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TEMPERATURE CONTROL DEVICE

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Abstract

A temperature control device includes a deformable flexible envelope having an interior chamber, at least one layer of open cell material located within the interior chamber and a fluid located within the interior chamber, the open cell material and fluid being sealed within the deformable flexible envelope. The at least one layer of open cell material is sandwiched between a first layer of insulating material and second layer of insulating material.

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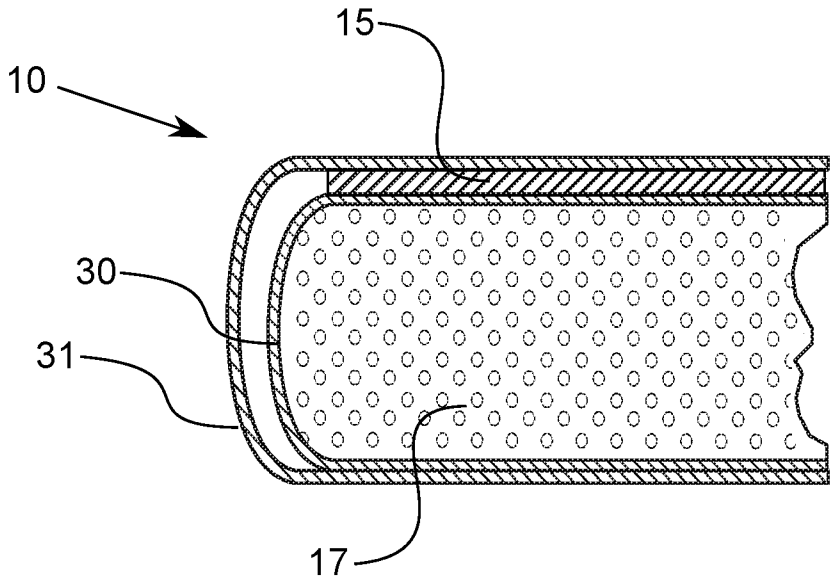

Figure 6

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TEMPERTURE CONTROL DEVICE

FIELD OF THE INVENTION

The field of the present invention relates to a temperature control device.

In particular, the present invention is directed towards a temperature control device or packing that is fully sealed.

DESCRIPTION OF THE PRIOR ART

Ice packs are well known item in which a flexible package is filled with a liquid and then frozen and placed within the confines of an insulated container, such as a polystyrene container. The cooled liquid in the ice pack then absorbs the ambient heat within the insulated container to in order to try and keep the contents of the container at a temperature below or close to that required.

For example, in the transport of perishable products, such as food, which needs to be transported from one location to another, such foods are first produced or kept at a required temperature that is considered optimal for the storage of the food product. Transport of that food can then be via a refrigerated container, which is best, however may not be practical for smaller consignments and also requires an energy source to power the refrigeration unit, thus adding expense to the transportation.

Polystyrene or other similar insulated containers are often used for smaller consignments of goods as the insulating properties of such containers helps to slow the transfer of heat into the interior of the container. Such insulated containers on their own are useful for the transport of perishable goods over small distances, or where the climate is relatively cool. For longer distances the insulated container may be supplemented with the addition of an ice pack.

The liquid in the ice pack is usually a liquid that has a relatively low freezing point. The use of water will allow the ice pack to have a temperature of approximately

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0°C, while the use of a liquid with a lower freezing point, such as an salt/water mix will have a temperature less than 0°C.

Typically such ice packs are formed in sheets, frozen and then added to the insulated container prior to transporting the perishable goods. Ice pack such as these however suffer from a number of drawbacks such as relatively prompt melting, poor performance relative to size and poor handling characteristics when the fluid is in a liquid state.

When the fluid in an ice pack begins to melt, the now warmed liquid, relative to the solid component, rapidly seeks to find a local low point in the package due to the action of gravity. This has a flow on effect in that the now warm liquid begins to create a localised warm spot, relative to the solid part of the ice pack and thus can create a localised warming of the perishable product that is in immediate proximity of the local warm spot.

