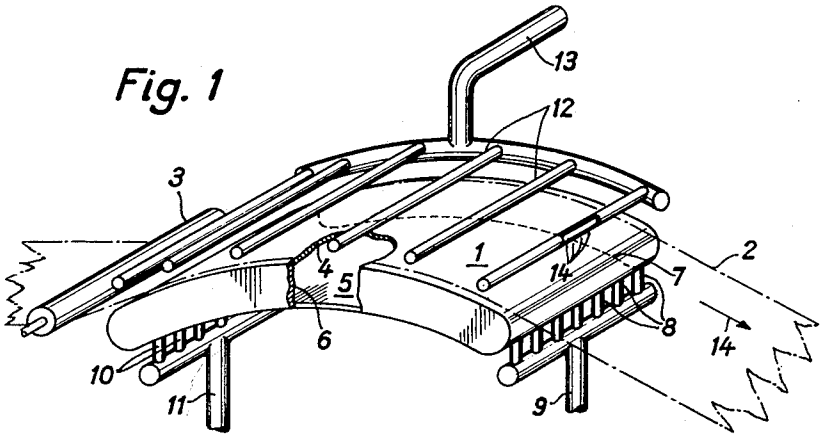
Feb. 6, 1962 W. LÖLIGER 3,020,120

METHOD AND MEANS FOR STERILIZING STRIPLIKE MATERIAL

Filed Feb. 17, 1958

Fig. 1



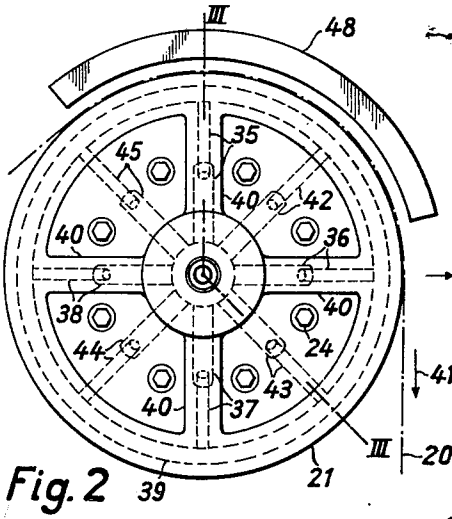


Fig. 2

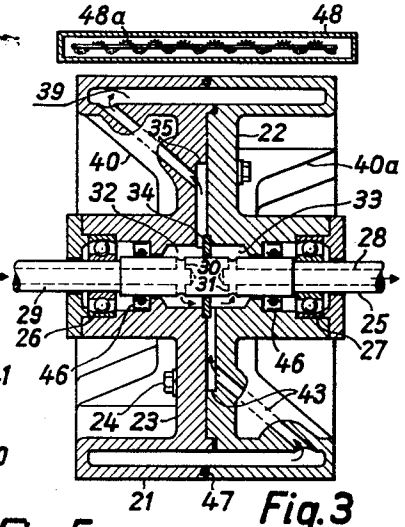


Fig. 3

Fig. 4

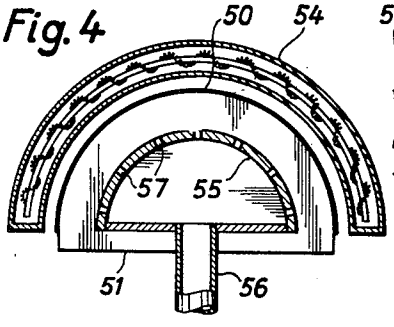
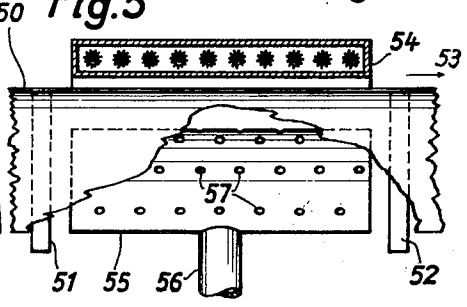


Fig. 5



INVENTOR.
WILLI LÖLIGER
BY K. A. Meyer
PATENT ATTORNEY.

