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EQUIPMENT FOR, CLEANSING AND/OR STERILISING THE FILLER TUBE IN PACKAGING MACHINES
Original Filed Feb. 17, 1969 2 Sheets-Sheet 1

Fig.1

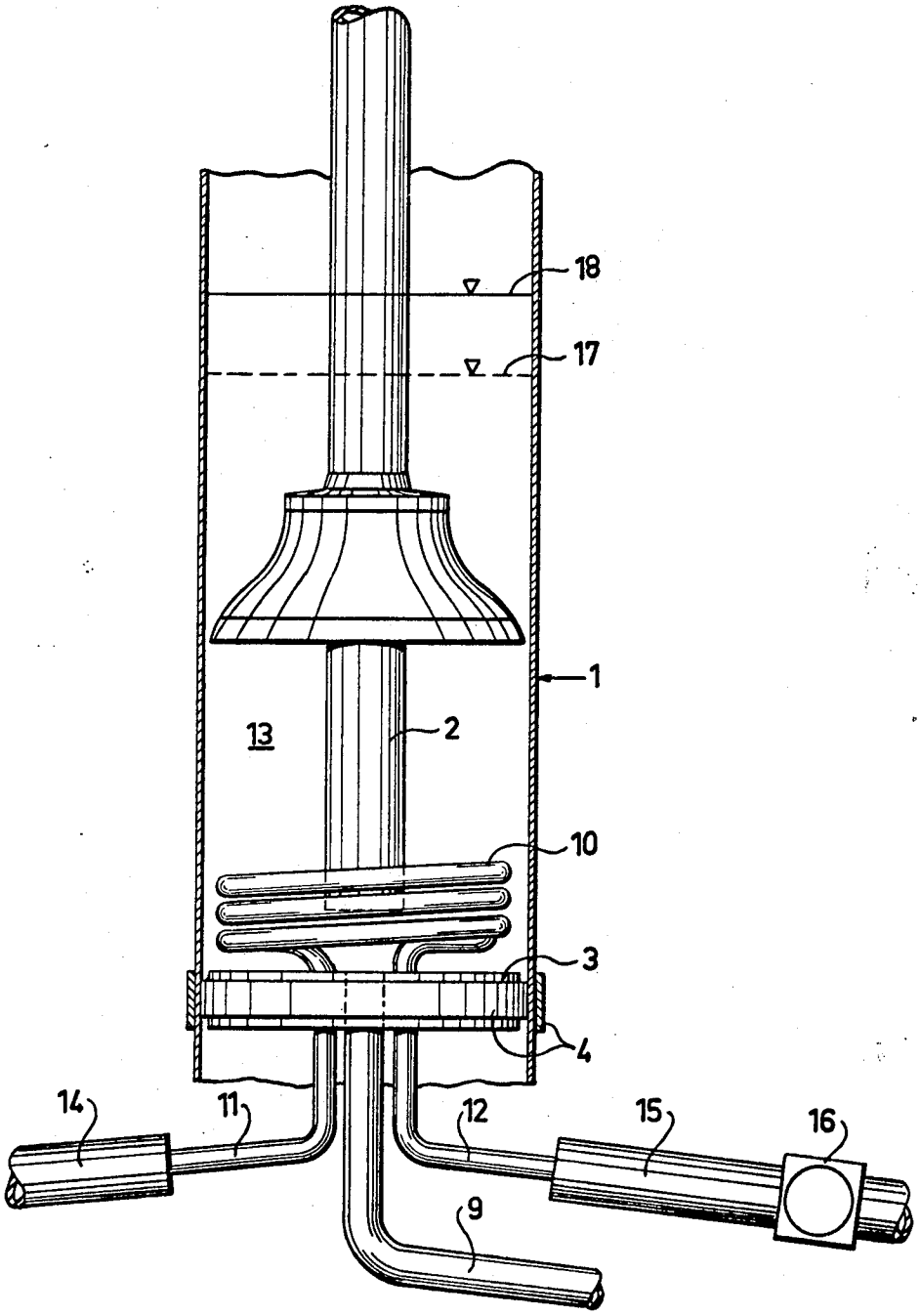
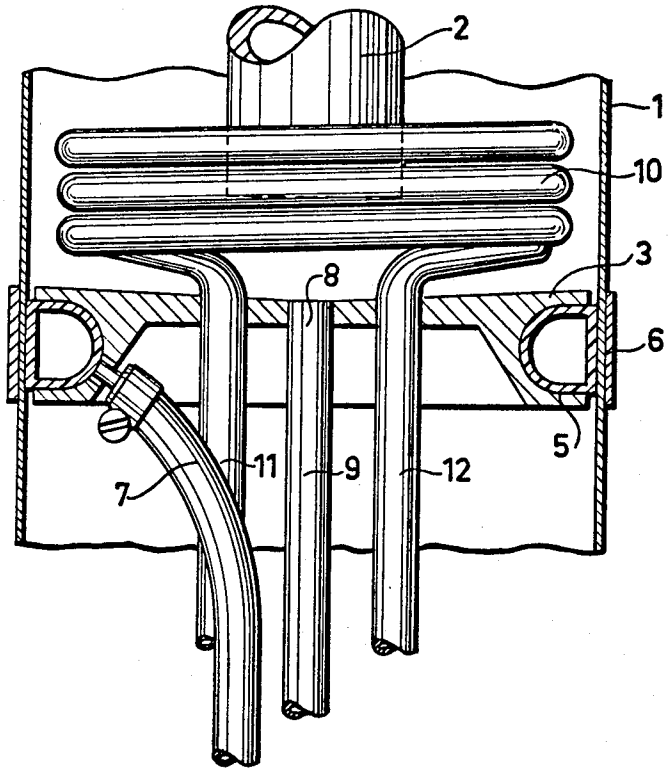


