

June 12, 1945.

J. M. KEARNEY

2,378,087

ICE PACK

Filed July 7, 1939

Fig.1

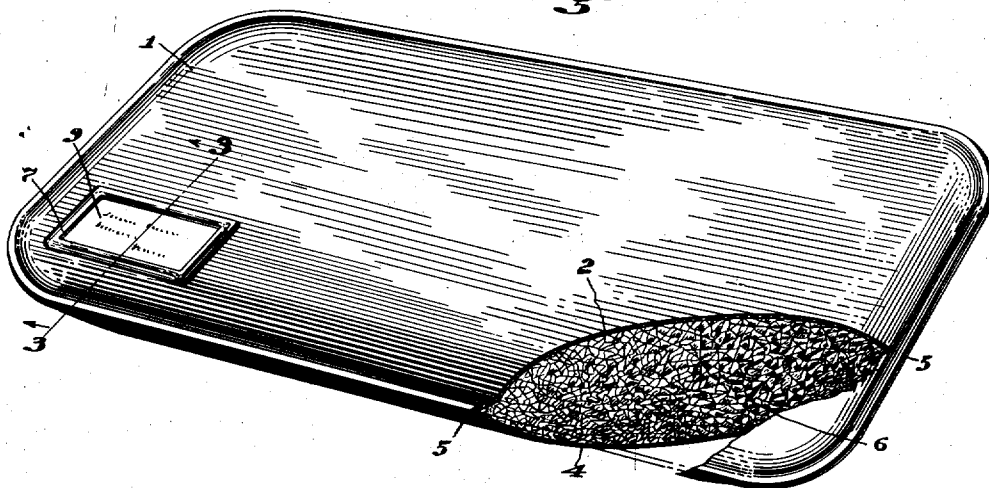


Fig.3

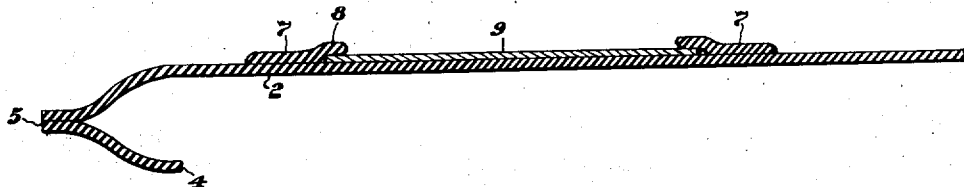
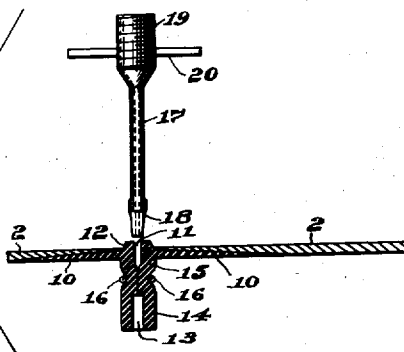


Fig.2



INVENTOR
Justin M. Kearney
BY *C. E. Hammett*
ATTORNEY

UNITED STATES PATENT OFFICE

2,378,087

ICE PACK

Justin M. Kearney, Cambridge, Mass.

Application July 7, 1939, Serial No. 283,169

5 Claims. (Cl. 62—1)

My invention relates to cooling appliances and more particularly to ice packs suitable for application to the human body for therapeutic purposes and the like.

An object of my invention is to provide an ice pack of simple construction containing a liquid that can readily be frozen into a yielding slush by means of ordinarily available refrigerating equipment, without the necessity of special precautions to prevent the formation of a hard mass.

Another object of my invention is to avoid the necessity of providing internal partitions, ridges or protuberances in the pack designed to break up ice masses, by filling a pack of simple construction with a liquid that freezes into a yielding mass of small crystals, or slush, even at the lowest temperatures found in the usual refrigerating equipment of homes or hospitals.

Another object of the invention is to increase the rapidity with which an ice pack can be prepared for use by providing a cooling medium which may be frozen at comparatively low temperatures without the formation of a hard mass but with the formation of a yielding slush.

Another object of the invention is to provide an ice pack with the cooling liquid sealed therein so that no hard caps or other such parts, which would cause discomfort to the user, are necessary.

