

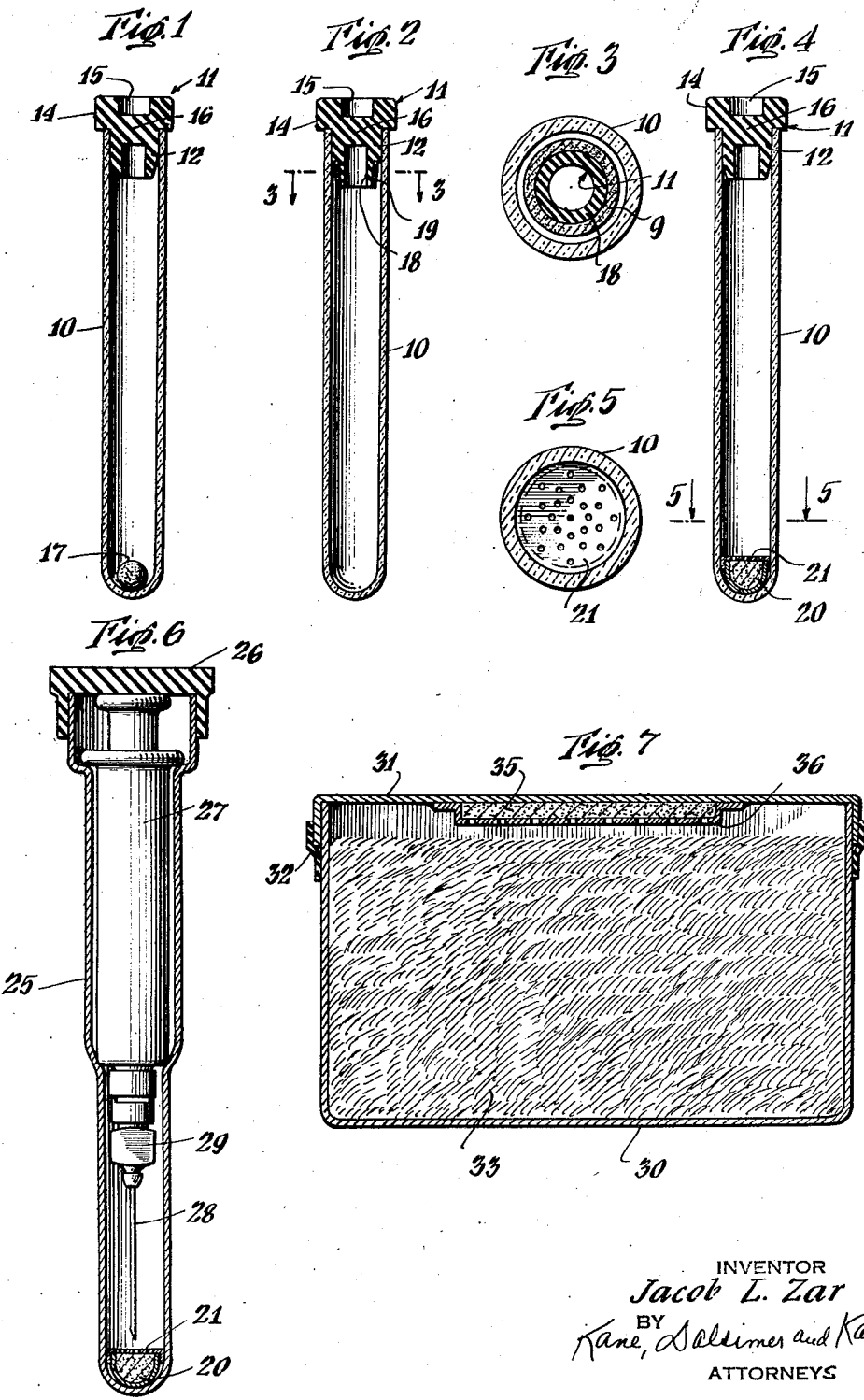
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CONTAINER ASSEMBLY AND METHOD

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CONTAINER ASSEMBLY AND METHOD

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This invention relates to an improved container assembly and more specifically to a sealed container and package which can be readily sterilized and dehydrated and also to a method of treating containers and packages so as to sterilize and/or dehydrate them.

