

Feb. 10, 1970

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3,494,142

END CLOSURE AND COOLANT INSERT FOR SELF-COOLING CONTAINER

Filed April 23, 1968

2 Sheets-Sheet 1

Fig. 1.

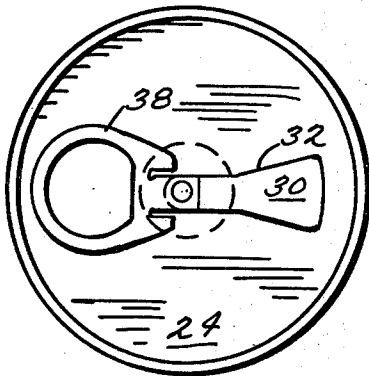


Fig. 2.

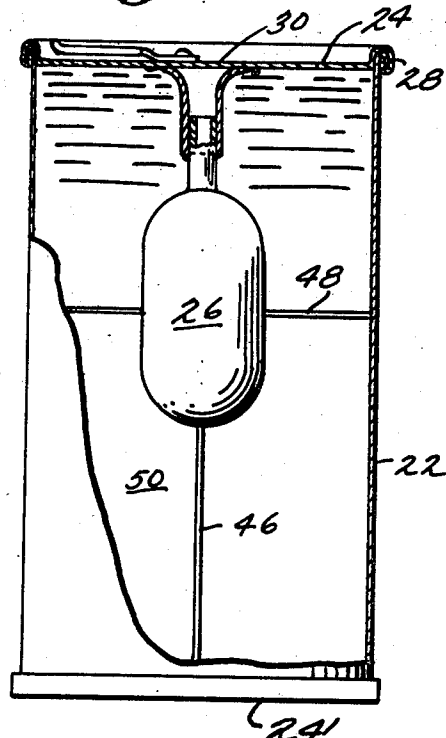


Fig. 3.

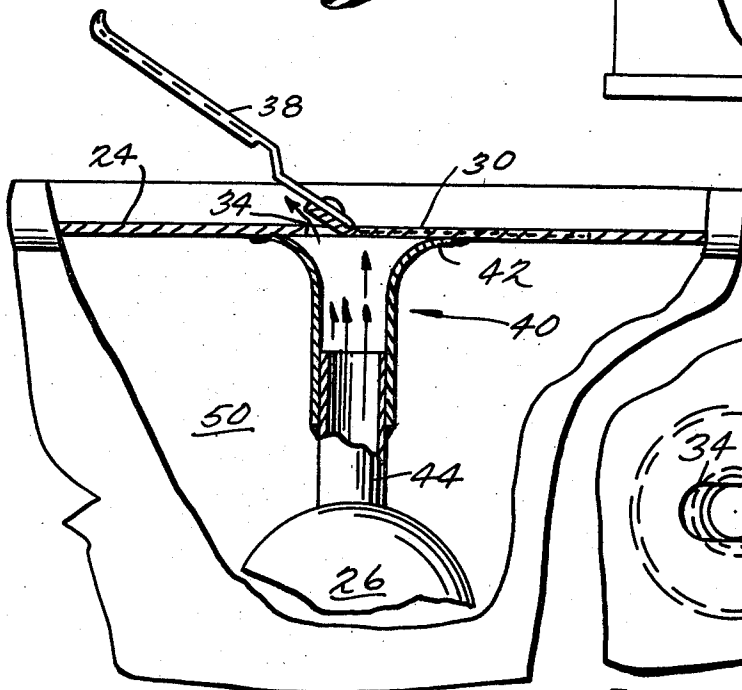
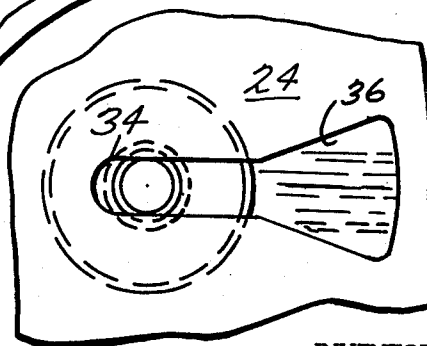


Fig. 5.



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Fig. 6.

