United States Patent

[11] **3,571,940**

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[21] Appl. No. **817,904**
[22] Filed **Apr. 21, 1969**
[45] Patented **Mar. 23, 1971**
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[54] **THERMAL CASSETTE**
2 Claims, 4 Drawing Figs.

[52] **U.S. Cl.** **34/5,**
220/17, 62/460
[51] **Int. Cl.** **F26b 5/06**
[50] **Field of Search** 62/3, 460;
220/17; 34/5

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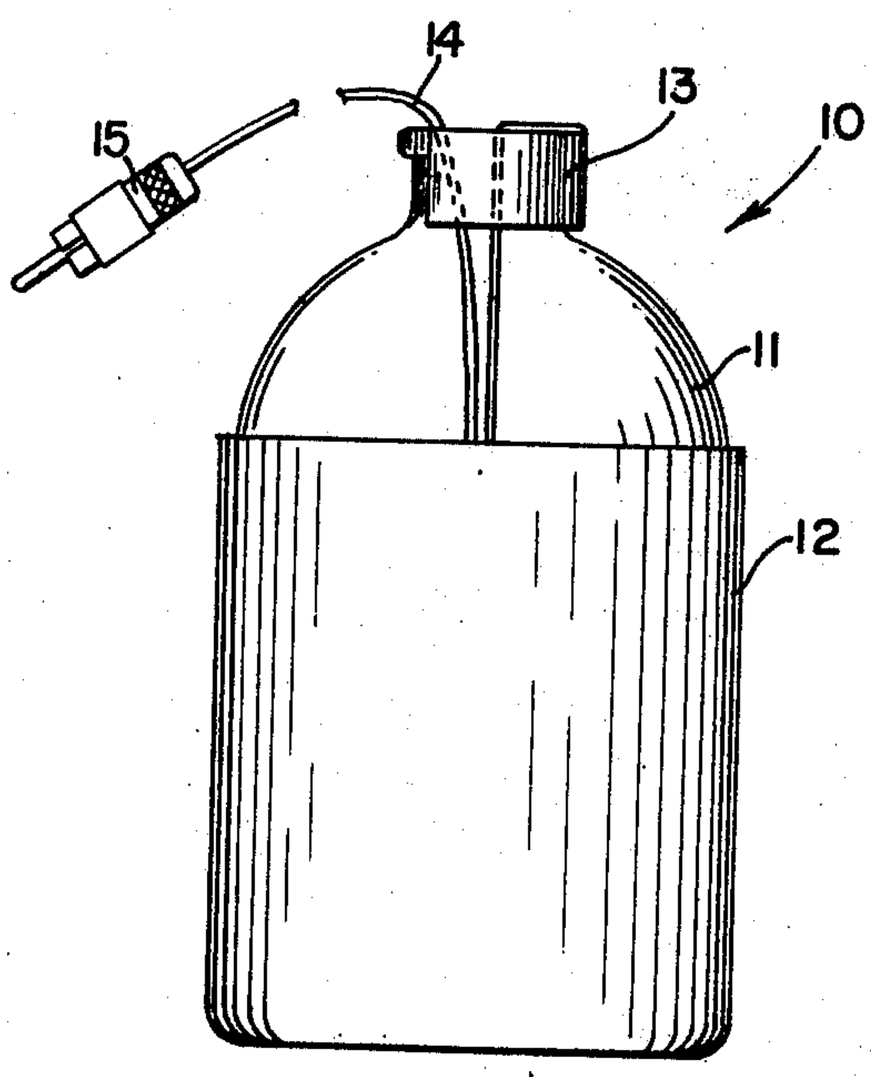
ABSTRACT: A thermal cassette for housing a container of material to be freeze dried, said cassette having radiation absorbing quality to provide for uniform heat transfer to the container contents to promote better and faster freeze drying.



