United States Patent

Trimble

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[54] HEAT EXCHANGE CONTAINER

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[52] **U.S. Cl.** **126/263**, 126/262

[51] **Int. Cl.** **F24j 1/00**

[58] **Field of Search** 126/263, 262

[56] **References Cited**

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Primary Examiner—Charles J. Myhre
Attorney—Eugene C. Goodale

[57] **ABSTRACT**

A heat exchange container for use in effecting a temperature change in consumable products is disclosed. Inner and outer containers are connected at one end by a flexible member and define chambers for separating the consumable products from the reaction chamber. The heat exchange occurs through the interaction of a solid chemical mixture and a liquid chemical. The liquid chemical is separated from the solid chemical by an independent container secured within the outer container.

4 Claims, 9 Drawing Figures

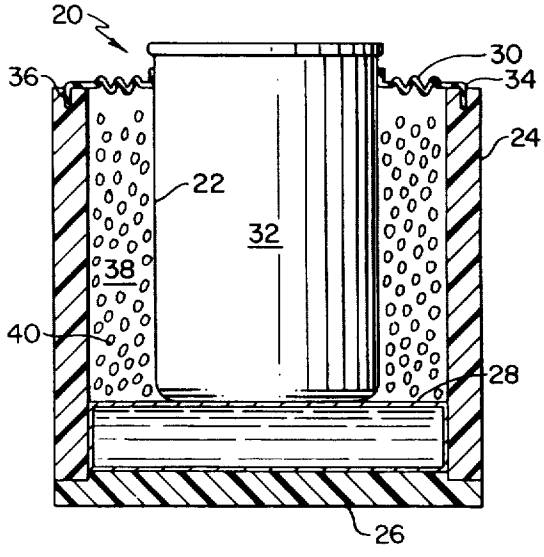


