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Devlin

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[54] **DRINKING CUP FOR FREEZING A BEVERAGE TO A SLUSH-LIKE CONDITION**

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[52] **U.S. Cl.**.....**62/457,** 62/438

[51] **Int. Cl.**.....**F25d 3/00**

[58] **Field of Search**.....62/1, 66, 457, 530, 525, 114, 62/438

[56] **References Cited**

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[57] **ABSTRACT**

A portable liquid cooling container having a receptacle of a predetermined capacity and a surrounding receptacle defining a compartment for a refrigerant having a sufficient heat absorption capability to convert the liquid contents of the receptacle from a liquid to a semi-congealed condition under ordinary room temperature conditions.

11 Claims, 2 Drawing Figures

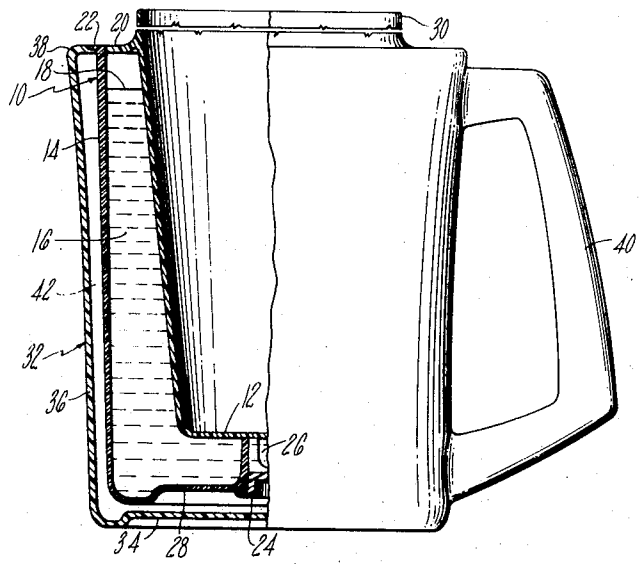


FIG. 1

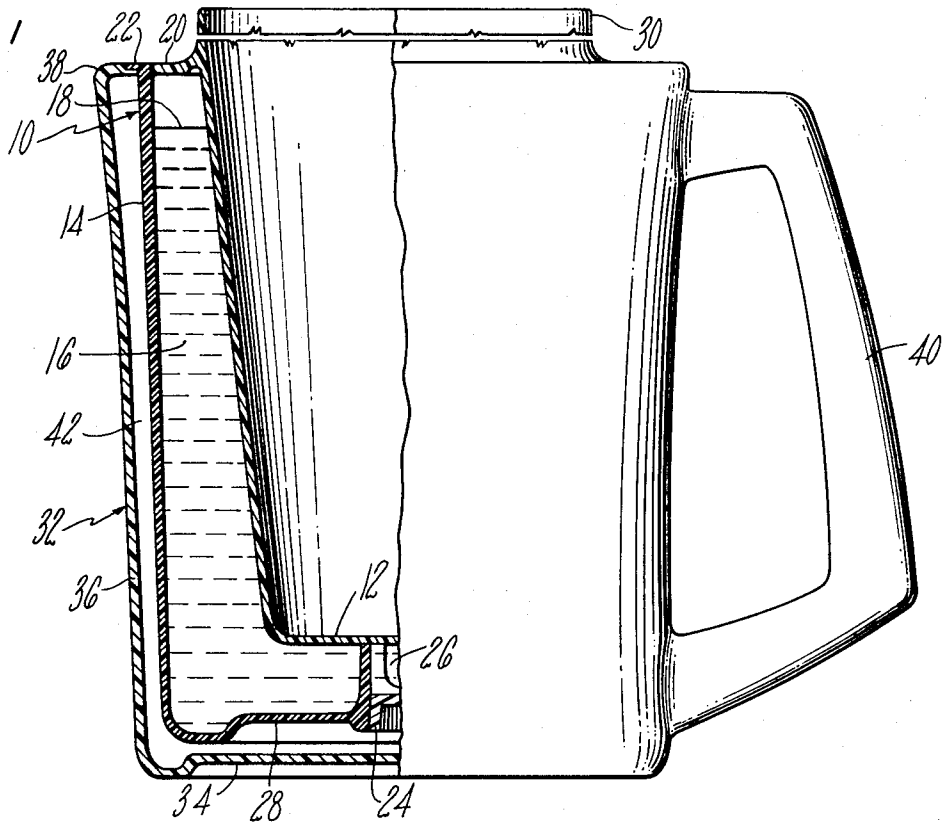
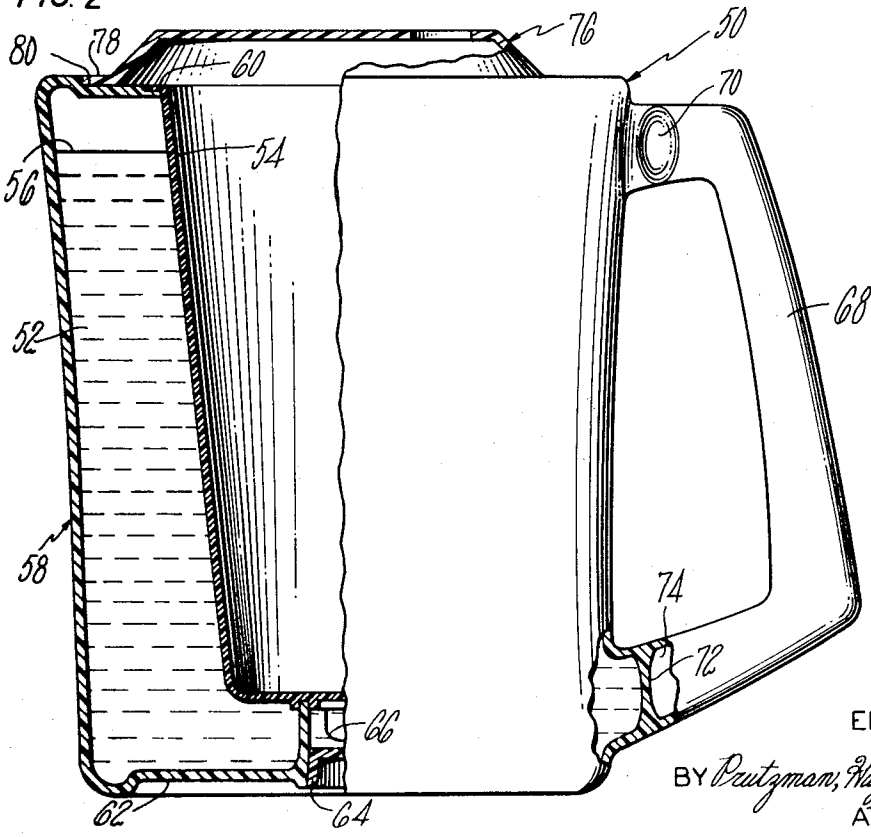