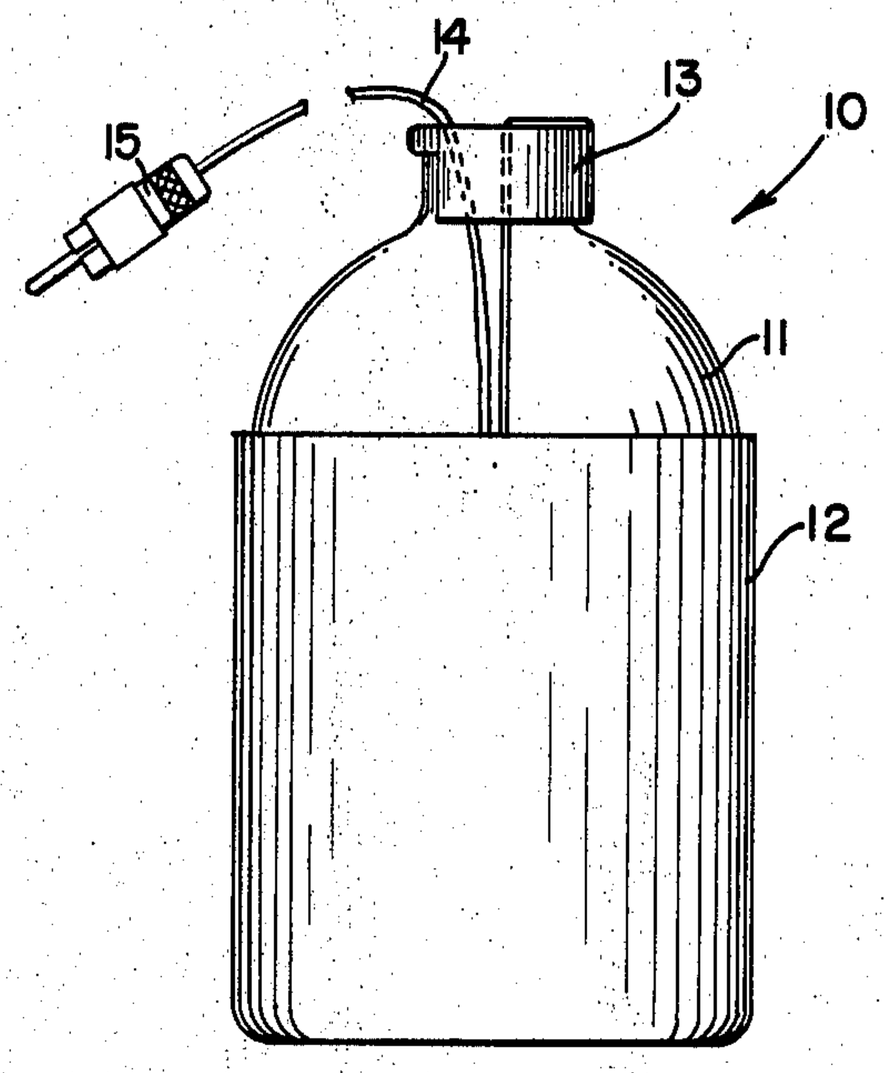


FIG. 1.

