

March 15, 1960

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2,928,219

APPARATUS FOR STERILE PACKAGING STERILE CONSUMER GOODS

Filed March 24, 1958

2 Sheets-Sheet 1

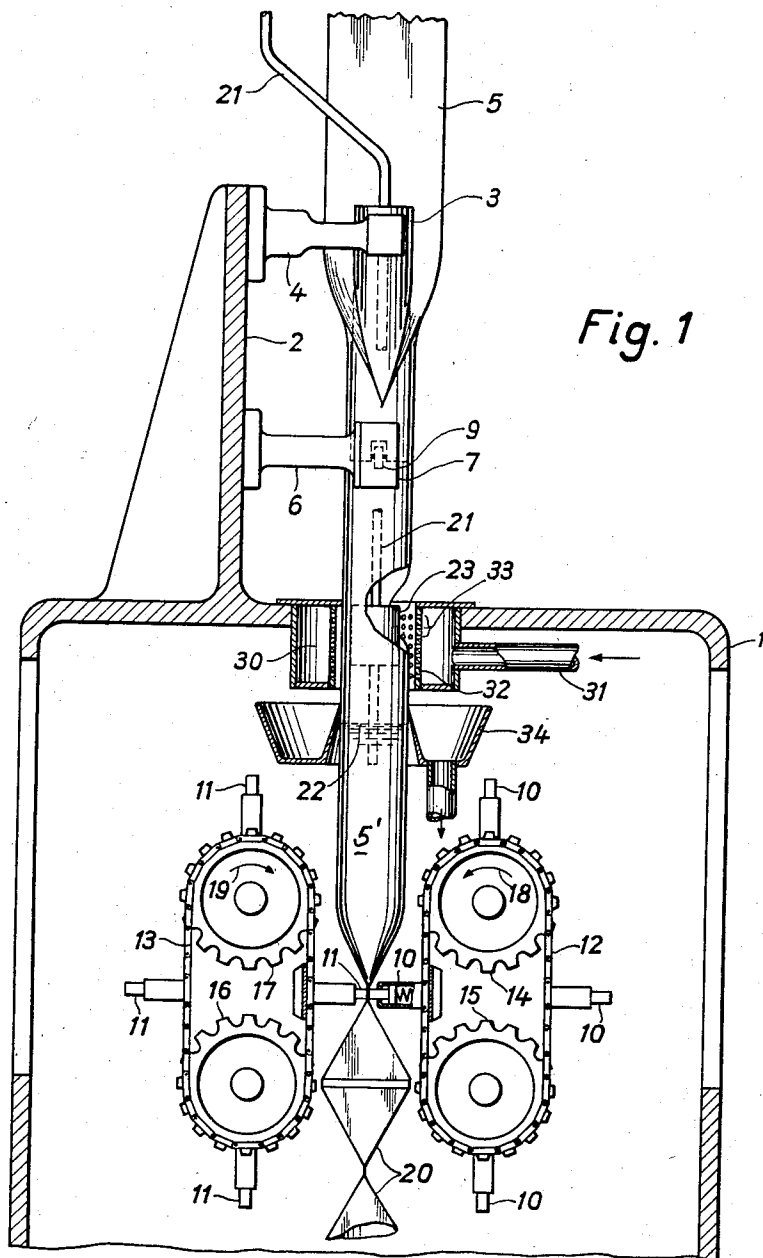


Fig. 1

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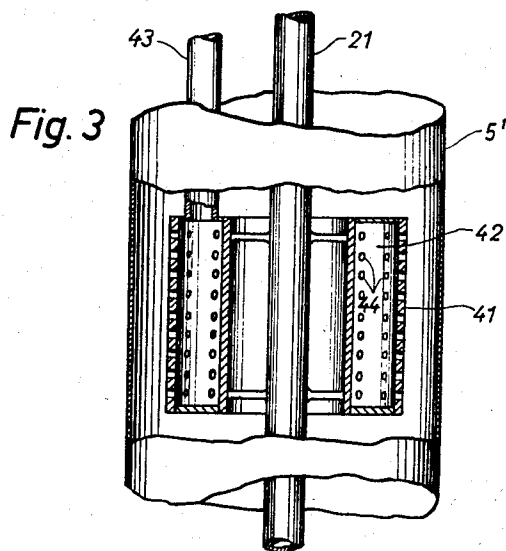
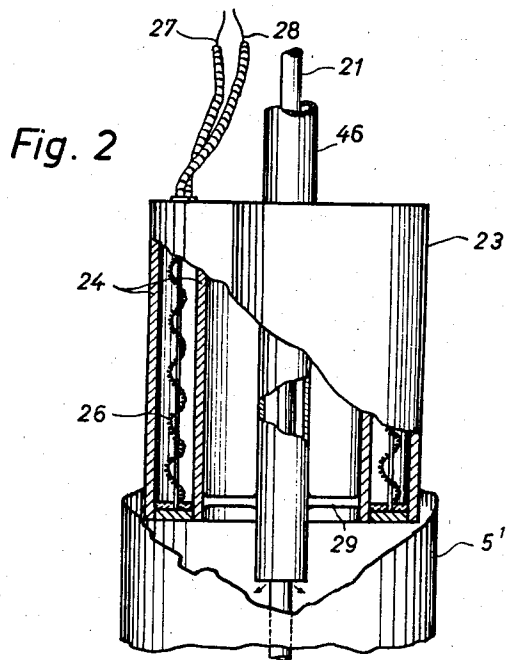
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APPARATUS FOR STERILE PACKAGING STERILE CONSUMER GOODS

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Application March 24, 1958, Serial No. 723,530

Claims priority, application Switzerland March 26, 1957

6 Claims. (Cl. 53—180)

The present invention relates to an apparatus for packaging sterile consumer goods wherein a flexible band-like material is conducted into a package forming and filling machine where the material is formed into a tube which is partly filled with the goods to be packed and which is compressed in a direction normal to the longitudinal axis of the tube at spaced localities to form closed containers.

According to the invention the interior of the newly formed tube is sterilized by the application of heat above the level of the goods in the tube.

The apparatus according to the invention makes it unnecessary to sterilize the band-like material before it is transformed into a tube. By sterilizing the interior of the tube at a locality above the level of the goods or substance which have been filled into the tube all germs which may be inside the tube are destroyed before the goods come in contact with the interior of the tube. The apparatus prevents germs to advance through the air in the unfilled portion of the tube towards the goods filled into the tube so that the interior of the newly formed package and the sterile goods therein are fully protected against subsequent infection. This is accomplished by the provision of heating means which destroy germs which may pass alongside of the heating means in the interior of the tube. As a modification sterile air may be introduced into the tube below or downstream of the open top of the newly formed tube and made to escape through said open top, preventing passage of germs from the outside into the tube.

The interior of the tube is preferably heated by heat radiation or by means of a gaseous or vaporous heat carrier. For protection of the material from which the tube is formed the outside of the tube may be cooled while the inside is heated. For this purpose a gaseous or vaporous coolant is applied to the outside of the tube or a liquid coolant is sprayed onto the outside of the tube substantially opposite the locality where the inside is heated.

The apparatus according to the invention includes elements for continuously transforming the flexible band-like material into a tube, a conduit for filling sterile goods into the newly formed tube, and pressing elements for for compressing the tube at predetermined localities for forming closed containers. The sterilizing means according to the invention include stationary heating means placed in the interior of the travelling tube above the level of the goods or substance which have been filled into the tube for heating the interior of the tube to sterilization temperature.

