

[54] COOLING CUSHION

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[22] Filed: June 20, 1973

[21] Appl. No.: 371,906

[52] U.S. Cl. .... 62/530, 62/430, 62/457, 165/46

[51] Int. Cl. .... F25d 3/08

[58] Field of Search ..... 62/529, 530, 430, 457; 165/46

[56] References Cited

UNITED STATES PATENTS

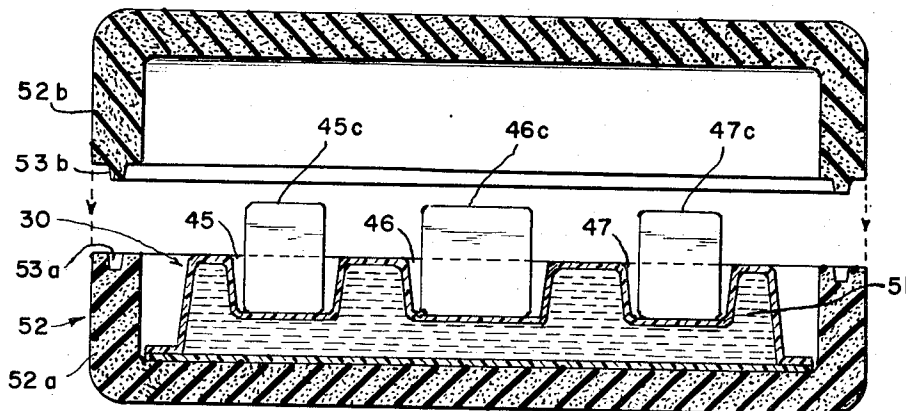
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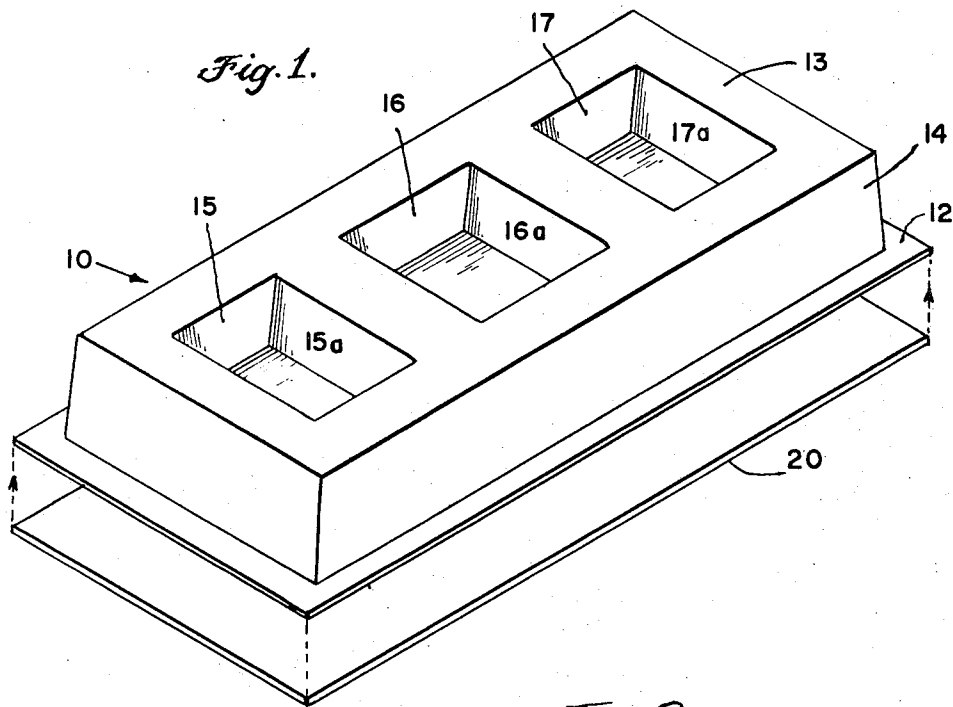
Primary Examiner—William J. Wye  
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[57] ABSTRACT