FIG. 1

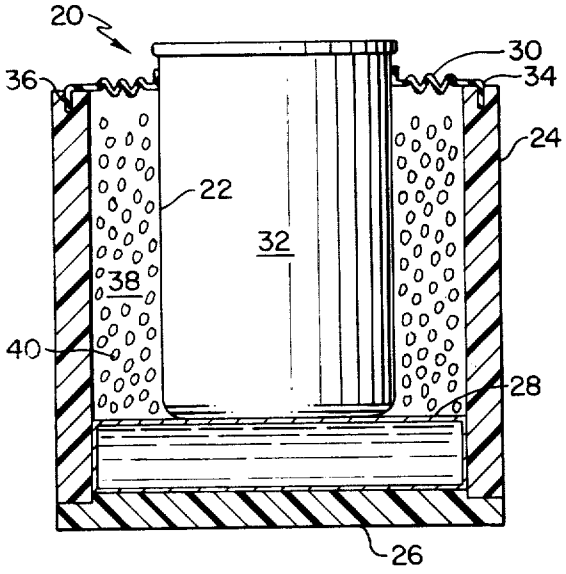


FIG. 2

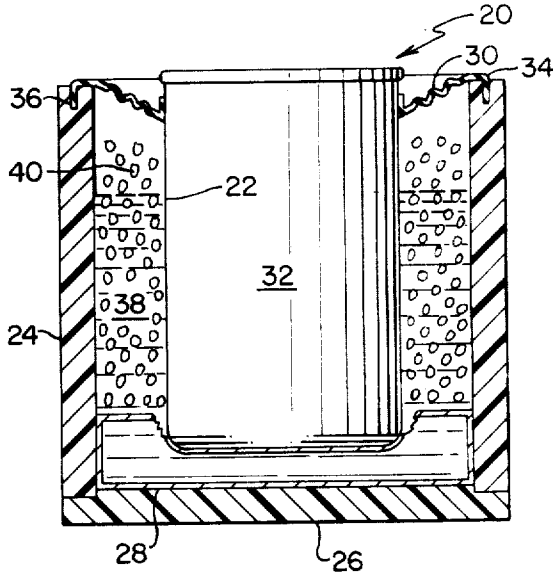


FIG. 3

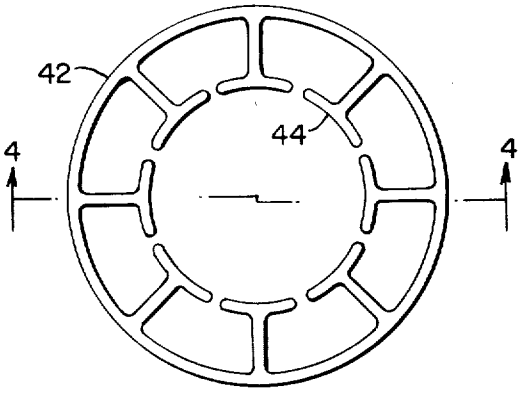


FIG. 4

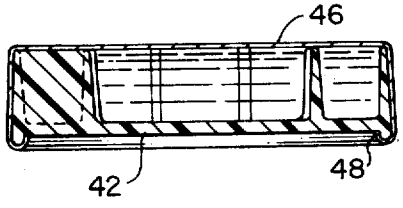
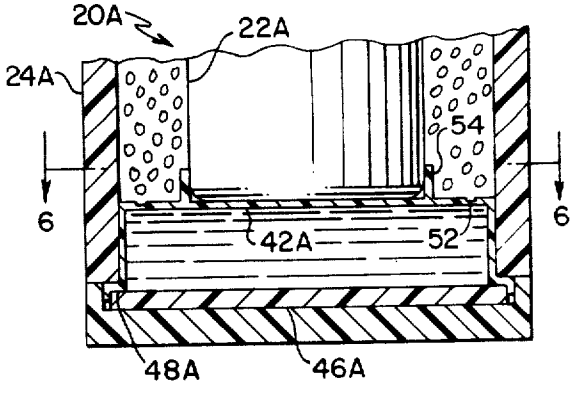


FIG. 5



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FIG. 6

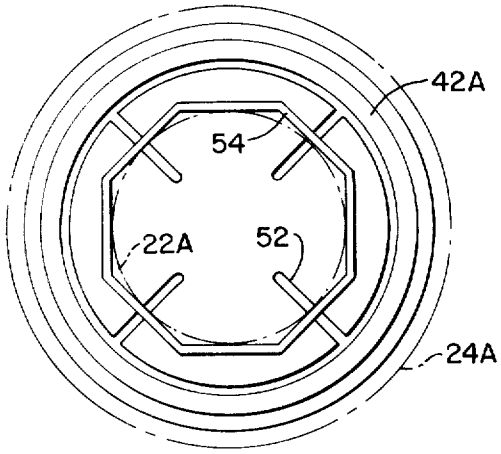


FIG. 7

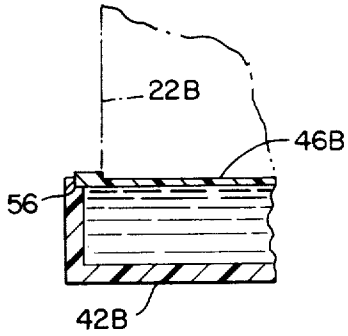


FIG. 8

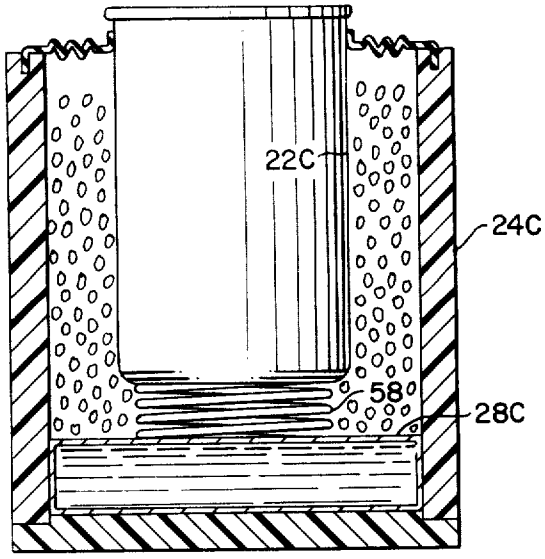
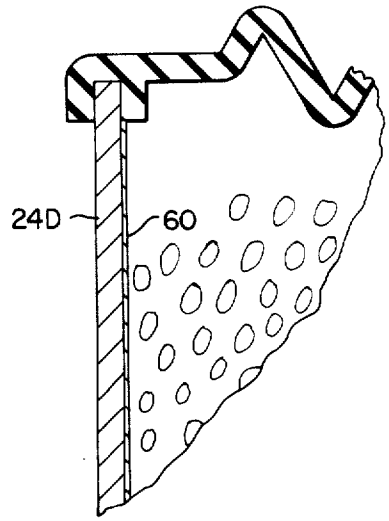


FIG. 9



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HEAT EXCHANGE CONTAINER

BACKGROUND OF THE INVENTION

This invention relates in general to containers and more particularly to novel improvements in a heat exchange container for use with consumable products. While the disclosure herein relates more specifically to cooling devices by endothermic reactions, it is to be understood that the container of this invention is equally adaptable for heating by exothermic reactions.