For many purposes, it is necessary or desirable to provide a sealed, sterile container or package. Containers and packages of this type generally are sealed first and thereafter sterilized by being subjected to elevated sterilizing temperatures in excess of 250° F. An example of a container assembly of this type is the sealed, evacuated container used for collecting, storing and transporting blood. Blood collecting containers of this type are provided with a rubber or similar resilient stopper which provides a sealed closure.

The container is sealed, evacuated and sterilized and may thereafter be used for collecting blood by inserting a hypodermic needle in the blood vessel of a donor and by inserting a second hypodermic needle, which is connected to the first one by means of flexible tubing, through the stopper into the sealed evacuated container causing the blood to be drawn into the container. Container assemblies of this type are sterilized after sealing and evacuation by subjecting them to elevated sterilizing temperatures in an autoclave. To promote sterilization and to insure complete sterilization of the inside of the container assembly, a small quantity of a fluid is provided in the sealed evacuated container which will vaporize when subjected to sterilizing temperatures and for this purpose a drop or two of water is frequently employed.

When subjected to elevated sterilizing temperatures, the water vaporizes, changing to steam which rapidly sterilizes the interior of the container. Unfortunately, however, fluids, such as water, used for this purpose frequently produce undesirable results. As an example, the small quantity of water present in the container will frequently produce hemolysis of the blood subsequently collected in the container. Also, the water will frequently interfere with silicone or other coatings provided in the interior of the container, with the result that blood clots will adhere to the surface of the container. In other types of sealed containers and packages the water or other fluid is of course a contaminant which will produce other undesirable results such as corrosion of metallic parts.

It is a prime object of the present invention to overcome the difficulties and disadvantages heretofore encountered in sealed packages and containers of this type and to provide an improved container assembly which can be readily sterilized without any of the undesirable effects heretofore resulting from the water or other sterilizing fluid provided in the container.

A further object of the invention is the provision of an improved method for sterilizing and/or dehydrating sealed containers and packages.

My invention contemplates the provision of an improved container assembly in the form of a sealed envelope having a small quantity of an adsorbent therein.

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Adsorbed in the adsorbent at normal temperatures is a fluid such as water which is subject to desorption and to vaporization when the assembly is subjected to elevated sterilizing temperatures in excess of approximately 200° F.

In the accompanying drawing—

Fig. 1 is a sectional view in elevation of one form of container assembly embodying my invention;

Fig. 2 is a similar sectional view in elevation of a modified form of container assembly embodying my invention;

Fig. 3 is a cross sectional view in the direction of the arrows on the line 3—3 of Fig. 2;

Fig. 4 is a sectional view in elevation of a further modified form of container assembly embodying my invention;

Fig. 5 is a cross sectional view in the direction of the arrows on the line 5—5 of Fig. 4;

Fig. 6 is a sectional view in elevation of a further modified form of container assembly embodying my invention showing a sealed package having an article packaged therein; and

Fig. 7 is another sectional view in elevation of still another modified form of container assembly in the form of a sealed package of food.

My invention is applicable to any type of sealed container or package where it is desired to efficiently sterilize the container after it has been sealed and where it is desired to prevent the sterilizing fluid from contaminating the interior of the container or its contents.

In the first five figures of the drawing I have shown my invention as applied to a container for collecting, transporting or storing blood of the type disclosed in United States Letters Patent No. 2,460,641 granted on February 1, 1949, to Joseph J. Kleiner. Thus, I have shown an envelope in the form of a tube 10 made of suitable material such as glass, plastic, metal or the like. The lower end of the tube is closed, as shown, while the open upper end of the tube is sealed by means of closure 11 made of rubber, synthetic rubber, or some suitable resilient material which will seal the tube when inserted therein under compression.