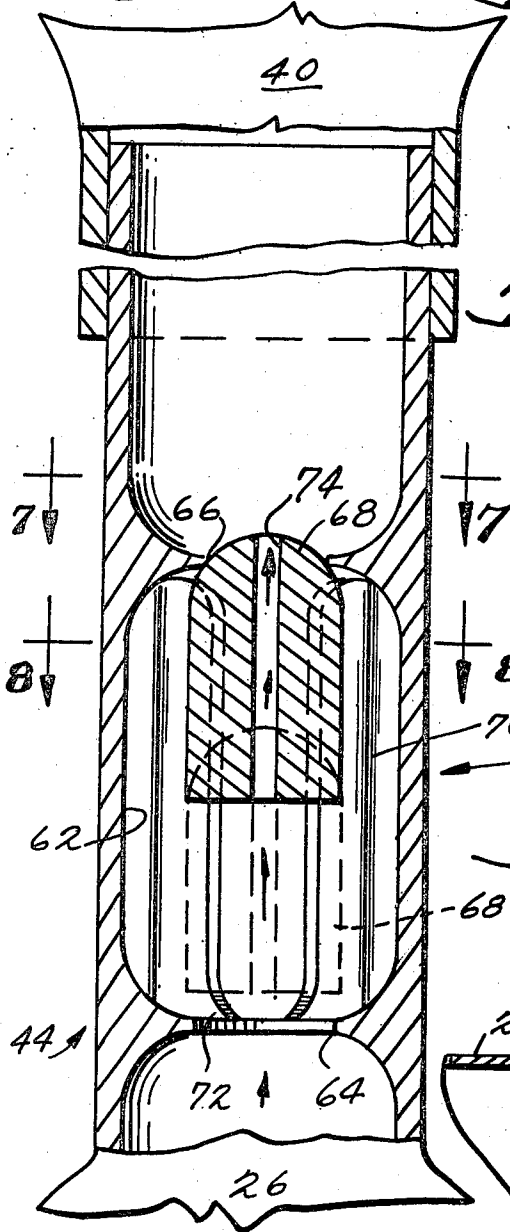


Fig. 7.

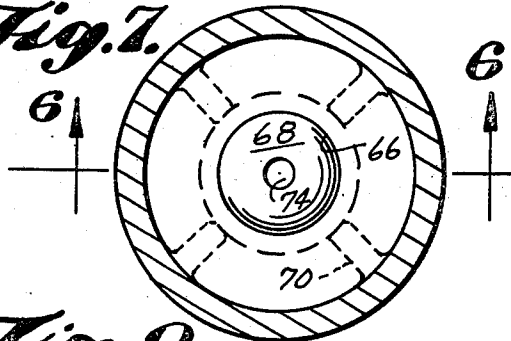


Fig. 8.

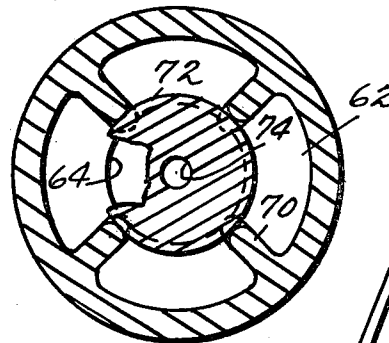
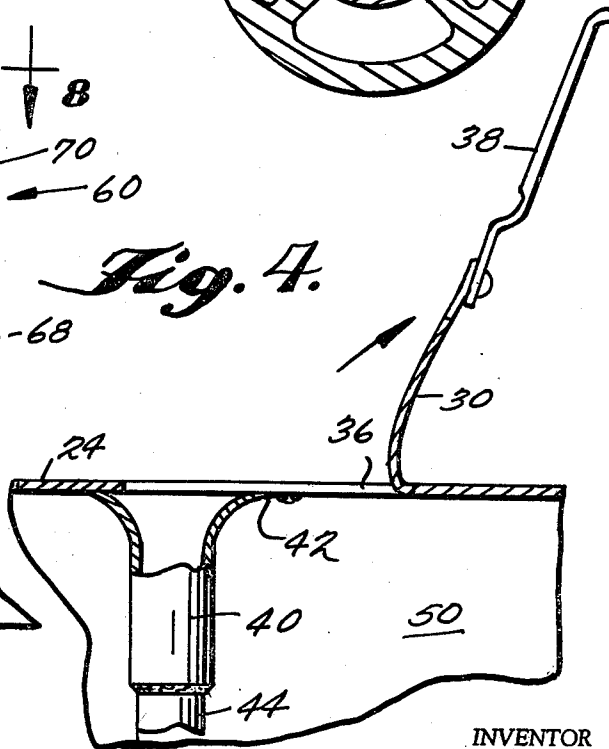


Fig. 4.



