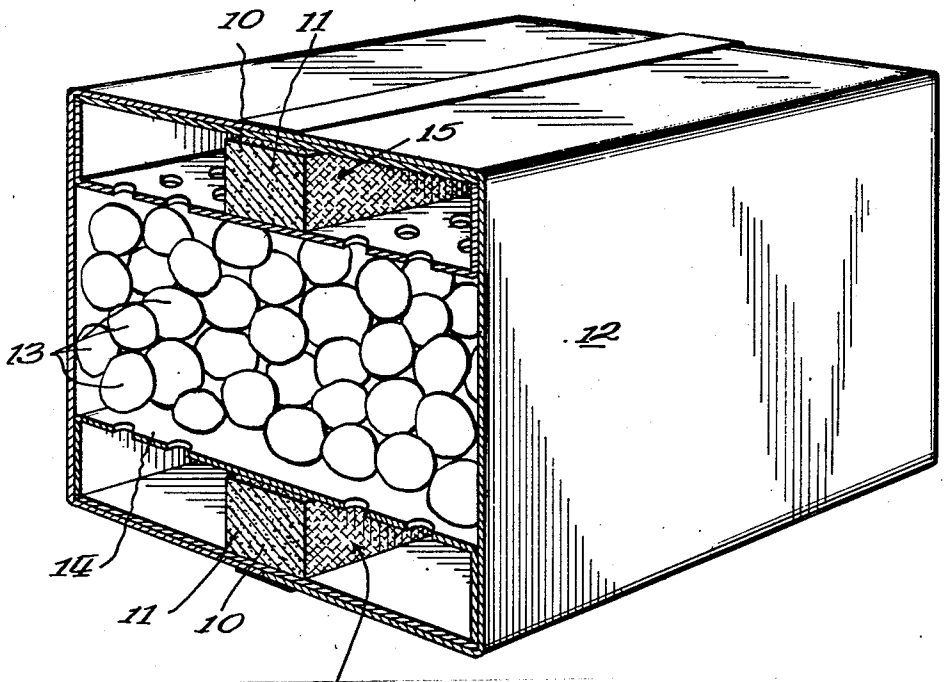
106. COMPOSITIONS, COATING OR PLASTIC
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CROSS REFERENCE
Examiner

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PACKAGE REFRIGERATION

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PACKAGE REFRIGERATION

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19 Claims. (Cl. 62—1)

My invention relates to package refrigeration. It is especially concerned with the refrigeration of the cases or packages in which fresh fruit, fresh vegetables, fish, flowers, etc., are shipped to the market.

Refrigeration is effected by a heat absorbing body placed within the case when it is packed. It is calculated to preserve the contents at sufficiently low temperature to prevent spoiling, for three or four days or even more without the necessity of opening the package to replace the heat absorbing body. Cases and similar packages thus internally refrigerated may be shipped in ordinary unrefrigerated express cars, freight cars, truck, or the like.

Among the objects of my invention are the following:

(*a*) A heat absorbing body which, together with the adapter or holder incorporated in the case, is sufficiently inexpensive to reduce the cost of refrigeration to a fraction of the comparable cost of refrigeration, even in carload lots by shipment in refrigerated cars.

(*b*) A heat absorbing body which, when it has absorbed its maximum of heat, does not drip liquid within the package.

(*c*) A heat absorbing body which in both its frozen and defrosted condition is a self-contained and self-supporting unit and can be handled as such.

(*d*) A heat absorbing body which can readily be varied in its manufacture to produce different degrees of refrigerated temperature in the case to adapt the case to the requirements of different commodities, such as fruits, fish, ice cream, etc.

(*e*) A heat absorbing body which although free to the circulation of air within the case, does not contain harmful material or give off objectionable odors which might contaminate the contents.

(*f*) A frozen heat absorbing body which upon melting forms its own heat insulating shell for delaying the rate of melting of the entire body, thereby avoiding a freezing temperature for the contents of the case and extending the refrigerating period for three or four or more days.

The foregoing together with further objects, features and advantages are set forth in the following description of specific embodiments of my invention and illustrated in the accompanying drawing which is a perspective section of a shipping case containing my refrigerating body along with articles to be refrigerated during shipment.

