FILLING OF CONTAINERS WITH LIQUIDS WHICH ARE DELETERIOUSLY INFLUENCED BY CONTACT WITH AIR

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ABSTRACT

Containers to be filled are advanced towards a filling station, and immediately upstream of the filling station they have their interior flushed with inert gas whereupon they are immediately supplied to the filling station, have the inert gas evacuated and are filled with liquid.

8 Claims, 5 Drawing Figures
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BACKGROUND OF THE INVENTION

The present invention is concerned with the filling of containers with liquids, and more particularly with the filling of containers with liquids which are deleteriously influenced by contact with air. Still more particularly, the present invention is concerned with a method of filling such containers with such liquids and with an apparatus for carrying out the method.

Many liquids which are to be filled into containers are deleteriously influenced by contact with air when oxidation takes place and results in a change of the color of the liquid, of the taste and/or the shelf life. It is therefore one of the important concerns of the bottling industry (the term should be understood as relating to the introduction of liquids not only into bottles but also into cans, cartons and the like) to assure that as little air as possible remains in the container when the same is filled with liquid.

The problems having long been realized, various approaches have been suggested to overcome it. A particularly advantageous approach which has been used is the pre-evacuation of air. According to this method, the containers are closed, and a method against the filling instrumentation at the filling station, and are evacuated whereupon they are filled. However, even in this way it is not possible to entirely remove the air from the container so that some air will always be included in the filled container and will be able to exert its disadvantageous influence upon the container contents. In addition, there are certain types of containers which are subject to deformation, such as bottles of synthetic plastic material, cans of light metal or synthetic plastic material, and other containers, in which only a very small amount of suction can be produced during the evacuation in order to avoid damage to the containers. This, of course, means that the amount of air that can be evacuated will be correspondingly less, and the efficiency of the method will be further reduced. Consideration has been given to increasing the length of time during which the individual container, which is connected with the filling instrumentation of the filling station, is subjected to underpressure in order to increase the amount of air that can be evacuated, and at the same time to flush the container with an inert gas. However, this necessarily results in a substantial decrease of the throughput per unit of time, because during the time during which the container is connected with the filling instrumentation the latter is not available for connection with another container. This is not acceptable because modern bottling machines are constructed and intended for high-speed operation and must be utilized in this manner in order to produce economically.

SUMMARY OF THE INVENTION

It is, accordingly, a general object of the present invention to overcome the disadvantages of the prior art.

More particularly, it is an object of the invention to provide an improved method of filling containers with liquids which are to be protected against contact with air.

Still more particularly it is an object to provide such an improved method which is capable of removing all or substantially all of the air from the interior of the container.

Another object of the invention is to provide such an improved method which does not cause any decrease in the throughput per unit of time of the filling apparatus on which it is practiced.

Another object of the invention is to provide such a method which is capable of removing almost all of the air from a container even if they are of a type which is highly susceptible to deformation, such as plastic containers or the like.

Another object of the invention is to provide an improved apparatus or machine for carrying out the novel method.

In keeping with these objects, and others which will become apparent hereafter, one feature of the invention resides in a method of filling containers with liquids which are deleteriously influenced by contact with air. Briefly stated, the novel method comprises the steps of advancing the containers to be filled towards a filling station, flushing the interior of the containers immediately upstream of the filling station with inert gas, and therewith immediately supplying the flushed container to the filling station for filling with liquid.

Thus it will be seen that the air is removed from the interior of each container before the latter is moved into engagement with a filling instrumentation of the filling station. This is accomplished by flushing the interior of the respective container immediately upstream of the filling station with inert gas, which displaces by far the major portion of the air from the container, leaving behind only a small proportion of air which forms a mixture with the inert gas in the container. Of course, in this mixture the proportion of air has already been significantly reduced. Subsequently the container is then supplied to the filling station where it is connected with the filling instrumentation. It may now be either filled with the liquid displacing the air-inert gas mixture, or the mixture may be first evacuated from the interior of the container before the latter is filled. Due to the high concentration of inert gas, the deleterious proportion of air is withdrawn or expelled almost completely from the container, even if a separate step of evacuating the interior of the container is not utilized.

