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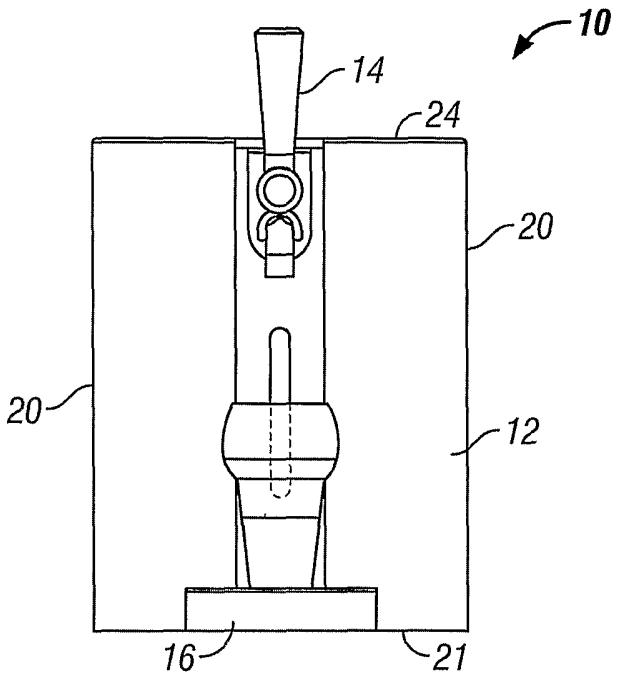
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(54) Title: ALCOHOL BEVERAGE DISPENSING APPARATUS



(57) Abstract: A cooling system for a home beer dispensing apparatus has a mediated thermal bridge providing a bank of latent cooling capacity. The bridge may have a cavity filled with a cooling solution with at least one series of spaced apart heat exchange fins extending substantially along and interstitially into the cavity from at least one wall of the cavity so as to enhance heat transfer across the cavity. The bridge is arranged in thermal conducting relation through a cooling plate between a keg containing the beer and a Peltier thermoelectric cooling device adapted to cool the cooling solution by extracting heat therefrom to an active heat sink. A fan directs air flow horizontally along the fins of the sink and out the two lateral open sides of the heat sink. This prevents heat from rising in the apparatus and thereby affecting other system component parts. The cooling solution may comprise 5% by volume glycol and freezes at a temperature below that of water providing an improved thermal bank. The cooling plate has an electrical resistance heater mounted therein to maintain the temperature of beer in the keg adjacent a bottom portion thereof above the freezing temperature of the beer. The cooling system is economical in its space requirements and enhances the chilling of the beer to a desired serving temperature. The invention also provides a beer keg for such systems.

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ALCOHOL BEVERAGE DISPENSING APPARATUS

Field of the Invention

The present invention relates to a cooling system for use in an alcohol beverage dispensing apparatus and in particular, relates to a cooling system having a mediated thermal bridge for use in a home beer dispensing apparatus. It further relates to the construction of a container, namely a beer keg, for use in such systems.

Background of the Invention

Beer dispensing apparatus are known in the art for dispensing of draft beer in taverns and the like. Typically, the beer is chilled prior to being dispensed by passing through a conical run of tube that passes through a chilled compartment containing ice and water. In some instances the compartment is refrigerated. Such draft beer dispensers are utilized in taverns where the large volumes of beer are dispensed everyday and the taverns have room to store such chillers. This is not the case for a domestic or home beer dispensing apparatus that is adapted to sit on a countertop in a kitchen where space is at a premium.

Further, due to limited countertop space requirements, there still is a need to chill or cool the beer in the dispensing apparatus to serving temperatures in an optimal manner in spite of the limited space. Further, the quicker the beer is chilled to a desired serving temperature, the more useful the beer dispenser is to the consumer. Hence improvements in heat transfer capabilities within the dispensing apparatus are important features.

Moreover, in a home beer dispenser, beer is typically drawn adjacent the bottom of the keg as this is usually the first region in the keg to chill. However, in the event the keg is left in the dispensing apparatus for a period of time greater than that necessary to bring the beer down to a serving temperature near the freezing temperature of the beer, the beer may freeze adjacent the bottom region of the keg preventing proper dispensing of the beer.

Summary of the Invention

It is an object of the present invention to provide an alcohol beverage, such as beer, dispensing apparatus having a cooling system that is economical in its space requirements and enhances the extraction of heat from the beer.

Another object of the present invention is to provide an alcohol beverage dispensing apparatus having a cooling system which prevents the beverage from freezing in the

apparatus.

It is a further object of the present invention to provide a keg for containing an alcohol beverage which keg has a keg shell construction that is economical to manufacture and that is suitable for use in a home alcohol beverage dispensing system, preferably, a beer dispensing system.

The present invention relates to a cooling system for use with an alcohol beverage dispensing apparatus where the cooling system has a mediated thermal bridge having a banked latent cooling capacity provided by a cooling medium, preferably a solution of water and glycol, contained in a cavity in the thermal bridge. The thermal bridge is arranged in thermal conducting relation between a keg containing the alcohol beverage and a cooling device which acts as an active heat sink. Preferably the mediate thermal bridge is a fully intermediated bridge in which all of the heat is transferred from the alcohol beverage to the cooling device, including the active heat sink, through the thermal bridge.

In another aspect, the cooling system may also have a heat sink having a plurality of spaced apart heat exchange fins extending along corresponding spaced apart, preferably generally, horizontal planes. Preferably, the heat sink has a support wall from which the exchange fins extend to define two opposing lateral open sides and an open front. Means for directing air flow towards the open front of the heat sink are provided whereby the horizontal extending fins and supporting wall direct the air flow generally horizontally or side wards along the fins and out the two lateral open sides of the heat sink. This prevents heat from rising making it more readily acceptable to mount other component parts above the heat sink and thereby conserve on space. Alternatively, the horizontal flow of air may be directed inwardly from one of the two opposing lateral open ends. Also, the heat sink may have only two open sides as contrasted to three open sides in the preferred embodiment.

Preferably, the cavity has a second wall, opposite to the one wall, that supports a second series of spaced apart heat exchange fins that extend along and interstitially into the cavity in spaced apart relation with the first series of spaced apart heat exchange fins so as to further promote heat exchange through the cavity.

In yet a further aspect, the present invention relates to a cooling system for use with a alcohol beverage dispensing apparatus wherein the beverage is contained in a container such as a keg and where a heater is located adjacent the bottom portion of the keg in thermal conducting relation therewith to prevent the beverage from freezing in the apparatus and specifically adjacent the internal bottom portion of the keg.

Therefore, in accordance with one embodiment of the present invention there is

provided a cooling system for cooling a keg containing an alcohol beverage. The cooling system comprises a thermal bridge adapted to contact a surface portion of the keg. The thermal bridge has a reservoir or cavity filled with a cooling solution comprising a mixture of water and glycol. The cooling system further comprises a cooling device adapted to chill the thermal bridge, including the cooling solution in the reservoir, so as to produce a latent heat cooling capacity in the thermal bridge for cooling the alcohol beverage contained in the keg when the keg is mounted in heat transfer relation with the thermal bridge.

In accordance with another embodiment of the present invention there is provided a cooling system for cooling a keg containing an alcohol beverage. The cooling system comprises a thermal bridge adapted to contact a surface portion of the keg. The thermal bridge has a cavity filled with a cooling solution. The cavity has a first series of space apart heat exchange fins extending substantially along and interstitially into the cavity from at least one wall of the cavity. The cooling system further comprises a cooling device adapted to chill the thermal bridge and extract heat through the thermal bridge from the alcohol beverage contained in the keg when the keg is mounted in heat transfer relation with the thermal bridge.

