is very short, as for example during rush hours, at which time the operator might be forced to do the work hastily and without sufficient care. Occasionally the job is even completely neglected due to this or some other condition. Therefore it is the purpose of my invention to include in such apparatus a combination mixing chamber and dispenser from which a uniform solution of concentrated cleaning material is adapted to flow into the reservoir 20 automatically and in the proper quantity whenever such addition becomes necessary, thus eliminating the necessity of the operator attending to the same.

My combination mixing chamber and dispenser from which such additional concentrated compound may be drawn comprises essentially a container 38 having a removable lid 40, the under surface of which is provided with an integral flange or guide ring 42, the lid 40 being preferably tight fitting and the dispenser rendered watertight by the interpositioning of a gasket or the like 44 between container and lid, and some suitable fastening means 46 may be provided for attaching the lid 40 securely over the mouth of the dispenser.

The dispenser 38 may be in the form of a simple hollow container having an inlet 48 the flow through which is controlled by a manually operable valve 50 connected to a supply line 52 carrying a substance such as water or the like. An outlet 54 is provided in the dispenser and is preferably located near the top thereof so as to act as an overflow, and this outlet leads to the machine 10 by way of a section of tubing 56 which extends through the wall 12 of the machine and has its terminus directly over the reservoir 20.

At suitable times the container 38 is provided with a supply of soap powder or some other soluble cleaning compound in highly concentrated form, this cleaning compound becoming thoroughly dissolved by contact with the liquid entering the container through the inlet 48. The resulting solution then flows out of the container and into the reservoir 20 through the tube 56 whenever the level of the solution in the container reaches the plane of the outlet 54 and so long as liquid continues to be admitted through the inlet 48.

In order to provide for maximum efficiency I prefer to construct the dispenser 38 as best shown in Figures 1 and 3, wherein the same is formed with a relatively large central or inner chamber 58 and an outer chamber 60 separated

by a continuous wall 62, and within the central chamber 58 is positioned a third compartment in the form of a suspended soap container 64 composed of sidewalls 66 and bottom 68, the sidewalls 66 having screened openings 70, the bottom 68 being preferably spaced away from the floor of the dispenser. The upper portion 72 of the element 64 is flared outwardly, extending over the wall 62 and continuing upward and outward interiorly of the dispenser to a point adjacent the upper edge of the outer wall thereof, where it may be secured by soldering or the like to prevent leakage, or arranged in some other manner to render the contact watertight or nonspilling, and, if desired, there may be a watertight seal effected between the upper edge of the wall 62 and the flared portion 72 by the use of suitable gaskets, or by soldering or the like.

In my preferred construction of the dispenser, the inlet 48 is formed interiorly of the container with an elongated tube 74 which leads directly into the central chamber through the wall 62, where its body is directed downwardly toward the floor or bottom of the container so as to provide for the utmost contact between incoming liquid and the lower portion of the contents of the compartment 64 as well as any undissolved soap which may have gravitated through the screened openings 70 and settled upon the floor of the container.

As the liquid level within the central chamber 58 rises, the contents of the compartment 64 will become gradually dissolved by contact with the liquid passing through the screened openings 70 and into the compartment 64, and thereafter the resulting concentrated cleaning solution will pass outward in solution through the screened openings 70 and into the chamber 58, which, when filled, will allow the charged liquid to overflow into the outer chamber 60 through a series of elongated overflow tubes 76 mounted in the wall 62, the long lower ends of these tubes being also downwardly directed and leading the overflowing concentrate downward to the bottom of the chamber 60 so as to cause a maximum dissolving action of any soap particles which may have accumulated at that point. The rising of the liquid level in this outer chamber 60 will eventually cause the same to overflow through the outlet 54 for delivery of a concentrated solution of purely liquid consistency into the reservoir 20 of the washing machine 10.

In the showing made in Figure 1, the installation is one in which the concentrate is delivered into the dish washing machine under pressure, since the location of the machine proper is above that of the concentrate dispenser 38. This type of arrangement is highly desirable when it is more convenient to locate the dispenser 38 at a point removed from the machine 10 so as to make it more accessible to the operator attending to its refilling. It may, in fact, be located in a distant room or even on a different floor above or below that on which the machine 10 is located. Obviously, the dispenser 38 may also be used to supply concentrate for more than one washing machine or other apparatus, by simply providing each unit to be served with a similar line equipment to that illustrated in Figure 1, leading same to the dispenser 38, and providing the proper additional intake and outlet connections in the latter.