In the latter case, also, a much less deleterious effect can be expected due to the relatively high concentration of inert gas in the mixture in the container which mixture moves into the gas compartment of the filling machine as it is expelled by the incoming liquid.

The novel machine for carrying out the method utilizes a filling station for the containers, transporting means for transporting the containers to the filling station, and nozzle means on the transporting means for introducing the inert gas into the container being transported so as to flush their interiors prior to filling at the filling station. Advantageously, the transporting means is in the form of a star-wheel conveyor, which is in any case utilized in machines for filling of containers with liquid so that special measures for the introduction of the inert gas or for the evacuation of the container, as would be required if the container were already in contact with the filling instrumentation at the time the introduction or evacuation occurs, can thereby be avoided. This makes the construction less expensive and less subject to malfunction. Also, an evacuation of containers subject to deformation, such as plastic containers, can be carried out much more successfully than...
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heretofore because due to the drastically reduced proportion of air in the air-inert gas mixture, the amount of suction required can be decreased beyond what has been known heretofore in the art.

The filling station is provided, in conventional manner, with a container-supporting table which rotates so as to supply the containers to filling instrumentality. According to the invention it has been found advantageous if the transporting means supplies the containers tangentially to the rotary path described by the table. It is advantageous if the nozzle means on the transporting means, particularly if the latter is a star-wheel conveyor, is associated with a rotary distributor which connects the nozzle means associated with the respective containers carried by the star-wheel conveyor with a source of supply for the inert gas when a specific pre-selected occasion occurs, for instance when a container has been first engaged by the star-wheel conveyor. This of course drastically reduces the amount of inert gas required and facilitates economic operation of the novel machine.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will best be understood from the following description of specific embodiments when read in connection with the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a fragmentary perspective detail view showing a portion of a filling station, the transporting means which supplies containers to the filling station, and the nozzle means for the inert gas;

FIG. 2 is a fragmentary cross-section showing a detail of FIG. 1;

FIG. 3 is a top-plan view of the components shown in FIG. 1;

FIG. 4 is a fragmentary detail view showing a portion of FIG. 3; and

FIG. 5 is a partly sectioned elevational detail view illustrating a further embodiment of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Discussing now firstly the embodiment illustrated in FIGS. 1–4, it will be seen that the novel filling machines has a conventional filling station known to those skilled in the art. It has a container-supporting table 1 with container supports 2 provided thereon. Above the container supports 2 are arranged the filling instrumentality 3 of the filling station. A transporting and transferring arrangement 4 is associated with the table 1 and is provided with an advancing means in the form of a feed screw 5 which engages the incoming containers 8 and spaces them in a manner necessary for them to be supplied sequentially to the arrangement 4.

In the illustrated embodiment the transporting means utilizes a star-wheel conveyor 6 which has pockets 7 each of which is to accommodate one of the containers 8 and to subsequently yield it to the supports 2. The containers 8 are inserted into the pockets 7, having been fed by the screw 5. The pockets 7 are approximately semi-circular in configuration as shown, and at their upper end 10 which faces the upper open end 9 of the containers 8, there are provided nozzles 11 which are fed via a bore 14 but can be connected with a gas supply source 13 via a rotary distributor 12. Thus, inert gas can be introduced via the nozzles 11 into the upper open ends 9 of the respective containers 8. FIG. 4 shows that the nozzles 11 may be in form of tubes mounted on the star-wheel conveyor 6.

In the embodiment of FIG. 3, which otherwise corresponds to that of FIGS. 1–4, there is provided a transporting and transferring arrangement which supplies the containers 8 tangentially to the circular path of the supports 2 of the table, the circular movement being indicated by the arrow. Above the transporting and transferring arrangement, which in FIG. 5 is indicated with reference numeral 13, there are provided station-ary gas nozzles 11 which are mounted on a carrier 16. However, these nozzles 11 could also be made pivotable or tiltable in the direction of movement of the containers 8, or they can be made to move with the containers in a to-and-fro fashion.