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END CLOSURE AND COOLANT INSERT FOR SELF-COOLING CONTAINER

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12 Claims

ABSTRACT OF THE DISCLOSURE

A self-cooling, disposable container is disclosed having an end closure with a tear strip and a refrigerant filled coolant insert therein which is interconnected with the end closure through a discharge tube in such a manner that upon the initial severing of the tear strip, only the coolant insert is vented to enable the contents of the container to become cooled prior to further severing of the tear strip which forms a vent and pouring spout for the contents of the container. A variable orifice is provided in the discharge tube so that only gas is released when the coolant insert is vented.

BRIEF DESCRIPTION OF THE INVENTION

This invention relates to self-cooling disposable containers and, more particularly, to an improved end closure and coolant insert for use with such containers.

The present invention is designed to meet the needs for a disposable, self-cooling container which can be used where normal auxiliary refrigeration is not available. Such a container is particularly well adapted for use by sportsmen, travelers, personnel of the armed forces, picnickers and other individuals engaged in outdoor activities where normal means of auxiliary cooling are not readily available.

The simple, yet novel, design of the present invention not only enables such containers to be economically manufactured, but also provides a container which exhibits many advantages over the self-cooling containers of the prior art. One such advantage is a tear strip which, when removed, both vents the refrigerant from the coolant insert and forms a pouring spout for the beverage chamber of the container. The tear strip and end closure are designed to vent the refrigerant from the coolant insert prior to exposing the beverage within the container so that there is no possibility of the refrigerant being intermingled with the beverage. By venting and completing exhausting the refrigerant from the cooling insert prior to exposing the beverage, the beverage within the container is cooled prior to being exposed thereby eliminating the foaming over of carbonated and other pressurized beverages when the container is opened and reducing the loss of carbonation from such beverages so as to preserve the flavor of the drink. In the self-cooling beverage containers of the prior art where the beverage is not cooled prior to being exposed, the consumer, by even slightly shaking the container, runs the risk of having the beverage spurt forth upon the initial opening of the container with the consequent loss of both beverage and the carbonation in the beverage.

In addition, with beer, carbonated soft drinks and

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other beverages which develop pressure within the container, the pressure of the container contents acting on the external surface of the coolant insert can be utilized to offset the stresses caused by the internal pressure within the coolant insert thereby enabling the use of lighter and more economical coolant inserts. Since the refrigerant within the coolant insert is exhausted prior to venting the contents of the container, the internal pressures within the coolant insert are eliminated prior to any significant reduction of the pressure acting on the external surface of the coolant insert thereby insuring that the lighter coolant inserts can be used without fear of malfunctions.

The present invention comprises a coolant insert interconnected to a hollow nipple on the underside of an end closure by means of a small diameter discharge tube. The end closure is provided with a tear strip having a pull tab secured thereto at its innermost end for facilitating removal of the tear strip. The innermost end of the tear strip is centered over the hollow nipple whereby upon the initial severing of the tear strip at its innermost end, the coolant insert is vented to the atmosphere without exposing the beverage within the container to either the atmosphere or the refrigerant. After the refrigerant in the coolant insert has been exhausted, and the beverage within the container cooled, the tear strip is torn off thereby venting the beverage chamber of the container and forming a pouring spout for the beverage chamber.

The above-mentioned objects and advantages of the present invention along with other advantages of the present invention will become more apparent from the following detailed description of the self-cooling, disposable beverage container when taken in conjunction with the accompanying drawings in which:

FIGURE 1 is a plan view of the upper surface of the end closure of the present invention;

FIGURE 2 is a side view partially in section of a container provided with the end closure and coolant insert of the present invention;

FIGURE 3 is an enlarged view, partially in section, of one end of a container showing the ring pull tab and tear strip after the tear strip has been initially severed to form the vent for the coolant insert;

FIGURE 4 is an enlarged view, partially in section, of the upper portion of the container showing the tear strip almost completely removed;

FIGURE 5 is a plan view of a portion of an end closure showing the tear strip completely removed;

FIGURE 6 is a sectional view of a discharge tube of the cooling insert provided with a velocity actuated variable orifice;

FIGURE 7 is a sectional view of a velocity actuated variable orifice taken substantially along line 7—7 of FIGURE 6; and

FIGURE 8 is a sectional view of the velocity actuated variable orifice taken substantially along line 8—8 of FIGURE 6.

