

Nov. 26, 1940.

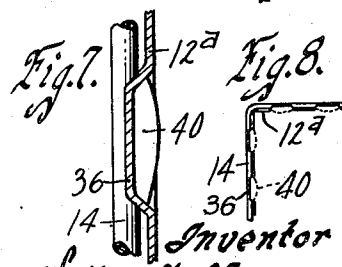
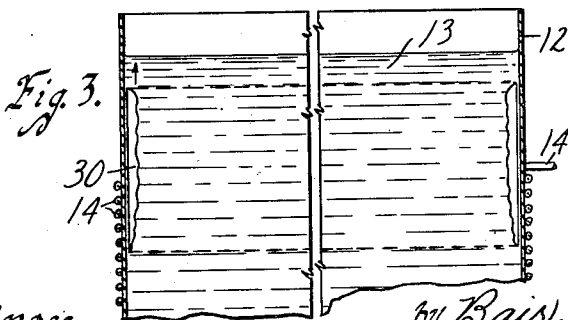
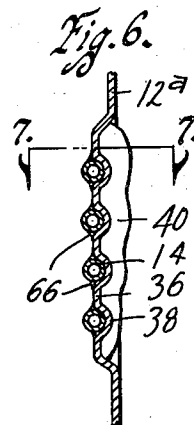
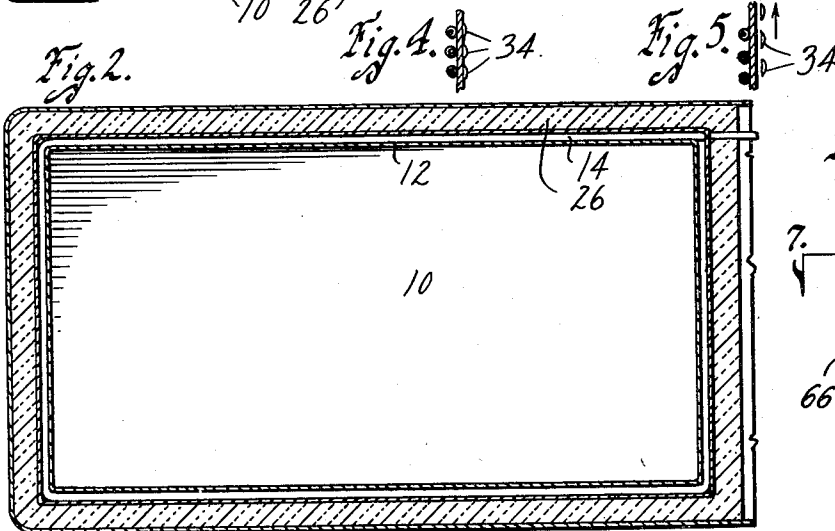
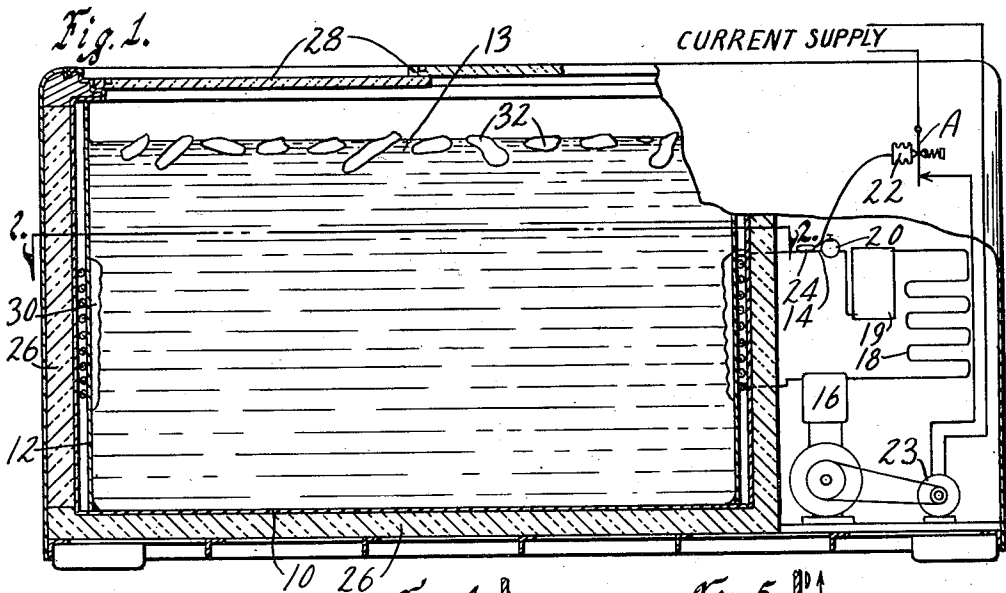
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2,223,159