Preferably, the first and second series of heat exchange fins extend into the cavity in parallel interleaved relation. Also, the cavity is formed of a top portion and a bottom portion that are secured together in sealed relation. The top portion has a cooling plate that is adapted to contact the keg in heat exchange relation. The first series of fins extend into the cavity from the top portion. The bottom portion supports the second series of fins to extend into the cavity therefrom.

In accordance with another embodiment of the present invention there is provided a cooling system for cooling a keg containing an alcohol beverage, which system comprises a cooling plate adapted to receive a bottom portion of the keg in heat transfer relation therewith, and heating means mounted with the cooling plate adapted to maintain the temperature of beverage in the keg adjacent the bottom portion of the keg above the freezing temperature of the beverage.

Preferably, the heating means or heater conducts sufficient heat energy into the base of the keg to provide an insulated layer of beer adjacent the bottom of the keg where the beer is dispensed from the keg. The heater is preferably an electrical resistance heating element located in the cooling plate of the cooling system. Additionally, a temperature controller may be adapted to sense the temperature adjacent the bottom region of the keg and when the sensed temperature falls below a predetermined temperature where the beer may freeze, the

temperature controller energizes the heater to warm the beer until the sensed temperature rises above the predetermined temperature.

The cooling solution preferably comprises 5% by volume glycol and freezes at a temperature below that of water providing an improved thermal bank. Further the cooling solution may contain anti-corroding particles to prevent or reduce the occurrence of corrosion in the thermal bridge. Preferably, the cooling solution is cooled to a temperature that forms ice. Preferably, the cooling device further includes an active heat sink adapted to remove heat produced by the cooling system as the cooling system cools the thermal bridge. The active heat sink is also adapted to dissipate heat transferred through the thermal bridge from the alcohol beverage in the keg.

In accordance with yet another aspect of the present invention there is provided a keg suitable for containing an alcohol beverage. The keg comprises two keg half shells each identically formed to have an end wall portion and side walls extending from the end wall portion that terminate in a continuous side wall edge portion. The two keg half shells have their respective side wall edge portions placed in abutting relation with one another and joined together to form the keg.

An advantage of the present invention is that forming the keg from two identical shells provides a manufacturing cost reduction.

Preferably, the end wall portion of each half shell is formed with a raised annular collar and a face plate extending across the collar to normally close the collar. The face plate of one of the two keg half shells is adapted to engage a cooling plate of a dispensing apparatus in heat transfer relation therewith and the other of the two keg half shells is at least partially removed to form an aperture for receiving a valve and spear for filling into and dispensing from the keg the beverage. This preferred construction of the keg renders the keg operable for use in a home beverage dispensing system such as, for example, a beer dispensing apparatus.

Preferably, the side walls of the two keg half shells comprise a continuous substantially cylindrical wall extending substantially normal from the end wall portion. The side wall edge portions of each cylindrical side wall preferably abut each other along a common plane that passes through a center of the keg. Preferably, the keg half shells are joined by a weld to form the keg.

By substantially cylindrical wall it is meant a wall that resembles a cylinder either having a constant radius along its length or a substantially constant radius along its length. It is envisaged that the radius of the keg may be slightly large toward the keg center to provide

a center bulge.

Preferably the alcohol beverage is beer and the cooling system is utilized in a home beer dispensing apparatus.

Brief Description of the Drawings

For a better understanding of the nature and objects of the present invention reference may be had to the accompanying diagrammatic drawings in which:

Figure 1 is a front elevation view of a home beer dispensing apparatus in accordance with the present invention;

Figure 2 is a side elevation view of the home beer dispensing apparatus;

Figure 3 is an enlarged perspective view of the cooling system for the beer keg housed in the home beer dispensing apparatus illustrating the thermal bridge and its cavity and the keg of the present invention mounted on the cooling plate;

Figure 4 is a perspective view of the top portion of the thermal bridge;

Figure 5 is a perspective view of the base portion of the thermal bridge showing the orientation of the base portion reversed relative to the orientation of the top portion shown in Figure 4;

Figure 6 is a cross sectional view of the cavity of the thermal bridge taken along section line VI-VI of Figure 3;

Figure 7 is a plan view of the heat sink and fan showing the horizontal air flow across the heat exchanger;

Figure 8 is a sectional view of the keg of the present invention showing two keg shells prior to joining; and

Figure 9 is a cross-sectional view of a formed keg having a dispensing spear within the keg and resting on a cooling plate for cooling the contents of the keg.

Detailed Description of the Invention

Referring to Figures 1 and 2 there is shown a home beer dispensing apparatus, appliance or unit 10. The dispensing apparatus 10 is primarily intended for use in domestic kitchens but may also be used in utility rooms, garages, domestic bars, caravans etc. While the preferred embodiment relates to dispensing beer, alternatively carbonated solutions or other alcohol beverages may be dispensed by apparatus 10.

The home beer dispensing apparatus 10 has a front wall 12 and a dispensing tap 14 protruding forward of the front wall 12. A drip tray 16 also protrudes forward of the front

wall 12 and is adapted to support an open glass container 18 below the dispensing tap 14. The home beer dispensing apparatus 10 further has a base 21 adapted to rest on a counter top. The front wall 12 is an extension of two pivoting side walls 20 which may be moved between closed and open positions to allow the keg 22 (see Figure 2 in broken lines) to be inserted into the housing of the home beer dispensing apparatus 10.

The housing of the home beer dispensing apparatus 10 further includes a top wall 24 and a rear wall 26. The rear wall 26 has a grill 30 that permits for air circulation within the home beer dispensing apparatus 10. An electrical cord 32 extends through the rear wall 26 of the apparatus 10 to provide a connection into a main electrical supply to supply electrical power to the electrical components housed within the unit 10. Alternatively, a 12 Volt DC supply input may be used.

The dispensing apparatus 10 has a cooling system 34 located behind and below keg 22 that is adapted to cool beer 70 in keg 22 when keg 22 is placed into dispensing apparatus 10. The dispensing apparatus 10 also dispenses the beer by providing and using a pressurized air supply (not shown).

Referring to Figure 3, the cooling system 34 is utilized to keep the beer in keg 22 at an ideal serving temperature for drinking.

The cooling system 34 has a Peltier thermoelectric device 36 that produces the necessary cooling effect. When a voltage is applied to the Peltier device 36 across leads 38 a thermal differential is generated across the Peltier device 36 which is used to cool a mediate thermal bridge 40. The Peltier thermoelectric device 36 provides a low continuous cooling rate along its cold side portion 60 to aluminum block 42 mounted to rear wall 70 of the thermal bridge 40.

To maximize the cooling power of the Peltier device 36, the hot side portion 44 of the Peltier device 36 is cooled by an active heat sink 46 coupled to the hot side portion 44. The heat sink 46, as seen in Figures 3 and 7, has a series of spaced apart horizontally extending fins or ribs 48 which extend along corresponding horizontal planes and across which air flows to cool the heat sink 46. The heat sink has a supporting wall 47 from which the heat exchange fins 48 extend to define two opposing lateral open sides 51, 53 and an open front 55.

A fan 50 is coupled to heat sink 46 against the open front 55 to blow ambient air passing through the grill 30 over the fins 48, out open sides 51, 53 and thereby make the heat sink 46 active. The fan 48 is positioned such that air is blown directly onto the face of the heat sink 46 as indicated by arrows 52 so as to maximize the turbulent air flow and the

resultant heat dissipation from the heat sink occurs as the air flows horizontally out of the heat sink 46 between and across fins 48 as exemplified by air flow arrows 54. In Figure 7, a plan view of the heat sink 46 and fan 50 further illustrates the air flow 52 and 54 entering open front 55 and exiting opposing open sides 51, 53.

While vertical air flow across fins of a heat sink is considered a usual air flow path that takes advantage of the chimney effect of rising heat, the area within the dispensing apparatus 10 is filled with other component parts for the unit such as, for example, air pressure devices, the dispense tap, and possibly electronic hardware that should be kept at ambient temperature to operate effectively. In this environment, the chimney effect of a heat sink is detrimental to the operation and fitting of component parts in the fixed housing space of apparatus 10 and the operation of the horizontal air flow across heat sink 48 is beneficial.