The closure has a plug or neck portion 12 inserted in the open end of the tube which terminates in a tubular end portion whose extremity is preferably tapered to facilitate its insertion in the tube. The closure is also provided with an enlarged head portion 14 which overlaps the end of the tube 10 as shown and has central recess 15 extending inwardly from the upper surface thereof. A diaphragm 16 extends across the closure adjacent the area of connection between the head and plug portions so that a portion of the diaphragm extends into the open end of the tube 10 and a portion projects thereabove when the closure has been applied. The diameter of the plug portion of the closure is such as compared with the open end of the tube that the diaphragm is under compression when the closure has been applied.

As previously indicated, a flexible tube having a pair of hypodermic needles connected to its opposite ends may be used in withdrawing blood from a donor and collecting it in the tube or envelope 10. When the needle has been inserted through the diaphragm 16, it provides communication with the interior of the tube. After it has been withdrawn the diaphragm instantly seals itself. Also, as previously indicated, the container is evacuated and sterilized prior to use. Due to the fact that the container has been evacuated it will draw blood from the donor, and the container can be substantially filled if desired, when the needle at one end of the flexible tube has been inserted in the blood vessel of the donor and the other needle has been inserted through the diaphragm 16.

In each of the three forms of my invention, shown in Figs. 1 to 5 inclusive, I have incorporated inside the envelope, tube or container 10 a small quantity of an adsorbent

material such as aluminum oxide, silica gel, activated charcoal, fuller's earth, diatomaceous earth, kaolin, bentonite, or other adsorbent materials which are inert to and will not contaminate or affect the blood or other material to be collected in the container as well as the sterilizing fluid or agent which is adsorbed by the adsorbent. A preferred form of adsorbent is aluminum oxide as, for instance, the highly adsorptive form of activated aluminum oxide sold by the Aluminum Corporation of America, identified as Alcoa H141.

The quantity of adsorbent as compared with the cubic contents of the container is relatively small since only enough adsorbent is required to adsorb sufficient sterilizing fluid to permeate the interior of the container when it has been heated to sterilizing temperature. Thus, the major portion of the interior of the container remains unobstructed to hold the blood or other material to be collected, packaged or stored therein.

In the form of my invention shown in Fig. 1 the adsorbent has been pelletized and formed into a relatively small spherical pellet 17 inserted inside the glass tube 10 before the stopper 11 has been applied.

In the form of my invention shown in Figs. 2 and 3 the lower end 18 of the neck portion 12 of the stopper is made of reduced exterior diameter and a tapered ring of the adsorbent material has been formed and applied to the outer surface thereof, as indicated at 19.

In the form of my invention shown in Figs. 4 and 5 the adsorbent material is in granular form, as shown at 20, and is inserted in a small cartridge or container 21 having a perforated upper wall and which is inserted into the tube or container 10 in frictional engagement with the surface thereof so as to retain it in fixed position, as for instance, the lower end thereof.

From these three illustrative embodiments, it will be appreciated that the adsorbent material may be arranged inside the container in any suitable manner.

The adsorbent has adsorbed therein a suitable sterilizing agent, preferably a fluid, which will remain adsorbed during normal temperatures encountered when the container is being used, stored or transported but which will be desorbed and will vaporize, permeating the entire interior of the container, when it is heated to sterilizing temperatures—as an example—in excess of 200° F. The sterilizing agent or fluid employed is preferably water although other agents which are isotonic with blood may be employed such as aqueous solutions, specifically physiological saline solution, 3.8% sodium citrate solution and in addition other fluids as, for instance, certain alcohols may be employed.

