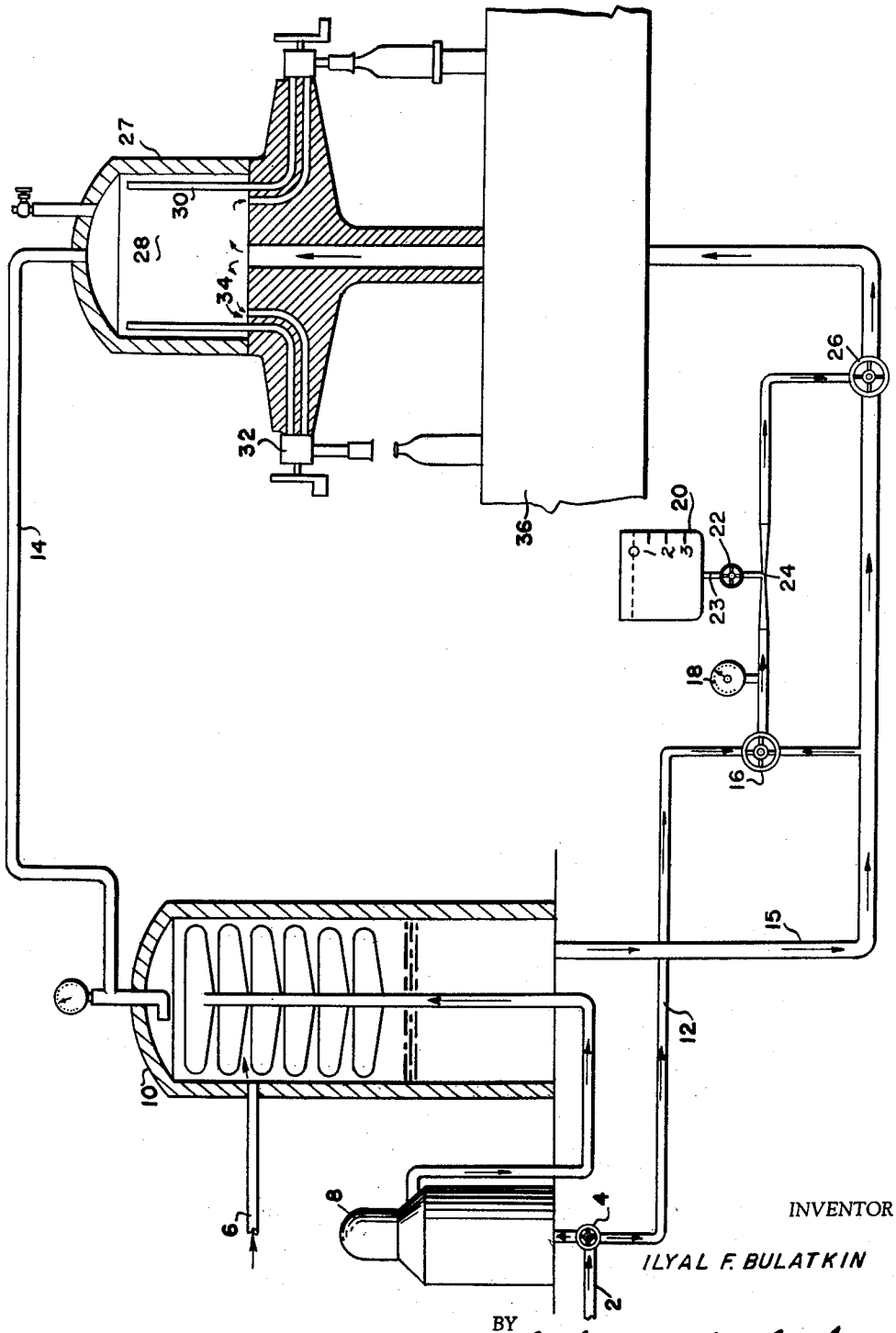
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METHOD OF SANITIZING CARBONATED BEVERAGE BOTTLE FILLERS

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METHOD OF SANITIZING CARBONATED BEVERAGE BOTTLE FILLERS

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This invention relates to bottling systems, and more particularly, to a novel process for both cleaning and sterilizing the systems.

Bottling systems are in large use today in the preparation of beverages, for example, those of a sweetened and often also of a carbonated nature. A major concern in the industry is the problem of preventing spoilage and contamination of the beverage and insuring the production of a beverage having such highly desirable qualities as uniform taste, color and purity.

The bottling systems must be maintained at all times in a clean and sterile condition. It is known that 90 percent of the cases of microbiological spoilage in bottling plants is caused by yeast, which generally originates in sugar employed in the beverage composition. Thus, it is obvious if traces of sugar are left in the internal parts of the filler such as the filling or snift valves, or the counterpressure tubes, the possibility is always present, especially over week ends and other rest periods, for the propagation of yeast, as well as bacteria and other micro-organisms, which will ultimately result in the contamination and spoilage of the beverage.