DETAILED DESCRIPTION OF THE INVENTION

Referring now to FIGURES 1 through 5, a self-cooling, disposable container for carbonated soft drinks, beer and the like is indicated by reference character 20. The pre-

ferred form of the self-cooling, disposable container comprises a cylindrical casing 22, end closures 24, 24' and coolant insert 26. While a preferred form of the present invention, setting forth the principles and mode of operation of the present invention, will be described in detail, it is to be understood that the invention is not to be restricted to the exact structure illustrated and that various equivalents can be resorted to without departing from the principles of the present invention.

The peripheral edges of end closures 24, 24', which are preferably made of aluminum or some other commonly utilized metal, are secured to casing 22 by means rolled seams 28 or other conventional seams. End closure 24 is provided with a removable area or tear strip 30 defined by a score line 32 in the upper surface of the end closure. The inner spaced-apart portions of score line 32 extend substantially parallel with respect to each other and are joined at their innermost ends by a curved portion of the score line to define an elongated segment of tear strip 30 that forms a vent 34 when the tear strip is initially severed. The outer spaced-apart portions of score line 32 diverge with respect to each other and are joined at their outermost ends by a curved portion of the score line to define an enlarged segment of the tear strip 30 that forms a pouring spout 36 when completely removed. The innermost segment of the tear strip 30 is provided with a ring pull tab 38 for facilitating removal of the tear strip which is spot welded or otherwise suitably secured to the innermost end of the tear strip.

The underside of end closure 24 is provided with a hollow metallic nipple 40 which is centered beneath the innermost end of the tear strip 30. The nipple 40 is flared at its base 42 where it is welded or otherwise secured to the underside of the end closure in such a manner that the base 42 of the nipple is sealed to the underside of the end closure. The lower portion of the hollow nipple is cylindrical in shape and receives the uppermost end of the discharge tube 44 of the coolant insert 26 with the discharge tube being welded, fused, adhesively bonded or otherwise secured to the nipple in such a manner that the nipple 40 and discharge tube 44 are sealed together.

Insert 26 is made of plastic, aluminum or other suitable materials with the walls of the hollow insert being of sufficient thickness to withstand the stresses exerted by pressurized refrigerant (liquified Freon-12 or other suitable refrigerants) on the interior of the insert. Spacer elements 46, 48 can be provided to extend between the coolant insert 26 and casing 22 and end closure 24' to help position the insert within the container. These spacers can be integral with the insert, as when the spacers and insert are molded as a unit, or the spacers can be welded, fused or otherwise bonded to the exterior surface of the insert.

In operation, the tear strip 30 of the end closure, 24 is initially severed by pulling up on ring pull tab 38 to form vent 34. The initial severing of the tear strip 30 vents the coolant insert 26 to the atmosphere and is accompanied by the usual popping sound made when tear strips are initially severed indicating to the consumer that the coolant insert is being vented. Once the coolant insert is vented, the refrigerant rapidly vaporizes and passes up through discharge tube 44, nipple 40 and through vent 34 formed in the end closure above the nipple. The evaporation of the refrigerant liquid causes absorption of the latent heat of evaporation of the refrigerant from the contents within the container cooling the same. Due to the central location of the vent 34, with regard to the nipple 40, and the fact that the nipple 40 is sealingly affixed to the end closure 24 while the discharge tube 44 is sealingly affixed to the nipple, only the refrigerant is vented and the contents of beverage chamber 50 are neither exposed to the atmosphere nor the refrigerant.

After the cooling process is completed, the time required for cooling being as long as it takes for the vapor phase of the refrigerant to become fully exhausted, the

tear strip is torn completely off to form the pouring spout 36 as shown in FIGURES 4 and 5. Due to the narrow configuration of the tear strip adjacent the periphery of the base 42 of the nipple 40, the beverage chamber 50 is initially vented to the atmosphere through a small opening to prevent excessive loss of carbonation or the foaming of the beverage which has already been minimized due to the fact that the beverage within the chamber 50 is cooled prior to the exposure of the beverage to the atmosphere. The enlarged portion of the tear strip, upon removal, forms a suitable pouring spout 36 in end closure 24 to facilitate the pouring of the pre-cooled beverage from the container.