Referring again to Figure 1: A measured flow of water into the container 38 is provided by means of the valve 50, which is manually operable and may be of the conventional type, such as a needle valve or the like, which, when once set, will allow a predetermined rate of flow into the container 38. However, I have found in practice that the ordinary type of valve requires adjustment at short intervals because of the considerable variation in the flow of liquid therethrough due to corrosion of parts, etc. To minimize or eliminate this condition I have provided a new and novel type of valve for this purpose which performs much more satisfactorily than a needle valve and requires little or no adjustment even after very long periods of constant use, yet maintaining the maximum uniformity of the flow throughout any given period of operation. This new device is best illustrated in Figure 4, and consists of the usual body 88 provided with an inlet port 90 and an outlet port 92, with the customary packing-nut 96 and stem packing 98 and fitted with a partially solid stem 100 to which is attached a control handle 102, the stem 100 being suitably screw threaded for insertion into the body 88 in the usual manner. The lower end 104 of the valve stem 100 is hollow and of reduced size, fitting snugly into the outlet channel 92, so as to provide a watertight fit along the interior wall of said outlet channel.

The outlet opening 92 as well as the inlet opening 90 open interiorly of the body 88 into a slightly enlarged chamber 106 located centrally of the valve, the chamber 106 being large enough in size to allow for ready passage of liquid therethrough around the upper and wider central portion of the valve stem 100, and the floor of this central chamber is formed at right angles with its sidewall, forming a seat 108 for the rectangular shoulder 110 formed in the solid portion of the valve stem 100 when the valve is in fully closed position. The hollow lower portion 104 of the stem 100 extends from a lower outlet orifice 112 through the narrow portion of the stem, and terminates at a point slightly above the shoulder 110 as shown at 114. A short distance below the plane of the shoulder 110 the hollow valve end 104 is drilled transversely to provide a small inlet orifice 116 which extends through the walls of the hollow stem portion 104 to the exterior surface thereof. Thus turning the valve handle 102 in a clockwise direction will cause the orifice 116 to assume a closed position interiorly of the outlet channel 92, resulting in a closed valve and preventing the particular element carried in the chamber 106 from escaping through the orifice 116 and into the outlet 112—92, since the wall of the channel 92 will completely cover said orifice 116.

A counter-clockwise turning of the handle 102 will raise the location of the orifice 116 and cause a partial opening of the valve as soon as said orifice assumes an open connection with the central chamber 106, as best illustrated in Figure 4. Further counter-clockwise turning of the handle 102 will obviously cause the orifice 116 to assume a completely open connection with the central chamber 106, to provide the maximum amount of flow through the device, and thus providing a continuous passage for liquid from the intake port 90 to the outlet port 92, which may by this means be effectively regulated as to flow, the diameter of the orifice 116, of course, governing the maximum flow of substances through the valve when the device is in open position. In apparatus other than that illustrated herein, this same type of valve may serve equally well for lines carrying air, steam, gas, or other elements.

As hereinbefore pointed out, the rate of flow through the valve is governed by the area of the orifice 116 which is exposed above the shoulder 110, and it has been found that this construction results in a more uniform and constant flow of substances, over considerable periods of time, especially in small valves of the type used in connection with apparatus such as that hereinbefore described.

The liquid supply for the dispenser 38 may be tapped from any available supply line, as, for example, from the rinse water pipe 24 at a point anteriorly of the valve 26, thus creating a by-pass flow through the dispenser 38, which may be manually controlled by a simple use of the valve 50, by means of ordinary conduit such as the element 52.

However, when automatic and coordinated operation is desired and the rinse water is found adequate for the purpose, the rinse line 24 may be tapped on the discharge side of the valve 26, whereupon the solution replenishing process previously described will occur automatically each time the rinse line of the machine is operated by opening of the valve 26, and the delivery of cleaning solution into the reservoir 20 will continue for the exact period of time that the valve 26 remains open, and thus by a simple regulation of the amount of water circulated through the dispenser 38 by such by-passing method, any wash-water lost by dilution or overflow from the reservoir 20 will be completely replenished simultaneously with operation of the rinse line and between the heavy cleaning operations, which is the most suitable time for this purpose. It will, of course, be obvious that when a different time is selected for the replenishing operation, the liquid supply for the dispenser may be similarly tapped from other sources of supply.

When in some cleaning machine installations it is desirable for any reason to derive the supply of liquid for the container 38 from a source other than the rinse line 24, and yet retain the very desirable feature of the automatic coordinated timing, as, for example, when cold water is desired for the dispenser 38 in preference to the hot or tepid water of the rinse line 24, or when warm water is desired for the dispenser 38 when a cold rinse line is used, it would, of course, be necessary to provide some suitable automatic flow control means actuated by the pressure of the liquid carried by the rinse line.

