Aug. 22, 1967 J. B. VAN DER WINDEN 3,336,722

METHOD AND INSTALLATION FOR FILLING STERILIZED CONTAINERS IN A STERILE SPACE WITH A STERILIZED SUBSTANCE AND SUBSEQUENT CLOSURE OF SAID CONTAINERS

Filed Sept. 10, 1963

2 Sheets-Sheet 1

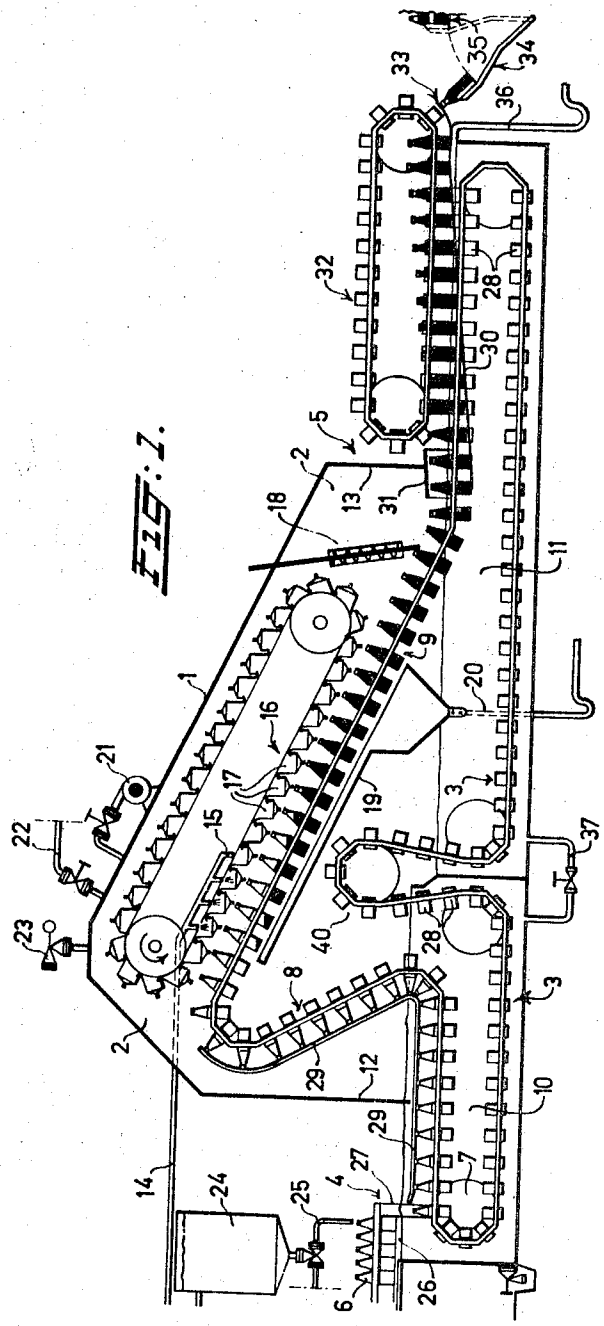


FIG. 1.

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2 Sheets-Sheet 2

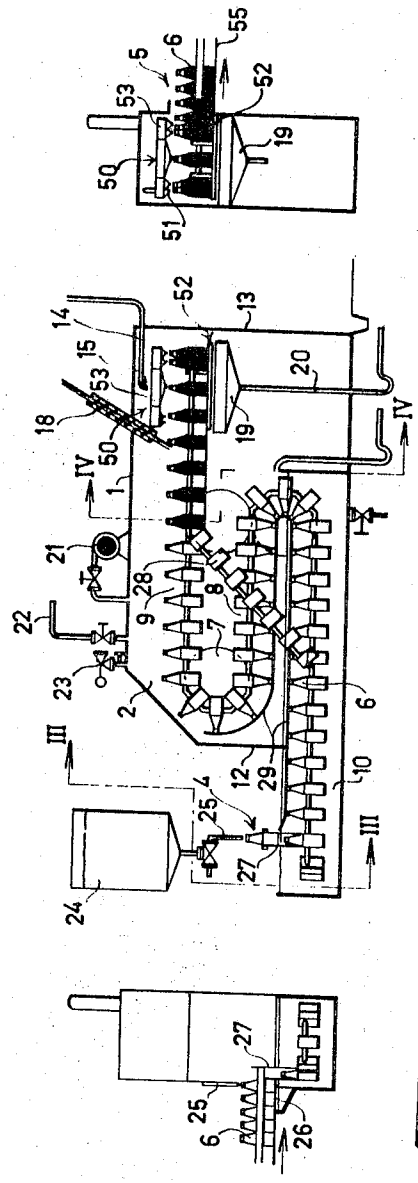


FIG. 2.