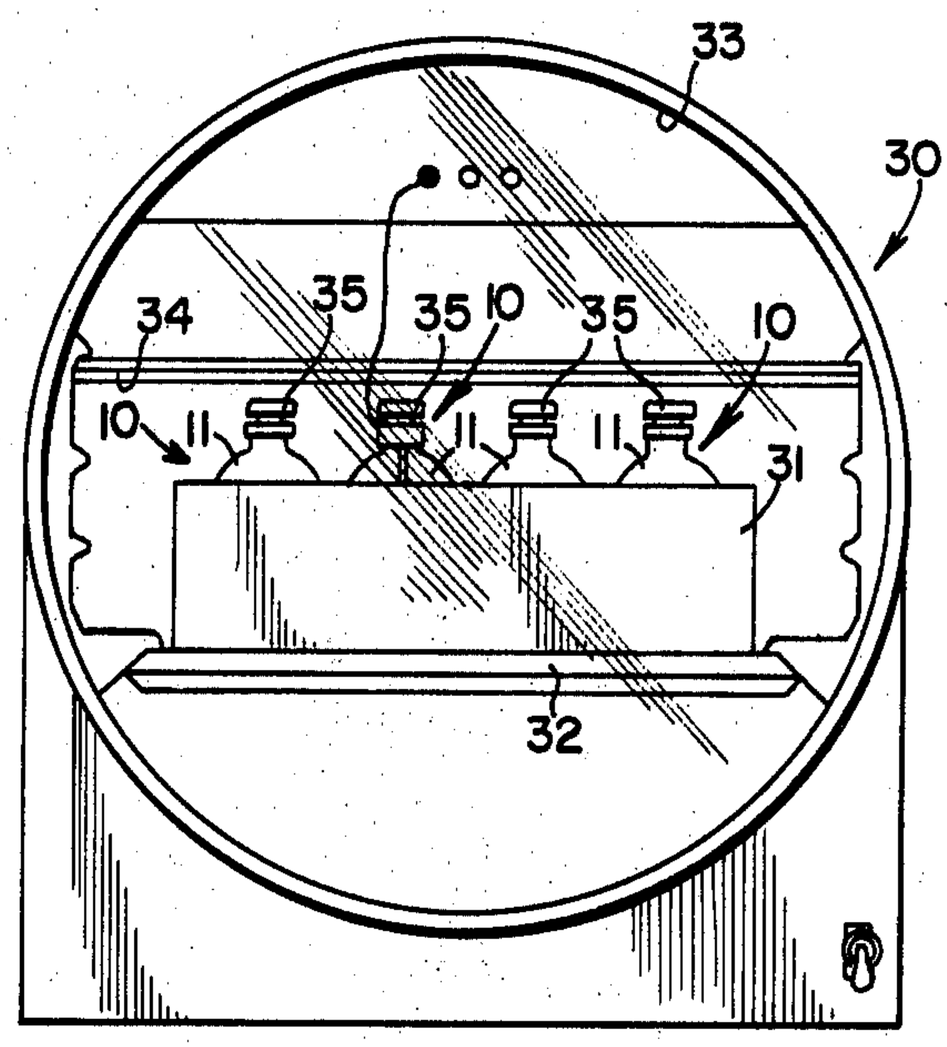


FIG. 2.