For this purpose I have devised a novel mechanism by which the same identical result may be attained automatically, the same as in an installation in which the discharge side of the valve 26 is directly tapped for the liquid by-passing purpose. This is accomplished by tapping the discharge side of the water supply line 24 as best shown in Figure 1 as well as a second liquid supply line which may be represented by the element 118 (Figure 1) and connecting therebetween a special type of valve or other mechanism, a preferred construction of which is best shown in Figures 1 and 5, by means of which the flow of liquid from the element 118 may be started and sent through the dispenser 38 by means of tubing such as that shown at 52 whenever the rinse valve 26 is opened, and maintained throughout the rinsing operation until the valve 26 is again closed.

My preferred construction of a mechanism of this type comprises a valve consisting of a T-shaped hollow member 120 having three communicating openings 122, 124, and 126. The openings 122 and 124 are interiorly screw threaded and adapted for connection to similarly screw threaded free ends along the pipe line 24 as best indicated at 128 and 130 in Figure 1, which arrangement forms a continuous passage into the machine 10 for liquid carried through the pipe 24.

The third opening 126 is outwardly directed and slightly enlarged, as best shown in Figure 5, and the walls thereof provided with an outwardly directed annular flange 132 formed exteriorly of the opening 126 and at right angles thereto, the flange 132 having a series of openings 134 therethrough for accommodating screws, bolts, or the like 136.

To the member 120 is attached a second cylindrical member 138 having an opening 140 of substantially the same diameter and depth as the enlarged portion of the opening 126, and having a flange 142 with openings 144 corresponding to those in the flange 132, and in registration therewith. Between the openings 126 and 140 is positioned a non-rigid disc 146 preferably formed of rubber composition or similar material, capable of forming a pliant diaphragm, this disc being of a diameter large enough to cover the entire open faces 126 and 140, and the disc is preferably perforated along its periphery with openings adapted to register with the openings 134 and 144, whereby the disc 146 is held in fixed position by means of the bolts or screws 136, which are tightened to provide a perfectly watertight connection at this point.

The member 138 is formed with a continuous passage comprising a relatively small bore 148, a larger centrally located bore 150 of somewhat larger diameter, and an enlarged opening or inlet 152 which is exteriorly screw threaded to receive the similarly screw threaded end of a cap 154 having a central bore 156 beginning interiorly thereof with a recessed portion 158, and terminating exteriorly with an enlarged opening or inlet port 160 adapted for threadable engagement with the pipe line 118 by some suitable connecting means 162. The opening 140, of course, also forms part of the continuous passage just described.

A transverse bore 164 through the middle of the element 138 communicates with the passage 150, and the lower end thereof forms an outlet 166 adapted for threadable connection with the pipe 52, while its upper end is adapted to threadably receive the stem of a second pressure-gauge 168.

Positioned interiorly of the assembled elements 138—154 is a valve-head 170, one face of which is adapted to seat against an annular flat surface or shoulder 172 formed interiorly of the chamber 152, and the valve 170 has an integral stem 174 which extends interiorly through the passage 150 and is slidable therein, and is adapted to engage a slidable rod 176 having on its opposite end an integral head 178 in the form of a thin metal disc slightly smaller in diameter than the opening 140 so as to be readily movable therein.

The opposite face of the valve 170 is provided with an integral projection 180 over which is adapted to fit one end of a coil spring 182, which bears against the valve 170, and the opposite end of this spring is seated within the recess 156 and bears against the flat surface of an annular shoulder 158'. The normal closed position of the valve mechanism is best illustrated in Figures 1 and 5, wherein the spring 182 is shown bearing forcibly against the valve head 170 so as to seat

the latter against the surface 172 and cause the same to assume a tightly closed position and effectively bar passage of liquid or the like between the inlet 166 and outlet 166. Thus pressure of the valve stem 174 will have forced the slidable rod 176 with its attached head 178 to the extreme outer end of the chamber 140, where the head 178 will bear against the adjacent face of the disc 146. Thereafter any pressure exerted from within the chamber 126, as, for example, by liquid under pressure entering the discharge end of the rinse line 24, will, upon reaching the disc 146, cause the central portion of the disc to bend in the direction of the chamber 140 with sufficient force to cause the assembly 170—174—176—178 to move backward against the tension of the spring 182, causing said spring to partially contract and allow a corresponding opening of the valve 170 by separating it from the valve seat 172, and providing an opening through which liquid might pass from inlet side to outlet side of the device. Similarly, releasing of the pressure in the chamber 126 by shutting off the flow of the rinse line 24 will permit the spring 182 to again fully expand and close the valve 170 by forcing the assembly 170—174—176—178 back into its original position wherein the head 178 will have forced the central portion of the disc 146 in the direction of the chamber 126.