Fig. 2



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EQUIPMENT FOR CLEANSING AND/OR STERILISING THE FILLER TUBE IN PACKAGING MACHINES

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Int. Cl. B65b *1/24, 3/04;* B67c *3/00*

U.S. Cl. 141—90 5 Claims

ABSTRACT OF THE DISCLOSURE

Apparatus for washing the filler tube of a liquid packaging machine with a washing agent including means for closing one end of the packaging tube to form a space thereabove and means for introducing a washing agent into the space and for heating the agent so as to cleanse and/or sterilize the filler tube extending into the packaging tube.

This application is a divisional application of our earlier filed patent application Ser. No. 799,560, filed Feb. 17, 1969 now Pat. No. 3,615,823.

This invention is related to packaging technology and is concerned wth a method of, and equipment for, cleansing and/or sterilising the filler tube in packaging machines of the kind which form a packaging tube around the filler tube, and where the packaging tube, while partially filled with the liquid to be contained in the packages, is divided into filled and sealed packages at the same time as the column of liquid in the packaging tube is also divided.

The demand for a sterile packaging process, particularly in connection with the packaging of goods such as milk which offer a conductive environment for bacteria, has been increasing. These demands have been further accentuated in connection with aseptic packaging of sterile liquids, and a number of methods have therefore been proposed for bringing about satisfactory aseptic conditions when such goods are being packaged. One method e.g. aims at sterilising the inside of the filler tube, and the method is used for filler tubes where there is a possibility of circulating the cleansing agent. With these filler tubes, circulation washing and sterilisation are carried out right down to a base plate attached to the opening of the filler tube during the washing operation.

One aim of this invention is therefore to supplement such a sterile washing process by cleansing and sterilising the outside of the filler tube as well. This aim has been achieved by this invention, which is characterised by the lower end of the packaging tube being closed by a device, whereby the packaging tube and the device together define a space which is supplied with a cleansing and/or sterilising agent through a duct in the device, at least up to that level which the liquid surrounding the filler tube reaches while the packaging machine is in operation, after which the cleansing and/or sterilising agent is heated to a suitable cleansing and sterilising temperature.