At present, the suggestion has been made to obviate this problem by cleaning and sterilizing the filler apparatus of the bottling system at least twice a week by employing germicides and detergents. When the bottler tries to sanitize the internal parts of the filler in this manner, the major difficulty which he encounters is that there has not been any simple, quick way to inject a detergent or germicide into the system. These materials are usually introduced at the present time by the cumbersome procedure of attaching a special reagent tank to the saturator or by using the open water cooler for mixing and delivering the cleaning or sanitizing agent. If both cleaning and sterilizing agents are to be used, it is necessary to attach a tank containing one of these, and then flush out the lines before employing the other. This is not only cumbersome and time consuming, but is also wasteful of the reagents employed.

Consequently, bottlers are reluctant to follow the above proposal, because the mechanical difficulties of the cleaning and sanitation procedure necessitate the expenditure of a great deal of time, work and materials. As a result, the procedure in effect in most bottling plants for maintaining the internal parts of the filler in a sanitary condition comprises nothing more than the daily flushing and rinsing of the filling valves with carbonated water, and leaving the filling tank full of tap water or carbonated water over night and over week ends.

Accordingly, it is an object of this invention to maintain high and uniform quality of the beverage during the bottling thereof.

It is also an object of this invention to maintain a bottling system in a clean and sterile condition in a direct, efficient manner not heretofore employed.

It is a further object of this invention to introduce

detergents and germicides or sterilizing agents into a bottling system in a simple, direct manner so as to completely obviate the difficulties heretofore encountered.

A still further object of this invention is to employ in an advantageous manner a detergent and sterilizing composition, the detergent and sterilizing properties being controlled at will by the regulation of the pH of the composition.

Other objects and advantages of this invention will be apparent from the following description and the accompanying drawing.

Referring to the drawing, there is disclosed a conventional bottling system employing the present invention. The bottling system comprises a cooler (not shown), a pump 8 and a saturator 10 having carbon dioxide inlet 6 and a cooled water inlet 2. A valve 4 permits tap water from line 2 to be fed either into pump 8 or into line 12. The saturator is connected to a filler indicated generally at 27. Counterpressure line 14 and carbonated water line 15 connect the saturator to the filler. The filler comprises a reservoir 28, filling and snift valves 32, carbonated water tubes 34, counterpressure tubes 30 and bottle support 36.

As previously stated, it has been extremely difficult to maintain these lines and the filler in a clean and sterile condition. The invention primarily is concerned with obviating this difficulty. A jet ejector or venturi 24 is attached to the system between saturator 10 and filler 27. The ejector may be any conventional one, and in its simplest form comprises a tube constricted in its center. A length of approximately 7 to 8 inches will suffice for the purpose of this invention. Attached to the venturi at its constricted area is feed line 23. At the other end of feed line 23 is located container 20, which holds a supply of the detergent and sterilizing composition. The container may be graduated if desired, and for such purpose a transparent material may be used in its construction. A container having a one gallon capacity is suitable although the capacity of the container is not critical. Valve 22 in feed line 23, when open, permits the passage of the contents of container 20 to venturi 24.

A pressure gauge 18 is located in a position adjacent to the venturi or jet ejector. On one side of the jet ejector is positioned a three-way valve 16, which admits tap water to the jet ejector while preventing, at the same time, any inflow of carbonated water supplied from the saturator 10. In another position valve 16 admits carbonated water from the saturator 10 while preventing inflow of the tap water. The valve in its third position prevents entry of any liquid into the jet ejector, thus permitting it to be by-passed. Valve 26, located on the opposite side of the jet ejector from valve 16, is also a three-way valve. In one position valve 26 prevents flow of liquid from the jet ejector to the filler 27. By appropriate positioning of valve 16 and opening valve 26 in the above-indicated position, carbonated water is admitted directly to the filler. By other arrangements of the valves, tap water can similarly be admitted directly to the filler instead of carbonated water. In this manner the jet ejector is by-passed by fluid traveling to the filler 27. By further operation of valves 16 and 26, the ejector is opened to the line and either tap water or carbonated water can be admitted to the ejector and then admitted to the filler.