United States Patent Office 3,020,120 Patented Feb. 6, 1962

3,020,120
METHOD AND MEANS FOR STERILIZING STRIPLIKE MATERIAL

Willi Löliger, Grunegg, Konolfingen, Switzerland, assignor to Alpura Aktiengesellschaft, Bern, Switzerland, a corporation of Switzerland

Filed Feb. 17, 1958, Ser. No. 715,657
Claims priority, application Switzerland Feb. 20, 1957
4 Claims. (Cl. 21—2)

The present invention relates to a method and means for sterilizing striplike material subsequently used for producing sterile containers, the material consisting at least partly of organic substances.

Methods are known for sterile production of liquid or solid substances such as foodstuff, beverages, pharmaceutical products or adjuvant substances, or for sterilizing the substances after they have been produced. It is also known to fill milk and other liquids in a sterile manner into cans and to hermetically close the cans. It has also been endeavored to fill milk under sterile conditions into conventional bottles and to apply suitable closures to the bottles. The relative high cost of cans and the excessive weight of bottles as well as the costs connected with returning and cleaning the bottles prohibit the use of this type of containers at least for consumer goods, as milk. Moreover, glasses used for making bottles for these purposes do not sustain repeated heating up to the sterilization temperature of about 250° C. and higher temperatures.

Packings and containers are known which are made of a material which consists at least in part of organic substances, for example, synthetic materials as polyethylene or paper which carries at least on one side layer of a synthetic material. For sterile packing of sterile goods in containers made of such materials it is necessary to sterilize at least the surface of the material prior to formation of the containers which surface will be on the inside of the containers after they are formed. As a rule only heat treatment assures a complete germicidal effect. The necessary sterilization temperature is at least 200° C. The packing materials which are at least in part made of organic substances usually are sensitive to heat. In materials which consist either entirely or partly of synthetic substances these substances soften at temperature below the required sterilization temperature. Certain papers begin to carbonize already at temperatures above 200° C. and become brittle or discolored at still lower temperatures. The surface of papers which is covered with synthetic material and heated must not make contact with guiding or transport devices so that a complicated guiding and transport system must be provided. A temperature must be maintained which is just sufficient to effect sterilization and as low as possible to avoid undesirable change of the packing material. This requires a longer period of heating so that when heating the material while it travels toward the container forming mechanism, a relatively long piece of material must be heated.

It is an object of the present invention to provide a method and means for sterilizing striplike material subsequently used for producing sterile containers whereby the aforedescribed disadvantages and difficulties are substantially avoided. According to the invention the surface of the sheet-like material which forms the inside of the container subsequently produced from the material is heated prior to formation of the container to sterilizing temperature while, simultaneously, the opposite surface of the material which forms the outside of the subsequently formed container is cooled by contact with a heat-removing agent. This agent acts on the material in the same zone which is heated.

The aforedescribed method affords, prior to making the container, heating of the surface of the material which forms the inside of the susequently formed container to considerably higher temperatures, considerably reducing the required heating time without damaging or producing undesired changes in the treated material. It has been found that it is sufficient for obtaining sterile containers to heat to sterilization temperature only the surface of the material which will be on the inside of the subsequently formed containers, while simultaneously cooling the surface of the material which forms the outside of the subsequently formed containers. In this way the heat can be distributed through the thickness of the material in such a manner that the major part of the section of the material has a temperature which is considerably below the sterilization temperature which is produced on the heated surface of the material. In papers one side of which is covered by a layer of synthetic material this layer may be heated to 250° C. without doing any damage to the paper on which the layer is mounted. The surface of materials which are entirely made of synthetic material which surface is on the inside of the subsequently produced container may be heated to a temperature of 250° C. or higher temperature whilst the opposite surface of the material which is on the outside of the subsequently produced container is sufficiently cooled to prevent softening of the synthetic material; the cooled surface can be guided on stationary guide surfaces without any danger of sticking of the material on the guide surface due to the heating operation.

The surface of the material to be sterilized is preferably heated by heat radiation or by means of a gaseous or vaporous heat carrier. The opposite surface of the material is cooled preferably by blowing a gaseous or vaporous coolant or by spraying a coolant onto the surface. When moving material of relatively small breadth towards the mechanism which forms containers from the material the surface to be cooled may run over a cooled surface with which the material is in contact.

It is also an object of the present invention to provide a device for carrying out the aforesaid method. This device includes means for transporting the material towards a machine which forms containers from the material and heating means for heating the surface of the material which forms the inside of the subsequently formed containers while the material is moved towards the container forming machine, cooling means being provided which simultaneously cool the side of the material which is opposite to the heated side of the material.