As shown in Figure 1, the dispensing apparatus 10 has the grill 30 located in it's rear wall 26 through which air flow 52 into the apparatus 10 is drawn in by fan 50 and air flow out at 54 is achieved by horizontal extending fins 48 of the heat sink. The exit air flow 54 from grill 30 is shown to be above and below intake air flow 52 in Figure 1; however, in practice, the exiting air flow 54 is more to the side of input air flow 52. Hence the horizontal orientation of fins 48 of heat sink 46 result in an air flow in a direction away from component parts located above the heat sink 46 within dispensing apparatus 10.

As mentioned, the cold side wall portion 60 of the Peltier device 36 is attached to the thermal bridge 40 through aluminum block 42. In the preferred embodiment, the thermal bridge 40 is aluminum and has an internal reservoir cavity 62 formed therein. The cavity 62 contains a cooling solution 66 (see Figure 6) of water and, preferably 5%, glycol. The cavity 62 provides a cooling bank and is cooled by Peltier device 36.

The bridge 40 has a cooling plate 64 upon which the keg 22 is located within the dispensing apparatus 10. The cooling plate 64 is located underneath the keg 22 so that the weight of the keg 22 is applied to the interface between the keg 22 and the cooling plate 64 thereby improving conductivity. The cooling at the bottom portion 68 of the keg 22 also ensures that beer to be drawn first, from the bottom of the keg, is cooled first. Cooling at the bottom portion 68 also permits insulation (not shown) around the top of the keg 22 to be thinner and less effective to allow cold air created inside the dispensing apparatus 10 to sink to the bottom portion 68.

It should be understood that the rate of cooling across the interface between keg 22 and cooling plate 64 is proportional to both the effectiveness of the interface contact between the two and the temperature differential between beer 69 housed in keg 22 and cooling plate

64.

Referring to Figures 4, 5 and 6, the assembly for the mediated thermal bridge 40 is shown. The mediated thermal bridge comprises cavity 62 filled with the cooling solution 66 (Figure 6) comprising a mixture of water and 5% glycol. This mixture improves cooling rate, whilst ensuring that the beer does not actually freeze. The freezing point of the water in the ice store is reduced by a couple of degrees by the addition of the small amount of antifreeze or glycol. The cooling plate is now at 0°C rather than 2°C and the cooling rate of the beer increased. The cooling solution 66 effectively provides a bank of latent cooling capacity through cooling plate 64 to keg 22.

The ice store cavity 62 of the thermal bridge 40 preferably contains 1.5 liters of water and glycol mixture (5% glycol) and is permanently sealed. The 5% glycol allows freezing at –2°C. The glycol water mixture effectively increases the differential temperature between the beer and the cooling plate. The ice store mixture may also contain corrosion inhibitors.

The thermal bridge 40 comprises a top portion 72 (see Figure 4) comprising a top wall 74 and the cooling plate 64 beveled to receive the beveled bottom 68 of the keg 22. The top wall 74 has a series of spaced apart elongated fins 76 extending along and outwardly therefrom and interstitially into the cavity 62. The top portion 72 is adapted to sealingly engage side walls 78 of cavity bottom portion 80 (see Figure 5). Bottom portion 80 has a base wall 82 and a series of spaced apart elongated fins 84 that extend along and outwardly from base wall 82 and interstitially into cavity 62. Part 80 is filled with cooling solution 66 (Figure 6) and part 72 is sealed to part 80 to form cavity 62. Fins 76 of top portion 72 are inter spaced with and between fins 84 of lower portion 80 to provide an interleaved relationship when the thermal bridge 40 is assembled. The cooling solution 66 is positioned within cavity 62 located between fins 76 and 80 (see Figure 6). The cooling solution 66 boosts the cooling effect in cavity 62 between fins 76 and 84 due to additional latent heat capacity because water in the solution is frozen when sufficient cooling is provided by the Peltier device 36. The frozen water is a thermal bank. When the keg 22 is put on cooling plate 64, the latent cooling, or thermal bank provides ability to draw heat out of the keg 22 more readily. The latency is built in to the cooling cycle in course of operating the dispensing apparatus 10.

The utilization of the ice storage cavity 62 of the thermal bridge 40 in the cooling system 34 boosts the ability of the cooling system 34 to lower the temperature of the beer 70 in the keg 22. The bridge 40 decreases the cooling time for the beer to a desired serving temperature offering benefits to the user. This is achieved by means of an ice store located in

the aluminum block cavity 62. The solution is frozen to form ice by the Peltier device 36 once a keg 22 of beer is cooled in preparation for the next keg. The latent energy required in the phase change from water to ice is considerable. About 2kg of water, when frozen, has the capacity to absorb enough energy to cool 6kg of water by 20°C. When a new keg 22 is inserted into the dispensing apparatus 10, the new keg cools much quicker than by the use of a Peltier device and cooling fan alone.

Further, a good thermal contacting relation between the cooling solution 66 and the aluminum block cavity 62 provided by interleaved fins 76 and 84 ensures both rapid freezing of the ice and rapid thawing when cooling beer. This is achieved by using the elongated finned internal surfaces of the fins 76 and 84 in a manner similar to a heat sink.

An ice store of cooling solution 66 is preferably at 0°C when cooling the beer. However, there is a temperature gradient through the aluminum block cavity 62 and the ice store or cooling solution 66, when cooling, is colder than the cooling plate 64 by as much as 2 or 3°C. The differential between beer and cooling plate 64 temperatures is less than it could be if the cooling plate were at 0°C and cooling would be slower.

The Peltier unit 36 preferably is a 50W or 72W rated device. The Peltier unit 36 is preferably clamped between the heat sink 46 and thermal bridge 40 by using two stainless steel bolts (not shown).

Referring to Figure 3, the cooling plate 64 has mounted therein an electrical resistance heater or heating element 45. Heating element 45 is connected to a source of electrical supply (not shown). Heating element 45 is mounted in heat transfer relation with the keg 22 and maintains the temperature of beer 69 adjacent the bottom portion 68 of the keg 22 above freezing temperature of the beer 69. The cooling system 34 further includes a temperature sensor 63 adapted to contact the keg 22 adjacent the bottom portion 68 for sensing temperature related to the temperature of the beer 69 in the keg 22. The cooling system 34 has a temperature controller 65 responsive to the temperature sensed by the temperature sensor 63 to energize the heater 45 to transfer heat into the bottom portion 68 of the keg 22 to maintain the temperature of the beer 69 above its freezing temperature. The temperature sensor and controller may comprise a bi-metal thermostat in circuit with the heating element 45 which cycles the heating element 45 on and off. Alternatively, the temperature sensor may comprise a thermistor connected with a control circuit to cycle the heating element on and off.

The Peltier device 36 and fan 50 supply voltages are controlled so that when the beer is finally cooled to the desired serving temperature a lower rate of energy extraction is

provided to avoid freezing the beer and to reduce energy consumption and noise. The use of Peltier device 36 and fan 50 preferably limits the cooling power to, at most, 50W and more typically 30W. The cooling of a 6 liter keg of beer from 23°C to 3°C by the Peltier device 36 and fan 50 alone typically takes 8 to 20 hours. The material of the keg 22 has an effect on this cooling time.

The rating of the heat sink 46 and fan 50 is better than 0.25°C/W. At an ambient temperature of 22°C, the heat sink 46 temperature measured adjacent to the hot side 44 of the Peltier device 36 is preferably not be above 35°C. The heat sink 46 is preferably made from extruded Aluminum. It need not be coated. The fan 50 preferably provides 29cfm (cubic feet per minute) at 12V supply. The fan is capable of starting at 6V.

