This invention relates to glassware cleansing machines suitable for cleansing tumblers and the like.

The purpose of the machine is to remove soil, residue material, cosmetic, etc. from the tumbler or other receptacle and also to sanitize the tumbler surface, rendering it substantially free of bacterial contamination. These two results are achieved by the same cleansing action which repeats itself during each cycle of operation on the machine. Each item of glassware is thus ensured of an effective cleansing operation to make it fit for re-use.

It has hereunto been common practice in connection with washing machines for glasses and the like to supply washing fluid at a relatively high temperature, frequently of the order of 170-180° F. The heat of the washing fluid at this temperature is such as to contribute materially to the sterilizing effect and even though germicidal materials were added to the washing solution, the temperature of the solution was maintained at this relatively high value in order to obtain the necessary cleaning effect.

In accordance with the present invention a glassware washing machine is provided particularly adapted for the washing of glasses, tumblers, and the like, utilizing a supply of unheated water supplied from the water tap and a measured amount of germicidal material, this combination being highly effective at the relatively low temperature. The machine is designed to accomplish an effective washing and scrubbing action of the inner and outer surface of the tumbler while at the same time introducing a flow of germicidal material and unheated water directly onto the surface to be cleaned, assuring a full and complete coverage of the entire surface of the article being washed.

Further, where it has been common in the past to have a washing cycle in which all or a part of the washing liquid is recirculated, the present invention provides for a direct continuous flow of unheated fresh water from a tap or supply line into which a predetermined quantity of the cleansing agent is introduced. An arrangement such as this has several advantages. That is, it makes it possible to obtain adequately clean glasses without the need for a supply of hot water. The machine is merely connected to an ordinary cold water supply line and there is a consequent reduction in the expense for installation and operation. It likewise eliminates the need for a collecting tank or reservoir as well as a water pump for recirculating wash water from such reservoir. The machine thus is smaller in size, lighter in weight, and more economical in manufacture.

Still further, the machine in operation utilizes a continuous flow of fresh water which serves at one time during the cleansing cycle as a carrier for the germicidal agent mixed therewith, and thereafter, the flow of fresh water provides a rinsing action at the glassware surface, removing the germicidal agent.

During the cleansing cycle, it is possible to vary the point at which the cleansing agent is included within the stream of fresh water, thereby providing if desired, a prewash in which a major part of the foreign material, soot, etc. is first removed. The prewash is then followed by the cleansing and rinsing action.

Since all residues do not respond in the same manner to a given cleansing cycle, various changes may be made in the duration of prewashing, cleansing, rinsing, so as to provide the most effective steps of removal of the foreign material. Even for the most adherent type foreign materials such as those with a high fatty content, an effective cleansing cycle can be obtained with the machine of the present invention using water at ordinary tap temperatures.

The machine in operation, simultaneously scrubs both the inner and outer tumbler surfaces while at the same time providing a continuous flow of water and cleansing agent against said inner and outer tumbler surfaces.

A further object of the invention is to provide a scrubbing action on the items of glassware in such manner that there is only negligible imbalance of forces on the glass wherein no apparent twisting effect is developed on the glass making it quite effortless to hold the item of glassware in washing position. This object is accomplished by means of a central brush rotatable about the longitudinal axis thereof and a series of outer brushes also rotatable about the longitudinal axis of said inner brush but in the opposite direction of rotation. During the described counterrotation, a flow of cleansing agent is provided through said inner brush as well as through an outer spray ring. The means for achieving counterrotation of the brushes is a novel arrangement of coaxial drive shafts which are turned oppositely for actuation of the respective inner and outer brushes. Drive means are associated with one end of each of said drive shafts to receive motive power from a source such as an electric motor or the like.

It is a feature of the machine construction that the series of outer brushes are mounted for radial movement toward and away from the central brush to accommodate different diameter size glassware. The outer brushes are further mounted to rock slightly about their centers in order that the brushes can conform with the outer surface of the glassware thus making it possible to cleanse glassware having a considerable range in size and shape.

Another feature of the outer brush arrangement is the provision of means movable radially to direct the outer brushes into forcible engagement with the outer glassware surface.