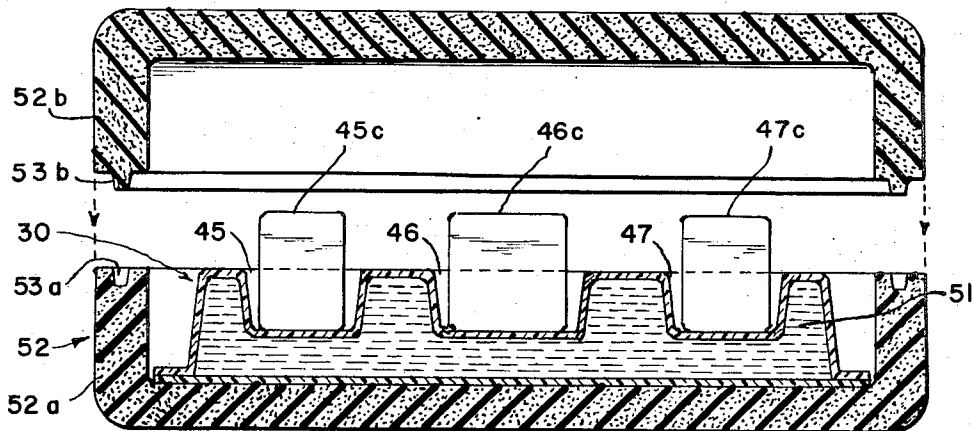
A quilt-like sheet comprises two layers of polyethylene defining a plurality of small containers joined together through bonded container boundary zones, each container serving as a cooling cushion by reason of being filled with a pre-cooled stiff gel which has not frozen rigid, but which has a gel like temperature range of at least 30°F, desirably about 60°F. Each such flexible container can provide some cushioning and protection from impact. The composition of the gel has a rigid freezing point lower than about -40°F, desirably lower than -60°F, and consists of a mixture of 20 to 55 percent by weight amide of an acid having a molecular weight of at least 200, from 30 to 65 percent by weight of an organic water-miscible liquid having at least one hydroxyl group and a molecular weight less than 100, and from 15 to 50 percent by weight of water. The cushions can also have other shapes.

6 Claims, 8 Drawing Figures





*Fig. 2.*



*Fig. 3.*

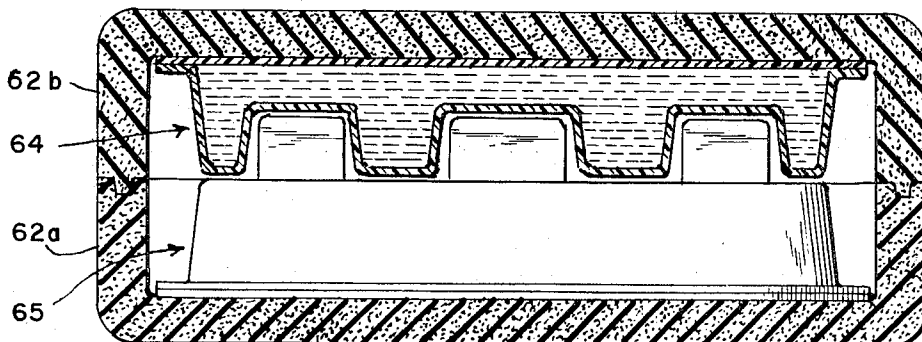


Fig. 4.

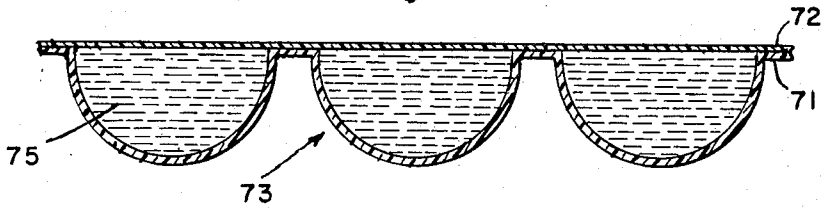


Fig. 5.