The mediate thermal bridge 40 connects the Peltier device 36 cold side wall portion 60 to the cooling plate 64 underneath the keg 22. The temperature gradient between these two points preferably does not exceed 3°C at 40W flow.

The mediate thermal bridge 40 is preferably manufactured from cast aluminum alloy LM 20. This material has been chosen for its thermal conductive properties.

The cooling plate 64 to keg 22 interface is preferably matched to the form of a keg pressurized at 1.5 bar. The temperature differential between cooling plate 64 and the keg bottom surface 68 (which is at 3°) shall be <3°C (i.e. the cooling plate 64 should be at a temperature of 0°C under these conditions).

While the preferred embodiments described in relation to the drawings are for a thermal bridge having a cavity located in heat transfer relation with the keg below the bottom portion of the keg, it should be understood that the thermal bridge may be located in other locations in heat transfer relation with the keg. One such other location, for example, is to locate the thermal bridge beside the keg in heat transfer relation to the side wall of the keg.

Referring to Figures 1 to 3, the cooling of the keg 22 within the beer dispensing apparatus 10 is accomplished by a the cooling system 23 having a cooling plate 64 having a cooling surface 172 that is in mechanical and heat transfer contacting relation with the bottom portion 140 of the keg 22.

The dispensing apparatus 10 also fills and dispenses beer into and out of the keg 22 through a valve 142 and spear 144 as best seen in Figure 4. The keg 22 preferably includes a bag (not shown) for holding the beer within the keg 22 and into which the spear 144 extends.

Referring to Figures 8 and 9, the keg 22 of the present invention is shown in more detail.

In accordance with this aspect of the present invention, the keg 22 is formed from two

keg half shells 150. Each of the keg half shells 150 are identically formed by deep drawing of a material selected from the group consisting of steel, stainless steel, and aluminum.

The keg half shells 150 each have an end wall portion 152 and substantially cylindrical side wall 154. The cylindrical side wall 154 is shown in Figure 8 to comprise a wall having two different radii r_1 and r_2 where r_2 is greater than r_1 to provide a bulge 160 at the center 162 of keg 22. In Figures 4 and 5 the cylindrical side wall 154 of each keg half shell 150 has a uniform radius r_3. As shown in Figures 3 to 5, the substantially cylindrical side walls 54 extend substantially normal or perpendicular to the end wall portion 152. The end wall portions 152 of the keg shells 150 each have a generally concave curvature 156 relative to the cylindrical side wall 154 and interior of the keg 22.

Each end wall portion 152 is formed with a raised annular collar 164 and flat face plate 166 extending across the collar 164 to normally close the collar 164. While only one face plate 166 is shown in the bottom shelf half 150 in the drawings, it should be understood that keg half shells 154 are each formed with a face plate 166. The collars 164 strengthen the keg. The bottom face plate 166 of the two keg half shells 150 is adapted to engage the cooling plate 64 in heat transfer relation therewith. The other or top face plate (not shown) of the two keg half shells 150 is at least partially removed to form an aperture 180 as seen in Figure 8. Aperture 180 is adapted to receive valve 142 (see Figure 9) and hollow spear 144 shown extending into the keg 22. The valve 142 and spear 144 provide means for filling keg 22 with beer and for dispensing beer from keg 22 through tap 114 (Figure 1).

Each end wall portion 152 has an annular rim 151 shown curved in Figures 3 and 9 and as a ridge in Figure 8. The annular rim 151 extends about the periphery of end wall portion 152 adjacent the cylindrical wall 154. The rim 151 is adapted to support a chime (not shown) for orientating the keg 22 in the home beer dispensing apparatus 10.

The cylindrical side wall 154 terminates in a continuous side wall edge portion 157. The two keg half shells 150 have their respective side wall edge portions 157 placed in abutting relation with one another along a common plane 159 that passes through the center of the keg 22. The keg half shells 150 are joined together by a weld 161 along the abutting side wall edge portions 157 to form the keg 22.

The formation of the keg of the present invention has the advantage of utilizing a simple embossed design that produces a centering bottom face plate 166 for supporting the keg 22 in a heat transfer seated arrangement with a cooling plate 64 and a centering aperture 180 for receiving the valve 142 and the spear 144 for filling into and dispensing beer from the keg 22.

Although not shown in the drawings, a closed cell foam membrane is located below the cooling fluid. As the cooling fluid expands and contracts the foam collapses ensuring the upper surface is always contacted. This is particularly important when a phase change occurs. It also provides for better heat transfer by allowing the cavity to be filled up with the cooling fluid which is in contact with the upper cooling face without having to allow for expansion head space.

It will be appreciated that beer is the beverage of choice to be dispensed using the present invention but other, especially, carbonated beverages could also benefit from using the present invention.

WHAT IS CLAIMED IS:

1. A cooling system for cooling a keg containing an alcohol beverage, the cooling system comprising:

a thermal bridge adapted to contact a surface portion of the keg and having a cavity filled with a cooling solution; and

a cooling device adapted to chill the thermal bridge, including the cooling solution in the cavity for extracting heat from and for cooling the alcoholic beverage contained in the keg when the keg is mounted in heat transfer relation with the thermal bridge.

2. A cooling system according to Claim 1 wherein the cooling solution is chilled to the extent it has a latent heat cooling capacity.

3. A system according to Claim 1 or 2 wherein said cooling solution is a mixture of water and glycol.

4. A cooling system for cooling a keg containing an alcohol beverage, the cooling system comprising:

a thermal bridge adapted to contact a surface portion of the keg and the thermal bridge having a cavity filled with a cooling solution comprising a mixture of water and glycol; and

a cooling device adapted to chill the thermal bridge, including the cooling solution in the cavity, so as to produce a latent heat cooling capacity in the thermal bridge for cooling the alcohol beverage contained in the keg when the keg is mounted in heat transfer relation with the thermal bridge.

5. The cooling system of Claim 4 wherein the cooling solution comprises 5% by volume glycol.

6. The cooling system of Claim 4 wherein the cooling solution further contains a corrosion inhibitor.

7. The cooling system of Claim 4 wherein the solution is cooled to form ice.

8. The cooling system of Claim 4 wherein the cooling device has a Peltier thermoelectric cooling unit that has a cool surface portion in heat transfer contact with the thermal bridge and that has a hot surface portion in heat transfer contact with a heat sink.

9. The cooling system of Claim 8 wherein the cooling device further includes a fan for directing air flow across the heat sink.

10. The cooling system of Claim 4 wherein the thermal bridge comprises a cooling plate adapted to contact a bottom surface portion of the keg.

11. The cooling system of Claim 4 wherein the cooling device further includes an

active heat sink adapted to remove heat from the thermal bridge and to dissipate heat transferred through the thermal bridge from the alcohol beverage in the keg.

12. A home beer dispensing apparatus having a cooling system for cooling a keg containing beer, the cooling system comprising:

a thermal bridge adapted to contact a surface portion of the keg and the thermal bridge having a reservoir filled with a cooling solution comprising a mixture of water and glycol; and,

a cooling device adapted to chill the thermal bridge, including the cooling solution in the reservoir, so as to produce a latent heat cooling capacity in the thermal bridge for cooling the beer contained in the keg when the keg is mounted in heat transfer relation with the thermal bridge.

13. The dispensing apparatus of Claim 12 wherein the cooling solution comprises 5% by volume glycol.

14. The dispensing apparatus of Claim 12 wherein the cooling solution further contains a corrosion inhibitor.

15. The dispensing apparatus of Claim 12 wherein the solution is cooled to form ice.

16. The dispensing apparatus of Claim 12 wherein the cooling device has a Peltier thermoelectric cooling unit that has a cool surface portion in heat transfer contact with the thermal bridge and that has a hot surface portion in heat transfer contact with a heat sink.

17. The dispensing apparatus of Claim 16 wherein the cooling device further includes a fan for directing air flow across the heat sink.