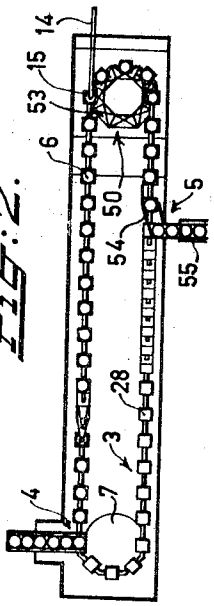


FIG. 5.

FIG. 3.

FIG. 4.

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METHOD AND INSTALLATION FOR FILLING STERILIZED CONTAINERS IN A STERILE SPACE WITH A STERILIZED SUBSTANCE AND SUBSEQUENT CLOSURE OF SAID CONTAINERS

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14 Claims. (Cl. 53—37)

The invention relates to a method for filling sterilized containers in a sterile space with a sterilized substance, whereafter said containers are closed. Various methods have been attempted, but due to the fact that so far it has not been possible to eliminate completely the risk of reinfection on filling and closing, it has been deemed necessary to carry out a second sterilization of the filled containers in order to be sure of the storage qualities of the substance in the containers.

It is an object of the invention to provide a continuous method in which the second sterilization required heretofore is eliminated.

The invention also contemplates operating with a sterilized substance and containers, so as to obtain in one process a product with unlimited storage qualities.

The substance to be put in the containers may be a liquid like milk for instance, but a granular or powdery product can be treated as well by the method according to the invention. The expression "containers" is used here in the generic sense and includes bottles, tins and the like.

The invention relates further to an installation for filling containers with a sterilized substance and for subsequent closing of continuously fed sterilized containers, the said installation comprising a sterile space, a conveyor, a portion of which is capable of movement within the said space, and a station, situated outside of the sterile space, for feeding containers to the conveyor. An object of the invention further consists in providing as installation which makes it possible to obtain a continuous process wherein any possibility of reinfection during filling and closing is eliminated.

A further object of the invention is to avoid any risk of infection from the outside of the sterile space owing to the conveyor extending beyond this space.

The foregoing and other objects and advantages of the invention will appear in the description to follow. In the description reference is made to the accompanying drawings, which form a part hereof, and in which there is shown by way of illustration and not of limitation a specific form in which the invention may be embodied.

In the drawings:

FIG. 1 shows a side elevation of a first embodiment of the invention, the side walls being removed for the sake of clarity;

FIG. 2 shows the same view of an installation according to a second embodiment;

FIGS. 3 and 4 are sectional views taken along the lines III—III and IV—IV, respectively in FIG. 2;

FIG. 5 is a plan view of the installation according to FIG. 2, the upper wall being removed.

As is visible in FIG. 1 the installation consists of a housing 1, enclosing a sterile space 2. Provided in this housing is a conveyor 3 which partially is situated within the said space 2. There is further a feeding station 4 and a discharge station 5 for the containers 6, which in this case are constituted by bottles. The conveyor 3 is guided

along a number of wheels 7 one or more of which can be driven for the locomotion of the conveyor.

The path of the conveyor 3 within the sterile space 2 consists of a first part 8 in which the containers are moved in a downwardly inclined position and a second part 9 in which the containers are moved in a substantially erect position. For the rest of the path the conveyor 3 extends under the liquid level of a disinfectant bath 10 situated on the side of the feeding station 4, and of a disinfectant bath 11, situated on the side of the discharge station 5. The housing 1 at the location of these baths 10 and 11 is partially open and the walls 12 and 13 of this housing are immersed into the baths 10 and 11 respectively in order to form a sealing for the sterile space 2.

A duct 14 provided with four mouths 15, situated within the space 2, serves for the continuous supply to this space of sterilized substance with which the containers 6 are to be filled. Filling is effected by a distributor 16 which is synchronously moved with the conveyor 3. In the embodiment according to FIG. 1 this distributor 16 consists of an endless belt, formed by a row of pivotally interconnected funnels 17, the lowermost part of the belt being substantially parallel to the second portion 9 of the conveyor path.

Disposed within the sterile space 2 are means 18 for providing a closure on the containers 6. Under the portion 9 of the path is a catch plate 19 with a discharge duct 20 for catching and discharging the substance, if any, which has left the mouths 15 but has not entered the containers 6. Connected to the space 2 is a blower 21, feeding sterile air at a light overpressure to the space 2. A steam inlet 22 for the sterilization of the entire installation after a normal cleansing, and further a safety 23 are both connected to the space 2.

The feeder station 4 is provided with a tank 24 containing liquid disinfectant which is fed by way of a duct 25 to the first row of containers 6 fed on a table 26. There is further provided a tube 27 for feeding the containers 6 to carriers 28 of the conveyor 3. Above the portion of the conveyor 3 situated at the left in FIGURE 1 and in the bath is a guide plate 29 for holding the containers 6 under the liquid level of the bath 10, this plate 29 extending also along the portion 8 of the path in order to support the containers in their downwardly inclined position.