Further objects of the invention will appear from the reading of this specification.

My invention is illustrated in the accompanying drawing, in which—

Fig. 1 shows a perspective view of my preferred form of ice pack, with part of the wall of the container broken away to show the filling and the simplicity of the internal construction;

Fig. 2 shows in section a form of valve which may be used with my ice pack for refilling purposes without making the pack less comfortable to the user; and

Fig. 3 is a cross-section, partly broken away, along the line 3—3 of Fig. 1, showing a card holder which may be used on my ice pack for purposes of identification.

Fig. 1 shows one form of ice pack according to my invention. In this form the skin or wall 1 of flexible sheet material, such as rubber, of the container is made of two pieces 2 and 4 sealed together along their edges 5. A liquid, hereinafter described, is sealed in the container, and when sufficiently cooled forms a slush 6. Although the presence of a quantity of air together with the liquid in the container does not interfere with the refrigerating qualities of the liquid

I use, I prefer to fill the container entirely with the slush-forming liquid. This provides an ice pack of somewhat more uniform compressibility which may be somewhat more convenient and comfortable to the person to whom it is applied.

The container is made of some flexible waterproof material, such as rubber, a rubber latex or rubberized fabric, and may be made in any size or shape convenient for application to the body. This will ordinarily be a pack of the general shape shown in the drawing, conveniently about a foot long, about four inches wide and about an inch thick. Packs of other shapes and dimensions may also be found convenient. I may make the pack from two similar pieces of heavy sheet rubber, of the grade ordinarily used for hot water bottles, vulcanized together about their edges. The liquid is sealed in and the seal may be vulcanized according to the usual practice for making sealed liquid containers of rubber. More than two pieces of flexible waterproof material may of course be used and they may be fastened by other methods, for example by cementing, instead of by vulcanization. The container may also be made by dipping or molding methods commonly practiced in the rubber goods art.

It is to be noted that because the liquid I use freezes into a yielding mass of discrete crystals, it is unnecessary to provide any partitions, ridges or protuberances within the ice pack to facilitate the breaking up of the ice. Instead, the pack may be made of smooth sheet rubber, which is economical and generally available. Even when the container is made by dipping a form into rubber latex or by forming rubber on a mold, the manufacture of a container without inside protuberances or partitions has distinct advantages in economy and practicability over more complex structures. Also the existence of rubber protuberances, partitions, etc., would cut down the available space for cooling fluid, thus decreasing the cooling capacity of a bag of a given weight, and would tend to retard the transfer of heat.

If it is desired to produce an ice pack that can be filled or refilled after manufacture is complete, a valve adapted for the insertion of a hollow needle or thin tube, such as the valves used in certain types of footballs, basketballs, and the like, may be embedded in the walls of the ice pack. This type of valve is shown in Fig. 2. It is provided with a rubber flange 10 which may be cemented or vulcanized to the rubber wall 2 of the container, leaving only a slightly raised rubber lip 12 projecting through

the hole in the container wall. The body of the valve is a substantially cylindrical piece of rubber with an axial passage that forms the comparatively broad openings 11 and 13 at the ends of the cylinder. The middle part of the passage is restricted and is normally held tightly closed by a small piece of metal 16, usually in the form of a stiff wire ring. The opening 11 is adapted to receive a narrow metal tube 17, the end 18 of which is designed for insertion into the valve. The other end of the tube 17 is fitted with an expanded cylindrical end 19 threaded with screw threads to receive the end of a filling appliance (not shown). A transverse rod 20 is provided to aid the insertion of the end 18 of the tube 17 into the opening 11 and into the restricted passage. When the end of the tube has passed the restricted portion of the passage the container may be filled or emptied through the tube. Insertion of the tube is usually aided by wetting the end 18 or the orifice 11 with a drop or two of water. Since these valves can be made almost entirely of rubber, they cause little or no discomfort to the user of the ice pack. I have found that the liquid I use will not leak out of a valve such as shown in Fig. 2, even if the liquid contains some glycerin. For most purposes, however, the simpler hermetically sealed ice pack will be found satisfactory.