This has particular consequences if the perishable product is sensitive to minor changes in temperature, such as for example chocolate. The formation of local warm spots over a container of high value chocolate products can be detrimental to the particular form and look of the product resulting in the potential for significant losses during transportation of small batches over extended distances

Similarly with temperature sensitive pharmaceutical products or vaccines where slight changes in localised temperature of the product may not be immediately recognised, this can still result in a degradation or loss of efficacy of the product which can had unpleasant consequences.

In addition, the economic loss can be significant if the goods are damaged or appear unattractive.

OBJECT OF THE INVENTION

It is an object of the present invention to provide a temperature control device that provides increased temperature retention.

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It is a further object of the present invention to provide a temperature control device that is economical to manufacture.

A further object of the present invention is to provide a temperature control device that has increased structural support.

Other objects and advantages of the present invention will become apparent from the following description, taking in connection with the accompanying drawings, wherein, by way of illustration and example, an embodiment of the present invention is disclosed.

SUMMARY OF THE INVENTION

According to the present invention, although this should not be seen as limiting the invention in any way, there is provided a temperature control device including a deformable flexible envelope having an interior chamber, at least one layer of open cell material located within the interior chamber and a fluid located within the interior chamber, the open cell material and fluid being sealed within the deformable flexible envelope.

In preference, the temperature control device includes at least one layer of insulating material.

In preference, the at least one layer of open cell material is sandwiched between a first layer of insulating material and second layer of insulating material.

In preference, the liquid is water.

In preference, the liquid is at least one of the liquids from the group consisting of propylene glycol, water or polyvinyl alcohol.

In preference, the insulating material is a heat reflective material.

In preference, the deformable flexible envelope is vacuum-sealed.

BRIEF DESCRIPTION OF THE DRAWINGS

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By way of example, an embodiment of the invention is described more fully herein with reference to the accompanying drawings, in which:

Figure 1 shows a perspective view of the present invention.

Figure 2 is a cross section of the present invention without insulation.

Figure 3 is a cross section of the present invention with a single layer of insulation.

Figure 4 is a cross section of the present invention with a double layer of insulation.

Figure 5 is a cross section of the present invention wherein the double layer form is encased.

Figure 6 shows a cross section of the further form of the present invention

DETAILED DESCRIPTION OF THE INVENTION

Referring to figure 1, there is a temperature control device 10 being an envelope 11 constructed from a suitably resilient material such as a plastics material. Located within the inner chamber 12 of the envelope 11 is an open-cell material 15. The open cell material 11 can take up the entire area of the inner chamber 12 so as to form a planer shape as shown in figure1. Alternative shapes of the envelope may be used, along with alternative shapes of the open-cell material 15 depending on the requirements of a user. For example, rectangular strip shapes may be useful for filling smaller areas in a container, whereas larger rectangular shapes may be useful for placing over an upper area of a consignment of perishable goods in a container.

Within the inner chamber 12 is also a liquid 17. The liquid 17 can be water or similar aqueous liquids such as a salt-liquid mixture. In addition the liquid 17 can be a polyvinyl alcohol, gel, propylene glycol or similar material in which the temperature characteristics of such liquids make them suitable for use in cold pack. Such liquids are commercial available and are able to be cooled lower than water, that is such liquids have a freezing point that is less than 0°C.

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The use of the liquids is known and allows the temperature characteristics of the temperature control device 1 to be adapted depending upon the use by varying or selecting the appropriate liquid 17.

The open-cell material 15 can be a foam material in which there are a number of open cells or pores that are connected to one another.

When the liquid 17 is introduced into the envelope 11, it flows through the open cells of the open-cell material 15, and air is displaced from within the inner chamber 12. Any excess air in the inner chamber 12 can be removed under vacuum conditions. As shown in figure 2, a cross section view, the open-cell material 15 is securely surrounded by the envelope 11. When the temperature control device 10 is then placed in a suitable freezer the liquid 17 cools and if the temperature of the freezer is sufficient the liquid 17 may solidify.