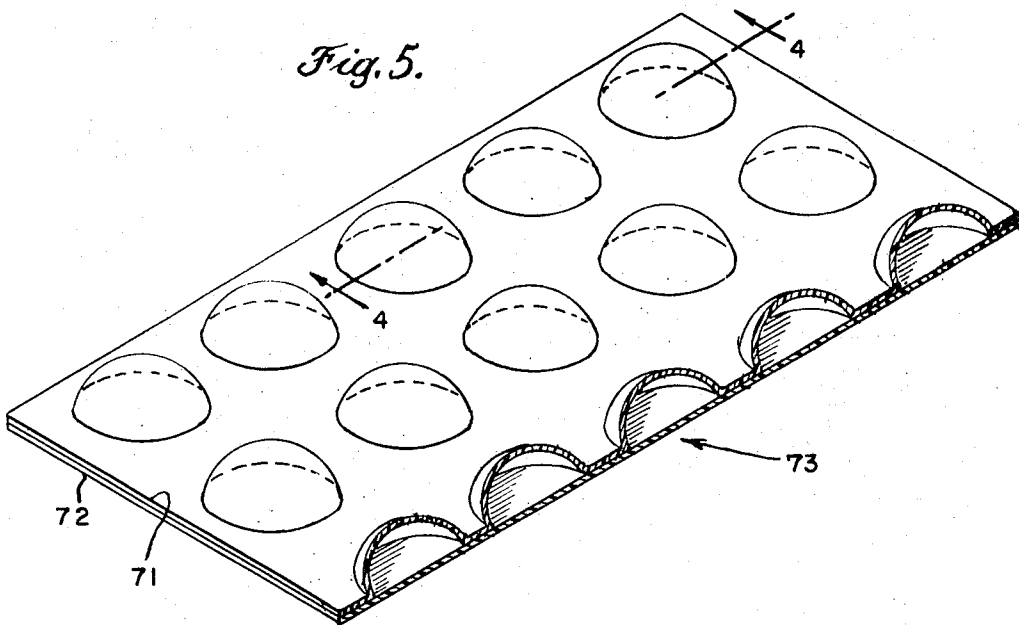


Fig. 6.

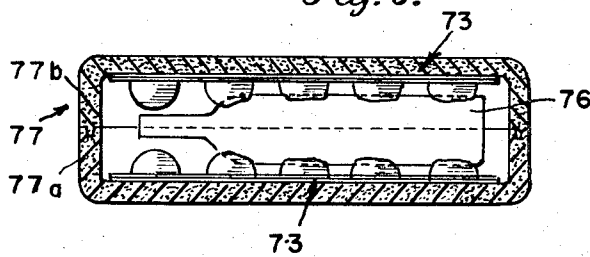


Fig. 7.

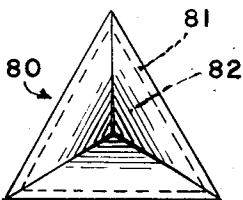
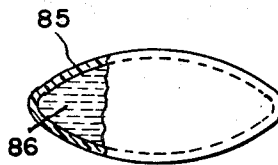


Fig. 8.



## COOLING CUSHION

## BACKGROUND OF THE INVENTION

## 1. Field of Invention

This invention relates to cushions employed for protecting articles during shipment. This invention also relates to devices featuring low-freezing compositions which require significant heat to melt to an all liquid condition, whereby the pre-cooled composition can be employed for temporary cooling of articles.

## 2. Prior Art

Rigid cans containing aqueous glycol having been pre-cooled and employed in insulated picnic baskets to keep items cold during the slow warming of the antifreeze composition in the rigid can. Compositions intended for this type of cooling are herein designated as slow-warming compositions. There has been a suggestion that slow-warming compositions should be mixtures instead of pure compounds, in order to provide a range in which the composition was a slush instead of a rigid solid. Calcium chloride or other inorganic salts have sometimes been used in slow-warming compositions, sometimes modified by montmorillonite clay to widen the temperature range in which slush conditions prevail.