It is an object of the invention to accomplish a complete washing and rinsing cycle of the glassware in a short period of time thus conserving water and cleansing agent which are the most expensive materials, and also making it possible to handle greater quantities of glassware. The time period of the washing and rinsing cycle can be reduced because of the efficiency of cleansing operation, which takes place over a definite time period so that each item of glassware will receive a standard cleansing treatment which enables the glass to meet rigorous hygienic requirements. A timer mechanism is provided for this purpose and the operator is not required to guess what is the proper time to allot each item of glassware. The machine operation begins automatically by inserting an item of glassware in washing position, it runs for a prescribed period and then shuts itself off, all automatically.

It is a further object of the invention to provide a glass washing machine operation which provides at each cleansing cycle, a predetermined quantity of cleansing agent having both germicidal and detergent properties, the structure providing this being an axial flow positive displacement pump which delivers said cleansing agent during any selected portion of the cleansing cycle.

It is of further importance to the invention that the outer brushes are reversible end-for-end to provide greater uniformity of wear of the bristles.

Another object of the invention is to provide a glass cleansing machine in which various safety features are
The central brush consists of a corrosion resistant post 37 having a number of bristles 38 extending radially outward from the longitudinal brush axis which is the axis of rotation of the brush 36. The bristles 38 are formed in three rows along the length of the post 37, as indicated in FIGS. 10 and 11. Since the tips of the bristles 38 are most effective in cleansing the interior surfaces of the glassware 35 the bristles are cut at an angle (FIGS. 2, 10) so that they extend outwardly with a tapered radial dimension. As shown in FIG. 11 this has the effect of providing contact of at least a portion of the bristles along the tips thereof regardless of variations in dimension of the tumbler. At the top of the back and brush 36 (FIG. 2) the bristles 38 extend in such a direction that they will contact the inside bottom of the glass to perform a scrubbing action at this surface. Thus a glass which is inverted and fitted over the inner brush will have all of the inner surfaces thereof contacted by the bristles 38.

A number of outer brushes 40 are spaced circumferentially within the machine (FIGS. 10, 11) to scrub the outer surface of the tumbler 35. Each outer brush 40 comprises a corrosion resistant backing 41 constructed from a felt-like material such as nylon or the like. Bristles 42 are spaced along the length of the backing 41 and are fixed at the ends thereof in the backing 41. The bristles are relatively pliable so that they can bend at the tips thereof in order to accommodate various size tumblers. Backing 41 has at its midsection a slotted boss 43 which can be press fitted onto a cross bar 45 of an adapter 46. The adapter 46 in turn, is mounted by trunnions 47 in the slotted arms 48 of a rotatable spider designated generally by reference numeral 49.

Three pairs of arms 48 are provided for as many adapters 46, each carrying an outer brush 40. The slotted boss 43 allows the outer brush to rock back and forth on the cross bar 45, this rocking movement being limited in one direction by a stop 50 and in the other direction by a stop 52. The adapter 46 rocks back and forth on trunnion 47 which fits within the slots 53 of arms 48. The described rocking movement of the outer brushes 40 enables usage of the machine with various size and shaped tumblers. The adapters 46 can retract radially for larger size tumblers and the brushes will rock back and forth to insure complete contact along the entire outer surface of the glass.

End 55 of each adapter is enlarged and forms a counterweight with respect to the outer brush carried oppositely to trunnion 47 which acts as a fulcrum. The ends 55 tend to be thrown radially outward by centrifugal force when the spider 49 is rotated, thus pivoting the adapters 46 on trunnions 47 and bringing the outer brushes 40 radially inward against the surface of the tumbler 35.

Each of the outer brushes can be pulled off its associated cross bar 45 and reversed end-for-end in order to equalize wear of the bristles which tend to become worn at a faster rate along the leading edges 57 thereof. When the brushes are reversed, the zone of greater wear is transferred from one side of the brush 40 to the other, so that longer usage is had from the brush before it is disposed of by normal attrition.

The outer brushes 40 are rotated by the spider 49 which is fastened through a central bushing 58 with a bayonet lock 60 (FIGS. 3, 8). The drive shaft 62 (FIG. 3), the drive shaft 62 being rotated by a bayonet driving member 63 having a spline connection 65 with the end 66 of shaft 62 (FIG. 5). The bayonet lock 60 facilitates removal of the spider 49 for inspection, service, periodic cleaning, reversal of the outer brushes 40, etc.