If the ice pack is to be used in a hospital or in some other place where a number of bags are likely to be used, I provide each pack with a rubber card holder as shown in Fig. 1, adapted to hold a small removable card which may be used for purposes of identification. The card holder is shown in cross-section in Fig. 3. It may be formed and vulcanized onto the container during manufacture.

The card holder shown in Fig. 3 may be made of a rectangular strip of rubber 7, preferably a strip provided with a beaded edge 8, either formed into a rectangle or made up to form a rectangle, with the beaded edge on the inner side. The outer part of the rectangle is cemented or vulcanized to the flexible wall of the container and a portion of the strip in the neighborhood of the beaded edge 8 is left uncemented. By stretching the rubber strip, either with or without stretching the container wall, a card or other stiff indicating device 9 may be slipped under the inner edges of the rectangle and held there as shown in Fig. 3. Other ways of making card holders of this and similar types can also be used.

The composition of the liquid used is a very important feature of my invention. I have found that although a number of substances when added to water will cause the formation of a slush upon freezing under certain conditions, many of them will not prevent the formation of an undesirable hard mass at temperatures 5 or 10 degrees F. below the freezing point of water, which temperatures may be encountered in household refrigerating apparatus. This is true, for instance, of solutions of moderate amounts of methyl or ethyl alcohol in water. Solutions which will freeze into the desired slush over a wide range of temperatures are advantageous because freezing proceeds more rapidly in the lower part of the range and hence by freezing at such temperatures the slush may be produced more quickly.

Some substances, otherwise suitable, such as glycerin, exhibit a tendency to leak out of very small cracks and orifices, and are therefore un-

suitable for most ice packs. Glycerin may be used, however, if great care is taken to avoid pin holes and cracks. It is also important that the liquid should contain a large amount of water, because of the relatively high heat of fusion of ice, and that the mixture should begin to freeze at a temperature within a few degrees of the freezing point of water, so that the pack will not be too cold. Solutions containing enough alcohol to prevent the formation of a hard mass at any temperature likely to be found in a household refrigerator fail to satisfy these two last named requirements. Temperatures of about 10° or 12° F. are frequently found in household refrigerators. In larger installations, such as those used in hospitals, temperatures as low as 0° F. may often be found in the neighborhood of the cooling coils. As a result it is necessary that the solution chosen for an ice pack that is to be frozen in an ordinary electric refrigerator should freeze into a yielding slush over a considerable range of temperatures.

I have found that the solutions of a number of compounds will form a slush over the desired range of temperatures. For organic liquids soluble in water the concentration should be between about 3% and about 15% by volume. I prefer to use a solution containing from 5% to 10% by volume of propylene glycol. Such a solution will begin to freeze above 27° F. and will freeze into a yielding slushy mass of crystals even at 0° F. or at any temperatures ordinarily encountered in household or hospital refrigerating equipment.

Solutions containing less than 2% by volume of glycols or of glycerin exhibit a tendency to freeze into a slush only over a narrow range of temperatures. For instance a solution containing 2% by volume of propylene glycol will form a yielding slush only between about 30° and about 26° F. Below about 26° the crystals formed coalesce into a hard mass. I prefer to use about 5% or a little more of glycol for this reason, although solutions of somewhat lower concentration are often satisfactory. Substances, solutions of which will form the desired type of slush at any temperature in the range of ordinary refrigerating equipment are: the glycols, such as ethylene and propylene glycol; glycerin and glycol-ethers, such as "ethyl-cellosolve" (2-ethoxy-ethanol), "butyl-cellosolve" (2-butoxy-ethanol), "butyl-carbitol" (2-(β -butoxy-ethoxy) ethanol), diethylene glycol and triethylene glycol. Solutions of the above substances of a concentration of 5% by volume are satisfactory for ice packs. Solutions of the higher alcohols, such as butyl and amyl alcohols, are more suitable than ethyl or methyl alcohol solutions, but because they do not form a slush over as wide a range of temperature, I prefer the other solutions.

Among other advantages of my invention it may be noted, as previously indicated, that special precautions to prevent the formation of a hard mass or lump of ice, such as ridges or partitions in the container or the careful control of the freezing temperature, may be dispensed with, and the liquid may be frozen quickly in a simple container without special attention to the freezing process.

