Aug. 16, 1949. J. N. MASCI 2,478,931

METHOD OF TREATING SEALED TUBES

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Fig. 1.

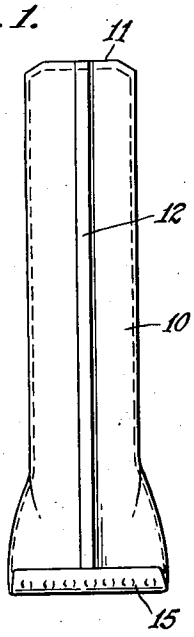


Fig. 2.

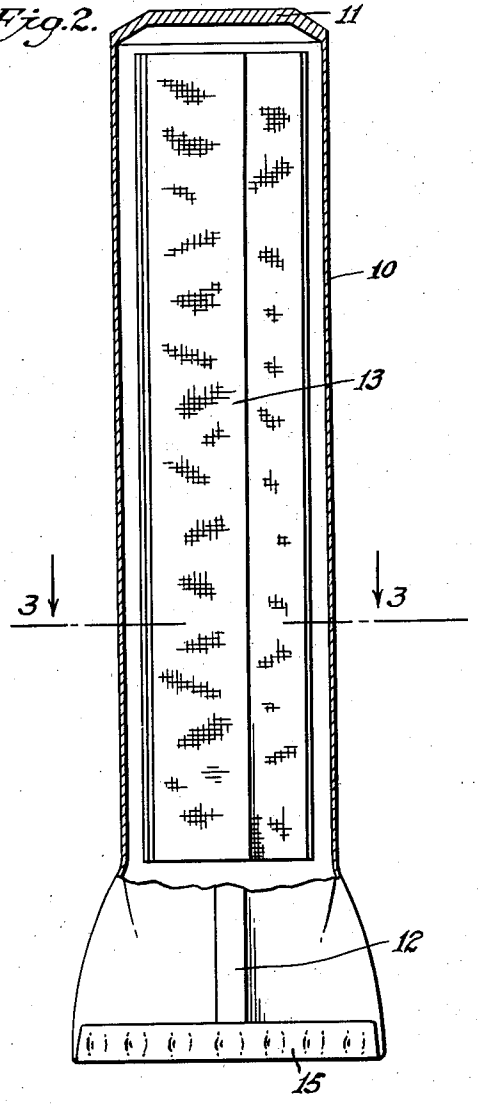
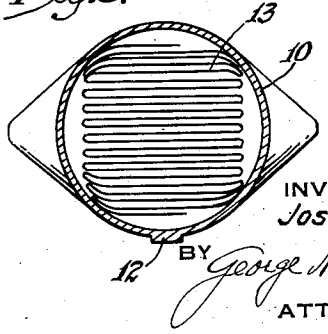


Fig. 3.



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METHOD OF TREATING SEALED TUBES

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5 Claims. (Cl. 21—92)

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This invention relates to novel methods for sterilizing packages under pressure. More particularly this invention is directed to novel methods for sterilizing packages under heat and pressure in such a manner as to minimize danger of distortion or rupture of the package during sterilization. In one of its more specific aspects, the invention is directed to novel methods for sterilizing under heat and pressure collapsible packages containing therein surgical dressing impregnated with a medicament such as petroleum or the like.

In the art of gauze bandages and especially in that of bandages of this type which are impregnated with a medicament, it has been found necessary to employ sealed containers therefor to maintain the same in proper physical and sterile condition. These containers are generally one-time use containers ordinarily composed of tin, aluminum, alloys or the like and are relatively thin and collapsible by finger pressure. Containers of this type may be readily manufactured and there may be inserted therein a length of gauze dressing which may be impregnated with a medicament. Then the package may be hermetically sealed in any of the ways known to this art. If these hermetically sealed containers are placed in a chamber and heated to about 320° F. or above, as is necessary in dry heat sterilization and as is common practice today, the containers will become distorted and sometimes ruptured because the pressure exerted by the gaseous or vapor medium at said elevated temperatures within the sealed containers is much greater than that of the air in said chamber surrounding the container.