The discharge station 5 is provided with slanting rails 30 for gradually lifting the containers 6 from the conveyor portion at the right hand side in FIG. 1. Provided in the wall 13 of the sterile space 2 is a port shaped passage or tunnel 31 at the level of the surface of the bath, the said passage permitting passage of the containers, slightly projecting from the bath. There is further provided a discharge chain 32, which is synchronized with the conveyor 3 for the purpose of gradually taking over the feeding function of the conveyor 3 whereby the containers 6 are carried on the rails 30 towards the curved end 33. Under this end 33 is a conventional device 34 for periodically receiving the foremost row of filled and closed containers 6 for transporting this row to another conveyor 35. Ducts 36 and 37 ensure that the level in the bath 11 remains at the desired height.

The operation of the installation is as follows. The sterilized containers 6 are fed on the table 26. The foremost container by way of the duct 25 is filled with disinfectant liquid from the tank 24. On account of its own weight the foremost container falls by way of the tube 27 in a carrier 28 of the conveyor 3 and is thus entirely submerged in the liquid of the bath 10. During the further advance of the conveyor 3 a possible upward movement of the containers 6 is impeded by the plate 29. The containers subsequently pass in the portion 8 of the path situated within the sterile space 2. The disinfectant flows from the containers in this portion of the path and are

completely drained. The containers **6** then become filled with the sterile air of the space **2**.

Thereupon the containers **6** reach the area **9** of the path, the phase of the distributor **16** in respect of the conveyor **3** being determined in such a way that there is always a filling funnel **17** over the mouth of a container **6**. The funnels and contatiners are moving at an equal speed in the same direction. The sterilized substance is continuously supplied by way of the duct **14** and the mouths **15**. The capacity of each mouth **15** is determined in such manner that on passing a funnel **17** the influx therein is exactly a quarter of the volume of a container **6**. In this way the containers **6** are gradually filled as is visible in FIGURE 1. In the event of stoppage or slowdown in feeding the containers, the substance supplied through the mouths **15** flows off by way of the catch plate **19** and the duct **20** to a sterilizer (not shown) in order to be sterilized again.

The container **6** is closed by means of the device **18** which, in the embodiment represented in the drawing, insures that a sterile closure is provided on the bottle **6**. The containers **6** leave the sterile space **2** by way of the port or tunnel **31**. The sealing of this space in respect of the atmosphere is partially effected by the bath **11** and for the rest by the sterilized air which is flowing from the tunnel **31** and around the upper portion of the containers **6** so that the atmosphere cannot penetrate the space **2**.

The filled and closed containers are further conveyed by way of the discharge chain **32** and the rails **30**. The conveyor **3** together with the carriers **28** remain under the liquid level of the bath **11**, where the remainder, if any, of the filling substance is washed away. The conveyor passes through the sterile space **2** via the paths **8, 9** and thereupon submerges again in the bath **10**, after which the cycle is repeated. Since the conveyor **3**, apart from the sterile space **2**, is never moving above the liquid level of the disinfectant baths **10** and **11**, the risk of infection of the conveyor is eliminated.

The conveyor **3** according to FIG. 1 is always represented with a single carrier **28**, but it will be obvious that a row of a number of carriers may be arranged for receiving the containers fed in a row of an equal number on the table **26**.

The installation according to FIGURES 2–5 corresponds essentially with that according to FIG. 1 and corresponding elements are therefore denoted by the same references. The most important differences are the modified construction of the distributor **16**, the provision of only one disinfectant bath and the lateral feeding and discharging of the containers.

The distributor **16** consists in this case of a rotatable annular element **50** with outflow openings **51**. Above element **50** is situated the mouth **15** of the feed duct **14**. The conveyor portion **52** is in the shape of an arc of a circle extending under element **50**. The element **50** consists of a number of funnels **53**, arranged in an annular configuration and adjoining one another.

The conveyor **3** according to this modification does not move in a single plane as in the installation according to FIG. 1 but in two planes, as is best seen in the plan view according to FIGURE 5. The conveyor **3** only passes through the disinfectant bath since the rest of the conveyor does not leave the sterile space **2** as is the case according to the first embodiment.

The containers **6** are fed at the location of the station **4** in the same way as according to the embodiment represented in FIG. 1, except laterally, as is best seen in FIG. 5. Discharging at the location of the station **5** is also effected laterally by means of guide rails **54**, which push the containers sidewise from the U-shaped carriers **28**, so that the said containers land on the discharge track **55**. Due to the slight overpressure in the space **2** a small quantity of sterile air is escaping continuously through this discharge region, so that nothing can penetrate into this space from the outside.