18. The dispensing apparatus of Claim 12 wherein the thermal bridge comprises a cooling plate adapted to contact a bottom surface portion of the keg.

19. The dispensing apparatus of Claim 12 wherein the cooling device further includes an active heat sink adapted to remove heat from the thermal bridge and to dissipate heat transferred through the thermal bridge from the beer in the keg.

20. A cooling system for cooling a keg containing an alcohol beverage, the cooling system comprising:

a thermal bridge adapted to contact a surface portion of the keg and the thermal bridge having a cavity filled with a cooling solution, the cavity has a first series of spaced apart heat exchange fins extending substantially along and interstitially into the cavity from at least one wall of the cavity; and,

a cooling device adapted to chill the thermal bridge and extract heat from the alcohol

beverage contained in the keg when the keg is mounted in heat transfer relation with the thermal bridge.

21. The cooling system of Claim 20 wherein the cooling system is a solution of glycol in water.

22. The cooling system of Claim 20 wherein the cavity has a second wall, opposite to the one wall, that supports a second series of spaced apart heat exchange fins that extend along and interstitially into the cavity in spaced apart relation with the first series of spaced apart heat exchange fins, and the cooing solution filling the space between the first and second series of heat exchange fins.

23. The cooling system of Claim 22 where the first and second series of heat exchange fins extend into the cavity is parallel interleaved relation.

24. The cooling system of Claim 22 wherein the cavity is formed of a top portion and a bottom portion that are secured together in sealed relation, the top portion comprising a cooling plate the is adapted to contact the keg in heat transfer relation and the first series of fins extending into the cavity from the top portion, and the bottom portion supporting the second series of fins to extend into the cavity.

25. The cooling system of Claim 22 wherein the cooling solution comprises 5% by volume glycol.

26. The cooling system of Claim 22 wherein the cooling solution is cooled to form ice.

27. The cooling system of Claim 22 wherein the cooling device comprises a Peltier thermoelectric cooling unit that has a cool surface portion in heat transfer contact with the thermal bridge and that has a hot surface portion in heat transfer contact with a heat sink.

28. The cooling system of Claim 27 wherein the cooling system further includes a fan for directing air flow across the heat sink.

29. A home beer dispensing apparatus having a cooling system for cooling a keg containing beer, the cooling system comprising:

a thermal bridge adapted to contact a surface portion of the keg and the thermal bridge having a cavity filled with a cooling solution, the cavity has a first series of spaced apart heat exchange fins extending substantially along and interstitially into the cavity from at least one wall of the cavity; and,

a cooling device adapted to chill the thermal bridge and extract heat from the beer contained in the keg when the keg is mounted in heat transfer relation with the thermal bridge.

30. The home beer dispensing apparatus of Claim 29 wherein the cavity has a second wall, opposite to the one wall, that supports a second series of spaced apart heat exchange fins that extend along and interstitially into the cavity in spaced apart relation with the first series of spaced apart heat exchange fins, and the cooing solution filling the space between the first and second series of heat exchange fins.

31. The home beer dispensing apparatus of Claim 30 wherein the first and second series of heat exchange fins extend into the cavity is parallel interleaved relation.

32. The home beer dispensing apparatus of Claim 30 wherein the cavity is formed of a top portion and a bottom portion that are secured together in sealed relation, the top portion comprising a cooling plate the is adapted to contact the keg in heat transfer relation and the first series of fins extending into the cavity from the top portion, and the bottom portion supporting the second series of fins to extend into the cavity.

33. The home beer dispensing apparatus of Claim 30 wherein the cooling solution comprises 5% by volume glycol.

34. The home beer dispensing apparatus of Claim 30 wherein the cooling solution is cooled to form ice.

35. The home beer dispensing apparatus of Claim 30 wherein the cooling device comprises a Peltier thermoelectric cooling unit that has a cool surface portion in heat transfer contact with the thermal bridge and that has a hot surface portion in heat transfer contact with a heat sink.

36. The home beer dispensing apparatus of Claim 35 wherein the cooling system further includes a fan for directing air flow across the heat sink.

37. A cooling system for cooling a keg containing an alcohol beverage, the cooling system comprising:

a heat sink having a plurality of spaced apart heat exchange fins extending along corresponding spaced apart non-vertical planes.

38. The cooling system of Claim 37 wherein the heat sink has at least one supporting wall from which the heat exchange fins extend to define at least two open sides, one of which is lateral and means for directing air flow towards one of the open sides along the heat exchange fins and out the other open side whereby the fins and at least one supporting wall direct the air flow along the fins and out the lateral open side of the heat sink.

39. A cooling system for cooling a keg containing an alcohol beverage, the cooling system comprising:

a heat sink having a plurality of spaced apart heat exchange fins extending along

corresponding spaced apart horizontal planes.

40. The cooling system of Claim 39 wherein the heat sink has at least one supporting wall from which the heat exchange fins extend to define at least two open sides, and means for directing air flow towards one of the open sides along the heat exchange fins and out the other open side whereby the horizontal extending fins and at least one supporting wall direct the air flow horizontally along the fins.

41. The cooling system of Claim 39 wherein the heat sink has a supporting wall from which the heat exchange fins extend to define two opposing lateral open sides and an open front, and means for directing air flow towards the open front of the heat sink whereby the horizontal extending fins and supporting wall direct the air flow horizontally along the fins and out the two lateral open sides of the heat sink.

42. The cooling system of Claim 41 wherein the means for directing air flow comprises a fan mounted directly to the open front of the heat sink.

43. The cooling system of Claim 42 further including a Peltier thermoelectric cooling unit mounted to an outside surface of the supporting wall of the heat sink and being adapted to be mounted in heat transfer relation with the keg for enhancing the extraction of heat from the beverage contained in the keg therethrough for dissipation from the heat sink.

44. The cooling system of Claim 43 further including a cooling plate in heat transfer relation with the Peltier thermoelectric cooling unit and a bottom surface portion of the keg.

45. A home beer dispensing apparatus having a cooling system for cooling a keg containing beer, the cooling system comprising:

a heat sink having a plurality of spaced apart heat exchange fins extending along corresponding spaced apart horizontal planes.

46. The home beer dispensing apparatus of Claim 45 wherein the heat sink has at least one supporting wall from which the heat exchange fins extend to define at least two open sides, and means for directing air flow towards one of the open sides along the heat exchange fins and out the other open side whereby the horizontal extending fins and at least one supporting wall direct the air flow horizontally along the fins.

47. The home beer dispensing apparatus of Claim 45 wherein the heat sink has a supporting wall from which the heat exchange fins extend to define two opposing lateral open sides and an open front, and means for directing air flow towards the open front of the heat sink whereby the horizontal extending fins and supporting wall direct the air flow horizontally along the fins and out the two lateral open sides of the heat sink.

48. The home beer dispensing apparatus of Claim 47 wherein the means for directing air flow comprises a fan mounted directly to the open front of the heat sink.

49. The home beer dispensing apparatus of Claim 47 wherein the cooling system further includes a Peltier thermoelectric cooling unit mounted to an outside surface of the supporting wall of the heat sink and being adapted to be mounted in heat transfer relation with the keg for enhancing the extraction of heat from the beer contained in the keg therethrough for dissipation from the heat sink.

50. The home beer dispensing apparatus of Claim 49 wherein the cooling system further includes a cooling plate in heat transfer relation with the Peltier thermoelectric cooling unit and a bottom surface portion of the keg.

51. The home beer dispensing apparatus of Claim 47 wherein the dispensing apparatus contains at least one grill through which ambient air is drawn into the apparatus across the open front of the heat sink and warmed air is directed by the heat exchange fins horizontally out of the apparatus through the at least one grill.

52. The cooling system of Claim 10 and 24 wherein a heater is mounted with the cooling plate and adapted to maintain the temperature of beverage in the keg adjacent the bottom portion of the keg above freezing temperature of the beverage.