In order to clarify still further the subject matter of the invention, it may be mentioned that in packaging machines of the above kind the liquid is introduced into the packaging tube below the liquid level, and there is therefore great danger that some of the liquid will be left behind on the outside of the filler tube. This danger is particularly great when operation of the machine is stopped either temporarily or for the day. In either case the outside of the filler tube, where one or perhaps several individual microorganisms may find good conditions for growth in the substrate, is a potential source of contamination unless measures are taken, on the one hand, to prevent adhesion of the substrate to the outside of the filler tube and on the other, to ensure that any organisms there may be present will not survive. It may be mentioned further that the packaging tube is made use of during cleansing and sterilisation of the outside of the filler tube to form the walls of a container for the reception of the cleansing, sterilising and rinsing agents.

There are a number of advantages in cleansing and/or sterilising the ouside of the filler tube by the method specified in the invention, as compared with processes used earlier. The method is thus simpler and requires less time than if washing were carried out manually, since there is no need to remove and to dismantle the apparatus. Aseptic conditions are in addition maintained when the method in accordance with the invention is used in the event of a breakdown in operation or when work is finished. A further advantage is that only the area actually exposed to danger is sterilised, which means, among other things, that parts of the machine which do not have to be subjected to such harsh treatment will not become overheated or be exposed to chemical attack, and it is further possible to carry out this cleansing and/or sterilisation processes of the milk steriliser or other components used in conjunction with the sterile filling operation.

The invention is also concerned with equipment to be used for carrying out the method specified, the equipment being characterised by a supporting arrangement designed to be fitted around a packaging tube, and by a devise designed to be introduced into the packaging tube, whereby the device consists of a plate, disc or similar component, having

(a) a sealing strip around its periphery, the sealing strip being designed to form a liquid-tight seal against the inside of the packaging tube,

(b) a combined supply and drainage duct for the cleansing and/or sterilising agent,

(c) piping connected to the combined supply and drainage duct for the supply of the cleansing and/or sterilising agent into the space defined by the inner side walls of the device and of the packaging tube, and to remove it therefrom,

(d) surfaces on the inner side wall which slope towards the combined supply and drainage duct, and

(e) a heating coil designed to heat the cleansing and/or sterilising agent.

Further advantages and objects of the invention will be apparent from the following description of the invention, reference being made to the attached diagrammatic drawings of which

FIG. 1 shows, in partial cross section, equipment for carrying out the method in accordance with the invention, and

FIG. 2 shows, also partially in cross section, a part of the equipment depicted in FIG. 1, to an enlarged scale.

Reference **1** in FIG. 1 denotes a packaging tube which consists of paper, aluminum or a plastic material, or of a combination of these materials, and which has been formed around a filler tube **2** designed to introduce liquid into the tube **1**. Reference **3** denotes a plate which has a sealing arrangement **4** around its periphery. There is furthermore a combined filling and drainage hole in the plate **3** for the cleansing and/or sterilising agent which is supplied through the piping **9**. The plate **3** also has a heating coil **10** with inlet and outlet pipes **11** and **12** respectively. The plate **3** and its sealing arrangement **4** are designed to form a liquid-tight seal in the packaging tube **1**, whereby the plate **3** and the packaging tube **1** will form a container **13** for the cleansing and/or sterilisation process.