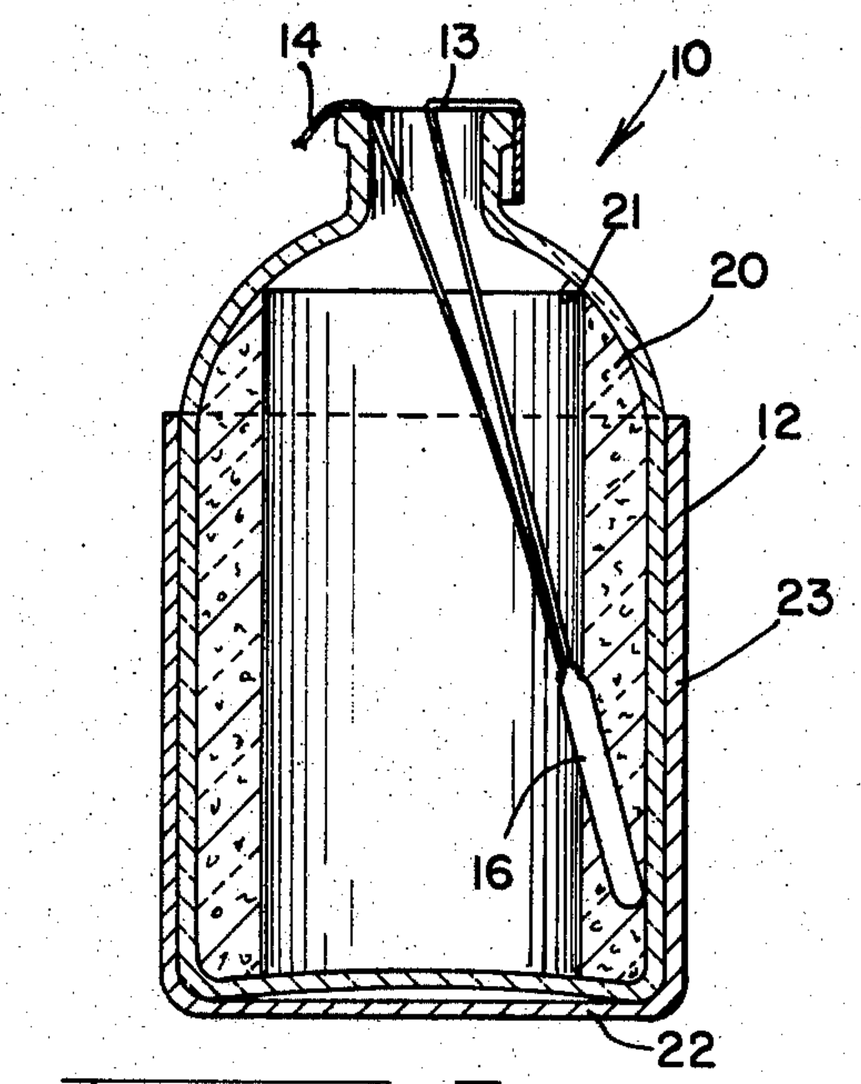


FIG. 3.

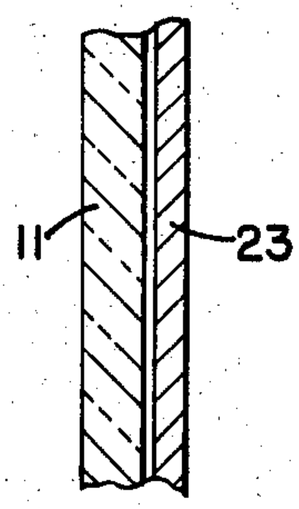


FIG. 4.

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THERMAL CASSETTE

This invention relates to improvements in heat transfer means and, more specifically, is related to a new and improved thermal cassette particularly adapted for use in freeze drying materials such as blood, serums and the like. Freeze drying is a well-known art and may be accomplished in a variety of ways. A commonly used way in connection with materials requiring critical temperature and control during freeze drying is shell freezing the material in a uniform layer around the interior walls of a known-type of container such as a glass bottle. The material is then subjected to a vacuum along with a controlled heat input to permit the frozen water to sublime, i.e., go directly to a vapor while bypassing the intermediate liquid phase.

In practice, controlling the rate and uniformity of heat input is quite important. In most biomedical substances, great care must be exercised to assure that the water will not go to a liquid state, causing the freeze drying process to be interrupted and rendering the material unusable. Accordingly, the rate of heat transfer to the material should be kept as uniform as possible to assure that vaporization will occur throughout the process. As is well known in the art, glass vials, plastic bags and bottles are not always of uniform wall thickness and, therefore, the rate of heat transfer through the walls should be as uniform as possible to promote fast and uniform freeze drying. It is to overcome this problem that the present invention was developed.

The present invention consists of a cassette or container of sleevelike shape having a closed bottom which receives the glass container having the frozen material to be freeze dried therein. The use of the novel cassette provides for uniform heat distribution to the container contents and assures that stray radiant heat will not affect the heat input during the freeze drying process.

A better understanding of the invention will be had when considering the objects and specific description which follows.

It is an object of this invention to provide a new and improved means for controlling heat input to materials to be freeze dried.

It is a further object of this invention to provide a new and improved thermal cassette adapted for use in freeze drying materials.

It is a still further object of this invention to provide a new and improved thermal cassette which may be inexpensively formed.

Objects other than those specifically stated will become apparent to one skilled in the art upon reference to the accompanying drawings and following description.