My present invention embraces three phases: the heat absorbing body, the method of making it and the method of using it.

Briefly described in generalities, my heat absorbing body consists of a frozen block 10 of brine-soak sawdust 11, which is placed within the shipping case 12 in such a position that air may circulate over the contents 13 and over the block to maintain the contents refrigerated.

Brine rather than ordinary water is used to reduce the melting temperature and thereby preserve the contents of the case at a range of 35° to 40° F. or lower, as the requirements may be, whereas with water the internal temperature could not well be maintained so low.

The purpose of the sawdust is three-fold: It may be pressed into a brick-shaped or otherwise shaped block and be self-supporting, whether frozen or defrosted. It absorbs the brine when the brine melts, thereby preventing any loose liquid brine which could be spilled on to the contents. It gives an insulating characteristic to the block which delays melting of the brine.

I shall now describe a preferred formula for my refrigerating block and the method of making it: I mix about five ounces of casein (or prepared casein glue) in a gallon of water. This constitutes a binder for the sawdust. This is mixed with fifty pounds of sawdust—preferably a soft wood sawdust, such as pine, because of its greater moisture absorbing characteristic. The sawdust with the binder thus mixed into it is then pressed into blocks. For most purposes I prefer the blocks to be of brick shape 2½x2½x12 inches, for example. This will provide adequate refrigeration for a fiberboard case containing eight five-pound baskets of tomatoes.

In pressing the sawdust and binder mixture into the blocks, I prefer to use a pressure of some 200 pounds per square inch. It is preferable that the die parts of the press be heated to dry the casein binder around the surfaces of the block and to prevent the press from becoming sticky therefrom.

Despite the water content, the blocks are relatively dry to handle, because the water is so fully absorbed by the sawdust and under the pressure at which they are formed, the blocks will stand considerable handling without crumbling.

The blocks are then soaked in a vat of brine. This preferably consists of a solution of calcium chloride. The concentration will depend upon the melting temperature desired for specific uses. For shipments of fresh fruits, fresh vegetables, flowers, etc., where a refrigerated temperature of 35° to 40° is desired, the concentration of the brine may be at the rate of one pound of calcium chloride for about three gallons of water. This is for blocks where the water used in the binder has, for the most part, evaporated from the blocks. If the blocks are used shortly after being formed, so that they still have most of the binder water left in them, a slightly higher concentration of calcium chloride would be used

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in the brine vat. The brine-soaked blocks are then removed from the brine vat and any excess brine permitted to run off. The object is to keep the water content within the absorption capacity of the block so that after the block is frozen and then remelted in the shipping case, all of the brine will be held in absorption by the sawdust and none will be left free to spill on to the contents or to wet the fiberboard case.

Next the blocks are frozen. The necessary freezing temperature will depend, of course, on the concentration of the brine. For most purposes a uniform freezing compartment temperature of —30° F. will suffice for commercial production of blocks of varying concentration.

For best results, the melting temperature of the blocks will be different for fruits, vegetables and flowers, for fish and oysters, and for ice cream. To avoid confusion it is advisable to have the blocks bear some symbol of the brine concentration, that is, of the freezing temperature. This may be effected by tags or labels, but more conveniently it can be effected by mixing into the brine in the vat a little harmless and inexpensive dye, so that blocks of different freezing temperatures can readily be recognized by their color. For instance, in the drawing the blocks 18 are characterized by the conventional marking for the color "orange."

For vegetables, fruits, flowers, etc., the block is preferably of brick shape and placed at the center of the case and near the bottom 14. A false bottom of the same kind of paperboard stock as the case itself is made of, may be so formed as to keep the contents or their baskets out of actual contact with the frozen block to prevent chafing, but still permit air to circulate freely over the contents and the block. For cases which are not more than a few inches high, it suffices to place the block near the bottom. Where the height is considerable, it is more advisable to place the block or blocks nearer the top as at 15, to prevent thermal-stratification of the air.

For insuring still lower temperatures, in addition to using a more concentrated brine, the blocks may be more in the shape of pads and used as a liner for the entire case.