The plate and its attachments, as well as their working

will now be described more closely by reference to FIG. 2. The plate 3, as has been mentioned before, has a sealing arrangement 4 which is designed to form a liquid-tight seal in the packaging tube 1. The sealing arrangement consists of a sealing strip 5 and a supporting unit or pressure ring 6 which surrounds and is in contact with the tube 1 opposite the circumference of said strip. The sealing strip 5 consists at least partly of material that can be deformed, such as rubber, and may in its simplest version consist of a hose, a pipe vulcanised into a hose, or similar. As may be seen on the figure, the sealing strip 5 is seated in a groove at the peripheral edge of the plate 3. The sealing strip 5 is furthermore connected to a tube 7 which is intended to convey to the inside of the sealing strip a pressurised agent, e.g. a gas under pressure such as compressed air. One of the functions of the presure ring 6, which is fitted around the free portion of the sealing strip 5, is to shape the sealing ring and to prevent its deformation in the radial direction. The plate 3 is intended to be introduced into the packaging tube in such a way that the sealing strip 5 will be inside the tube and the pressure ring 6 outside the tube at the same level as the strip. When the setling strip 5 is subjected to pressure by the introduction of a pressurised agent through the pressure hose 7, the sealing strip will exert pressure against the inside of the packaging tube, which pressure and the area under pressure, or in other words the sealing surface, will be caused to increase owing to the action against the pressure ring 6. The sealing procedure may be described in other words by saying that the wall of the packaging tube 1 is clamped between the sealing strip 5 and the pressure ring 6, such clamping being the result of pressure from inside the tube (towards its inside surface and) radially outwards. The upper side of the plate 3 which faces the lower end of filler tube 2 should preferably have a somewhat conical or concave shape sloping downwardly towards the combined filling and drainage hole 8 for the cleansing and/or sterilising agent in the plate 3. The piping 9 is connected to the hole 8 which should preferably be situated at the centre of the plate 3, and functions to supply the cleansing and/or sterilising agent to the space 13 above and defined by the plate 3 and the packaging tube, and to remove it therefrom. The plate 3 also supports the heating coil 10, in the shape of e.g. a helix, which is intended for heating the cleansing and/or sterilising agent introduced into the space 13. The heating coil 10 is located adjacent the conical side of the plate 3 and is arranged so as to surround the lower end of the filler tube 2. The heating coil 10 is also connected to inlet and outlet pipes 11 and 12 respectively which pass through the plate 3. The inlet and outlet pipes 11 and 12 respectively are fitted with surrounding handles 14 and 15 and the outlet pipe 12 may in addition be fitted with a steam trap 16 when the heating medium is superheated steam. The heating coil 10 may naturally be designed to be heated in another way, e.g. electrically.

The method of operation of the above equipment will now be described, the expression "cleansing and/or sterilising agent" used heretofore being replaced by the term "washing agent" which is intended hereinafter and in the appended claims to refer to a cleansing agent, a sterilizing agent or a combination thereof.

When the outside of the filler tube 2 is to be cleansed and/or sterilised, the plate 3 is fitted into the free end of the packaging tube 1 which has been obtained by tearing off or in some similar way, care being taken at the same time that the tube material is inserted between the sealing strip 5 of the plate 3 and the pressure ring 6. The plate 3 is furthermore inserted into the tube 1 in such a way that the heating coil 10 is situated around the lower, outlet end of the filler tube 2. In order to retain the plate 3 in the tube 1, a pressurised agent such as compressed air is admitted through the pressure hose 7, whereby the sealing strip 5 is pressed against the inside of the packaging tube 1 and against the pressure ring 6 situated outside the tube 1. This operation at the same time produces a liquid-tight seal between the plate 3 and he packaging tube 1, the seal being accomplished from the inside of the tube 1 radially outwards. A well-defined space 13 is thus obtained for the cleansing, sterilising and rinsing agents, the space 13 being bounded by the plate 3 and the packaging tube 1. Washing agent is then introduced into the circumscribed space 13 through the washing agent pipe 9. The washing agent is admitted into the space 13 up to a level 18 such that the washing agent surrounds the filler tube 2 to a level higher than that of the liquid contained in the packages when the machine is in operation. The washing agent is then heated to boiling temperature with the aid of the heating coil 10, during which operation the washing agent is caused to circulate in the space 13 so that even such parts that are difficult to cleanse will be efficiently cleansed. After some time, when the cleansed or sterilised parts have been freed from particles of impurity and the like, the space 13 is cleared of washing agent through the piping 9 affixed to the plate 3. The space 13 may in the end be rinsed if desired by e.g. sterile hot water also introduced and drained away through the washing agent pipe 9. A filler pipe with a sterile outer surface will thus be obtained by the method of operation described above.