BOTTLED BEVERAGE COOLER

Filed June 20, 1936

2 Sheets-Sheet 1



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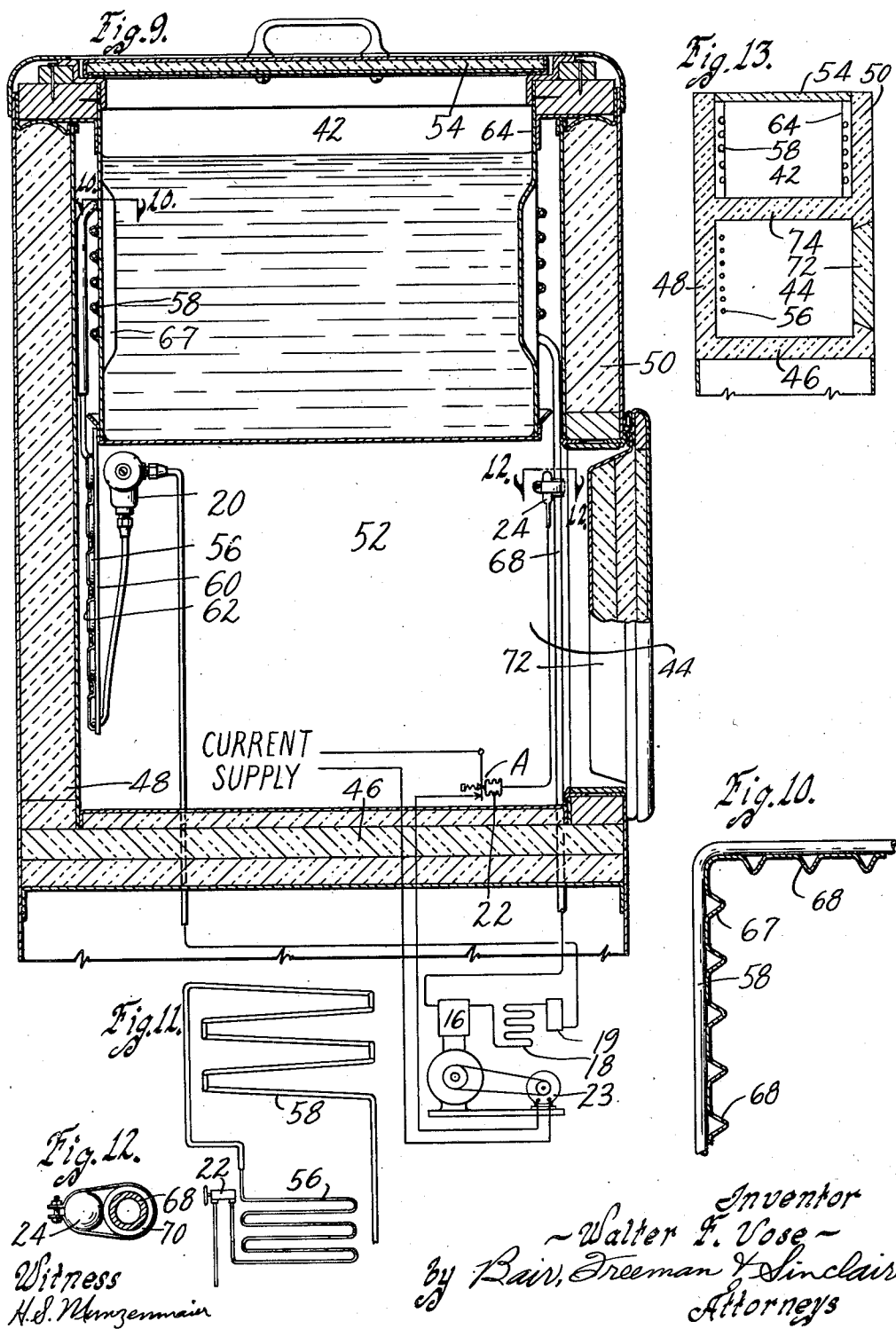
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BOTTLED BEVERAGE COOLER

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2 Sheets-Sheet 2



Patented Nov. 26, 1940

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UNITED STATES PATENT OFFICE

2,223,159

BOTTLED BEVERAGE COOLER

Walter F. Vose, Bloomington, Ill., assignor of sixty per cent to Peter Karonis and B. B. Karstens, both of Bloomington, Ill.

Application June 20, 1936, Serial No. 86,319

2 Claims. (Cl. 62—4)

An object of my invention is to provide a bottled beverage cooler of simple, durable and inexpensive construction.