The inner brush 36 is rotated oppositely from the outer brushes 40 by an inner drive shaft 70 which is coupled with drive shaft 62 and has a bayonet lock 72 (FIG. 3) with the post 37 of the inner brush 36, the bayonet lock permitting ease of removal of the inner brush. At the
end 73 of drive shaft 70 is a bevel drive member 74 similar in construction to the bevel drive member 63 and likewise a spline connection 75 therebetween. The two bevel drive members 63 and 74 can move relatively to the coaxial shafts to provide for variations in location. Drive shaft 76 is a bevel drive shaft 77 functionally engaging members 63 and 74. A spring 78 is provided to urge the drive member 77 into engagement with bevel drive members 63 and 74, the force of engagement between drive member 77 and the two drive members 63, 74 is equalized by cups 80 connected to each member 63, 74 and having bearing balls 82 therebetween. Power shaft 76 is turned by a motor 85 mounted on an inclined axis as indicated in FIG. 2.

To cleanse the tumbler, a fresh water supply is provided through the inlet conduit 87 (FIG. 12) at tap temperature and no effort is made to elevate the temperature thereof. The incoming water passes through a screen 89 which strains out any foreign material in the incoming water.

An inlet valve 90 turns the supply of water off and on. The inlet valve 90 admits water at constant flow rate regardless of line pressure this being accomplished by suitable flow control orifice within the valve. The water supply conduit 92 where it passes through an elevated vacuum breaker 95, the purpose of which is to prevent reverse flow of water back through the supply conduits 92 and 87 and into the potable water supply. Once the water supply passes the vacuum breaker it is fed downwardly through conduit 96 to a mixing chamber 98 where it meets with a slug of fluid carrying a cleaning agent which is stored from storage chamber or tank 100 (FIG. 2) through line 102 by pump 104. The combination of cleansing agent and water then leaves the mixing chamber 98 through a length of corrosion resistant conduit 105 which connects at a 110 where the flow is divided between conduit 107 and conduit 108. The conduit 107 extends upwardly and is then bent into a circular or ring outline 109 terminating at closed end 110. A series of perforations 111 project the water and cleansing agent inwardly in a spray which is directed against the external surface of the tumbler.

The flow in conduit 108 is fed to an annular chamber 112 (FIGS. 3 and 4) where it passes through openings 113 into a second annular chamber 114, the chamber 114 being defined as the spacing provided between collar 116 and shaft 62 (FIG. 4). The fluid in chamber 114 passes radially inwardly through conduit 115 and then passes upwardly in a circumferential direction through the center of the shaft 70. The conduit sections 115 also serve as retaining pins for the collar 116 which forms the inner surface of chamber 114. Instead of the four conduit sections 115 shown in FIG. 4, it is also possible to use a less number as for example two in order to simplify the construction and provide greater economy in manufacturing. The fluid then passes through the hollowed center portion 118 of the post 37 of the center brush 36 and is ultimately discharged through outlet openings 120 (FIG. 2) at the upper end of the post 37. The discharge through openings 120 subjects the exterior surface of the tumbler to a spray of water and cleansing agent to provide a washing and rinsing action at this interior surface.

Suitable seal members 125, 126, 127 and 128 are provided to confine liquid within chambers 112, 113 and 117.

To transfer the cleansing agent from storage 100 (FIG. 2) to the motor 85, the vacuum is momentarily relieved. The ball check valve 88 is actuated to pull the piston 130 (FIGS. 13, 14) upwardly causing a positive fluid displacement by axial flow through the pump. As the piston 130 moves upwardly, one-way valve 131 is raised from seat 132 against the resistance of spring 133 allowing liquid cleansing agent to flow in the direct direction of the arrowhead 134 through the motor. The water displacement continues through the outlet passage 140 against the resistance of the fluid loaded ball check valve 141. Thus, during the upstroke of the piston 130 a quantity of liquid cleansing agent is pumped from annular spacing 139.