For ice cream, the conventional cylindrical container may be used entirely surrounded by the heat absorbing bodies. Preferably the sides are formed by two blocks, each in the form of a split tube, and the bottom and top are formed by disc-shaped blocks.

As heat is absorbed by the block, the brine is melted first along the outer surfaces, forming what is in effect a jacketing layer of sawdust substantially saturated with brine. While not as good an insulator as dry sawdust, this layer acts effectively to insulate the frozen interior of the block to retard its further melting.

The relatively fast melting at the start is of some positive advantage. Quite often the goods will be placed in the case without first being chilled. There is thus a relatively large amount of heat to be extracted initially from the contents to bring them down to the desired preserving temperature. After that initial absorption of heat, very much less heat need be absorbed per hour. This need is well served by my heat absorbing blocks, because initially with their frozen surfaces exposed, they absorb a relatively large amount of heat, but soon thereafter the layer of insulation is formed between the exterior and the still frozen portion of the block, retarding the rate of heat absorption. This not only provides the necessary relatively large initial absorption of heat, but subsequently retards the absorption of heat to avoid danger of freezing the contents and to increase the duration of the refrigerating effect.

This function of self-jacketing with insulation after the initial melting of the outer surface, is a feature peculiar to the form-retaining characteristics of my heat absorbing block and due to the use of the binder. If the sawdust were impregnated with brine without being formed into a block by the use of a binder, but merely put in a container or wrapper to give it form, the portions of the material which melted would become sufficiently fluid so that in the vibration of ordinary transportation, the yet frozen portion would float up to the top so that it would not be jacketed by the sawdust of the melted portion at the top region. In that event, the melting would not be sufficiently retarded.

Another advantage of forming the blocks under pressure is that the volume may thus be greatly reduced without materially lessening the amount of brine absorbed by the sawdust. In this way the blocks do not take up so much space in the case.

These frozen blocks may be manufactured at a central factory and conveniently shipped by refrigerated truck, for example, for one hundred miles or more to the user, who can in turn store them at about 0° F. until ready to use them.

A second and alternative method of manufacturing the heat absorbing blocks is to mix all of the ingredients together at one time. The casein is preferably first dissolved in some of the water and then added to the sawdust, the calcium chloride, and the additional water. This is calculated to produce a mixture which is not quite mushy, because the water is fully absorbed by the sawdust. This mixture is then pressed into blocks, which do not have to be soaked, because they already containing their maximum content of brine. They are then frozen.

Sodium silicate may be substituted in whole or in part for the casein as the binder.

The addition of a small amount of sodium hydroxide—say one-third of an ounce for three gallons of water—is of advantage in some instances because of its tendency to retard defrosting.

I contemplate that salts other than calcium chloride may be substituted, but I prefer calcium chloride because it is cheap in relation to its effect in reducing the freezing temperature, and because it is harmless for most goods. Similarly other absorbent materials may be substituted for the sawdust.

My invention is also susceptible of adaptation to therapeutic treatment in fever cases. For this purpose the blocks are especially molded to mate the conformation of the body and enclosed in a suitable sterilized jacket or bag and applied after the fashion of an ice-pack.

I claim:

1. A heat absorbing body adapted to be placed within a shipping case to refrigerate perishable goods packed therein, comprising sawdust and a binder therefor pressed into a block, and brine only substantially saturating the sawdust, the absorbed brine being frozen, and the block being homogeneous and retaining its shape in both the frozen and the melted conditions of the brine.

2. A heat absorbing body for the purpose de-

scribed, consisting of a block, the block comprising compressed sawdust, a binder for holding the compressed sawdust in its block form, and brine not more than substantially saturating the sawdust and frozen therein.

3. A heat absorbing body for the purpose described, consisting of a block, the block comprising compressed sawdust, a binder for holding the compressed sawdust in its blocked form, and brine not more than substantially saturating the sawdust and frozen therein, the brine comprising sodium hydroxide.

4. A heat absorbing body for the purpose described, consisting of a block, the block comprising compressed sawdust, a binder for holding the compressed sawdust in its blocked form, and brine not more than substantially saturating the sawdust and frozen therein, the brine comprising calcium chloride and sodium hydroxide.