5 A further object is to provide a cooler for bottled beverages, or other articles to be cooled by immersion in cold water in which refrigerating mechanism serves the purpose of chilling a container of water so that ice forms on the wall thereof, means being provided for freeing the ice from the wall so it will float to the surface of the water, thus inducing a circulation in the water, and the ice will be distributed throughout the water for chilling the entire body thereof in a substantially uniform manner.

15 Still a further object is to provide a cooler comprising a tank having water therein and a refrigerating mechanism having an evaporator coil in heat conducting relation to the wall of the tank, so that on the tank wall over the evaporator coil ice will form while the refrigerating mechanism is in operation, and such ice will be melted from the wall when the refrigerating mechanism is inoperative for a sufficient period of time for the water to melt the ice loose.

25 A further object is to provide a cooler in which ice is formed and then loosened so that this ice can be distributed throughout the water to equalize the temperature thereof and provide a hold-over period while the refrigerating mechanism is on its off cycle, thus assuring maintenance of a substantially constant temperature during operation of the cooler.

30 Still another object is to provide a tank wall with a plurality of pockets with which the evaporator coil of the refrigerating mechanism is in heat conducting relation, whereby to form ice in such pockets, the pockets being isolated so that individual chunks of ice are thus formed, and such individual chunks automatically becoming free of the container wall when the refrigerating mechanism is shut off for a period of time.

35 Still a further object is to provide a controller for the refrigerating mechanism set so that it is operative to keep the refrigerating mechanism in operation long enough to form ice, and then keep it inoperative long enough to permit the ice to melt sufficiently to free itself from the container wall, so that it will rise in the water in the container and thus become distributed throughout the water, as well as induce the desired circulation of the water.

40 Still a further object is to provide a "dual" refrigerator box in which a wet compartment for bottled beverages is provided and a dry compartment for meats, milk and other food, such a box being especially desirable for use in restaurants and the like where foods are to be preserved and bottled beverages are to be cooled.

45 Another object is to provide such a dual box

with a single refrigerating mechanism and an evaporator mechanism, the evaporator coil of which has a portion for cooling the food or dry compartment, and a portion for chilling the wet compartment, the arrangement being such that the portion for the wet compartment also furnishes some cooling effect for the food compartment.

50 Still a further object is to provide a modified construction in which the food compartment and the wet compartment are thermally isolated to eliminate moisture on the wet compartment from entering the dry compartment.

55 Still a further object is to provide a dual box in which proper cooling effect for the dry compartment as well as proper ice forming effect for the wet compartment is obtained by a single evaporator coil of the refrigerating mechanism, the coil being arranged for dual expansion to secure the desired cooling and ice forming effect without the necessity of having two individual refrigerating mechanisms, one for the dry compartment and one for the wet compartment.

60 A further object is to provide control mechanism which is effective to properly control the refrigerating mechanism so that the dual expansion coil will operate properly, this control being arranged in novel association with the refrigerating mechanism and the dry compartment.

65 With these and other objects in view, my invention consists in the construction, arrangement and combination of the various parts of the device, whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in my claims, and illustrated in the accompanying drawings, in which:

70 Figure 1 is a vertical sectional view through a bottled beverage cooler embodying my invention, the upper right hand portion thereof being shown in side elevation and the refrigerating mechanism being shown diagrammatically.

75 Figure 2 is a horizontal sectional view on the line 2—2 of Figure 1.

80 Figure 3 is a sectional view similar to a portion of Figure 1, showing the action of the cooler during one portion of the cycle of operation.

85 Figure 4 is a sectional view similar to a portion of Figure 1 showing a modified mode of operation.

90 Figure 5 is a view similar to Figure 4 showing a further step in the modified operation of the cooler.

95 Figure 6 is a sectional view similar to a portion of Figure 1 on an enlarged scale showing a modified construction which produces ice in individual chunks, these chunks being formed in separate pockets.

100 Figure 7 is a sectional view on the line 7—7 of Figure 6.

Figure 8 is a diagrammatical view similar to

Figure 7 showing how a plurality of pockets are arranged in spaced relationship.

Figure 9 is a vertical sectional view through a cooler for both bottled beverages and food, there being a separate compartment for each, and refrigerating mechanism as well as the control therefor being shown diagrammatically.

Figure 10 is a sectional view on the line 10—10 of Figure 9 showing the shape of the wall in the wet compartment and its association with the evaporator coil.

Figure 11 is a front elevation of the evaporator coils of the refrigerating system.

Figure 12 is an enlarged sectional view on the line 12—12 of Figure 9 showing the arrangement and association of a temperature responsive bulb of the control device for the refrigerating mechanism with the refrigerant return line; and

Figure 13 is a diagrammatical view showing a slight modification as compared to the arrangement shown in Figure 9.

On the accompanying drawings I have used the reference numeral 10 to indicate a tank bottom. A tank wall 12 is provided, the bottom 10 and wall 12 serving the purpose of containing cooling water 13.