The quantity of sterilizing agent employed should be sufficient as indicated above to readily permeate all of the interior of the container when heated to sterilizing temperatures. The proportion of adsorbent to sterilizing agent is preferably such that the adsorbent is less than completely saturated when at normal temperatures. Under this arrangement, the adsorbent will readily re-adsorb all of the sterilizing agent after desorption and cooling.

In assembling the forms of apparatus shown in Figs. 1 to 5 inclusive, the adsorbent with the sterilizing agent adsorbed therein is inserted in the container and the closure or stopper 11 is applied, and thereafter the atmosphere inside the container is exhausted as, for instance, by inserting through the stopper a hypodermic needle connected to a vacuum pump or other source of vacuum. When the container has thus been evacuated, it may be sterilized by inserting it in an autoclave and heating it to a sterilizing temperature in the general area of 200° F. or more. When thus heated, the adsorbed water or other sterilizing agent is desorbed and it vaporizes permeating the interior of the container and serving to sterilize the internal surfaces and the space inside the container. Thereafter, the container is cooled and the water or other sterilizing agent is reabsorbed by the adsorbent and the container is ready for use.

When the container is used for collecting blood, there is no hemolysis or other undesirable affects since the water remains adsorbed by the adsorbent. Similarly, the silicone or other lining inside the container is not adversely affected since the water is re-adsorbed as soon as the container is cooled.

The three embodiments in Figs. 1 to 5 inclusive have been described as applied to a container for collecting, transporting, and storing blood. It may also be applied to containers for collecting other physiological fluids or which are used for entirely different purposes. Thus, in Figs. 6 and 7 I have shown my invention as applied to containers serving as packages. The packages shown in Figs. 6 and 7 may serve as commercial packages and the device of Fig. 6 may also serve as a sterilizing holder or package.

Referring to Fig. 6, I have shown an envelope in the form of a container or tube 25 of a size and shape to accommodate a hypodermic syringe. The tube may be made of any suitable material such as glass, plastic material, or metal. The lower end of the tube is closed, as shown, and the upper end is open and is fitted with a cap 26 which has sealing engagement therewith. The cap 26 may be made of suitable resilient material such as rubber, synthetic rubber, or the like and it has a tight friction fit with the upper end of the tube so as to provide the desired seal. Packaged inside the container is a conventional hypodermic syringe 27 having a cylinder and piston portion made of glass or plastic material and a needle 28 and hub or fitting 29, made of suitable metal such as steel.

Suitably arranged inside of the tube 25 is my improved combination of adsorbent and sterilizing agent. Thus, for example, I may provide a cartridge 21 having a perforated top and having an adsorbent in granular form with a fluid adsorbed therein of a type generally similar to that shown in Figs. 4 and 5. The cartridge may be frictionally held in fixed position in the tube 25 as, for instance, the lower end.

In this form of my invention, the adsorbent and sterilizing agent are inserted in the container, the hypodermic syringe is then placed therein and the closure 26 is sealed over the open end of the tube. The interior of the container and its contents may be sterilized by placing the assembly in an autoclave and heating to a sterilizing temperature to cause desorption of the sterilizing agent and vaporization thereof. The vapor at sterilizing temperatures will permeate the interior of the container and its contents causing it to be sterilized. Thereafter, when the container cools, the sterilizing agent will be reabsorbed by the adsorbent. Where the sterilizing agent employed is water, the sterilizing temperature should be in excess of approximately 212° F. to cause desorption and vaporization.

After sterilization, the water will not cause corrosion of the metallic parts since it is quickly reabsorbed by the adsorbent upon cooling. As a matter of fact, since the adsorbent is preferably less than completely saturated at normal temperatures, it serves to maintain the atmosphere inside the package in a dry, dehumidified, condition. The package shown in Fig. 6 may be used as the commercial package for the hypodermic syringe. It may also serve as a sterilizing holder or container in which the syringe may be sterilized.