When the machine ends the washing cycle, spring 142 pushes the piston 130 downwardly, closing the one-way valve 131, and the quantity of fluid trapped in expanded chamber 143 is passed upwardly, unseating ball check valve 135, and liquid cleansing agent is forced through interior chamber 144 and radial passages 145 to annular spacing 139. Since the cross sectional area of chamber 143 is greater than the cross sectional area of spacing 139, more fluid is displaced on the downstroke of the piston then was pumped during the upstroke of the piston. This additional volume is forced through outlet 140 as provided by the action of valves 131, 141. The slug of fluid which is pumped during downstroke of the piston 130 remains in the vicinity of chamber 98 since water flow is stopped at the time of the piston downstroke. The slug is retained in the chamber 98 and is carried out by the flowing water along with the slug of fluid displaced during upstroke of the piston 130 in the next cleansing operation. The pump 104 is thus double acting in that an axial flow is provided during upstroke of the pump in either direction. The pump is self-priming and is particularly adapted to deliver precise quantities of cleansing agent. The quantity of liquid delivered for each reciprocation of the pump is measured by the length of stroke of piston 130. This stroke length is regulated by means of a stem 146 threadedly received in an end plate 151 of casing 149 of the pump to define the lowermost position of the piston 130. Since the upstroke of piston 130 is controlled by solenoid operation, the regulation of pumping volume is determined by movement of the stem 146 so as to control movement of the piston 130 in the opposite or downward direction. Once an adjustment is made the stem remains stationary (FIG. 15). Accuracy of volumetric delivery by the pump can be adjusted and maintained to within extremely close limits.

Placement of a tumbler or other item of glassware 35 in washing position is used to start operation of the machine. When an inverted tumbler 35 is fitted over the inner brush 36 the tumbler is moved downwardly until the base contacts push rod 152 (FIGS. 2, 3 and 6) fitted within opening 153 of the inner brush 36. Grooves 154 along the sides of opening 153 permit movement of water and cleaning agent upwardly for discharge through outlet opening 120. Then the push rod 152 and the opening 153 of the inner brush 36 which permits the passage of fluid to flow upward and out the tip of the post 37 so that the bottom of the tumbler (or other item of glassware) is wetted by the cleansing and rinsing fluid. The clearance need not be great, only sufficient to allow the fluid to pass between push rod 152 and opening 153 and out of the opening in the end of post 37.

The push rod 152 is moved downwardly against the resistance of spring 160 acting against washer 162 received within a recess in rod 165. The end 165 of rod 165 is socketed to receive the push rod 152 therein. Tapered end 167 of rod 165 is moved downwardly by insertion of the tumbler, thereby contacting cam follower 168 (FIG. 2) to close normally open switch 170 (FIG. 16). Closing of switch 170 will start operation of the machine assuming there is sufficient water pressure and sufficient cleansing agent in storage.

The machine is inoperative when there is insufficient water pressure. A switch 172 (FIG. 16) responsive to pressure in the water supply line is connected to line 88 (FIG. 12) which leads from the inlet water supply line 97. The switch 172 is arranged to break the circuit from conductor 175 to conductor 176 when the water pressure drops below a predetermined level.

To safeguard against operation of the machine where there is insufficient cleansing agent, a float 177 is provided which is responsive to the level of the cleansing
agent in storage tank 100. The float 160 is arranged to drop with the falling level of detergent to open switch 178 breaking the circuit in conductor 176 to 179, thus preventing operation of the machine under these conditions. A light signal 190 is lit by completing a circuit from conductor 176 to conductor 191, signaling the need for replenishing the cleansing agent.

When the switch 179 is closed by insertion of a tumbler in washing position the timer 182 is started. Assuming that cleansing agent is to be used at the start of the washing cycle (no "prewashing" phase), the switch 183 is closed and switch 184 opened so that current is made to flow through conductors 186, 187 by operation of the timer 182 and thence through conductors 189, 191 and 193 to energize solenoids 194 to open inlet valve 90, and energize solenoid 196 to operate pump 104 by lifting piston 130. Conductor 193 completes the circuit to motor 85 which has a capacitor 198 for starting of the motor 85. Conductors 200, 201 and 202 from the solenoids 196, 194 and motor 85 are connected with conductor 205 to complete the circuit to the master switch 206.