The heating means may be in the form of an electrically heated radiator. As an alternative, an apparatus may be used for blowing a gaseous or vaporous heat carrier against the inside of the tube which must be heated. If a heat radiator is used this is preferably provided with a cylindrical radiating surface which is placed inside and coaxially of the tube. The pipe for transport-

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ing the sterile goods into the tube preferably extends through the heating apparatus. Means are preferably provided for applying a coolant to the outside of the tube.

The novel features which are considered characteristic of the invention are set forth with particularity in the appended claims. The invention itself, however, and additional objects and advantages thereof will best be understood from the following description of embodiments thereof when read in connection with the accompanying drawing in which:

Fig. 1 is a longitudinal sectional view of a package forming, filling and sterilizing apparatus according to the invention.

Fig. 2 is a part sectional view of a detail of the apparatus shown in Fig. 1.

Fig. 3 is a part sectional view of a modified detail of the apparatus shown in Fig. 1.

Referring more particularly to Fig. 1 of the drawing, numeral 1 designates the housing of a package forming and filling machine. A standard 2 is provided on top of the housing 1 for supporting a forming element 3 by means of an arm 4. A band-like material 5, for example, paper covered on one side with a synthetic substance, for example, polyethylene is continuously supplied and placed around the element 3 so as to form a tube 5' whereby the covered side of the material faces the element 3. The longitudinal marginal portions of the band-like material overlap, forming part of the tube. An electrically heated heating shoe 7 supported by a carrier 6 presses against the overlapping portions of the material 5, agglutinating said portions by heating. A roller 9 mounted to the lower end of the forming element 3 props the material against the heating shoe.

Electrically heated compression elements 10 and 11 are arranged inside the casing 1 for compressing limited portions of the tube 5' in a direction normal to the longitudinal axis of the tube. The elements 10 and 11 are mounted on endless chains 12 and 13, respectively. The chains 12 and 13 run over sprocket wheels 14, 15 and 16, 17, respectively, the wheels 14 and 17 being rotated in the direction of arrows 18 and 19, respectively, by means, not shown. Additional compression elements mounted on additional endless chains, not shown, compress the continuously downwardly travelling tube 5' in a direction normal to the direction of the compression effected by the elements 10 and 11 and in spaced relation thereto. The downward movement of the compression elements is imparted to the tube 5' while the elements engage the tube. This operation transforms the tube into consecutive closed containers 20. The goods to be filled into the containers, for example, sterilized milk, are supplied to the apparatus by means of a pipe 21 extending downwards through the forming element 3 into the tube 5'. The supply of the milk is so adjusted that the liquid level remains at substantially the same location while the apparatus is in operation.

A heating device 23 is placed inside the newly formed tube 5' above the substance which is filled in the tube. This device 23 is preferably in the form of a hollow cylinder having a hollow wall and placed coaxially of the tube 5'. As seen in Fig. 2 an electrically heated wire 26 is arranged inside the hollow wall 24 of the device 23. Conduits 27 and 28 for supplying electric current to the wire 26 extend upwards through the interior of the tube 5'. The heating device is connected, by means of stays 29, with a pipe 46 whose purpose will be described later and which surrounds the filling pipe 21. If current is supplied, the wall 24 is heated and acts as a heat radiator. If the pipe 46 is omitted, the stays 29 are connected with the pipe 21.

An annular hollow sleeve 30 (Fig. 1) extends around

the tube 5' opposite the heating device 23. A coolant, for example, cool air or water is supplied to the interior of the sleeve 30 by means of a pipe 31 from a source, not shown. The wall 32 of the sleeve 30 which wall faces the tube 5' is provided with apertures through which the coolant is sprayed onto the outside of tube 5'. If a liquid coolant is used, a means for receiving the coolant, for example, a trough 34, should be provided below the sleeve 30.