The solution in container 20 comprises an aqueous mixture of a detergent and a sterilizing or germicidal agent. The detergent is selected from mild alkalies and should be a blended composition of ingredients such as soda ash (a source of active alkalinity and a good buffer), sodium metasilicate (which retards the corrosive action

of alkaline detergents upon metal surfaces), a sequestering agent such as sodium tetraphosphate (which prevents precipitation of calcium and magnesium salts when hard water is used), and a surface active agent (organic detergent) such as alkyl-aryl sulfonate or a related compound. When these compounds are dissolved in tap water, the water acquires softening, wetting, penetration, dispersion, emulsifying and free-rinsing properties. The detergents employed should be alkaline, any of the conventional sulfate or sulfonate detergents can be used for example, and the detergent and sterilizing solution should be of such strength that when added to tap water the resulting rinse solution has a pH between about 11 and 8, preferably 10. The sterilizing or germicidal agent employed is a compound capable of releasing chlorine. Examples of such compounds are sodium hypochlorite, chlorinated trisodium phosphate, calcium hypochlorite or commercial high-test hypochlorites, chloramines and related compounds. The effectiveness of the sterilizing properties of these agents is dependent upon the pH of the solution being most effective at an acid pH.

The effect which the pH of the water exerts upon the germicidal properties of chlorine and chlorine liberating compounds is shown by the fact that in media of about a pH of 5, as small an amount as two parts per million of chlorine is sufficient to kill anthrax spores, while at a pH above 7 much higher concentration of chlorine is needed for the same effect. At a pH of 9, 30 parts per million of chlorine has been found to be more effective as a germicidal than 100 parts of chlorine per million at a pH of 10. Further data discloses that at a concentration of 25 parts per million of available chlorine and a pH of 6, 99% of very resistant spores were killed in a time of 2½ minutes. At a pH of 9.35, the time was increased to 35½ minutes and at a pH of 10, this same concentration of active chlorine had little effect. Similarly a solution of calcium hypochlorite at a pH of 11.3 containing 1000 parts per million of available chlorine required 64 minutes to kill 99% of the spores exposed thereto. By the addition of hydrochloric acid to lower the pH to 7.3, this time was reduced to less than 20 seconds.

The present invention enables the bottler to advantageously clean and sterilize the bottling system by employing one solution containing both the alkaline detergent and the acid activated sterilizing agent. By transmitting the solution to the filler employing ordinary tap water as the carrier, a pH of about 11 results. This alkaline mixture insures a most satisfactory cleaning of the filler. At this pH, as indicated above the germicide is present in a relatively inactive state. On the other hand, by transmitting the solution with carbonated water as the carrier, a pH of about 4.4 will result, thus activating the germicide for sterilization purposes. Preferably the pH is maintained between about 5 and 7, for example, by mixing tap water with the carbonated water.

The transmission of the liquid solution is accomplished by passing the liquid into jet ejector **24** via feed line **23** with valve **22** in an opened position. In this manner admixture of the composition with either tap water or carbonated water as desired is accomplished. Specifically, when either tap water or carbonated water passes through the ejector a pressure reduction will occur in line **23**. This forces the contents of container **20** into the ejector, where it is mixed with the fluid and sent along to the filler **27**.

In order to insure the proper operation of the jet ejector, a pressure of approximately 20 to 30 pounds per square inch is required. Normal line pressure found in most cities will usually suffice for this purpose. However, should the pressure be less, an auxiliary pump may be employed.

The present ejector construction has numerous advantages. The ejector is a most efficient device for mixing the cleaning and sterilizing composition with its carrier, i.e., tap water or carbonated water. The ejector is a relatively simple device having a minimum of parts requiring attention. Moreover, use of external pumps for mixing the carrier liquid with the composition is obviated; mere line pressure suffices. The attachment of such an ejector to existing lines in the bottling system and its attendant container and supply line requires very little space and no major change of existing lines. The filling of the container above the ejector with the solution involves no difficult operation and the container itself is placed in an easily accessible position.

The control of the sterilizing and cleaning properties of the composition, by employing the above described arrangement is reduced to an easily manipulable operation. Mere control of the water, tap or carbonated, passing through the venturi results in the desired operation of either cleansing or sterilizing. Additionally, the time required to perform both operations is shortened. The ease of manipulation of the cleansing and sterilizing device encourages more frequent cleaning and sterilization of the equipment.

The following is a specific example of the preferred operation of this invention. A one gallon container is filled with a cleansing and sterilizing solution. This solution comprises approximately 720 grams of active component dissolved in one gallon of tap water. Of this amount, 708 grams represent the detergent which is a blended composition of 191.2 grams soda ash, 191.2 grams sodium metasilicate, 283.1 grams sodium tetraphosphate, 42.5 grams of an alkali metal alkyl-aryl sulphonate, specifically sodium p-decylbenzene sulfonate, and 12 grams of chloramin T (sodium p-toluene-sulfonchloramine). The first procedural step is to clean the filler **27** by action of the detergent. For this purpose, tap water at room temperature is admitted through line **2** at a pressure of between 20 to 30 pounds per square inch, through valve **16** into jet ejector **24**. At this point, while valve **22** is open, the liquid composition is drawn into the jet ejector and is admixed therein with the tap water. The pH of this mixture is approximately 11, thus maintaining the germicidal component in a relatively inactive state. The mixture then travels through valve **26** and up into reservoir **28** of filler **27**. In this manner, all of the valves, pipes and the like of filler **27** are thoroughly cleaned. The length of time of this operation is approximately 15 to 20 minutes and during such time approximately three-quarters of the one gallon solution is consumed.