It should be noted that the conveyor **3** of the installation according to FIGS. 2–5 contrary to the conveyor in the first embodiment, which only needs to pivot in a single plane, must be capable of pivotal movement in two planes, which are perpendicular to one another.

While preferred embodiments of the invention have been shown and described, it is to be understood that changes and variations may be made without departing from the spirit and scope of the invention as defined in the appended claims.

What I claim is:

1. An installation for filling with a sterilized substance and for subsequent closing of continuously fed sterilized containers, the said installation comprising a sterile space, a conveyor, a portion of which is capable of movement within the said space, and a station, situated outside of the sterile space, for feeding containers to the conveyor, a duct provided with at least one mouth for feeding continuously the sterilized substance to the said space, a distributor arranged to move synchronously with the conveyor, the said distributor being disposed between the conveyor and each mouth of the duct, and serving to fill the containers with sterilized substance, further means for providing a closure on the containers, said movable distributor consisting of an endless belt, formed by a row of pivotally interconnected filling funnels, one part of the belt being substantially parallel to a portion of the conveyor path which is within the sterile space.

2. An installation according to claim **1** in which the conveyor is composed of a number of pivotally interconnected carriers, each carrier being capable of supporting one container.

3. An installation according to claim **1**, whereby the entering of the conveyor into the sterile space at the location of the feeder station and the leaving of said conveyor out of said space at the location of the discharge station both take place through a disinfectant bath in said space.

4. An installation according to claim **3**, whereby the conveyor, except for its path within the sterile space, extends under the liquid level of the disinfectant bath.

5. An installation according to claim **4**, whereby the conveyor path within the sterile space consists of a first part in which the containers are moved in a downwardly inclined position, and a second part in which the containers are moved in a substantially erect position.

6. An installation for filling continuously fed sterilized containers with a sterilized substance and for subsequent closing of said containers, the said installation comprising a sterile space, a conveyor, a portion of which is capable of movement within the said space, and a station, situated outside of the sterile space, for feeding containers to the conveyor, a duct provided with at least one mouth for feeding continuously the sterilized substance to the said space, a distributor arranged for moving synchronously with the conveyor, the said distributor being disposed between the conveyor and each mouth of the duct, and serving to fill the containers with sterilized substance, further means for providing a closure on the containers, said movable distributor consisting of an endless belt, formed by a row of pivotally interconnected filling funnels, one part of the belt being substantially parallel to a portion of the conveyor path which is within the sterile space, the entering of the conveyor into the sterile space at the location of the feeder station and the leaving of said conveyor out of said space at the location of the discharge station both take place through a disinfectant bath which is within said space, the feeder station being provided with means for filling the supplied containers with a disinfectant before the same are placed on the conveyor.

7. An installation according to claim **6**, whereby means are provided for maintaining an overpressure in the sterile space.

8. A method for filling a sterilized substance into sterilized containers and subsequently closing said containers,

comprising the steps of conveying said substance in a continuous flow to a delivery mouth in a sterile space, feeding said substance from said mouth to a distributor constituted by a number of buckets moving continuously in a closed path within said sterile space, advancing empty containers from a supply outside the sterile space through a sterilizing bath into said space, moving said containers under a part of the path of the distributor in synchronism with said distributor, such that each container communicates with a respective bucket, the speed of the distributor being correlated with the feed rate of the substance, so that each bucket during its period of cooperation with the delivery mouth receives a quantity of substance equal to that to be filled in one container, said quantity being transferred to the associated container while the latter travels through said common part of the path of the distributor.

9. A method as claimed in claim **8** wherein the containers are advanced from said supply and discharged from said sterile space along a path which is substantially disposed in a vertical plane.

10. A method as claimed in claim **8** comprising filling the containers with a disinfectant liquid before introduction into the sterilizing bath.

11. A method of sterilizing and filling containers with a sterilized substance, said method comprising immersing successive open upright containers containing a sterilized fluid into a sterilized bath, continuously advancing the containers while still upright through said bath into a sterile atmosphere, inverting the containers in said atmosphere to discharge any sterilized fluid therein and leave the containers empty, reinverting the containers to upright

position, filling the containers with a sterilized substance while in said sterile atmosphere and while the containers are continuously advancing, sealing the containers while in said atmosphere and discharging the thus filled and sterilized containers from said atmosphere.

12. A method as claimed in claim **11** wherein said containers are filled by advancing individual distributors in synchronism with respective containers along linear parallel paths and successively introducing into each individual distributor a portion of the total quantity of material to be filled into each container as the distributor advances with its associated container.

13. A method as claimed in claim **11** wherein said containers are advanced along a descending slope as they are being filled.

14. A method as claimed in claim **11** comprising collecting any overflow of substance from said containers in said sterile atmosphere and discharging such substance outside said atmosphere.

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