For washing some kinds of residue from glassware such as milk or other fatty content materials, it is sometimes desirable to provide a prewash cycle which will flush the residue from the tumbler, this prewash being followed by a slug of cleansing agent and thereafter a rinsing operation. To accomplish this prewash the timer 182 is adjusted by opening switch 183 and closing switch 184 thus providing at the first interval a circuit from conductor 186 to 187 to energize the motor 85 initiating scrubbing action and also to energize solenoid 194 to operate valve 90 opening water line 87. Then after a predetermined period, the timer closes switch 210 to provide a circuit from conductor 186, 211, 212, normally closed switch 214, and conductor 213 to energize detergent pump solenoid 196. To provide a full measure of cleansing agent, the switch 184 is immediately opened thereafter, and solenoid 196 is deenergized, causing downstroke of the piston 130 to add a further increment of cleansing agent. This sequence is in contrast with the previous arrangement, in which cleansing agent is provided at the very beginning of the cycle and the timer provides for energization of the pump actuator solenoid 196 at the beginning and at the end of the washing cycles.

During the cleansing operation the liquid cleansing agent and water is discharged. waste is collected in the collection chamber 221 against the glassware and flows downwardly against the walls of casing 24 where it is collected at the lowermost part of the catch basin 23 and then runs out discharge opening 220 (Figs. 2, 12). The discharge opening 220 discharges the waste fluid through a T to a discharge line 221 having a hose 222 connected therewith. The flexible length of hose 222 then leads to a waste sink. In some installations the discharge line 221 can be permanently connected to a discharge facility. If the discharge line 221 becomes clogged and drainage becomes inadequate, waste fluid will eventually reach a spill line indicated by the dashed liquid level 225, whereupon it spills over the lip of the catch basin. Above this level 225 is a short length of conduit 226 which can drain substantially all of the liquid in the fluid line beyond vacuum breaker 95, thus preventing any siphoning of fluid back to the potable water supply even in the event of malfunctioning of vacuum breaker 95.

Since conduit 226 is at all times above uppermost level to which wastage fluid can rise, there is no possibility for siphoning any of the wastage fluid back to the potable water supply through the fluid conduits even in the event of malfunctioning of vacuum breaker 95. This arrangement fulfills all of the usual requirements in plumbing codes in various municipalities and States for safeguarding the potable water supply.

In operation, the timer is generally set to provide a total cleansing cycle of approximately 4 to 6 seconds per item of glassware. Assuming the water flow rate of two gallons per minute there is approximately 15 to 22 ozs. of water used per glass per washing cycle. In conjunction with this water, an amount of cleansing agent of the order of 1/2 to 2 fl. oz. ml. is suitable. An idophor cleansing agent having both detergent and germicidal properties has been found very effective for purposes of the present invention. A satisfactory material is that put out for example by Economies Laboratories, Inc., under the trade name "Micro-Kleen GW" or a product of Dubois Co. Inc. under the trade name "Fledex." This material can be replaced if desired by other suitable detergent-germicidal cleansing agents.

Assuming that the glassware is to be cleaned without a prewash, the timer is set to operate the pump 104 immediately upon starting operation of the machine. An item of glassware, such as tumbler 35 is inserted through opening 31 and being inverted, it is fitted over the inner brush 36. The base of the tumbler pushes against the rod 152 bringing end 167 into contact with can wheel follower 168, closing switch 179. Assuming that there is sufficient water pressure and cleansing agent, the closing of switch 179 will initiate operation of the machine.

The timer is started to run and will continue to run for a six second period during which time current will flow from conductors 186, 187, 193 to energize motor 85. Drive member 77 frictionally engages the tapered oppositely rotatable driver members 63 and 74 which counter-rotate the coaxial drive shafts 62 and 70. The drive shafts turn in turn counterrotate brush 36 and the spider 49 carrying outer brushes 40. The counterrotating brushes are caused to turn at approximately 500 r.p.m. As the outer brushes rotate, the ends 55 of their associated adapters 46 move radially outward under centrifugal force to bring the brushes into engagement with the outer surface of the tumbler 35. The outer brushes can rock back and forth at the center thereof so as to accommodate different tumbler shapes and sizes.

Since the inner and outer brushes are counterrotating, the wiping action of the bristles on the tumbler at the inner end and outer surfaces is in opposition and the forces are substantially balanced so that very little effort is required by the operator to hold the tumbler in place while it is being brushed.