IN THE DRAWINGS

FIG. 1 is an enlarged elevational view of a conventional container and probe assembly for freeze drying with the container housed in the thermal cassette of the present invention;

FIG. 2 is a schematic elevational view of a typical freeze drying arrangement including a chamber-type freeze dryer partially filled with the cassette and container combination shown in FIG. 1;

FIG. 3 is an enlarged cross-sectional view of the container shown in FIG. 1 and illustrating the cassette and container combination in cross section; and

FIG. 4 is an enlarged fragmentary cross-sectional view of a typical wall section of the container and cassette combination.

Referring now to FIG. 1, the freeze drying container and cassette combination is shown generally at 10 including a container 11 and thermal cassette 12. The container 11 as illustrated is the control container for freeze drying and includes a probe mounting means 13 having a probe lead 14 and jack 15 to permit the electrical signal to be transmitted to an external meter (not shown). The lower end of the probe 13 has housing 16 containing a thermister bead or other type of sensing means.

The container 11 is received in the cassette 12 with a close fit as shown in FIGS. 3 and 4, but with sufficient clearance to permit easy insertion and removal. In actual practice, material to be dried may be shell frozen as shown in a uniform layer 20 about the inner circumferential walls 21 of the container 11 or plug frozen in a conventional manner. The material 20 typically may be any type of material which is to be freeze dried such as blood, serum or the like.

The thermal cassette 12 is of a generally cup-shaped design having a bottom wall 22 and upstanding circumferential sidewalls 23 formed integral with the bottom wall 22. The cassette 12 should be formed of good conductive material such as aluminum or the like. It may be shaped by spinning or any other suitable manufacturing technique in the smaller sizes while in the larger sizes, it is cast and machined. Deep drawing is also a manufacturing possiblity. The aluminum is black anodized on the interior and exterior to provide a radiant heat absorbent surface. It can be painted or coated in any other fashion so long as the absorbent and radiant qualities are retained. The control sample is placed with other containers in a tray 31 which is placed on the shelf 32 in the chamber 33 of a chamber-type freeze dryer indicated generally at 30 in FIG. 2. As is well known in the freeze drying art, the chamber-type dryer 30 is sealed and has means to permit a controlled heat input to be applied to the shelf 32 while the chamber is placed under heavy vacuum. The water vapor is drawn off by the vacuum and is condensed on a condensing means being subsequently discharged as water.

A stoppering plate 34 is usually positioned above the bottles or containers 11 and serves to permit the container to be sealed off under vacuum by functioning to force the split stoppers 35 of conventional design into the mouth of the respective containers after the freeze drying is completed.

In the absence of thermal cassettes, the variation of the location of the bottles within the chamber 33 will normally result in the heat input being not completely uniform. The use of thermal cassettes assures that the heat input will be absorbed with greater uniformity by the cassette 12 and, thereafter, transferred with greater uniformity through the container walls to the freeze dried material. The thermister probe 16 is designed to carefully sense the temperature of the control sample while the contents are undergoing freeze drying with the information available to the operator on an external meter.

The thermal cassette provides for uniformity in heat transfer to the container contents through the cassette wall 23, assuring freeze drying rather than melting of the frozen material.

Upon a consideration of the foregoing, it will become obvious to those skilled in the art that various modifications may be made without departing from the invention embodied herein.

I claim:

1. The method of freeze drying materials which comprises the steps of freezing the material to be dried in a container, inserting said container in a thermal cassette to improve the uniformity of heat transfer to the material frozen, freeze drying said material through applying said container to a vacuum while controlling the heat input to said container through said cassette.

2. In combination, a container containing frozen material to be dried, a thermal cassette receiving said container with a close fit to provide good heat conductance to said container and facilitate removal of said container, said thermal cassette enveloping substantially all of said container for uniformity in heat transfer to said container and its contents thereby assuring uniformity in freeze drying, said thermal cassette being formed of metal having the interiorly and exteriorly facing surfaces thereof of a black color for radiant heat absorption and distribution to said container.