The temperature control device 10 is then in a required stated to be placed into a container, preferably one that is insulated, so as to control the temperature within the container. As the ambient temperature inside the interior of the container starts to rise, the latent heat is then absorbed by the temperature controlling device 10 and this has the effect of reducing the rate of temperature rise with the container.

As the temperature controlling device 10 device absorbs the latent heat within the container, the liquid 17, which may be in a solid state, starts to liquefy and due to the incorporation of the open-cell material 15 within in the inner chamber 12, provides support to the overall form of the temperature control device 11 preventing the liquid from gathering at any particular local low spot.

For example, if the temperature control device 11 did not have the open-cell material 15, the warmed liquid, that is liquid 17 having a temperature greater than that of the solid form of the liquid, would then gather at a localized low spot due to gravity. This results in areas of the temperature control device 11 being warmer than others and thus possibly have a detrimental effect on the perishable products.

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As the open-cell material 15 prevents the or at least reduces the flow of any liquid 17 throughout the temperature control device 11 then such localized low spots are dramatically reduced and the cooling effect is maintained over a more even surface.

In addition, an insulating material 20 can be located adjacent on a first side 21 of the open-cell material 15, positioned so that is located on the opposite side to where the perishable goods are stored. This insulating material 20 may be formed from any suitable insulating product such as a closed cell foam material or a reflective insulating material and may be of any such thickness or rigidity as desired. The insulating material 20 could be bonded to the open-cell material 15.

In a further form of the invention there is insulating material 20 and 24 respectively, positioned on both sides 21 and 22 of the open-cell material 15. This arrangement provides a slower absorption of latent heat from within the container of perishable goods and may be preferable depending upon the goods.

In addition, the open-cell material 15 and liquid 17 can be encased in a first envelope 30 to form a pad which is then encased in a second envelope 31 and if required insulating material may be positioned on either or both sides of the formed pad. The insulating material 20 may also be locate as shown in figure 6, between the first envelope 30 and the second envelope 31.

The temperature control device 10 therefore present a development over that which is presently known and provides a more efficient and reliable temperature control device that restricts to a substantial degree the movement of liquid within the temperature control device 10 as well as provides a more resilient and moldable form.

Moreover, the present invention now provides a temperature control device that has an extended functional life and is economical to produce.

Although the invention has been herein shown and described in what is conceived to be the most practical and preferred embodiment, it is recognized that

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departures can be made within the scope of the invention, which is not to be limited to the details described herein but it is to be accorded the full scope of the appended claims so as to embrace any and all equivalent devices and apparatus.

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THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A temperature control device including a deformable flexible envelope having an interior chamber, at least one layer of open cell material located within the interior chamber and a fluid located within the interior chamber, the open cell material and fluid being sealed within the deformable flexible envelope.

2. The temperature control device of claim 1, further characterised in that there is at least one layer of insulating material positioned adjacent to the open cell material.

3. The temperature control device of claim 1 or 2, further characterised in that the at least one layer of open cell material is sandwiched between a first layer of insulating material and second layer of insulating material.

4. The temperature control device of any one of claim 1-3, further characterised the liquid at least of from the group consisting of water, propylene glycol, or polyvinyl alcohol

5. The temperature control device of any one of claim 1-4, further characterised in that the deformable flexible envelope is vacuum-sealed.

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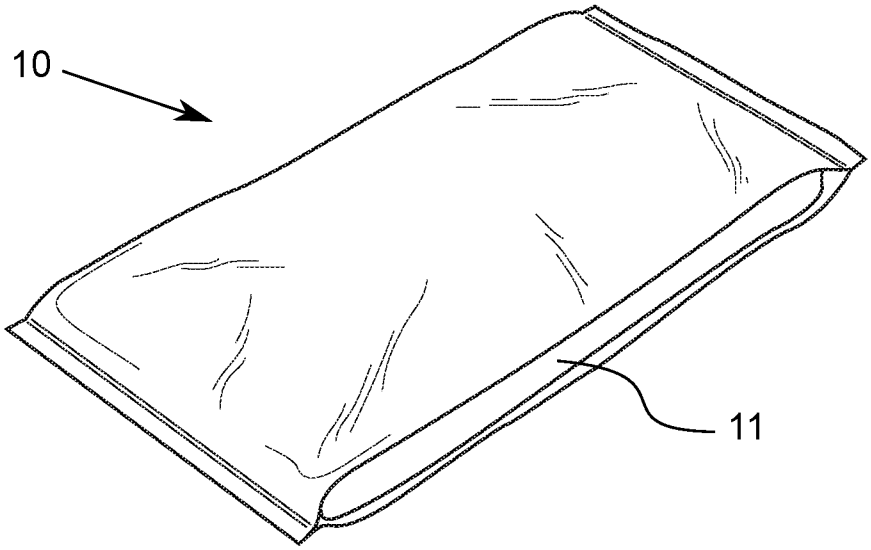