FIG. 2



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DRINKING CUP FOR FREEZING A BEVERAGE TO A SLUSH-LIKE CONDITION

This invention generally relates to containers for comestibles and particularly concerns a self-contained portable cooling container for freezing a liquid beverage.

A primary object of this invention is to provide a new and improved liquid cooling container particularly suited for home use and which is capable of converting a liquid to a semi-congealed state without any requirements for expensive special equipment.

Another object of this invention is to provide a container of the type described which may be energized simply upon being placed in a freezing compartment of a conventional refrigerator and thereafter be used for converting liquids such as carbonated soft drinks to frozen carbonated beverages.

Still another object of this invention is to provide such a liquid cooling container which is quick and easy to manufacture at relatively low cost and which may be repeatedly used even by children in making high quality frozen carbonated beverages and the like.

A still further object of this invention is to provide a new and improved method of converting a potable liquid to a semi-congealed condition and which is particularly suited to be carried out in the home while ensuring an end product of quality flavor which will remain frozen without dilution of its flavor over a substantial period of time.

Other objects will be in part obvious and in part pointed out in more detail hereinafter.

A better understanding of the objects, advantages, features, properties and relationships of this invention will be obtained from the following detailed description and accompanying drawing which sets forth certain illustrative embodiments and are indicative of the various ways in which the principle of this invention is employed.

In the drawing:

FIG. 1 is a side view, partly broken away and partly in section, showing a liquid cooling container incorporating this invention; and

FIG. 2 is a view similar to that of FIG. 1 showing another embodiment of a liquid cooling container incorporating this invention.

Referring now to the drawing in detail, a preferred embodiment of a liquid cooling container **10** incorporating this invention is shown in FIG. 1 having an inner receptacle **12** with an open top and an outer receptacle **14** which symmetrically surrounds the inner receptacle **12**. Upper end portions of the inner and outer receptacles **12, 14** are suitably sealed to form a unitary double-walled cooling unit having a compartment **16** therebetween. The container **10** is conveniently formed of a suitably tough plastic material, such as polyethylene. A suitable refrigerant **18** which is preferably a nontoxic, nonvolatile aqueous mixture or solution having a freezing point substantially below 32°F., for example, propylene glycol, is provided within the sealed compartment **16**.