There has long been a need for a convenient and effective container which may be used to effect a heat exchange in consumable products. The container must be of economical construction, simple to operate and be capable of separately storing the different chemicals required for the heat exchange until such time as the reaction is to be activated. Numerous such containers are known in the art but many such containers have limited use.

Many combinations of chemicals, all well known in the art, may be used with the containers to effect the heat exchange. If the consumable product is one which should be heated prior to use, the chemicals may be of such nature that the mixing thereof results in an exothermic reaction to transfer heat through the heat conducting wall to the product. On the other hand, if the product is a beverage or the like that should be cooled before use, chemicals may be of such nature that they absorb heat to produce an endothermic reaction. One particular combination of such chemicals is disclosed in my co-pending application Ser. No. 39,584, filed May 22, 1970, for Method of Cooling and Cooling Composition. The chemicals utilized to produce the endothermic or exothermic reactions are known in the art and as such do not constitute a novel part of the present invention.

Accordingly, it is an object of the present invention to provide a heat exchange container having novel structural arrangements for separating the storage compartments.

A further object of the present invention is to provide a container of the type set forth which requires a telescoping action of the separate containers to initiate the reaction.

Yet another object of this invention is to provide a container in which a hydraulic action may be repeatedly performed to further mix the reaction chemicals.

A still further object of this invention is to provide a container of the type set forth that is economical to manufacture and reliable in operation.

These and other objects of the present invention will be readily appreciated as the same becomes better understood by reference to the following detailed description wherein various embodiments of the invention are illustrated.

SUMMARY OF THE INVENTION

This invention provides an improved heat exchange container usable for consumable products. The heat exchange container comprises a heat conductive inner container flexibly secured to an insulated outer container so as to define a chemical receiving chamber separate from a consumable product. An independent liquid chemical container is secured within the outer container, said liquid container supporting the inner container. The heat exchange container is of simple and economical construction, and is easy to operate.

Other details, uses, and advantages of this invention will become apparent as the following description of the exemplary embodiments thereof presented in the accompanying drawings proceeds.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings show present exemplary embodiments of this invention in which:

FIG. 1 is a vertical sectional view showing the container of this invention in an assembled condition prior to use;

FIG. 2 is a vertical sectional view similar to FIG. 1 showing the container in use;

FIG. 3 is a top view of the liquid container of one embodiment;

FIG. 4 is a sectional view taken along lines 4—4 of FIG. 3;

FIG. 5 is a side view illustrating another exemplary embodiment of this invention and particularly illustrating different inner container supporting means;

FIG. 6 is a top view taken along lines 6—6 of FIG. 5;

FIG. 7 is a fragmentary sectional view of another embodiment of the liquid chemical container used for supporting the inner container;

FIG. 8 is a vertical sectional view illustrating another exemplary embodiment of this invention; and

FIG. 9 is a vertical fragmentary view of another exemplary embodiment of this invention particularly illustrating a different insulating outer container.

DESCRIPTION OF THE ILLUSTRATED EMBODIMENTS

Reference is now made to FIGS. 1, 3 and 4 of the drawings, which illustrate one exemplary embodiment of the improved heat exchange container of this invention, which is designated generally by the reference numeral **20**. The heat exchange container is comprised of an inner container **22**, an outer container **24**, a bottom lid **26**, a liquid chemical container **28** and a flexible connecting element **30**.

The inner container **22** is made of a heat conducting material, such as aluminum, and defines a chamber **32** in which the consumable products are placed. The container **22** may be an enclosed can, such as a beverage can or the like, in which the consumable products have already been placed or the can **22** may merely be a conducting receptacle into which the consumable product may be placed.

The flexible member **30** is of the type commonly referred to as a flexible spider similar to the types used to support speakers and the like. In other words, the member **30** has a plurality of concentric ring-like elements which are flexible so as to support the container **22** yet allow movement thereof as will be explained herebelow. The flexible spider **30** has a central aperture formed therein and into which the container **22** is mounted and sealingly secured therein by suitable means so as to prevent the escape of any gas. The outer periphery of the flexible spider **30** is secured at **34** to one end of the outer container or shell **24**. One convenient way of securing the spider **30** to the outer container **24** is by a suitable groove **36** formed in the member **24** into which the periphery of the spider **30** is placed and cemented.