53. The cooling system of Claim 52 wherein the heater comprises an electrical resistance heater mounted in the cooling plate.

54. The cooling system of Claim 53 further including a temperature sensor adapted to contact the keg adjacent the bottom portion of the keg for sensing temperature related to the temperature of the beverage in the keg, and a temperature controller responsive to the temperature sensed by the temperature sensor to energize the heater to transfer heat into the bottom portion of the keg and the beverage so as to maintain the temperature of the beverage above its freezing temperature.

55. The home beer dispensing apparatus of Claim 10, 18, 44 or 50 is a heater mounted with the cooling plate and adapted to maintain the temperature of beer in the keg adjacent the bottom portion of the keg above freezing temperature of the beer.

56. The apparatus of Claim 55 wherein the heater comprises an electrical resistance heater mounted in the cooling plate.

57. The apparatus of Claim 56 which further includes a temperature sensor adapted to contact the keg adjacent the bottom portion of the keg for sensing temperature related to the temperature of the beer in the keg, and a temperature controller responsive to the temperature sensed by the temperature sensor to energize the heater to transfer heat into

the bottom portion of the keg and the beer so as to maintain the temperature of the beer above its freezing temperature.

58. A cooling system for cooling a keg containing an alcohol beverage, the cooling system comprising:

a cooling plate adapted to receive a bottom portion of the keg in heat transfer relation therewith; and

a heater mounted with the cooling plate adapted to maintain the temperature of beverage in the keg adjacent the bottom portion of the keg above freezing temperature of the beverage.

59. The cooling system of Claim 58 wherein the heater comprises an electrical resistance heater mounted in the cooling plate.

60. The cooling system of Claim 59 further including a temperature sensor adapted to contact the keg adjacent the bottom portion of the keg for sensing temperature related to the temperature of the beverage in the keg, and a temperature controller responsive to the temperature sensed by the temperature sensor to energize the heater to transfer heat into the bottom portion of the keg and the beverage so as to maintain the temperature of the beverage above its freezing temperature.

61. The cooling system of Claim 59 further including a Peltier thermoelectric cooling unit mounted in heat transfer relation with the cooling plate for enhancing the extraction of heat from the beer contained in the keg.

62. A home beer dispensing apparatus having a cooling system for cooling a keg containing beer, the cooling system comprising:

a cooling plate adapted to receive a bottom portion of the keg in heat transfer relation therewith; and

a heater mounted with the cooling plate adapted to maintain the temperature of beer in the keg adjacent the bottom portion of the keg above freezing temperature of the beer.

63. The apparatus of Claim 62 wherein the heater comprises an electrical resistance heater mounted in the cooling plate.

64. The apparatus of Claim 63 further including a temperature sensor adapted to contact the keg adjacent the bottom portion of the keg for sensing temperature related to the temperature of the beer in the keg, and a temperature controller responsive to the temperature sensed by the temperature sensor to energize the heater to transfer heat into the bottom portion of the keg and the beer so as to maintain the temperature of the beer above its freezing temperature.

65. The apparatus of Claim 63 further including a Peltier thermoelectric cooling unit mounted in heat transfer relation with the cooling plate for enhancing the extraction of heat from the beer contained in the keg.

66. A keg suitable for containing an alcohol beverage, the keg comprising two keg half shells each identically formed to have an end wall portion and side walls extending from the end wall portion that terminates in a continuous side wall edge portion, and the two keg half shells having their respective side wall edge portions placed in abutting relation with one another and joined together to form the keg.

67. The keg of Claim 66 wherein the end wall portion of each half shell is formed with a raised annular collar and a face plate extending across the collar to normally close the collar.

68. The keg of Claim 67 wherein the face plate of one of the two keg half shells is adapted to engage a cooling plate in heat transfer relation therewith and the other face plate of the two keg half shells is at least partially removed to form an aperture for receiving a valve and spear for filling into and dispensing from the keg the beverage.

69. The keg of Claim 68 wherein the end wall portion of each keg shell has an annular rim extending about the periphery of the end wall portion and adjacent to the cylindrical wall.

70. The keg of Claim 69 wherein the rim is adapted to support a chime for orientating the keg in a home beer dispensing apparatus.

71. The keg of Claim 69 wherein the end wall portions of the kegs each have a concave curvature relative to the side walls and interior of the keg.

72. The keg of Claim 66 wherein each of the keg half shells are formed by deep drawing of a material selected from the group consisting of steel, stainless steel, and aluminum.

73. The keg of Claim 66 wherein the side wall edge portions are joined by a weld.

74. The keg of Claim 66 wherein the side walls comprise a continuous cylindrical wall and the side wall edge portions of each cylindrical side wall abut each other along a common plane that passes through a center of the keg.

75. The keg of Claim 74 wherein the side wall edge portions are joined by a weld.

76. The keg of Claim 74 wherein the end wall portion of each half shell is formed with a raised annular collar and a face plate extending across the collar to normally close the collar.

77. The keg of Claim 76 wherein the face plate of one of the two keg half shells is

adapted to engage a cooling plate in heat transfer relation therewith and the other face plate of the two keg half shells is at least partially removed to form an aperture for receiving a valve and spear for filling into and dispensing from the keg the beverage housed therein.

78. The keg of Claim 76 wherein the end wall portion of each keg shell has an annular rim extending about the periphery of the end wall portion and adjacent to the cylindrical wall.

79. The keg of Claim 78 wherein the annular rim is adapted to support a chime for orientating the keg in a home beer dispensing apparatus.

80. The keg of Claim 74 wherein the end wall portions of the kegs each have a concave curvature relative to the cylindrical side wall and interior of the keg.

81. The keg of Claim 74 wherein each of the keg half shells are formed by deep drawing of a material selected from the group consisting of steel, stainless steel, and aluminum.

82. A keg suitable for containing a beer, the keg comprising two keg half shells each identically formed by deep drawing of a material selected from the group consisting of steel, stainless steel, plated steel and aluminum to have an end wall portion and a cylindrical side wall that extends substantially normal from the end wall portion;

each end wall portion being formed with a raised annular collar and face plate extending across the collar to normally close the collar, the face plate of one of the two keg half shells being adapted to engage a cooling plate in heat transfer relation therewith and the other face plate of the two keg half shells is at least partially removed to form an aperture for receiving a valve and spear for filling into and dispensing from the keg the beer housed therein; and,

the cylindrical side wall terminating in a continuous side wall edge portion, the two keg half shells having their respective side wall edge portions placed in abutting relation with one another along a common plane that passes through a center of the keg, and the keg half shells being joined together along the abutting side wall edge portions to form the keg.

83. The keg of Claim 82 wherein the side wall edge portions are joined by a weld.

84. The keg of Claim 82 wherein the end wall portions of the kegs each have a concave curvature relative to the cylindrical side wall and interior of the keg.