Figure 1

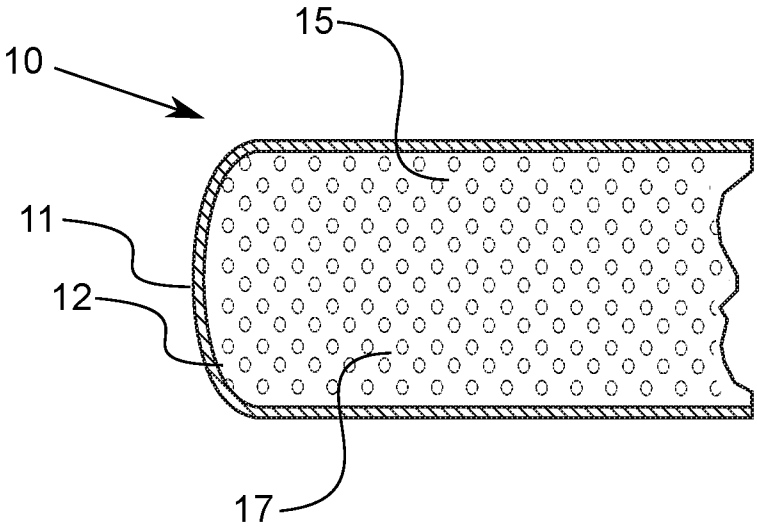

Figure 2

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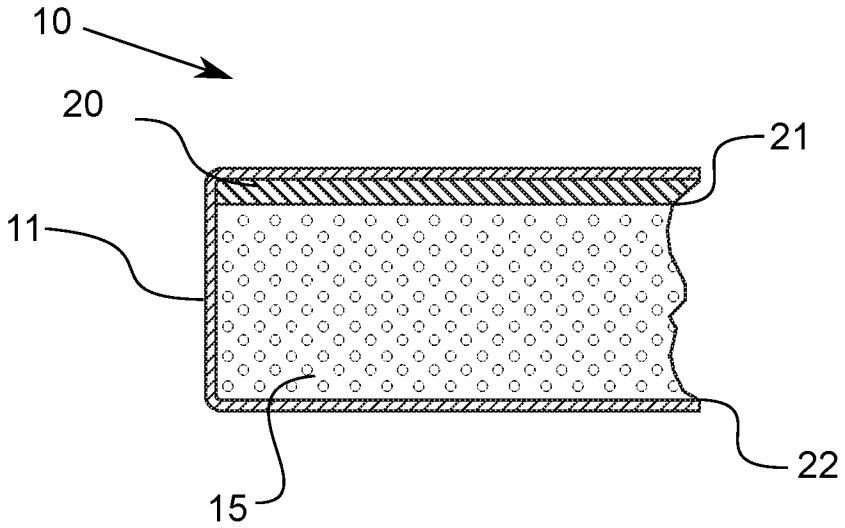