This invention was made with a view towards obviating this condition and so that packages containing a medicated surgical bandage, for example, may be hermetically sealed prior to sterilization. According to this invention, the ambient of the gaseous pressure outside of the sealed containers is varied so that it approximates that of the gaseous or vapor medium in the sealed container in the course of elevating the temperature of the container and the material therein in the course of sterilization, which temperature now is customarily as high as about 320° F. and may be higher if desired.

The objects and advantages of this invention

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will be readily apparent from the following description and drawings wherein,

Figure 1 is a front elevation of a container having a surgical dressing therein and illustrates a type of package which may be sterilized by practicing the present invention.

Figure 2 is a view similar to Figure 1, but is an enlarged fragmentary view, with a longitudinal portion thereof cut away to show the dressing therein.

Figure 3 is a cross-sectional view taken on ilne 3—3 of Figure 2.

In the drawings, there is illustrated one example of a product that may readily be sterilized by this invention and in this instance, there is provided a container comprising a normally cylindrical or hollow body portion 10 having integral therewith a circular bottom 11. A longitudinal narrow strip 12 of the body 10, materially thicker than the remainder of said body, extends from the bottom 11 to the other end of body 10, and provides a simple means of opening the container when it is desired to do so.

The container is employed to package, in this instance, a pleated fabric cotton gauze or the like employed in the surgical dressing field. After the pleated gauze has been inserted into the body 10 of said container, a medicament such as petrolatum, or some other substance which may have a high vapor pressure at sterilization temperatures is placed in the container. Thereafter, the free or open end of the container is hermetically sealed.

The hermetically sealed container as above described may be composed of any desirable material and preferably of a shatterproof and metallic material such as tin, aluminum or the like in order to prevent breakage in transportation.

The tube or container aforedescribed is only an illustrative example of the type of container which normally would become distorted or ruptured in the course of sterilization thereof, in a sealed chamber at sterilizing temperatures which may be as high as 320° F. or above. This is true because when hermetically sealed the container includes therein substances which at the elevated temperature of sterilization exert such a vapor pressure on the interior of the sides of said tube which is in such excess of the pressure

on the outside of said sides as to cause said distortion or ruptures to take place.

Referring again to the illustrated example, it is well known that gauze bandage after it has been processed and is ready for packaging contains between about 2% to 6% of free water. In addition when such a bandage is medicated with a material such as petrolatum and is elevated to a temperature of about 320° F. or above in a sealed container, that pressure is exerted on the inside surface of the container due to the vapor pressures of the free water and petrolatum therein, and of the entrapped air.

According to this invention, a hermetically sealed normally collapsible container, containing therein a gauze bandage 13 or other material to be sterilized and more particularly a gauze bandage coupled with a medicament, may be sterilized in a sealed chamber or autoclave without danger of rupture or distortion. In carrying out this process, I first measure, or when possible compute the vapor pressure of said media at 100° F. and for each 50° F. increase in temperature thereafter up to about 100° F. beyond the maximum temperature which I desire to employ in this sterilization treatment. Then in like manner, I ascertain the pressure of the gas such as air or the like which is to be employed in a sterilization chamber and at said temperatures. These two tables are placed side by side and will show that the vapor of the media in said container at the higher temperatures, such as those between about 250° F. and 350° F. are considerably higher than the pressure of the air or the like at corresponding temperatures. In the practice of this invention a plurality of said hermetically sealed packages are placed in an autoclave or sterilization chamber generally containing air or some other compressible fluid therein; then the chamber is closed or sealed and heated by any convenient means to elevate the temperature therein. In order to prevent appreciable distortion of said sealed packages, which would otherwise occur, I prefer to increase the pressure of the air in said chamber at this elevated temperature by introducing air or some other compressible fluid continuously or periodically under pressure into said chamber as the temperature of the container is increased to maintain the differential in pressure between the pressure of the vapor in said container or tube and the pressure of the air in said chamber insufficient to cause appreciable distortion of said container or tube, and preferably until the pressure of the air in said chamber at said particular elevated temperature is approximately equal to the vapor pressure in said sealed tube.