During the cleansing cycle the timer also completes a circuit through conductors 185, 186, 197, 191, to energize solenoids 194 operating valve 90 in the water inlet line 87 so that water is supplied continuously during the cycle to the machine. It has been found from control test procedures that the water need not be heated in order to produce an effective sanitizing of the glass. Although hot water can be used, it has become unnecessary to rely on heat as a cleansing factor in the invention. When the water enters the machine, it passes through conduit 92, the vacuum breaker 95, conduit 96 to the mixing chamber 98 where there is awaiting the cleansing agent metered from the pump 104. Approximately one half of the measure of cleansing agent is obtained from the downstroke of the piston on the last part of the preceding wash cycle and the other half comes from the upstroke of the piston which takes place at the very first part of each wash cycle. Assuming that the tumblers do not require an initial rinse during the washing cycle the contamination of cleansing agent and water is sprayed on the glass at the outset of the cycle. The timer is set to provide immediate detergent with switch 183 closed and switch 184 opened. Thus a circuit is made through conductor 186, conductor 187, conductor 189, closed switch 184, and conductor 213, solenoid 196 for immediately operating pump 104 to draw the piston 130 upwardly. This meters out a quantity of cleansing agent, which, adds to the increment from the preceding cycle already contained in the mixing chamber 98.
The two fluids, water, and cleansing agent pass through conduit 105 to the T 106 where the flow is divided between conduits 107 and 108, the flow in conduit 107 being sprayed over the external surface of the tumber and the flow in 108 being passed upwardly through the coaxial drive shafts and center brush post for discharge through openings 120 onto the interior of the tumber. Fluid is also caused to spray out of the end of post 37 because of the clearance between the push rod 152 and opening 153. The glass receives the mixture of cleansing agent and water for about the first second of the washing cycle. A part of the flow in conduit 108 is also directed to the short bush conduit 226 (FIGS. 2, 4, 12) where it is directed out the opening 230 forming a spray which is directed in the direction of the lip of the tumber.

For the next five seconds of the washing cycle the liquid sprayed on the tumber consists entirely of the cold water which rinses the cleansing agent from the tumber surfaces and also facilitates removal of residue, foreign material, etc., from the tumber surface. The one and outer brushes continuously counterrotate to provide scrubbing action throughout the six second glass cleansing operation.

While the operation is described as lasting six seconds, the time period can be lengthened or shortened as desired, by suitable adjustment of the timer 182. Also, the quantity of cleansing agent can be varied to suit requirements, this adjustment being as previously described.

Once the machine 20 is set for a given time period of cleansing operation, the machine will cycle at this period for each item of glassware and then the machine will shut itself off by breaking contact of conductor 186 with conductor 187 (see FIG. 16) through the timer 182 at which time the motor 85 is shut off, the water valve 90 is closed to shut off the supply of water to the level and the solenoid 196 of the cleansing agent pump is deenergized causing downstroke thereof.

The timer resets itself so that the machine is then ready for the next succeeding cleansing cycle.

The machine is constructed so that it will not pass contamination from one item of glassware to the next. That is, the brushes themselves are self-cleansing so that if they should pick up any bacterial contamination from one item it will not be passed onto the next because each cycle ensures cleansing action of the brushes as well as the glassware.

The over-all cleaning efficiency of the machine is accomplished by reason of the fluid distribution system which exposes substantially all of the glassware surface and brushes to the cleansing agent material which has both detergent and germicidal properties.

The cleansing cycle is more effective for removing residue material such as the residue from milk shakes and the like if there is used a prewash, followed by an injection of detergent and then a rinse. In this case, the six-second cleansing cycle consists of a two-second spray of water, then a one-second detergent-water spray, then three seconds of clear water rinse. Especially for removing milk residue from glasses this prewash step is desirable. The variation is provided by changes in the timer 182 which switch 183 is open and switch 184 is closed. The timer 182 then acts to close switch 210 to energize the cleansing agent pump solenoid 196 to operate the pump 104 after a set duration of the cleansing cycle.

Because the machine is used to sanitize the glassware used in public institutions, it must be subject to periodic checks to determine whether it is in satisfactory working order. It forms an important part of the invention that the machine can be readily inspected and checked to see if in proper working order. For example, the line 102 from the cleansing agent tank 109 to the pump 104 contains a flexible length of plastic conduit which can be connected with a delivery pipeette containing liquid cleansing agent. The machine is then operated to determine whether or not the operation of pump 104 will remove the prescribed quantity of fluid from the pipette.