Referring now to FIGURES 6 to 8, a preferred form of the velocity actuated variable orifice generally indicated by reference character 60 is illustrated setting forth the principles and mode of operation of the orifice. The velocity actuated variable orifice 60 comprises a chamber 62 having inlet and outlet openings 64, 66, respectively and a floating orifice member 68 which is housed within the chamber. The chamber and floating orifice member can be made of aluminum, plastic or other suitable materials.

The chamber 62 is located within discharge tube 44 of the cooling insert and is provided with a plurality of ribs 70 which extend radially inward from the inner tube wall to guide floating orifice member 68. The inlet end of chamber 62 serves only as a retaining means for the floating orifice member 68, the flow of refrigerant through the chamber being governed by outlet orifice 66 and floating orifice member 68. Consequently, the terminal portions 72 of ribs 70 flare inwardly to prevent the floating orifice member 68 from completely obstructing inlet aperture 64 during the latter part of the cooling cycle when the pressure and flow of fluid refrigerant has decreased and the floating orifice member falls within the chamber. The terminal portions of ribs 70 by permitting a flow of refrigerant past the floating orifice member 68 enables orifice 66 to control the flow of the refrigerant in the latter stages of the cycle.

Orifice 66, as best shown in FIGURES 6 and 7, is circular in configuration and cooperates with floating orifice member 68 during those portions of the cycle when the peak pressure and velocity of the fluid refrigerant are experienced to force the flow of fluid through orifice 74 of the floating member. The size of orifice 66 is dictated by the volumetric flow rate desired at the lowest system pressure for a fluid refrigerant having a certain velocity, density and viscosity.

Floating orifice member 68 is cylindrical in form with a rounded upper end which cooperates with a complementary surface in the chamber end wall adjacent orifice 66 to form a seal when high pressure and fluid velocities are experienced in the system. The diameter of longitudinally extending orifice 74 formed therein is dictated by the volumetric flow rate desired and the fluid refrigerant velocity, density and viscosity at peak system pressure.

In operation, when the coolant insert 26 is first vented to the atmosphere, the peak pressure and fluid velocity within discharge tube 44 forces the floating orifice member 68 into orifice 66 (as shown in solid line in FIGURE 6) so that the flow of fluid refrigerant through the chamber must pass through orifice 74 of the floating orifice member 68. In this manner, the coolant insert 26 is depressurized at a rate so that only gas is released from the exhaust tube. As the pressure in the coolant insert decreases and the velocity of the fluid within discharge tube 44 decreases, the weighted floating orifice member 68 falls within the chamber (as shown in dashed line in FIGURE 6) thereby allowing the fluid refrigerant to flow between the floating orifice member 68 and the sidewall of the chamber and out through orifice 66 which controls the flow of fluid refrigerant to insure that only a gas is released from the cooling insert. Of course, with a variable or slugging flow, the floating orifice member 68 will rise

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and fall in the tube according to the velocity, density and viscosity of the flowing fluid. As soon as the coolant insert is completely exhausted, the floating orifice member 68 comes to rest on the terminal portions 72 of the rib 70. After the cooling insert has been exhausted and the beverage within the container cooled, the consumer completes the opening of the container by completely removing the tear strip 30 from end closure 24.

While the preferred form of the variable orifice has been shown, it is also contemplated that a spring could be disposed between the floating orifice member 68 and fixed orifice 66 to urge the floating orifice member toward or away from the fixed orifice 66. In addition, it is contemplated that the variable orifice can be constructed within the discharge tube 44 by utilizing an erodable material secured to the interior of the tube. The erodable material initially has an orifice therein designed to attain the desired flow characteristics at peak refrigerant pressure and fluid velocity. As the exhaustion of the refrigerant from the coolant insert takes place and the system pressure and fluid velocity decreases, the size of the orifice increases due to the erosion of the material within the tube 44 and in this way, the size of the orifice changes to meet the requirements of the system at various pressures and flow velocity levels so that only a gas is released from the exhaust tube.

Referring again to FIGURES 1 through 5, the innermost curved portion of score line 32 adjacent the point where ring pull tab 38 is affixed to tear strip 30 is of a greater depth than the remaining portions of the score line to facilitate and limit the initial rupture of the tear strip. This construction further insures that upon the initial severing of the tear strip 30, only vent 34 is formed in the end closure above the nipple to vent the coolant insert 26 to the atmosphere without exposing the contents of chamber 50 to the atmosphere or the refrigerant. Thus, the consumer initially severs the innermost portion of the tear strip 30 from the end closure forming vent 34 whereby the contents of chamber 50 are cooled by the evaporation of the refrigerant in the coolant insert after which the tear strip is completely removed to vent chamber 50 and form a pouring spout for the chamber.