Electric radiators are preferably used as heating means or means may be provided for blowing a gaseous or vaporous heating medium onto the surface of the material which must be sterilized. If the material is continuously fed into the container producing machine, it is recommended that the surface of the material which must be cooled rests on a cooled, preferably metallic, guide surface which extends over the whole breadth of the material. The guide surface may be stationary or formed by the surface of a rotatable drum through which a coolant is conducted, the drum being rotated by the moving material. Alternatively, the material may move over a cooled guide surface which is curved about an axis which is parallel to the direction of movement of the material whereby a convex material surface is formed which is heated and a concave material surface is formed which is cooled.

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 perspective diagrammatic illustration of a heating and cooling arrangement according to the invention.

FIG. 2 is a side view of a modified heating and cooling arrangement.

FIG. 3 is a sectional view taken along line III—III of the arrangement shown in FIG. 2.

FIG. 4 is a sectional view of a further modification of a heating and cooling device according to the invention.

FIG. 5 is a part sectional view of the device shown in FIG. 4, the view being taken at a right angle to the view of FIG. 4.

Referring more particularly to FIG. 1 of the drawing, numeral 1 designates a curved metallic guide surface 1 for guiding a strip of material 2 which is indicated by dash-dot lines. The material consists, for example, of paper having a layer of synthetic material on one side. The material 2 rests with the paper surface on the guide surface 1 which is slightly broader than the breadth of the material. Before the material 2 reaches the guide surface 1 it passes underneath a roller 3. The guide surface 1 is the upper surface of a continuous strip of sheet metal 4 which surrounds a space 5 whose lateral sides are closed by plates 6 and 7.

At the end of the surface 1 from which the material 2 runs off a plurality of coolant distributing pipes terminate in the space 5. The pipes 8 are connected by means of a header with a pipe 9 which is connected to a source, not shown, of coolant, for example, water. At the end of surface 1 where the material 2 runs on, a plurality of pipes 10 are connected with the space 5 which pipes are connected by means of a header with a pipe 11 through which the coolant is continuously withdrawn after it has passed through the space 5.

Spaced from the surface 1 are a plurality of blow pipes 12 which are connected by means of a header with a pipe 13 through which a gaseous or vaporous heat carrier, for example, steam is supplied. The pipes 12 are provided with bores 14 through which the heat carrier is directed onto the top side of the material 2 which is covered by a layer of synthetic material.

The aforedescribed device operates as follows:

A coolant is passed through the chamber 5 which intensively cools the surface 1. Thereupon the material 2 is moved over the guide surface 1 by transport means, not shown, in the direction of the arrow 14. The heat carrier is now admitted through pipe 13 into the pipe 12 and blown onto the top surface of the material 2. The temperature of the heat carrier may be, for example, 400° C. The temperature of the coolant is approximately room temperature. The heat carrier heats the surface of the material 2 which will subsequently form the inside of the containers which are produced from the material 2, to approximately the temperature of the heat carrier whereas the surface of the material 2 which will form the outside of the containers is cooled to a temperature of less than 80° C. by contact with the cooled surface 1. In this manner any undesired change of the material 2 is avoided. Care must be taken that the material running off the device shown in FIG. 1 is not contacted by an atmosphere which contains germs. This can be done, for example, by conducting the material through a channel which is filled with pressurized sterile air.

In the embodiment of the invention shown in FIGS. 2 and 3 the material 20 runs on the surface of a rotatable cylindrical body or drum 21. The latter consists of two halves 22 and 23 which are interconnected by means of bolts 24. The drum is supported by a shaft 25 which rests in ball bearings 26 and 27. The shaft 25 is provided with two axial bores 28 and 29 which extend almost to the center of the drum. Radial bores 30 and 31 connect the axial bores 29 and 28, respectively, with annular chambers 32 and 33, respectively, which are separated by means of an annular member 34 closely surrounding the center of the shaft 25. The annular chamber 32 is connected by means of radial bores 35, 36, 37 and 38 with an annular cavity 39 provided adjacent to the cylindrical surface of the drum. The channels 35 to 38 are individually located within ribs 40 of the drum half 23. Ribs 40*a* of the drum half 22 contain bores 42, 43, 44 and 45 which connect the annular cavity 39 with the annular chamber 33. The ribs 40 of the drum half 23 are offset 45° of the ribs 40*a* of the drum half 22. The bearings 26 and 27 are separated from the anular chambers 32 and 33, respectively, by packings 46. The annular cavity 39 is sealed from the outside by means of a packing 47.