The effectiveness of amides of diethanolamine and higher molecular weight acids such as abietic acid (from rosin), dimer acids, stearic acid, etc., as emulsification agents has been known for decades, including Kritchevsky U.S. Pat. No. 2,089,212. Although such amides have been used in emulsions such as cutting oils, their appropriateness for other purposes was not recognized.

It has long been shown that the extent to which the freezing point of an aqueous mixture was lowered was dependent upon the molal concentration of the modifier. At any given weight percent of concentration of modifier, the molal concentration (and hence degree of freezing point depression) was inversely proportional to molecular weight, leading to preferences for modifiers having appropriately low molecular weights.

Substantially all of the widely marketed containers of slow-warming compositions have been mass-produced using automatic filling and sealing machines. Various modifications of techniques for packaging liquid have been technologically available to such distributors, but marketing practices have continued to rely upon the traditional rigid can for slow-warming compositions.

## SUMMARY OF INVENTION

In accordance with the present invention, a cooling cushion consists of the combination of a low temperature flexible container having all walls of macromolecular organic sheet material, and a slow-warming composition of matter substantially filling said container, said composition consisting of the combination of (a) from 20 to 55 percent by weight amide of an acid having a molecular weight of at least 200, (b) from 30 to 65 percent by weight of an organic water-miscible liquid having at least one hydroxyl group and a molecular weight less than 100, and (c) from 15 to 50 percent by weight of water, said composition having a rigid freezing point lower than  $-40^{\circ}\text{F}$ , and having a range of stiff gel state which extends throughout a temperature range greater than  $30^{\circ}\text{F}$ , said cooling cushion being adapted to be cooled to a temperature of about  $-50^{\circ}\text{F}$

in such stiff gel state, and thereafter employed as a coolant until said composition is warmed to near ambient temperature, said cooling cushion providing distortable cushioning throughout the wide range of temperature of the gel state.

In certain embodiments of the present invention, there may be a plurality of pockets secured to each other by sheet material to provide a quilt-like type of cooling cushion. The quilted pockets contain the slow-warming compositions in which the temperature range of the stiff gel state is at least  $60^{\circ}\text{F}$  and in which the freezing point is lower than about  $-60^{\circ}\text{F}$ .

The invention is further clarified by reference to a plurality of examples.

## EXAMPLE 1

A slow-warming composition is prepared to consist of 42 percent abietyl diethanol amide, 21 percent ethylene glycol, and 37 percent water. Such composition can be prepared by adding the amide to a composition consisting of about 38 percent ethylene glycol and 62 percent water. Abietyl diethanol amide can be prepared by alkalizing the product from the reaction of abietyl chloride (the abietic acid being derived from rosin, and converted to the acid chloride) and diethanol amine. The slow-warming composition is cooled to  $-50^{\circ}\text{F}$ , and has a consistency of the general nature of cold cream, and does not have rigid solid characteristics until a freezing point below  $-60^{\circ}\text{F}$ .

A quilted article comprises two sheets of a copolymer of propylene and octylene, whereby there is low temperature plasticizer copolymerized into the film structure. The plurality of pockets of the quilt are filled with said slow-warming composition prior to the sealing of the sheets together. The thus made quilt-like sheet is a useful pad for wrapping as a cushion for articles to be kept cold during shipment, the cold cream type of consistency and the flexible type container providing impact resistance.