The inner container **22** and the outer container **24** define a chamber **38** into which the solid chemical mixture **40** utilized to provide the appropriate reaction is placed. A suitable chemical mixture to provide an endothermic reaction is described in my co-pending application hereinabove mentioned. The outer container **24** is preferably of an insulating material such as a poly foam insulating material so as to protect the user's hand and to insure that there is a minimum heat loss through the outer container.

THe liquid chemical, such as water, which is required to cause the appropriate reaction, is held in independent container **28** which is more easily seen in FIGS. 3 and 4. The container **28** comprises a cup-like member **42** having a plurality of crushable ribs **44**. The liquid chemical such as water is placed in the cup-like member **42** and a suitable cover, such as aluminum foil **46**, is placed over the cup **42** to enclose and contain the liquid chemical therein. THe cover **46** is sealingly secured to the cup **42** by any suitable means such as by compression bonding of the cover **46** to the cup **42** at **48**. The ribs **44** support the inner container **22** so that the cover **46** is not ruptured when the container **20** is assembled. The ribs **44** are crushable but are of a sufficient strength to prevent inadvertent or premature crushing until an operator is ready to utilize the container **20**.

As best seen in FIG. 1, the container **28** is placed within the outer container **24** such that the inner container **22** rests thereon. The bottom lid **26** is then secured to the outer con-

tainer 24 by suitable means such as cementing the lid 26 to the container 24 at 50 to make a leak-tight seal.

To assemble the container 20 of this invention, the inner container 22 is inserted through the central aperture of the flexible spider 30 and the spider 30 is sealed thereto. The flexible spider 30 is sealingly secured to the outer container 24 so that the chamber 38 is defined. The containers 22 and 24 are inverted so that the flexible member 30 is at the bottom and the appropriate amount of solid chemical mixture 40 is placed in chamber 38. The liquid container 28, having previously been assembled, is placed in the container 20, the container still being in the inverted position, so that the container 28 rests on the bottom of the inner container 22. The bottom lid 26 is then secured to the outer container 24 and the container 20 may then be placed in the upright position of FIG. 1. In this way, the inner container 22 is supported by the ribs 44.

To operate the heat exchange container 20, it is only necessary to exert a sufficient downward force on the inner container 22 which will cause a rupturing of the cover 46 and ribs 44. FIG. 2 shows the container 20 in which the container 28 has been ruptured. When this occurs, it allows the liquid chemical within the container 28 to escape and make contact with the solid chemicals 40 to produce the desired reaction. To increase the reaction, the container 22 may be repeatedly raised and lowered which will produce an increased hydraulic mixing of the liquid chemical with the solid chemical. It should also be noted that as the reaction takes place, if a gas is generated, the gas by-product resulting from the reaction will accumulate in the area just under the flexible spider 30 and will tend to cause an expansion of the spider 30. Hence, use of the flexible spider 30 eliminates the need for any exhaust vent to allow escape of the gases and eliminates the need for high strength materials to prevent rupture thereof. The reaction mixture, i.e., solid and liquid chemical intermixed, surrounds the intercontainer 22 on the sides and bottom to provide an overall heat exchange surface.

Another exemplary embodiment of this invention is illustrated in FIG. 9 of the drawings. The container illustrated in FIGS. 5 and 6 is very similar to the container 20; therefore, such container will be designated generally by the reference numeral 20A and parts of the container which are very similar to corresponding parts of the container 20 will be designated by the same reference numeral as container 20 also followed by the letter designation "A" and not described again. The main difference between the container 20A and the container 20 is in the liquid chemical container 28. In this embodiment, the cup-like member 42A is inverted and closed with a cover 46A by any suitable means such as cementing one to the other at 48A. The member 42A is made of a light weight material such as plastic, having sufficient strength to support the inner container 22A. The cup-like member 42A has a fracture line of reduced crossed section 52 formed thereabout so that downward pressure on the container 22A will cause the member 42A to fracture along the line 52 when it is desired to initiate the chemical reaction. The cup member 42A is also formed with an outward protruding rib or lip 54 which receives and grips the container 22A.

Another exemplary embodiment of the liquid container is illustrated in FIG. 7. Only a fragmentary view is illustrated showing another embodiment of the liquid chemical container and will be designated by the same reference numerals followed by the letter designation "B" and not described again. In this embodiment, the cup-like member 42B is formed with an annular groove 56. The cover 46B is sealed in the groove 56. It should be noted that the cover 46B has a reduced thickness portion so as to receive the inner container and also to permit rupture thereof. The members 42B and 46B are preferably made of a light weight material having sufficient strength to support the inner container, yet allow rupture thereof.