When operation of the apparatus is begun, prior to the supply of milk through the pipe 21, the continuously arriving band-like material 5 is transformed into the tube 5' from which empty containers are formed by compressing the tube by means of the afordescribed compression elements. At the same time the heating device 23 is started and a coolant is applied to the outside of the newly formed tube in the vicinity of the heating device. The heat radiating from the device 23 raises the temperature of the inside of the tube 5' to about 300° C. whereby germs situated at and adjacent to the interior surface of the tube are destroyed. No harm is done to the tube material because it is simultaneously cooled from the outside. While there is still no milk supplied to the apparatus superheated steam or another suitable heat carrier is temporarily conducted through the pipe 21 whereby the pipe 21 is heated, for example, to 300° C. and thereby sterilized. Since the heat carrier escapes through the open end of the pipe 21 which is inside the tube 5' which has been closed below said open end, the heat carrier flows upward in the tube 5' taking along the germs which may be inside the tube, and transporting the germs upward and outside of the tube.

Thereupon supply of a heat carrier through the pipe 21 is stopped and sterilized milk is filled through the pipe 21 into the interior of the tube 5' up to the level 22. Germs which may enter the tube 5' from above are now destroyed by the action of the device 23 so that no germs can come into contact with the sterile goods in the tube 5'. If desired, a pipe 46, as shown in Fig. 2, may be arranged around the pipe 21 in spaced relation thereto and terminating above the level of the sterilized goods in the tube. Sterile air or another sterile gas may be continuously supplied through the pipe 46 into the interior of the tube 5', during normal operation of the apparatus. The sterile air or gas flows upwardly through the tube between the heating device and the inside of the tube, preventing passage of germs from the atmosphere towards the sterile goods.

Fig. 3 illustrates an embodiment of the invention whereby the inside of the newly formed tube 5' is heated by means of a gaseous or vaporous heat carrier. A hollow cylinder 42 having a hollow wall 41 is placed inside and coaxially of the tube 5', the interior of the wall 41 being supplied with a heat carrier, for example, superheated steam of 350° C., through a pipe 43 from a source, not shown. The side of the hollow wall 41 facing the inside of the tube 5' is provided with apertures 44 through which the heat carrier leaves the hollow wall and is blown against the inside of the tube 5'. The outside of the tube 5' may be cooled in the manner illustrated in Fig. 1.

The invention is not limited to the embodiments which are described and illustrated. The tube 5' may be formed of a material other than paper having a layer of synthetic material on one side; for example, the flexible band-like material from which the tube is formed may be a synthetic material or a metal foil. The method according to the invention is not limited to packaging of liquid goods; it may also be used for packaging solid goods. Instead of the heating devices shown in Figures 2 and 3 the inside of the tube 5' may be heated by electrical induction.

I claim:

1. An apparatus for sterile packaging a sterile consumer goods including means for continuously transforming a continuously longitudinally moving flexible band-like material into a continuously longitudinally moving tube, means for compressing a first limited portion of the newly formed tube in a direction normal to the longitudinal axis of the tube for closing the tube, stationary means extending into the newly formed tube for filling the sterile goods into the longitudinally moving tube upstream of the closed portion of the tube, means for compressing a second limited portion of the tube in a direction normal to its longitudinal axis to form a closed container after a predetermined length of the tube has been filled with the goods, and a stationary heating device placed in the interior of the newly formed tube upstream of the goods filled therein for heating the portion of the longitudinally moving tube above the sterile goods to the sterilization temperature prior to compressing the second portion of the tube.

2. An apparatus as defined in claim 1 in which said heating device is an electric radiator.

3. An apparatus as defined in claim 1 in which said heating device includes means for blowing a gaseous heat carrier against the inside of the newly formed tube.

4. An apparatus as defined in claim 1 in which said heating device is an electric radiator having a heated cylindrical surface placed coaxially of and spaced from the inside of the tube.

5. An apparatus as defined in claim 1 in which said means for filling the sterile goods into the tube is a pipe extending through said heating device.

6. An apparatus as defined in claim 1 including a cooling device placed outside of the tube substantially opposite to said heating device and including means for applying a coolant to the outside of the tube.

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