I claim:

1. An ice pack for application to the human body and adapted to be used repeatedly without refilling, comprising a flexible waterproof container and within said container an aqueous solu-

tion of a glycol, the total glycol content being greater than 3% and less than 15% by volume.

2. A device for cooling a portion of the body of a patient, said device comprising a bag constructed of thin flexible waterproof material and having sealed therein a quantity of water and a sufficient quantity of depressant of the freezing point of the water and having the property of forming therewith, at temperatures a few degrees below 32° F., a slushy mass that may be molded by the fingers of an operator, without substantial risk of puncturing the walls of the bag, to conform to the shape of such body portion of the patient, said depressant being selected from the group consisting of glycols and glycol ethers.

3. A device for cooling a portion of the body of a patient, said device comprising a bag constructed of thin flexible rubber and having sealed

therein a quantity of water and a sufficient quantity of a substance selected from the group consisting of glycols and glycol-ethers to form with said water at temperatures a few degrees below 32° F., a yielding slushy mass.

4. An ice pack for application to the human body, comprising a flexible waterproof container and within said container a quantity of water and a sufficient quantity of ethylene glycol to form with said water, at temperatures a few degrees below 32° F., a yielding, slushy mass.

5. An ice pack for application to the human body, comprising a flexible waterproof container and within said container a quantity of water and a sufficient quantity of propylene glycol to form with said water, at temperatures a few degrees below 32° F., a yielding, slushy mass.

JUSTIN M. KEARNEY.

CERTIFICATE OF CORRECTION.

Patent No. 2,378,087.

June 12, 1945.

JUSTIN M. KEARNEY.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, second column, line 60, for "temperature" read --temperatures--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 16th day of October, A. D. 1945.

Leslie Frazer

(Seal)

First Assistant Commissioner of Patents.

CERTIFICATE OF CORRECTION.

Patent No. 2,378,087.

June 12, 1945.

JUSTIN M. KEARNEY.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 1, first column, line 48, strike out the words and comma "of flexible sheet material, such as rubber," and insert the same before "sealed" in line 50, same page and column; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 27th day of November, A. D. 1945.

Leslie Frazer

(Seal)

First Assistant Commissioner of Patents.

tion of a glycol, the total glycol content being greater than 3% and less than 15% by volume.

2. A device for cooling a portion of the body of a patient, said device comprising a bag constructed of thin flexible waterproof material and having sealed therein a quantity of water and a sufficient quantity of depressant of the freezing point of the water and having the property of forming therewith, at temperatures a few degrees below 32° F., a slushy mass that may be molded by the fingers of an operator, without substantial risk of puncturing the walls of the bag, to conform to the shape of such body portion of the patient, said depressant being selected from the group consisting of glycols and glycol ethers.

3. A device for cooling a portion of the body of a patient, said device comprising a bag constructed of thin flexible rubber and having sealed

therein a quantity of water and a sufficient quantity of a substance selected from the group consisting of glycols and glycol-ethers to form with said water at temperatures a few degrees below 32° F., a yielding slushy mass.

4. An ice pack for application to the human body, comprising a flexible waterproof container and within said container a quantity of water and a sufficient quantity of ethylene glycol to form with said water, at temperatures a few degrees below 32° F., a yielding, slushy mass.

5. An ice pack for application to the human body, comprising a flexible waterproof container and within said container a quantity of water and a sufficient quantity of propylene glycol to form with said water, at temperatures a few degrees below 32° F., a yielding, slushy mass.

JUSTIN M. KEARNEY.

CERTIFICATE OF CORRECTION.

Patent No. 2,378,087.

June 12, 1945.

JUSTIN M. KEARNEY.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, second column, line 60, for "temperature" read --temperatures--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 16th day of October, A. D. 1945.

Leslie Frazer

(Seal)

First Assistant Commissioner of Patents.

CERTIFICATE OF CORRECTION.

Patent No. 2,378,087.

June 12, 1945.

JUSTIN M. KEARNEY.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 1, first column, line 48, strike out the words and comma "of flexible sheet material, such as rubber," and insert the same before "sealed" in line 50, same page and column; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 27th day of November, A. D. 1945.

Leslie Frazer

(Seal)

First Assistant Commissioner of Patents.