More specifically, the two receptacles **12, 14** are preferably made from suitable plastic moldings and are each provided with cooperating upper flanges **20, 22** which may be spin welded together in a unitary construction to effect a fluidtight seal about the top of the outer receptacle **14**. Thereafter the container **10** may be inverted and the compartment **16** may be nearly completely filled with refrigerant **18** which is then hermetically sealed within the compartment **16** by spin welding a plastic plug **24** to close an opening **26** in a bottom wall **28** of the outer receptacle **14**.

In the specific illustrated embodiment a generally cylindrical upstanding annular lip **30**, preferably of insulating plastic material, is formed in continuation with the inner receptacle **12** to extend upwardly therefrom a substantial distance above the outer receptacle **14** in a manner shown in U.S. Pat. No. Re. 26,724 to Roger L. Paquin, reissued Nov. 25, 1969 and assigned to the assignee of this invention. In addition, an outer member is also shown in the embodiment of FIG. 1 which may be preferably blow molded from a suitable plastic material to provide an open-ended shell **32** having an imperforate bottom wall **34** and integrally formed cylindrical side wall **36** extending upwardly from the bottom wall **34**. At the top of the side wall **36** is an upper inwardly turned lip **38** for supporting the radially extending flange **22** formed on the outer receptacle **14** for centrally positioning the cooling container **10** within the shell **32**. As more fully described in U.S. Pat. No. 3,302,428 to A. M. Stoner et al issued Feb. 7, 1967 and assigned to the assignee of this invention, the outer shell **32** additionally is provided with a convenient integrally formed handle **40** for holding the cooling container **10** without the discomfort of placing one's hand in direct contact with the cooling container **10** upon its being frozen, due to the insulating dead air space **42** surrounding the container **10** by the provision of its shell **32**.

To provide a liquid cooling container **10** which is particularly suited for home use in cooling liquids to at least a semi-congealed or partly frozen condition, commonly known as slush, under room temperature conditions, whereby even young children can make a frozen carbonated beverage in accordance with this invention, the sealed compartment **16** is of a predetermined volume relative to the volume of the inner receptacle **12** to contain a mass of refrigerant **18** which when frozen is sufficient to lower the temperature of a liquid added to the inner receptacle **12** to a point at which the liquid is converted to an ice-containing condition. While it will be recognized that many combinations of refrigerants of varying latent heats of fusion may be utilized in differing mass ratios to that of the liquid to be cooled, it has been found that for refrigerants having a freezing point, say, from 0° to 31°F when used in a range of mass ratios of refrigerant to the liquid to be cooled from 0.7/1 to 3.0/1, effectively convert a liquid preferably precooled to a temperature of about 35° to 45° F in a relatively short period of time to a slush condition. More specifically, a refrigerant having a freezing point of about 20°F and having a mass ratio of approximately two parts refrigerant to one part liquid soft drink precooled to a temperature of about 38°F has been found to make excellent slush at room temperature, say, about 60°F, usually within **10** minutes or less of having added the slightly chilled liquid soft drink to the inner receptacle **12**.

Moreover, if the liquid is stirred during the process of converting it to a frozen condition, the time required to freeze the liquid is even further reduced. The resulting slush has also been found to be maintained in an ice-

containing condition up to approximately 3 hours under room temperature conditions without requiring further refrigeration and without any undesired dilution of flavor due to the above-described construction. In summary, 10 minutes is usually more than adequate time to form a high quality slush from commercially available soft drinks despite certain time variations introduced by differences in the precooled liquid temperature, sugar content, and ingredients of the liquids to be cooled, particularly if it is stirred constantly after being added to the container **10** during formation of the slush. It will be appreciated that a substantial heat absorbing capability will remain in a unit of the above-described type wherein the liquid evolves a total amount of heat less than the total latent heat of fusion of the refrigerant, thereby providing a substantial so-called holding power for maintaining the slush in an ice-containing condition over an extended period of time.

Referring now to the embodiment of the invention shown in FIG. **2**, a unitary liquid cooling container **50** is provided which is suitable to be placed as a unit into a freezing compartment of a conventional refrigerator and which is significantly simplified in its construction for quick and easy manufacture while at the same time possessing the above-described advantages of the first embodiment. As in the first described embodiment, a large volume is shown provided in a sealed compartment **52** (relative to that of an inner receptacle **54**) for receiving a sufficient mass of refrigerant **56** to effectively lower the temperature of the liquid contents of the inner receptacle **54** to a slush condition as previously described. An outer receptacle **58** is preferably spin welded to an outwardly extending radial flange **60** at an upper end portion of the inner receptacle **54**, and after refrigerant **56** is placed in the compartment **52**, a bottom wall **62** of the shell is fitted with a plug **64** which is spin welded in an appropriate opening **66** to effectively seal the refrigerant compartment **52**.