5. A heat absorbing body for the purpose described, consisting of a block, the block comprising compressed sawdust, a binder for holding the compressed sawdust in its blocked form, and brine not more than substantially saturating the sawdust and frozen therein, the binder comprising casein.

6. A heat absorbing body for the purpose described, consisting of a block, the block comprising compressed sawdust, a binder for holding the compressed sawdust in its blocked form, and brine not more than substantially saturating the sawdust and frozen therein, the binder comprising sodium silicate.

7. A heat absorbing body for the purpose described, consisting of a block, the block comprising compressed sawdust, a binder for holding the compressed sawdust in its blocked form, and brine not more than substantially saturating the sawdust and frozen therein, the binder comprising casein and sodium silicate.

8. A heat absorbing body for the purpose described, consisting of a block, the block comprising compressed sawdust, and brine not more than substantially saturating the sawdust and frozen therein.

9. A heat absorbing body adapted to be placed within a shipping case to refrigerate the contents, comprising a block of absorbent material substantially saturated with brine frozen therein, the block preserving its shape when the brine is in its frozen state and also when in its melted state.

10. A heat absorbing body adapted to be placed within a shipping case to refrigerate the contents, consisting of a comminuted absorbent fibrous material and a binder therefor, pressed into a block and substantially saturated with brine which is frozen therein, the block being self-supporting and maintaining its shape when the brine is in its melted state also.

11. A heat absorbing body adapted to be placed within a shipping case to refrigerate the contents, consisting of a comminuted absorbent fibrous material and a casein binder therefor, pressed into a block and substantially saturated with brine which is frozen therein, the block being self-supporting and maintaining its shape when the brine is in its melted state also.

12. The method of making a heat absorbing body for the purpose described, which consists in mixing a comminuted absorbent fibrous material, such as sawdust, with a casein binder, forming the mixture under pressure into self-supporting blocks, soaking the blocks in brine, removing the blocks together with only so much brine as is absorbed by the absorbent material, and freezing the brine-impregnated block.

13. The method of making a heat absorbing block for the purpose described, which consists in pressing a comminuted absorbent fibrous material, such as sawdust, into self-supporting blocks with the aid of the binder incorporated therein, impregnating the block with brine not in excess of the absorption limit of the block, and freezing the brine thus absorbed in the block.

14. The method of making a heat absorbing body for the purpose described, which consists in forming a comminuted absorbent fibrous material into a block under such pressure that it will maintain its self-supporting form even when brine-saturated, impregnating the block with brine, and freezing the brine therein.

15. The method of making a heat absorbing body suitable for placing within a shipping case to refrigerate perishable goods packed therein, which consists in mixing together sawdust, a binder therefor, a brine-forming salt, and water not in excess of the absorption capacity of the absorbent material, forming the mixture under pressure into blocks, and freezing the blocks while still substantially saturated with the resulting brine.

16. The method of refrigerating perishable goods packed in a shipping case, which consists of compressing comminuted absorbent fibrous material into a block, substantially saturating the material with brine, freezing the brine therein, placing the freezing block in the shipping case, permitting air within the shipping case to circulate over the perishables therein and over the block, initially chilling the interior of the case and the perishables therein by defrosting the surface layer of the block, retarding the melting of the unfrozen interior of the block by the insulating effect of the initially defrosted surface layer of the material, and retaining melted brine within the block by its absorption by the absorbent material.

17. A heat absorbing body adapted to be placed within a shipping case to refrigerate its contents, comprising an unwrapped block of absorbent insulating material well impregnated—but not over-saturated—with brine frozen therein, the major surfaces of the block being exposed to air circulation thereover, and, when the block is defrosted, the material of the block retaining all of the previously absorbed melted brine and cohering to preserve the shape of the block.

18. A heat absorbing body adapted to be placed within a shipping case to refrigerate its contents, comprising a block of absorbent material well impregnated—but not over-saturated—with brine frozen therein, the major surfaces of the block being exposed to air circulation thereover, and, when the block is defrosted, the material of the block retaining all of the previously absorbed melted brine and cohering to preserve the shape of the block.

19. A heat absorbing body comprising a compressed, porous block of sawdust and a suitable binder, the block saturated with a solution of calcium chloride and then frozen.

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