It should be mentioned that it is also possible to direct gas out of the gas nozzles as the containers 8 are raised by the supports 2 against the filling instrumentality 3.

In operation of the invention, the screw 5 supplies the containers 8 seriatim to the star-wheel conveyor 6, so that they enter into the pockets 7. The star-wheel 6 of course rotates and the containers 8 are therefore moved along a track 17. At the moment at which the containers 8 enter the respective pockets 7, the rotary distributor 12 initiates the supply of inert gas through the nozzles 11 which flush the interior of the respective container 8 with the inert gas. The supply of gas is maintained until the respective container leaves the pocket 7 and moves onto one of the supports 2 of the table 1. This means that approximately half the circumference of the star-wheel conveyor 6 is available for the admission of inert gas into each container, that is while each container travels in a path corresponding to half the circumference it has inert gas admitted into it.

Immediately after a container 8 has been discharged onto one of the supports 2, the container is sealingly connected with the filling instrumentality 3 in a manner that is conventional and well known to those skilled in the art. Now, the container can be evacuated, which is also known from the art, and subsequently the container is filled, removed from the table 1 by the second star-wheel conveyor 18 and moved along to another processing station. It goes without saying that the star-wheel conveyor 18 may itself be provided with nozzles for admitting additional inert gas, and in conjunction with similar arrangements provided at the closure station of the machine (the closure station is not illustrated but known to those skilled in the art) this assures an exceedingly high concentration of inert gas above the level of the liquid in the respective container 8. Such an arrangement is particularly advantageous if the second star-wheel conveyor 18 serves at the same time to insert the filled containers into the closure station, because in this manner the container will be advanced up to the movement of closure under a protective inert gas which prevents contact of air with its contents. Of course, even if for any reason the evacuation of the air-gas mixture from the interior of the container is not possible or not intended, for instance if the containers are too thin-walled for this approach, so that after supplying to the support 2 the container is immediately filled rather than evacuated, a substantial reduction of
the deleterious air content in the container is nevertheless obtained in accordance with the present invention.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of constructions differing from the types described above.

While the invention has been illustrated and described in the filling of containers with liquid, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without in any way departing from the spirit and concept of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that from the standpoint of prior art fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations and modifications should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be protected by Letters Patent is set forth in the appended claims:

1. A method of filling containers with liquids which are deleteriously influenced by contact with air, comprising the steps of continuously moving a stream of containers towards a filling station; flushing the interior of each container while it is moving immediately upstream of the filling station with inert gas just prior to the arrival of the container at the filling station; presenting the just flushed advancing container at the filling station; and filling the container with liquid while it is located at said filling station.

2. A method as defined in claim 1; and further comprising the step of evacuating the interior of each flushed container at said filling station and immediately prior to filling with liquid.

3. In a machine for filling containers with liquid, a combination comprising a filling station for the containers; advancing means for advancing a stream of said containers towards a transporting means; said transporting means engaging successive ones of said containers and presenting them sequentially at said filling station; nozzle means mounted on and movable with said transporting means for flushing the interiors of the successive containers with inert gas while the latter are being transported for presentation at said filling station; and filling means for filling each flushed container with liquid at said filling station.

4. A combination as defined in claim 3, wherein said transporting means comprises a star-wheel conveyor.

5. A combination as defined in claim 3, said filling station having a container table arranged to rotate with the containers supplied thereto; and wherein said transporting means is arranged to supply flushed containers to said filling station tangentially of the circular path described by the rotating container table.

6. A combination as defined in claim 3, said transporting means comprising a rotary star-wheel conveyor; further comprising a source of inert gas; and distributor means for connecting said nozzles sequentially with said source in response to rotation of said star-wheel conveyor.

7. A combination as defined in claim 6, said star-wheel conveyor having a plurality of spokes consecutive ones of which define transporting positions for respective containers; and wherein said nozzles are located at the respective transporting positions.

8. A combination as defined in claim 7, wherein said distributor means connects the nozzle of a respective transporting position with said source in response to the transporting position reaching a predetermined angular location.

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