Figure 3

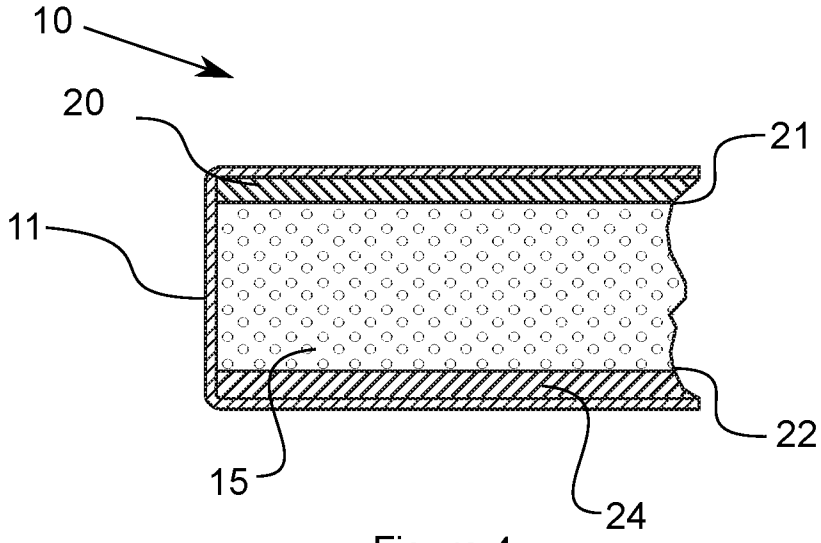

Figure 4

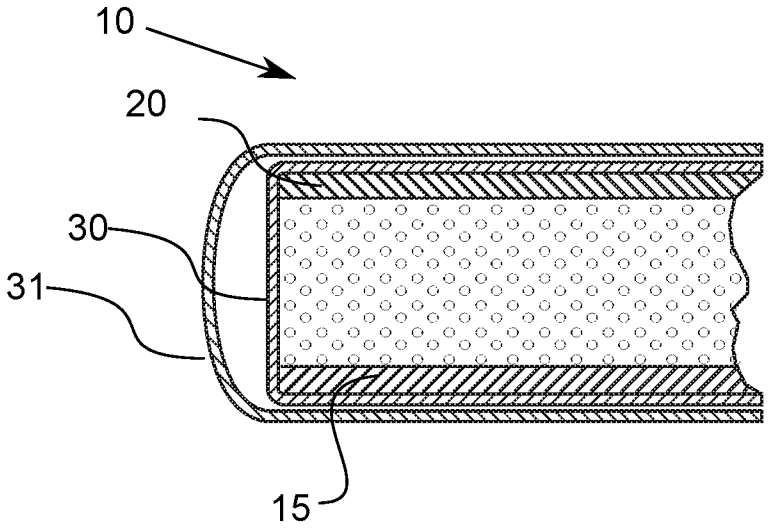

Figure 5

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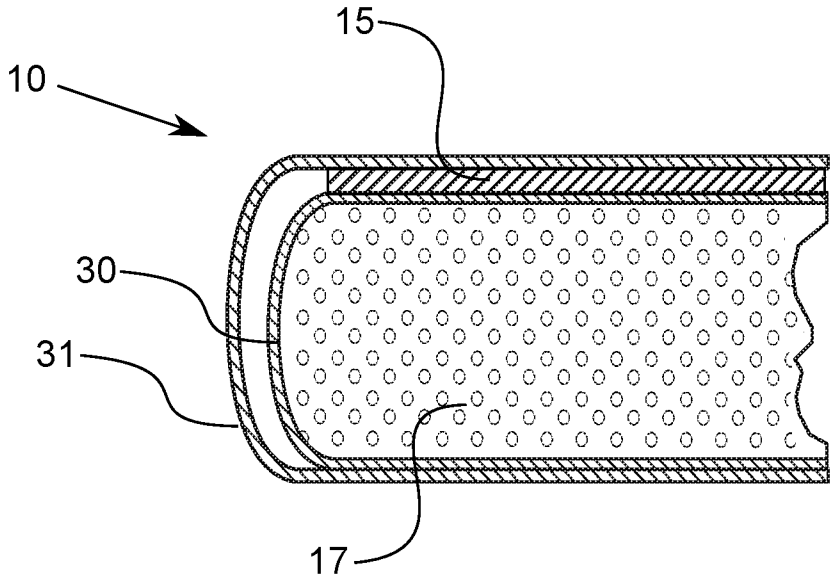

Figure 6