It will therefore be obvious that when the apparatus illustrated in Figure 1 is used, opening of the rinse water line 24 by means of the valve 26 will cause the water to flow under considerable pressure through the fitting 120 on its way to the interior spray head 30 of the dish-washing machine, and this line pressure, though it may be relatively low as compared with the pressure of the line 118, will also be effective against the disc 146 as above described, depressing same and causing opening of the valve 170, thereby permitting flow of liquid from the second supply line 118 into the dispenser 38, and causing a corresponding delivery of charged liquid into the reservoir 20 by means of the delivery pipe 56, such process then continuing without interruption until the rinse valve 26 is again shut off, and providing an automatic and perfectly co-ordinated process among the respective units of the apparatus. In a machine employing an air line in addition to the rinse line, for the purpose of drying the washed dishes, this mechanism can be similarly attached to such air line, with the same identical result, so far as automatic operation of the dispenser is concerned.

A modified form of flow control mechanism for the purpose just described and for other purposes is shown in Figure 6, wherein the discharge side of the rinse line 24 is tapped similarly to the showing in Figures 1 and 5, but the T-shaped element 120 having the three communicating openings 122, 124, and 126, flange 132, and fastening means 134, with disc member 146, are herein shown as connected to and adapted to actuate a mechanism which starts an electric pump or the like, through the medium of an electric snap switch. This mechanism consists of a member 184 having an extension 186 to which is pivotally attached a somewhat vertically disposed arm 188 which, in turn, is pivotally connected to a horizontally disposed element 190, which may be pivotally connected to the operating lever 192 of an electric switch 194 of the toggle type, said switch being connected to a motor-driven pump 196 by means of suitable electrical connections or wiring 198 receiving power through a usual source or line 200, the switch 194 itself being preferably of any one of a number of standard, well known constructions. Pump connections 202 and 204 are provided whereby liquid or other substances may be forced from point to point, as, for example, in a dish-washing machine installation or the like. The member 184 is provided interiorly thereof with an enlarged opening 206 approximately the same size as the enlarged portion of the opening 126 of the member 120, and joined thereto in the same manner as the showing in Figures 1 and 5. Opening from the chamber 206 is a smaller bore 208, with a still smaller passage 210 providing access from the exterior. Within the passage 206—208—210 is positioned a slidable stem 212 having an integral disc-shaped head 214, which is held securely against the rubber or composition disc 146 by means of a coil spring 216 located within the chamber 208 and around the stem 212, and bearing forcibly against the head 214 on one end, and on the other end against an annular shoulder 218 formed in the member 184 interiorly of the chamber 208.

The end portion 220 of the stem 212 is pivotally connected at 222 to the arm 188 in such manner that movement of the stem 212 and its related elements in a sidewise direction will force the arm 188 to move in an arc in relation to its attached parts, which arc is of greater distance at the lower end 224 of the member 188, and whereby any slight movement of the stem 212 as above described will quickly throw the switch lever 192 and start operation of the unit 196.

It will be seen that herein are provided various elements of new and novel construction which, when assembled, comprise cleaning and other apparatus for widely diversified uses, the individual elements of which are readily attachable and interchangeable with similar purpose devices of an unsatisfactory nature, now in use.

I am aware that many changes may be made and numerous details of construction varied throughout a wide range without departing from the principles of this invention, and I therefore do not purpose limiting the patent granted hereon otherwise than as necessitated by the prior art.

I claim as my invention:

1. A cleaning apparatus, comprising in combination, a cleaning chamber, a liquid storage reservoir in connection with said cleaning chamber, means for circulating the contents of said reservoir within said cleaning chamber, a pair of non-communicating supply lines, the first of said supply lines being introduced interiorly of said cleaning chamber and having an outlet within said chamber, a flow control valve for said first supply line, a reagent dispenser, said dispenser having inlet and outlet means, the second of said supply lines delivering substances to said dispenser through the inlet thereof, said dispenser outlet being connected to the cleaning chamber, and means actuated by the pressure in the first supply line when the flow control valve therefor is open for controlling the delivery of substances from said second supply line through said dispenser, whereby the substance carried by said second supply line may pass through the said dispenser and contact a reagent contained therein and thence proceed to said reservoir.

2. A cleaning apparatus, comprising in combination, a cleaning chamber, a liquid storage reservoir in connection with said cleaning chamber, means for circulating the contents of said

reservoir within said cleaning chamber, a pair of non-communicating supply lines, the first of said supply lines being introduced interiorly of said cleaning chamber and having an outlet within said chamber, a flow control valve for said first supply line, a reagent dispenser, said dispenser having inlet and outlet means, the second of said supply lines for delivering substances to said dispenser through the inlet thereof, said dispenser outlet being connected to the cleaning chamber, a normally inactive electrically driven pump for controlling the flow of substances through the second of said supply lines, and a pressure operated switch responsive to the pressure in said first supply line when the flow control valve therefor is open for activating the normally inactive pump.

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