## EXAMPLE 2

A polyethylene prepared with sufficient copolymer to have good flexibility at  $-55^{\circ}\text{F}$  is employed to prepare thin flat bags which can be heat sealed to provide a bag of the general dimensions of a sandwich bag. Prior to the sealing of the last edge, it is filled with a composition consisting of:

stearyl dipropanolamide—25 parts by weight  
methanol—30 parts by weight  
water—45 parts by weight

The bag is sealed with such slow-warming composition, and is employed as a cushion in packing items in a shipping container. The contents are placed in a refrigerating zone and cooled to about  $-50^{\circ}\text{F}$ . The slow-warming composition is not frozen solid, but retains a cold cream type of consistency because of the wide range of temperature throughout which it has a gel-like state. The container is removed from the cooling zone, and transported under conditions in which the filled bags serve as cushions for absorbing some of the impact of the shifting forces imposed by the transportation. The polyethylene film is both strong and flexible, and withstands the pressures created by the shifting cargo. As atmospheric heat penetrates the shipping container, it slowly warms the cushion, while still protecting the articles at the temperature of the cooling zone. Thus the filled and pre-cooled bags serve both as a refrigerant

and as cushions for absorbing some of the impact of cargo shifting during transportation.

#### EXAMPLE 3

Regular tetrahedron shaped bags are prepared from plasticized polyglycolterephthalate, and filled with a slow-warming composition consisting of palmitic diethylamide—21 parts by weight ethanol—42 parts by weight water—37 parts by weight

The tetrahedron containers are subjected to a cooling zone at about  $-60^{\circ}\text{F}$ , whereby the slow-warming composition is converted to a stiff gel adapted to absorb impact. The thus-cooled cushions are employed to pack around the articles to be shipped, serving both as refrigerant and as cushioning pads. In modifications of this approach, the small cushions can be of cubic, spherical, football, or other shapes, or mixtures thereof can be employed. It is usually advantageous to employ such cushions having a size resembling that of a ping pong ball.

#### EXAMPLE 4

A sheet of plastic is vacuum formed to define recesses suitable for receiving bottles of biological materials which should be maintained at a cold temperature. A flat plastic sheet is designed to bond to the based portion of the tray having recesses. The inverted tray is filled with the slow-warming composition of Example 3, and then the flat plastic sheet is bonded thereto. The tray is cooled to about  $-55^{\circ}\text{F}$ , and is then used either independently or in combination with a matched member to provide a slow warming refrigerating environment for the bottles of biological materials.

Particular attention is directed to the advantages of the combination of the slow-warming composition, the flexible container having recesses, and an outer container of insulating foam plastic. The thickness of the plastic is such that no front forms on the outside of the plastic foam insulation, such thickness regularly being less than four inches, and often about one inch. Such combination of the tray, slow-warming cushion, and insulating container can keep the articles fitting in the recesses at a low temperature for a period of many hours. The trays can be stacked in a cool storage zone, and the insulated containers removed in response to demand, whereby the longevity of the slow warming composition can be prolonged.

It is advantageous to employ the quilt-type sheets of cushioning pads of Example 1 with boxes of insulating plastic foam. For example, a plurality of such quilted pads can be used to cool a beverage bottle, which is placed in an insulated box featuring plastic foam insulation. The quilted pads provide both refrigeration and cushioning, and the plastic foam prolongs the period during which the beverage is chilled by the slow warming composition.

Using the insulated box and the cushions about the size of ping pong balls, as described in Example 3, a freshly caught fish can be preserved in a frozen condition for several days. The particles of cushion can pack around an irregular shape to protect the article to be cooled from the impact forces attributable to cargo-shifting during prolonged transportation. Ice cubes or other rigid packing members would not have the advantageous flexibility attained by the combination of

the plastic foam insulated outer box and the slow-warming pad cushions of the present invention.

The present invention is adequately clarified by the previous examples, but supplemental illustration of the invention is shown in the accompanying drawings. The relationship of the figures to the previously described embodiments is sufficiently clear to require no detailed explanation. The drawings show that cushioning pads are advantageously constructed of the combination of a container having flexible plastic walls and filled with a slow-warming composition such as described in the examples. The drawings show that such refrigerating cushions are advantageously employed in combination with a box featuring macromolecular organic (i.e., plastic) foam insulation. Such combination of plastic foam insulated box and refrigerating cushions makes it feasible to keep desired articles at a cool temperature for an advantageously prolonged period of time.