While the preferred form of the invention has been shown and described, it is to be understood that all suitable modifications and equivalents may be resorted to which fall within the scope of the invention as claimed.

What is claimed is:

1. A closure and coolant insert assembly for a self-cooling container and the like comprising:

a closure having removable tear strip means for forming upon removal vent means and pouring spout means;

a coolant insert adapted to contain a refrigerant and connected to said closure by discharge means; said discharge means interconnecting said coolant insert with said closure adjacent a portion of said tear strip means adapted to be initially severed whereby upon initial severing of said tear strip means from said closure said coolant insert is vented by said vent means formed after which upon further severing of said tear strip from said closure said pouring spout is formed.

2. The closure and coolant insert assembly of claim 1 wherein:

said discharge means comprises a hollow nipple secured to an underside of said closure beneath the portion of said tear strip means adapted to be severed initially.

3. The closure and coolant insert assembly of claim 1 wherein:

said discharge means comprises tubular means having a flared terminal portion secured to said closure with said terminal portion of said tubular means being substantially centered with respect to said portion of said tear strip means adapted to be initially severed.

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4. An end closure and coolant insert assembly for a self-cooling, disposable container and the like comprising:

an end closure having a tear strip with an innermost portion adapted to form vent means upon initial severing of said tear strip from said end closure and an outer portion adapted to form a pouring spout for contents of a container upon removal of said tear strip from said end closure;

a hollow nipple carried by an underside of said end closure, with the juncture of said hollow nipple and said end closure being fluid tight, said hollow nipple being centered beneath said innermost portion of said tear strip; and

a hollow coolant insert adapted to contain a refrigerant, said coolant insert having a discharge tube secured to said hollow nipple with the juncture of said discharge tube and said hollow nipple being fluid tight whereby upon venting said coolant insert by initially severing said innermost portion of said tear strip only said coolant insert will be vented.

5. The end closure and coolant insert assembly of claim 4 wherein:

a pull tab is secured to said innermost portion of said tear strip.

6. The end closure and coolant insert assembly of claim 4 wherein:

said coolant insert has spacer elements adapted to position said coolant insert within a container.

7. The end closure and coolant insert assembly of claim 4 wherein:

said nipple flares adjacent the juncture of said hollow nipple and said end closure.

8. A self-cooling container comprising:

first and second end closures secured to a tubular sidewall;

said first end closure having removable tear strip means for forming upon removal vent means and pouring spout means;

a coolant insert containing a refrigerant connected to said first end closure by discharge means, said discharge means interconnecting said coolant insert with said end closure adjacent a portion of said tear strip means adapted to be initially severed whereby upon initially severing said tear strip means from said end closure and said refrigerant within said coolant insert is vented by said venting means formed without venting contents of said self-cooling container after which upon further severing of said tear strip from said end closure said pouring spout is formed to facilitate the pouring of said contents from said container.

9. The closure and coolant insert assembly of claim 2 wherein:

said discharge means comprises a tubular extension of said coolant insert secured to said hollow nipple.

10. A closure and coolant insert assembly for a self-cooling container and the like comprising:

a closure having removable tear strip means for forming vent means upon initial removal and pouring spout means upon further removal;

a coolant insert adapted to contain a refrigerant connected to said closure adjacent a portion of said tear strip means adapted to be initially severed and the interior of said coolant insert being in communication with the exterior of the self-cooling container through said vent means on initial opening of said container;

whereby refrigerant in said insert may be vented upon initial removal of the tear strip means, cooling the contents of said container, and the cooled contents of said container can be poured through the pouring spout means formed upon further removal of the tear strip.

11. A closure and coolant insert assembly as set forth in claim 10 in which the resistance to removal of said tear strip is less adjacent the point of initial removal than in other portions, to insure that, upon initial severing of the tear strip, only the vent means is formed, without exposing the contents of the container until cooled.

12. A closure and coolant insert assembly as set forth in claim 11 in which said tear strip means is severed from the closure along a score line, the depth of said score line being greater adjacent the point of initial removal than in other portions to provide the said lower resistance to removal.

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U.S. Cl. X.R.

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