When the machine ceases to portion out liquid, e.g. overnight, the plate 3 and its ancillary equipment are fitted into the packaging tube 1 and are made to form a seal against the tube wall, after which at least one cleansing of the apparatus is carried out with a view to removing liquid that has been left behind. Before the machine is started up again, e.g. the next morning, another cleansing operation may be carried out if desired, but the apparatus must be sterilised at least once this time, as described above. When this has been done, the pressure in the sealing strip 5 of the plate 3 is released, so that the plate may be removed from the packaging tube 1 and put to the side, after which the machine may be started up. The apparatus is to be used in the way described even when the machine is out of action for a short time. A cleansing and sterilising operation using the above method and equipment may be carried out at any time when the machine is out of action.

In a test series using the equipment and the method specified in the invention, milk suspension containing spores of *Bacillus subtilis* as the contaminating agent, and a 2% caustic soda (NaOH) solution as the washing agent, were used.

During the tests, the 2% caustic soda solution was heated by the heating coil 10 which consisted of copper tubing. Steam, having a temperature of 145° C. (293° F.) and maintained at a pressure of 4 at. g. (59 p.s.i.g.) was continuously supplied to the heating coil 10 through the inlet pipe 11. The steam was exhausted through the outlet pipe 12 and had atmospheric pressure and a temperature of approximately 100° C. (212° F.) beyond the steam trap 16. After the washing operation, which went on for 10 minutes, the filler tube 2 was rinsed using sterile distilled water at room temperature, in order to neutralise any caustic soda solution left behind. The filler tube was then swabbed with beef tea that had been incubated for seven days at a temperature of 30° C. (86° F.), and checks were then made to find out if growth had taken place.

It was found that the equipment and the method specified in the invention lend themselves well to removal of all substrate particles remaining on the outside of the filler tube, and to sterilisation of the outside of the filler tube, without this having to be dismantled for manual cleansing and decontamination. It was further established, by carrying out a number of test series, and varying the washing period, that sterility was attained with a sufficient margin of safety when a washing period of 10 minutes was used.

It is naturally possible, within the framework of the

idea underlying the invention, to modify both the equipment described and the method of cleansing and sterilising the outside of the filler tube. The pressure ring may thus be attached to the plate, by making it in the shape of a U so that its legs reach round the lower free end of the packaging tube. The sealing strip may also consist of several parts, one of these parts being that capable of deformation which will constitute the means of accomplishing the seal. There is no need for the plate to be solid; it may for instance consist of two discs situated at a certain distance from one another, the sealing strip being clamped between these discs. The inlet and outlet pipes for the heating coil may be situated next to one another so that they can be fitted with a common handle.

We claim:

1. Apparatus for washing the filler tube in liquid packaging machines in which a packaging tube surrounds the filler tube and extends below the filler tube comprising sealing means adapted to be inserted into the packaging tube below said filler tube to form a seal with the packaging tube and thus form an enclosed space thereabove, conduit means for introducing and withdrawing a washing agent through said sealing means into and from the space thereabove, the washing agent being introduced to a level at least as high as the level of the liquid surrounding the filler tube when the packaging machine is in normal operation, said sealing means having an upper conical surface, the lowest point of which substantially coincides with the conduit means for introducing and withdrawing the washing agent and means mounted on said sealing means and disposed within the space thereabove for heating said washing agent, said heating means surrounding the filler tube within the packaging tube.

2. Apparatus as claimed in claim **1** wherein said sealing means includes a disc and an inflatable annulus around the periphery thereof and means for inflating said annulus to seal said disc within the packaging tube.

3. Apparatus as claimed in claim **2** and further comprising a pressure ring disposed about the outside of the packaging tube at that level at which the sealing means is located for receiving pressure from said annulus when inflated to prevent deformation of the packaging tube.

4. Apparatus as claimed in claim **1** wherein said heating means comprises a helical tube for conducting steam therethrough.

5. Apparatus as claimed in claim **1** wherein said heating means comprises an electrical heating element.

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21—93; 53—167; 134—105, 166 C; 141—91