#### IDENTIFICATION OF FIGURES

FIG. 1 is a perspective view of a tray having recesses, and is a schematic exploded view.

FIG. 2 is a schematic sectional view of one embodiment of a combination of a tray and a plastic foam box.

FIG. 3 is a partially sectional view of another embodiment of a combination of this type. FIGS. 1—3 relate to Example 4.

FIGS. 4—6 relate to Example 1.

FIG. 5 is a schematic perspective view. FIG. 4 is an inverted sectional view on line 4—4 of FIG. 5.

FIG. 6 shows a plurality of the quilts of FIG. 5 in use within a plastic foam box.

FIGS. 7 and 8 relate to Example 3.

FIG. 7 is a tetrahedral container having flexible walls.

FIG. 8 is a partially sectional schematic view of a football shaped container.

#### CLARIFICATION OF DRAWINGS

In FIG. 1 a tray 10 is shaped to include a rim 12, face 13, and outer walls 14. Recesses 15, 16, 17 have walls 15a, 16a, and 17a, whereby articles can be snugged into the recesses. A base sheet 20 can be bonded to the rim after the filling of the inverted tray 10 with any slow-warming composition of the present invention.

In FIG. 2, a tray 30 has recesses 45, 46, and 47, adapted to receive articles 45c, 46c, and 47c, which are kept cool because the slow-warming composition 51 has been pre-cooled. An insulated box 52 includes a lower portion 52a and an upper portion 52b, there being interfitting portions 53a and 52b.

In FIG. 3, a box 62 is constructed of polymeric organic plastic foam, there being an upper portion 62b and a lower portion 62a. Two refrigerating trays 64 and 65 are placed within the box, only tray 64 being shown in sectional view.

In FIG. 5, two sheets 71, 72 are bonded together to provide a quilted pad 73. As shown in FIG. 4, flexible containers are filled with a slow-warming composition 75 prior to the sealing of the quilt members together. As shown in FIG. 6, two quilts 73 can be used to cool a bottle 76 in a box 77 constructed of polymeric organic plastic foam, and having lower portion 77a and an upper portion 77b.

FIG. 7 schematically shows a molded tetrahedron 80 having a flexible wall 81 defining a cavity 82 filled with

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a slow warming composition. FIG. 8 shows a similar cushion having a football shape, there being a flexible wall 85 surrounding a cavity 86 filled with a slow warming composition.

Various modifications of the invention are possible without departing from the scope of the claims.

The invention claimed is:

1. A cooling cushion consisting of the combination of a low temperature flexible container having all walls of macromolecular organic sheet material, said container being filled with a composition of matter consisting of the combination of from 20 to 55 percent by weight amide of an acid having a molecular weight of at least 200, from 30 to 65 percent by weight of an organic water-miscible liquid having at least one hydroxy group and a molecular weight less than 100, and from 15 to 50 percent by weight water, said composition having a rigid freezing point lower than -40°F, and having a range of stiff gel state which extends throughout a temperature range greater than 30°F, said cooling cushion being adapted to be cooled to a temperature of about -50°F in such stiff gel state, and thereafter employed as a coolant until said composition is warmed to near

ambient temperature, said cooling cushion providing distortable cushioning throughout the wide range of temperature of the gel state.

2. The cooling cushion of claim 1 in which a plurality of containing pockets are secured to each other by sheet material to provide a quilted sheet type member adapted to be employed as a cooling cushion.

3. The cooling cushion of claim 1 in which the temperature range of such stiff gel state is at least 60°F, and in which the rigid freezing point is lower than about -60°F.

4. The cooling cushion of claim 1 pre-shaped as a tray having recesses for accomodating articles to be cooled.

5. The combination of the cooling cushion of claim 4 and a surrounding box having rigid foam insulating members at the walls of said box, said foam being of macromolecular organic plastic material.

6. The combination of the cooling cushions of claim 1 and a surrounding box having rigid foam insulating members at the walls of said box, said foam being of macromolecular organic plastic material.

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