In Fig. 7 I have shown a commercial package which may be used for a suitable food product such as a cooked cereal or roasted coffee. Thus, I have shown an envelope which may be in the form of a metal or glass container 30 having an open upper end to which a cover 31 is applied and sealed as by means of a sealing tab 32. The food product 33 is inserted in the container and my improved sterilizing combination of adsorbent and sterilizing agent are likewise suitably arranged therein. Thus, for instance, the adsorbent 35 with the sterilizing agent adsorbed therein may be held inside the cover by means

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of a perforated plate 36 suitably applied to the inner surface of the cover. The adsorbent and sterilizing agent employed in the form of my invention shown in Fig. 7 may be used for sterilizing the interior of the container and its contents in the manner previously described. It also serves to dehumidify the interior of the container and its contents and to maintain it in dry condition.

It will thus be seen that I have provided an improved container assembly which can be readily sterilized without undesirable affects from the water or other sterilizing agent employed. My improved container assembly also is maintained in dry and dehumidified condition.

Modifications may of course be made in the illustrated and described embodiments of my invention without departing from the invention as set forth in the accompanying claims.

I claim:

1. The method of sterilizing a sealed container comprising sealing into the container a small quantity of adsorbent material which is inert to water and is unaffected by elevated sterilizing temperatures having adsorbed therein a liquid which is desorbed and vaporizes at sterilizing temperatures, thereafter heating the sealed container to a sterilizing temperature in excess of approximately 200° F. to cause desorption and vaporization of the fluid and finally cooling the container while sealed to cause the fluid to be re-adsorbed by the adsorbent.

2. The method of sterilizing a sealed container comprising sealing into the container a small quantity of adsorbent material which is inert to water and is unaffected by elevated sterilizing temperatures having water adsorbed therein, thereafter heating the sealed container to a sterilizing temperature in excess of approximately 200° F. to cause desorption and vaporization of the water and finally cooling the container while sealed to cause the water to be re-adsorbed by the adsorbent, the quantity of water being sufficient to permeate the interior of the container when vaporized at sterilizing temperatures and the quantity of adsorbent being at least sufficient to adsorb the water.

3. The method of sterilizing a sealed container comprising sealing into the container a small quantity of ad-

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sorbent material which is inert to water and is unaffected by elevated sterilizing temperatures having water adsorbed therein, evacuating the container, thereafter heating the sealed container to a sterilizing temperature in excess of approximately 200° F. to cause desorption and vaporization of the water and finally cooling the container while sealed to cause the water to be re-adsorbed by the adsorbent, the quantity of water being sufficient to permeate the interior of the container when vaporized at sterilizing temperatures and the quantity of adsorbent being sufficient to adsorb the water.

4. Apparatus for use in collecting blood comprising a sealed evacuated container having a resilient self-sealing pierceable stopper, an adsorbent agent which is inert to blood and is unaffected by elevated sterilizing temperatures disposed in said container and a liquid which is isotonic to blood adsorbed in said adsorbent agent, said liquid being subject to desorption and vaporization when subjected to elevated sterilizing temperatures in excess of 200° F.

5. Apparatus for use in collecting blood as set forth in claim 4 in which the liquid is water.

6. Apparatus for use in collecting blood as set forth in claim 4 in which the quantity of adsorbent agent is more than sufficient to adsorb the liquid.

7. Apparatus for use in collecting blood as set forth in claim 4 in which the adsorbent is in the form of a pellet.

8. Apparatus for use in collecting physiological fluids comprising a sealed evacuated container having a resilient self-sealing pierceable stopper, an adsorbent material which is inert to blood and is unaffected by elevated sterilizing temperatures disposed in said container and a small quantity of water adsorbed in said adsorbent material, the quantity of adsorbent being more than sufficient to adsorb the water and the quantity of water being sufficient to permeate the interior of the container when vaporized whereby said water is subject to desorption and vaporization to permeate and sterilize the interior of the container when subjected to temperatures in excess of 200° F.

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