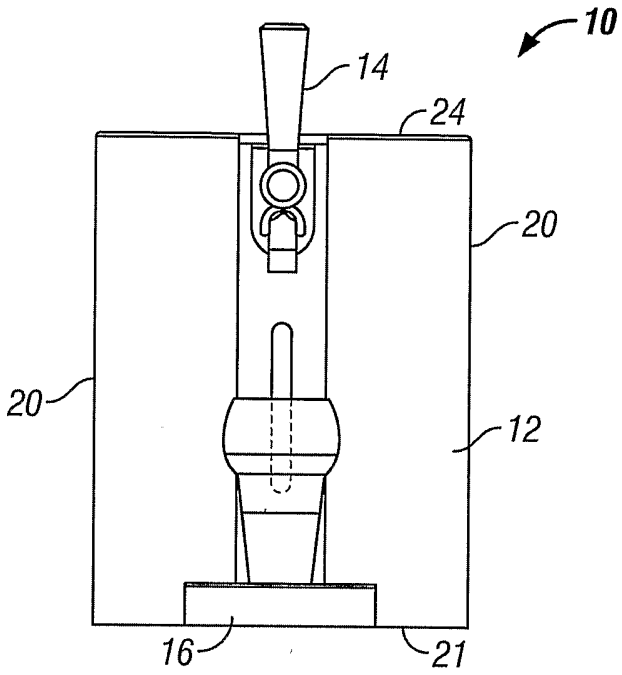


FIG. 1

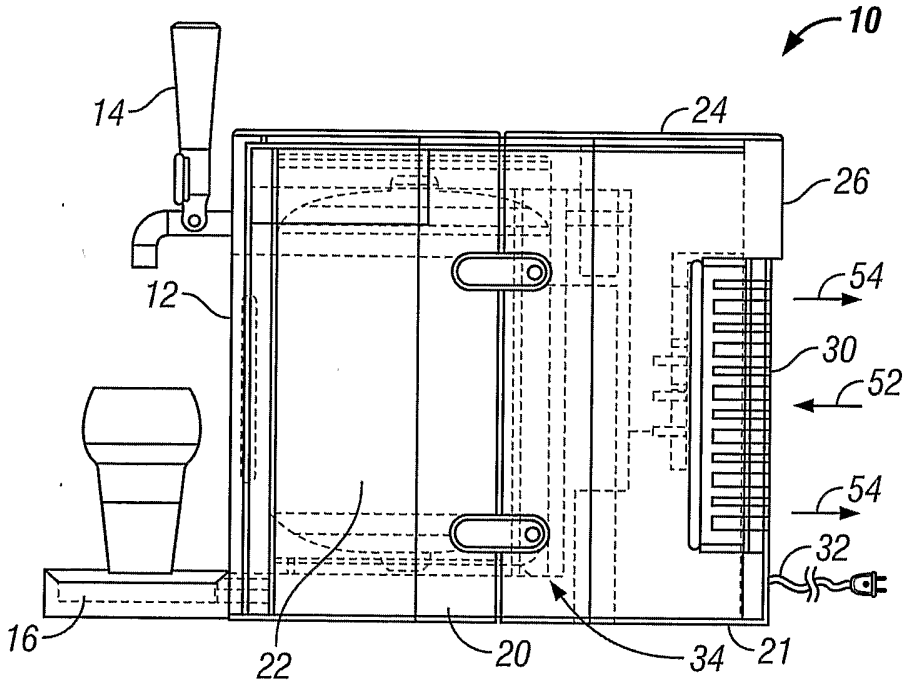


FIG. 2

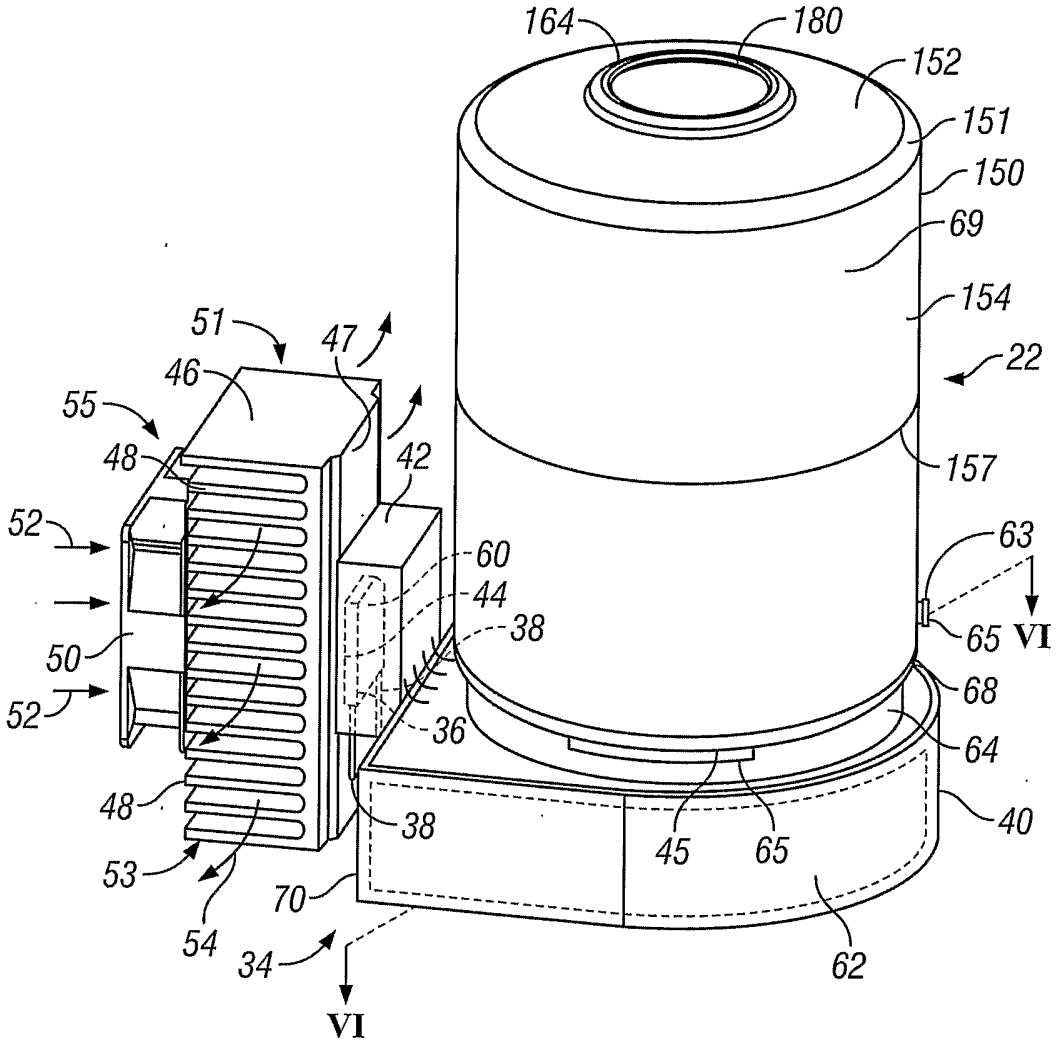

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FIG. 3

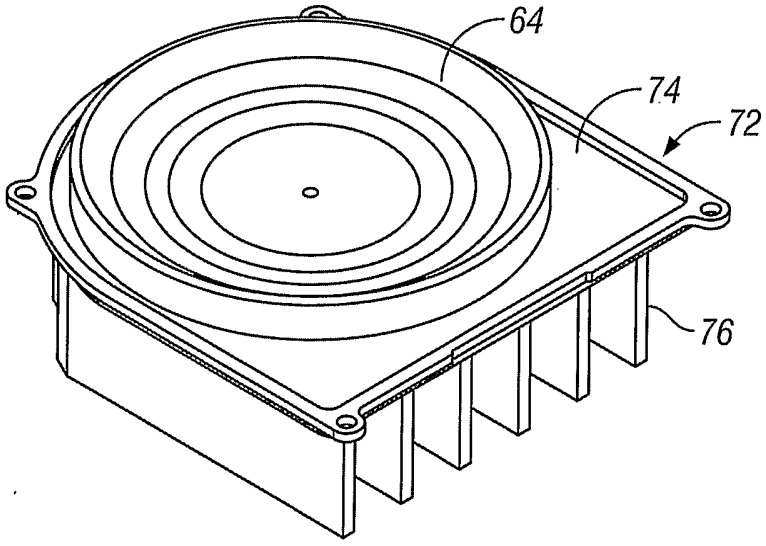

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FIG. 4

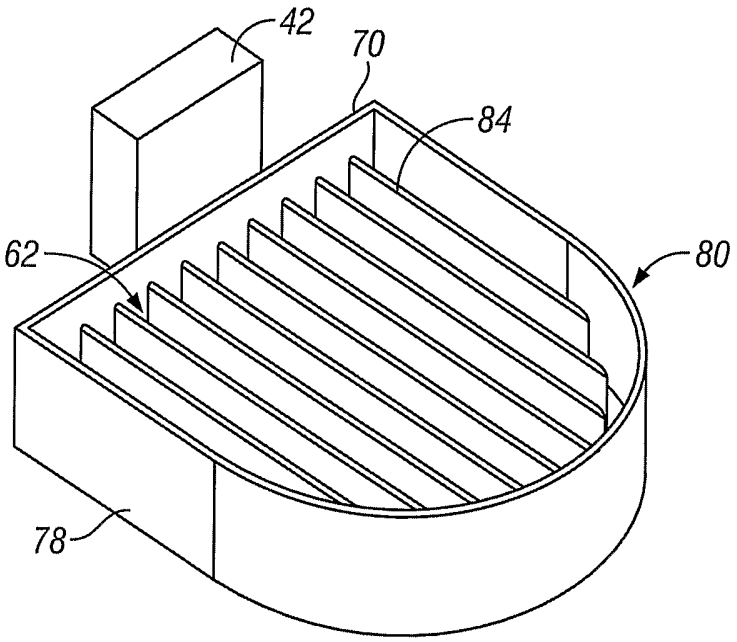