If prevention of rupture only is desired and slight distortion of the container is unimportant, a second method may be used. Instead of increasing the pressure of the air in said chamber by periodically or continuously introducing air under pressure into said chamber, I may at any stage in this process, and preferably before the temperature of the air in said chamber has attained a temperature of between about 30° F. to 100° F. below the maximum temperature which may be about 320° F. or higher in this sterilization step, increase the pressure of the air into said chamber by introducing air or other compressible fluid under pressure therein, so that the pressure of said air at said maximum temperature will be sufficient to prevent deleterious distortion or rupture of said container or tube. By practicing this particular embodiment of the invention, the tubes

having therein said media to be sterilized may be partially collapsed due to this increase in pressure of the air. However, as the temperature of the air in the chamber and also of the media within the tube increases, the pressure within the tube increases more rapidly than the pressure outside of the tube so that when maximum sterilization temperature is reached, the pressure within the tube reaches such a value as to expand the tube from a collapsed to a normal condition. And in this embodiment, I prefer that the pressure within the tube be slightly higher than the pressure of the air at the maximum temperature of sterilization but not materially greater than the pressure necessary to insure return of said tube to substantially normal condition.

The pressure of the air in the chamber may be increased by still another method and without introducing air under pressure thereto. This may be done by employing a cylindrical chamber hermetically sealed by a piston which may be lowered in said cylinder to compress the air therein.

In this instance, the gaseous medium, air, may be compressed so that the pressure of the air in the chamber approximates the vapor pressure within the sealed tubes at different stages of the heating in the course of sterilization and particularly at the maximum temperature employed.

After said tube containing said medicated gauze has been subjected to said elevated temperature of at least about 320° F. or that necessary to produce the desired results, in the manner aforesaid to sterilize or otherwise treat the same, the same is allowed to cool. Then as the temperature decreases, the pressure of said gaseous medium is likewise decreased by allowing some of said gaseous medium to be expelled from said gaseous chamber. In this manner, during the cooling step, the pressure within the chamber is maintained at approximately the same as the pressure within the tube, thus any distortion or rupture of the latter is prevented, even during the cooling step.

While this invention has been described in detail, it is not to be limited thereby because various changes and modifications may be made without departing therefrom.

I claim:

1. A method of treating a sealed tube, containing a material having a vapor pressure at elevated temperature sufficient to distort the tube, in a pressure chamber containing a compressible medium therein, comprising heating said compressible medium and increasing the pressure of said medium in said chamber above the pressure it would normally attain by heat alone to substantially balance the pressure within the sealed tube and thereby prevent distortion of said tube.

2. A method of treating a sealed tube in a pressure chamber containing a gaseous medium therein, said sealed tube containing a material therein whose vapor pressure at an elevated temperature is sufficient to distort said tube, comprising heating said gaseous medium to an elevated temperature of at least about 320° F., and increasing the pressure of said gaseous medium above the pressure it would normally attain by heat alone in being brought to said elevated temperature.

3. A method of treating a sealed tube containing a material therein whose vapor pressure at an elevated temperature is sufficient to distort

said tube, comprising placing said tube in a pressure chamber, introducing a gaseous medium into said chamber, heating said gaseous medium to an elevated temperature of at least about 320° F. and adding a gaseous medium under pressure into said chamber to increase the pressure of said gaseous medium above the pressure said gaseous medium would normally attain by heat alone in being brought to said elevated temperature.

4. A method of treating a sealed tube in a pressure chamber containing a gaseous medium therein, said sealed tube containing a material therein whose vapor pressure at an elevated temperature is sufficient to distort said tube, comprising heating said gaseous medium to an elevated temperature of at least about 320° F. and compressing said gaseous medium until its pressure is materially above that it would normally attain by heat alone in being brought to said elevated temperature.

5. A method of treating a sealed tube, containing therein a material having a vapor pressure at sterilization temperature sufficient to distort said tube, in a pressure chamber containing a gaseous medium therein; comprising heating said gaseous medium to an elevated temperature sufficiently high to sterilize the contents of said tube and increasing the pressure of said gaseous medium in said chamber above the pressure it would attain by heat alone to a value approximating the pressure within said tube and thereby prevent distortion of said tube.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,168,173	Davis	Jan. 11, 1916

FOREIGN PATENTS

Number	Country	Date
709,222	France	May 11, 1931