Then valve **4** is operated so as to introduce water into saturator **10** where it is carbonated and valves **16** and **26** are adjusted so that carbonated water at about room temperature mixed with tap water at room temperature passes through jet ejector **24**. At this point, the carbonated water-tap water mixture becomes admixed with the remainder of the solution in container **20** in the same manner as previously indicated. This mixture has a pH of about 5, thus activating the germicidal agent. The chloramine T is present in the mixture in an amount of about 10 p.p.m. The mixture then travels through valve **26** into a reservoir **28** of filler **27**. In this manner, the filler is sterilized by the action of the acidified chloramine T. For this sterilizing procedure, the remainder of the solution, namely about one-quarter of a gallon and containing approximately eight parts per million of available chlorine, is employed. About 10 minutes are required for the sterilization procedure.

Although not preferred because it requires the furnishing of two separate compositions, it is possible to introduce initially alone the cleaning components in tap water into the system for cleaning, and thereafter, the sterilizing or aseptizing agent is introduced to the system in carbonated water either alone or admixed with cleaning components. The use of a single composition in the tank **20** avoids the expense of as well as the confusion and risks involved in the use of two compositions, extra

tanks and extra valves where skilled labor is not available. Moreover, the presence of the aseptizing agent with the cleaning components allows an initial aseptizing effect to be obtained with assurance that this will be completed and in shorter time in the second stage of the operation.

If desired, by the operation of valves **16** and **26** the jet ejector and the solution may be cut out of the line and either plain water or carbonated water may be passed through the filler for rinsing purposes.

According to the above-described procedure, the filler can be both cleansed and sterilized in a simple, expeditious manner involving a minimum of time, equipment and reagents.

By the same procedure other parts of the bottling system may be cleaned and sterilized, e.g., the entire main water line including the paper or cotton polisher, the water cooler and the sand and gravel filter. If the latter equipment is to be cleaned, it is preferred to install the ejector pump inside the pipe of the main water line. By proper arrangement of the valves, lines and the like, the filler can also be cleaned and sterilized by merely reversing the flow through the jet ejector in this form of the invention also.

While the form of the apparatus and the method of cleaning and sterilizing described herein disclose a preferred embodiment of the invention, it is to be understood that the apparatus and method are not limited thereto, and changes may be made therein without departing from the scope of the invention as defined in the claims.

I claim:

1. A process for cleaning and sterilizing bottle fillers comprising the steps of (1) admixing tap water with an alkaline cleansing and sterilizing solution to give a pH of about 8–11, (2) introducing said mixture into said bottle fillers whereby a cleansing action therefor is obtained, (3) admixing carbonated water with a separate portion of said cleansing and sterilizing solution to give a pH of 5–7 and (4) introducing said mixture into said bottle fillers whereby a sterilizing action therefor is obtained.

2. The process of claim 1 wherein said cleansing and sterilizing solution comprises an alkali cleansing agent and a free chlorine liberating sterilizing agent.

3. The process of claim 1 wherein said cleaning and sterilizing solution includes soda ash.

4. The process of claim 1 wherein said cleaning and sterilizing solution includes sodium metasilicate.

5. The process of claim 1 wherein said cleaning and sterilizing solution includes sodium tetraphosphate.

6. The process of claim 1 wherein said cleaning and sterilizing solution includes an alkyl-aryl sulfonate.

7. The process of claim 1 wherein said cleaning and sterilizing solution includes calcium hypochlorite.

8. The process of claim 1 wherein said cleaning and sterilizing solution includes sodium hypochlorite.

9. The process of claim 1 wherein said cleaning and sterilizing solution includes a chloramine.

10. The process of claim 1 wherein the introduction of said cleaning and sterilizing solution with tap water into said bottle fillers is for a time of about 20 minutes.

11. The process of claim 1 wherein the introduction of said cleaning and sterilizing solution with carbonated water into said bottle fillers is for a time of about 10 minutes.

12. A process for cleansing and sterilizing bottle filling systems comprising the steps of (1) admixing tap water with an alkali metal salt detergent and cleansing agent and a chlorinated metal salt sterilizing agent composition, (2) introducing said mixture to the components of said bottle filling system of a pH of about 8–11 whereby a cleansing action is obtained, separately admixing carbonated water with another portion of said composition to form a mixture having a pH of between 5 and 7, and (4) introducing said mixture to the components of said system whereby a neutralizing action is obtained.

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