FIG. 5

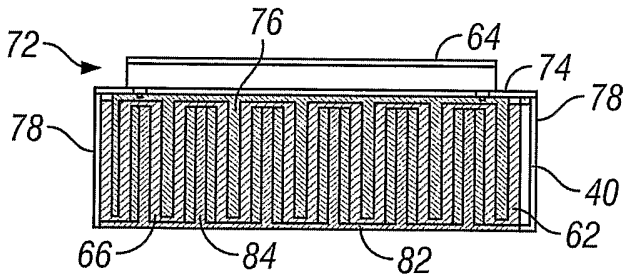


FIG. 6

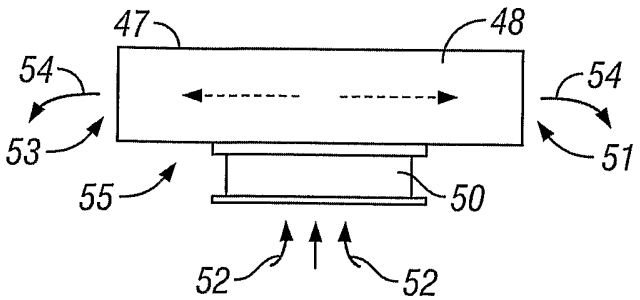


FIG. 7

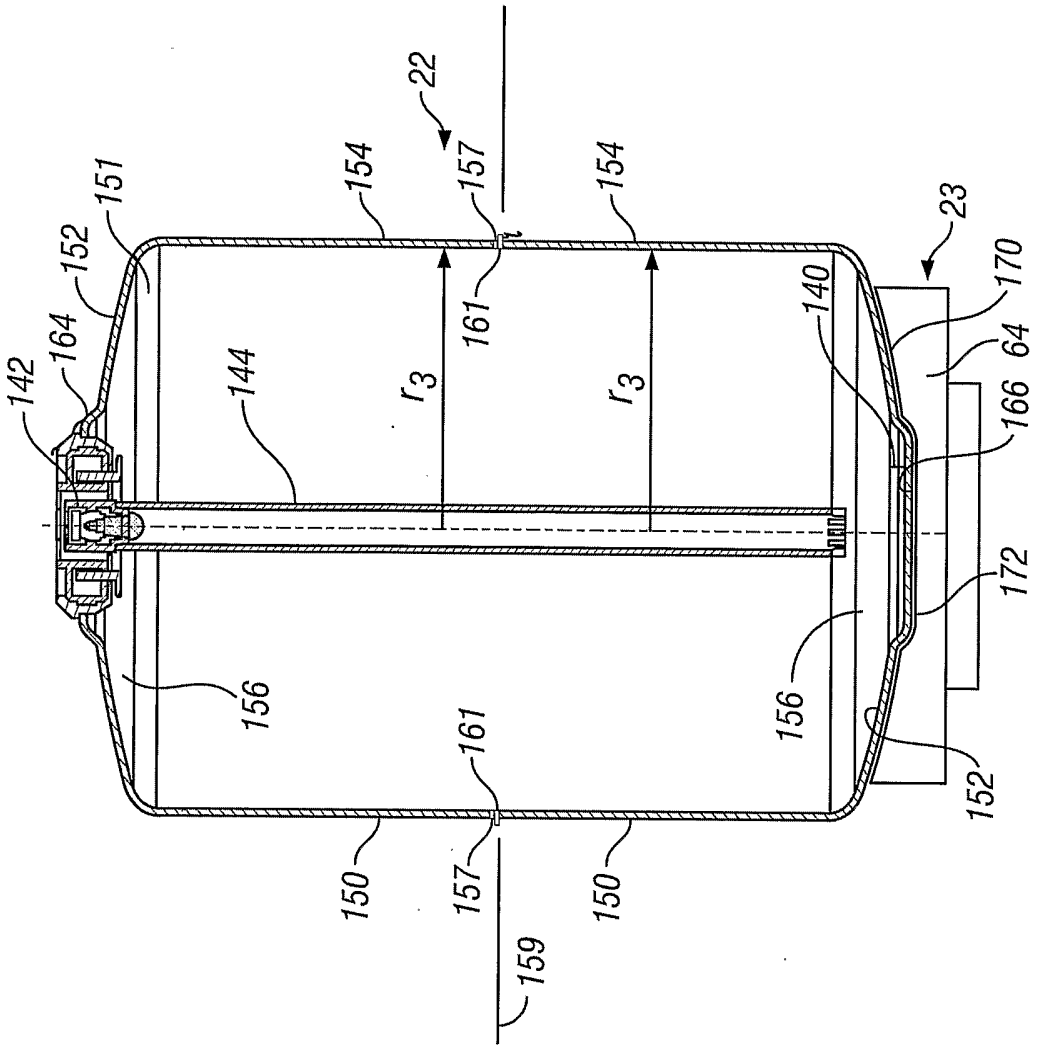

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FIG. 9

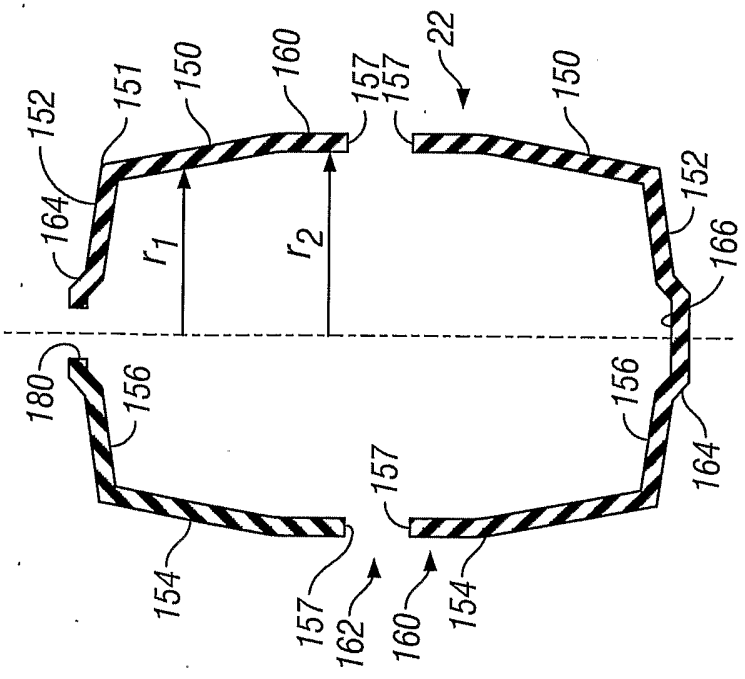

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FIG. 8