As an additional safety factor, the machine will not operate under inadequate water pressure by reason of operation of sensing apparatus 172; neither will the machine operate if there is an inadequate supply of cleansing agent in the tank 100 by operation of the float valve 177 and switch 178.

The washing cycle is sufficiently rapid so that large quantities of glassware can be treated. Therefore the machine is especially adapted for restaurants, hospitals, public institutions, etc., where glassware must be cleaned rapidly and efficiently. Because each item of glassware is subjected to the same cycle, the cleansing action provides a uniform protective treatment to all items of glassware without the independent judgment of the operator.

While the form of machine herein described constitutes a preferred embodiment of the invention, it is to be understood that this invention is not limited to this precise form of machine and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. A cleansing machine adapted for effective operation with unheated water to cleanse and sterilize individual pieces of glassware and the like, comprising counterrotatable brushes means concentrically arranged and spaced apart in the form of a piece of glassware therebetween and to provide simultaneous scrubbing actions in opposite directions at the interior and exterior surface of said glassware, motor means to rotate said brush means, conduit and spray means connected to transmit unheated water from a supply line onto the glassware while it is being scrubbed, starter switch means, means responsive to movement of a piece of glassware into scrubbing relation with said brushes to close said switch means and initiate operation of said machine, electrically operated valve means controlling water flow through said conduit means to provide a washing and rinsing cycle, a timer mechanism controlling the duration of operation of said motor means and operation of said valve means to provide a continuous flow of water through said conduit means during said washing and rinsing cycle in response to actuation of said switch means, a storage chamber for liquid germicidal agent, and a positive displacement pump also controlled by said timer mechanism and connected for metering quantities of germicidal agent from said chamber into the flow of water conducted onto the glassware during the washing portion of each operating cycle.

2. In a glassware cleansing machine, counterrotatable brush means concentrically arranged to provide simultaneous scrubbing actions at the interior and exterior surface of individual pieces of glassware, motor means to rotate said brush means, conduit means to transmit fluid for washing and rinsing said glassware while it is being scrubbed, starter switch means, means responsive to movement of said glassware into scrubbing relation with said brushes to operate said switch means and initiate operation of said machine, a timer mechanism actuated by said starter switch means for controlling the duration of operation of said motor means, a normally closed electrically operated valve means operable by said timer to allow continuous fluid flow through said conduit means during a washing and rinsing cycle, a positive displacement pump actuated by said timer and operative to meter quantities of germicidal agent into said fluid to be carried by said fluid over said glassware, and circuit means predetermining the point in said cycle at which said pump becomes operative.

3. In a glassware cleansing machine suitable for cleansing tumbler and the like, two oppositely rotatable co-axial drive shafts each having a beveled drive member at one end thereof, said drive members being adjacent to each other and having their respective beveled parts arranged facing each other, means connecting each said
drive member to its respective drive shafts while providing for movement of the drive members along the lengths of said drive shafts, a motor for driving said drive shafts, beveled drive means connected to said motor and mounted on an axis transverse to said drive members, means urging said drive means into engagement with said drive members to produce opposite rotation thereof, said drive members being displaceable along said drive shafts to provide for variation in location of said drive means, means connecting said drive members to equalize the driving force developed thereon by said drive means connected to said motor, and counterrotatable beveled drive means operated by said respective drive members, the bristles of said brush means being proportioned to receive an inverted tumbler therebetween for cleaning simultaneously and in opposite directions the interior and exterior surfaces thereof.

4. In a machine for cleansing individual pieces of glassware, a fluid distribution system for conducting germicidal agent and rinse water to said glassware, said fluid distribution system comprising a first conduit having a circular perforated portion for discharging fluid onto the exterior of the glassware, oppositely rotatable coaxial drive shaft means each having brushing elements associated therewith for simultaneously obtaining said interior and exterior of said glassware, a second conduit constructed interiorly of said drive shaft means for conducting fluid to the interior of the glassware, electrically operated valve means for connecting a water pressure source to said conduits, mechanically operated switch means for initiating operation of the system, and an actuating means connected to placement of a piece of glassware between said brushing elements, a positive displacement pump means for measuring out a predetermined quantity of germicidal and detergent material, said pump being connected to inject such material into the water supply admitted through said valve means, a timer mechanism actuated initially by said switch means and regulating the duration of cleansing operation, said timer operating both said valve means and said pump means and including electrical control means for determining the stage at which said pump is operated.