For ease of handling, portions of a handle **68** at its junctures **70**, **72** with the outer receptacle **58** of the container **50** are preferably pinched off to provide a dead air space **74** within the handle **68** which is shown as being hollow as formed, e.g., from a blow mold manufacturing process. If desired, the handle **68** may also be filled with any suitable nonconductive insulating material or may even be formed as a solid plastic handle which would be readily warmed up after the liquid cooling container **50** is withdrawn from a freezing compartment of a refrigerator.

To provide a substantially fluidtight closure serving to extend the time the slush may be maintained in a frozen condition under room temperature conditions without further refrigeration, a cap **76** having a suitable contoured side wall portion **78** is provided in the embodiment shown in FIG. **2** to closely conform and frictionally engage a recessed lip portion **80** at the upper end portion of the outer receptacle **58**. The cap **76** is preferably formed of a suitable plastic material which is at least partially resilient to conform to the more rigid plastic material of the lip portion **80** of the outer receptacle **58**.

A liquid cooling container constructed in accordance with this invention will be seen to provide a relatively low cost unit which is readily used even by children for producing a high quality frozen carbonated beverage, e.g., which may be maintained in a frozen or partially frozen condition for an extended period of time without any dilution of flavor. The unit itself is quick and easy to manufacture and because of its tough durable plastic construction may be subjected to abuse while still providing reliable home manufacture of slush on a repeated basis.

As will be apparent to persons skilled in the art, various modifications, adaptations and variations of the foregoing specific disclosure can be made without departing from the teachings of this invention.

I claim:

1. A drinking cup with a handle, for the controlled, selective freezing of a liquid beverage such as a carbonated soft drink or the like to a partially frozen slush-like condition, comprising a cup handle, a tough plastic inner receptacle for holding the liquid beverage and having an open upper end, an outer closed receptacle with upper end portions of the inner and outer receptacles being joined and providing a hermetically sealed refrigerant compartment therebetween, and a mass of refreezable aqueous refrigerant disposed in the sealed compartment and having a freezing point of about 20°F, the sealed compartment being of a relative volume with respective to the volume of the inner receptacle to hold a mass of refrigerant such that the mass ratio of said refrigerant in said sealed refrigerant compartment to the liquid capacity of the inner receptacle is in the range of 0.7/1 to 3.0/1 whereby when said refrigerant is in a frozen condition, a liquid beverage placed within said inner receptacle may be converted to a slush-like condition through the formation therein of a finely divided crystalline ice phase distributed therethrough.

2. The beverage-freezing drinking cup of claim **1** wherein said inner receptacle defines an open space free of rotatably mounted blades adjacent the inner wall of said receptacle.

3. The beverage-freezing drinking cup of claim **2** wherein said inner receptacle is radially symmetrical to define a smooth-surfaced, unconvoluted cavity suitable for stirring the liquid placed therein during its conversion to a slush-like partially frozen condition.

4. The beverage-freezing drinking cup of Claim **1** wherein said sealed refrigerant compartment symmetrically surrounds said inner receptacle.

5. The beverage-freezing drinking cup of claim **4** further including an exterior shell in attachment with said handle, and having an open upper end and imperforate bottom and side walls, said refrigerant-containing inner and outer receptacles being positioned as a unit within the shell and bodily removable therefrom to be frozen before use.

6. The beverage-freezing drinking cup of claim **4** wherein said handle is secured to the outer receptacle in insulated relation thereto to minimize transfer of heat from the handle to the outer receptacle.

7. The beverage-freezing drinking cup of claim **2** wherein the inner and outer receptacles are removably supported on the upper end of the shell with its bottom and side walls being in spaced relation thereto and providing an insulating dead air space surrounding the outer receptacle.

8. The beverage-freezing drinking cup of claim 1 wherein the mass ratio of the refrigerant contained in the sealed compartment to the liquid capacity of the inner receptacle is about 2.0/1.

9. The beverage-freezing drinking cup of claim 1 further including an annular lip of insulating material extending upwardly from the inner receptacle a substantial distance above the outer receptacle.

10. The beverage-freezing drinking cup of claim 1 wherein said inner and outer receptacles are made of polyethylene or the like.

11. The beverage-freezing drinking cup of claim 1 wherein said aqueous refrigerant is a mixture of propylene glycol and water.

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