One additional illustrative embodiment of this invention is illustrated in FIG. 8 in which similarly corresponding parts of this embodiment which correspond to like parts of the container 20 will be designated by the same reference numeral followed by the letter designation "C" and not described again. In this embodiment, the inner container 22C is supported above the chemical container 28C by a spring 58. The downward movement of the inner container 22C will cause the spring 58 to rupture the container 28C to cause chemical reaction to be initiated. The spring 58 will cause the inner container 22C to be raised upward upon release of the downward force on the container 22C. The use of the spring 58 facilitates the hydraulic mixing action by readily permitting the up and down movement of the inner container 22C relative to the outer container 24C.

Although the outer container has hereinabove been described as being formed of a poly foam material so as to provide insulation, it is possible to make the outer container of a metal yet still have insulating capabilities. This embodiment is illustrated in FIG. 9. Only a fragmentary view is illustrated showing essentially another embodiment of the container and will be designated by the same reference numerals followed by the letter designation "D" and not described again.

In this embodiment, the outer container 24D is formed out of a metallic material. An insulating layer 60, such as a spray or the like, of which many are commercially available and known in the art, is applied to the inside surface of the container 24D. The layer 60 becomes a solid in a short time and thus provides the insulating qualities required and the container 24D provides added strength to prevent crushing of the container.

While the heat exchange containers hereinabove described have been specifically described and shown as being round containers, it can readily be seen that the container of this invention may be formed of other non-circular shapes.

It is seen that the container of this invention provides separate compartments or chambers to keep the consumable product, solid chemical and liquid chemical, separate one from another. The heat exchange reaction is initiated by the downward urging of the inner container causing a rupture of the liquid chemical container. Thus, this invention provides a heat exchange container which is of simple and economical construction, is easy to operate, and accomplishes the objects hereinbefore set forth.

While present exemplary embodiments of this invention has been illustrated and described, it will be recognized that this invention may be otherwise variously embodied and practiced by those skilled in the art.

What is claimed is:

1. A heat exchange container comprising:
an inner container defining a consumable products chamber;
an outer container;
flexible means connecting said inner and outer containers at one end, said inner and outer containers defining a first chemical chamber surrounding said first container; and
a rupturable container defining a second chemical chamber secured at the other end of said outer container, said rupturable container being a cup-like member having a plurality of crushable ribs extending inwardly from the periphery, a cover extending over the open end of said cup-like member and being sealed to the body portion of said cup-like member wherein said inner container is supported by said ribs whereby pressure exerted on said inner container causes a rupturing of said rupturable container so that chemicals maintained in said first and second chemical chambers become intermixed causing a temperature change to occur.

2. A container as set forth in claim 1 further comprising spring means mounted between said inner container and said rupturable container wherein said spring means will urge said inner container upward upon removal of the rupturing force applied to said inner container.

3. A heat exchange container comprising:
an inner container defining a consumable products chamber;
an outer container;

flexible means connecting said inner and outer containers at one end, said inner and outer containers defining a first chemical chamber surrounding said first container, and

a rupturable container defining a second chemical chamber secured at the other end of said outer container, said rupturable container being an inverted cup-like member, a cover sealingly attached to the open end of said cup-like member, a lip projecting outwardly from said inverted cup-like member for receiving said inner container, said inverted cup-like member being formed with an area of reduced cross section extending around said lip wherein pressure exerted on said inner container will cause said inverted cup-like member to fracture along said area of reduced cross section so that chemicals maintained in said first and second chemical chambers become intermixed causing a temperature change to occur.

4. A heat exchange container comprising:

an inner container defining a consumable products chamber;

an outer container;

flexible means connecting said inner and outer containers at one end, said inner and outer containers defining a first chemical chamber surrounding said first container; and

a rupturable container defining a second chemical chamber secured at the other end of said outer container, said rupturable container being a cup-like member having an annular groove about the periphery of the walls at the open end thereof, a cover sealingly mounted in said annular groove and closing said cup-like member, said cover being formed with an area of reduced cross section for receiving said inner container whereby pressure exerted on said inner container causes a rupture of said cover so that chemicals maintained in said first and second chemical chambers become intermixed causing a temperature change to occur.

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