5. A machine for rapidly cleansing and sanitizing individual pieces of glassware, tumblers, and the like, comprising wall means defining a washing chamber, hollow coaxial drive shafts extending into said chamber through said wall means, concentric inner and outer cleaning brushes mounted on said shafts and defining the circumference of a single piece of glassware, a spray member adjacent said outer brush and having means to direct a spray of cleansing liquid over the outer surface of a piece at said washing station, a central spray device within said inner brush and arranged to direct cleansing liquid over the interior of the piece, conduit means extending from said spray member and said central spray device and adapted for connection to a supply source of water, a control valve in said conduit means and selectively operable to determine the length of time of spraying each piece, drive means operable to rotate said shafts during opening of said valve, a storage tank for germicidal cleansing agent mounted adjacent said chamber, a selectively controlled metering pump connected to withdraw a predetermined amount of cleansing agent from said tank and to inject said amount into said conduit means for direct supply with water to said spray ring and said central spray device, means operable to maintain positioning of said germicidal agent over the piece before spraying of water is commenced, and a drain connection means for controlling the duration of opening of said valve and running of said motor means and operating said pump during a portion of the length of time said valve is opened substantially prior to closing of said valve to dispose of all sprayed liquid.

6. A machine for rapidly cleansing and sanitizing individual pieces of glassware, tumblers, and the like, comprising wall means defining a washing chamber, hollow coaxial drive shafts extending into said chamber through said wall means, concentric inner and outer cleaning brushes mounted on said shafts and defining the circumference of a washing station for a single piece of glassware, a spray ring surrounding said outer brush and having means to direct a spray of cleansing liquid over the outer surface of a piece at said washing station, a central spray device within said inner brush and arranged to direct cleansing liquid over the interior of the piece, conduit means extending from said spray member and said central spray device and adapted for connection to a supply source of water, a control valve in said conduit means and operable to determine the length of time of spraying each piece, drive means operable to rotate said shafts during opening of said valve, a storage tank for germicidal cleansing agent mounted adjacent said chamber, a selectively controlled metering pump connected to withdraw a predetermined amount of cleansing agent from said tank and to inject said amount into said conduit means for direct supply with water to said spray ring and said central spray device, means operable to maintain positioning of said germicidal agent over the piece before spraying of water is commenced, and a drain connection means for disposing of all sprayed liquid.
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 coaxial drive shafts extending into said chamber through said wall means, concentric inner and outer cleaning brushes mounted on said shafts and defining therebetween a washing station for a single piece of glassware, a spray ring surrounding said outer brush and having means to direct a spray of cleansing liquid over the outer surface of a piece at said washing station, a central spray device within said inner brush and arranged to direct cleansing liquid over the interior of the piece, conduit means extending from said spray ring and said central spray device and adapted for connection to a supply of water, a control valve in said conduit means and selectively operable to determine the length of time of spraying each piece, drive means operable to counter-rotate said shafts during opening of said valve, a storage tank for germicidal cleansing agent mounted adjacent said chamber, a selectively controlled metering pump connected to withdraw a predetermined amount of cleansing agent from said tank and to inject said amount into said conduit means for direct supply with water to said spray ring and said central spray device at each actuation of said pump, means operating said pump during a portion of the length of time said valve is opened and prior to closing of said valve to distribute the germicidal agent over the piece before spraying of water is completed, a drain connection from said chamber for disposing of all sprayed liquid, a timer control connected to operate said drive means and to open said valve for a predetermined cycle time, said control also having a connection to actuate said pump during an initial portion of said cycle time, and switch means responsive to positioning of a piece at said washing station to initiate operation of said timer control.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,044,092

July 17, 1962

Gerald B. Fox et al.

It is hereby certified that error appears in the above numbered pat-
ent requiring correction and that the said Letters Patent should read as
corrected below.

Column 10, line 62, for "operable" read -- operable --;
column 14, line 11, for "1,921,681" read -- 1,921,680 --.

Signed and sealed this 13th day of November 1962.

(Seal)

Attest:

ERNEST W. SWIDER
Attesting Officer

DAVID L. LADD
Commissioner of Patents