A hollow radiator body 48 extends oppositely to a portion of the cylindrical surface of the drum 21, electric heating coils 48*a* being arranged inside the body 48. A coolant, for example, water is supplied through the axial bore 29 in the shaft 25 and flows through the channels or bores 35 to 38 into the cavity 39 and therefrom through channels or bores 43 to 45 into the bore 28 of the shaft 25. In this way the portion of the drum 21 which forms the guide surface for the material 20, and the material which is almost as wide as the drum is long, are intensively cooled. This arrangement prevents an undesirable change of the material 20 by the effect of the heat applied to the outside of the material from the radiator 48. The material 20 is moved by means, not shown, in the direction of the arrow 41 towards the machinery which forms containers from the material. The drum 21 is rotated by the moving material.

In the embodiment illustrated in FIGS. 4 and 5 a length of material 50 is conducted over the semicircular surface of two elements 51 and 52 so that the surface of the material 50 which subsequently forms the inside of the containers is convex and the surface which subsequently forms the outside of the containers is concave. The material 50 is moved by means, now shown, in the direction of the arrow 53. A semicircular electrically heated radiator 54 is placed opposite the material 50 between the elements 51 and 52 for heating the convex surface of the material to sterilization temperature. A hollow body 55 of semicircular cross sectional configuration is placed between the elements 51 and 52. The axis of the curvature of the curved surface of the body 55 is parallel to or coincides with the axis of the semicircular surfaces of the elements 51 and 52. A coolant, for example, water or air is supplied through a pipe 56 to the inside of the hollow body 55. The curved wall of the body 55 is provided with bores 57 through which the coolant is directed onto the concave surface of the material 50. The coolant is diverted downwards by the material so that it cannot come in contact with the convex side of the material which must be sterilized.

In many cases it is desired that also the cooled surface of the material is temporarily sterilized until the container made from the material is filled and hermetically sealed. This can be effected by admixing a sterilizing agent, for example, permanganate or ozone to the coolant, or by bringing such a sterilizing agent in contact with the surface of the material which will form the outside of the subsequently produced containers during or after heating of the material.

The invention is not limited to the described examples. It is also suitable for treating material which consists only partly of organic substances, for example, a flexible strip of paper to which a layer of synthetic material is applied and which has an inlay in the form of an aluminum foil. Instead of electrically heating the radiator this may be done by means of a gaseous or vaporous heat carrier.

I claim:

1. In a system for producing sterile containers from continuous striplike material consisting at least in part of organic substances, transport means for conveying the material towards container forming means, said transport

means including sterilizing means, the latter including cooling means placed on the side of the material which side is on the outside of the subsequently formed containers, and heating means placed opposite said cooling means on the side of the material which side is on the inside of the subsequently formed containers, for heating the surface of the material which surface is on the inside of the subsequently formed containers to a temperature of at least 200° C. while the other side of the material and thereby the body of the material is cooled.

2. In a system as defined in claim 1 and wherein said cooling means includes an element having a stationary convexly curved cooled surface slidably supporting and being in contact with the striplike material throughout the entire width of the material.

3. In a system as defined in claim 1, guide means for bending the striplike material around an axis parallel to the longitudinal axis of the material, said cooling means being placed on the concave side of the bent striplike material.

4. The improvement in the art of producing sterile containers from continuous striplike material, which comprises continuously moving the material towards container forming means, sterilizing by heating to at least 200° C. the surface on the side of the material, which forms the inside of the subsequently formed container, while the material moves towards the container forming means, and simultaneously cooling the opposite surface of the material which surface is at the outside of the subsequently formed containers.

References Cited in the file of this patent

UNITED STATES PATENTS

1,867,256	Egli	July 12, 1932
2,297,314	Offen	Sept. 24, 1942
2,497,212	Donofrio	Feb. 14, 1950
2,816,837	Holsman	Dec. 17, 1957
2,928,219	Gubler	Mar. 15, 1960