Surrounding the wall 12 is an evaporator coil 14 of a refrigerating mechanism, shown diagrammatically in Figure 1, wherein the refrigerant compressor is indicated at 16, the liquid receiver at 19, the condenser coil at 18 and the expansion valve of the system at 20. An electric motor 23 is shown diagrammatically for operating the compressor 16, and an automatic controller A is provided for energizing and de-energizing the motor 23 in accordance with temperature requirements.

The controller A by way of example may consist of a bellows or the like 22, the expansion and contraction of which is controlled by a temperature responsive bulb 24. This bulb may be responsive to the temperature of the water 13 or to the temperature of the coil 14, it being illustrated as in thermal contact with the coil adjacent the expansion valve 20.

To make a practical commercial product, the tank wall 12 and the bottom 10 are preferably insulated with suitable insulating material 26 to minimize the effect of the heat in the surrounding atmosphere on the evaporator coil 14. Access may be had to the tank, comprising bottom 10 and wall 12, through sliding doors 28 formed preferably of insulating material.

Bottled beverages or any articles capable of being cooled by immersion in cold water can be chilled or cooled in my cooler. It is obviously adaptable for cooling bottled beverages or any other commodity which can be cooled in this manner.

In Figure 6 I have shown a modified construction in which the tank wall 12a is provided with a plurality of outwardly depressed pockets 36. A vertical section of the pockets is shown in Figure 6, while a horizontal section thereof is shown in Figure 7.

The pockets 36 are preferably relatively narrow and are spaced around the tank wall 12a as shown diagrammatically in Figure 8. The bottoms of the pockets 36 are provided with inwardly extending horizontal grooves 38 receiving the evaporator coil 14. The coil is preferably soldered or brazed in the grooves 38 to provide good thermal contact for the efficient heat trans-

mission from the wall 12a to the coil 14, preferably at the pockets 36 only.

In Figure 9 I have shown a sectional view through a "dual" box in which I provide a wet compartment 42 and a dry compartment 44. These compartments are suitably surrounded by an insulated bottom wall 46, an insulated back wall 48, an insulated front wall 50 and insulated side walls 52. Access can be had to the compartment 42 through a removable or slidable cover 54.

Refrigerating mechanism similar to the one shown in Figure 1 is illustrated and bears the same reference characters, namely: 16, 18, 19, 20, 22, 24 and A. An evaporator coil is provided, one portion of which is formed of relatively small tubing, for instance one-fourth inch, and indicated at 56, and the other portion of relatively larger tubing, for instance five-sixteenths of an inch, indicated at 58. The portion 56 is arranged at the back of the food compartment 44 by being supported on bars or the like 60 by clips 62, while the portion 58 surrounds a tank 64 which defines the compartment 42. The coil 58 is preferably soldered or brazed to the wall of the tank 64 as indicated at 66.

The wall of the tank may be flat, but is preferably corrugated as illustrated in Figure 10 to provide pockets 68 in which ice can form, as will hereinafter be described in connection with Figure 6.

I have found that the cooling or frost coil 56 for the compartment 44 must be smaller in diameter than the water tank coil 58, so that compound expansion of the refrigerant will take place. The sizes given for the coils 56 and 58 are merely arbitrary and will, of course, vary according to different installations.

When the coils are thus of different sizes, the temperature of the compartment 44 can be held down to adjacent the freezing point, while at the same time crops of ice can be formed on the inside of the water tank 64 when the coil 58 is in thermal contact therewith.

Practical operation

In the operation of my cooler, the controller A is preferably set so that a relatively thick coating of ice, indicated at 30, can be formed on the inner surface of the wall 12. The controller, of course, can be set to form this ice of the desired thickness.

After a desired thickness of ice has been formed, the controller A then opens the circuit, whereupon the temperature of the wall 12 under the ice 30 and the evaporator coil 14, will be raised due to the flow of heat from the water 13 to these parts. This will eventually free the ice 30 from the surface of the wall 12, as shown in Figure 3, whereupon it will rise to the surface of the water, and thus induce a circulation in the water which tends to keep the entire body of water at substantially the same temperature, and the ice may be broken up with an ice pick, or if left alone will eventually be broken into small pieces, such as indicated at 32 in Figure 1, as it melts, especially in view of the fact that it is not of uniform thickness, as it is thicker where it forms over the turns of the evaporator coil 14, thus giving it a corrugated shape, as illustrated in Figure 1.

If desired, the controller A may be set so that instead of a complete ring of ice, such as 30, being formed, individual strips of ice indicated at 34 in Figure 4 are formed. These, upon de-

energization of the motor 23, melt free of the wall 12 and rise, as shown in Figure 5, to the surface of the water.

In the operation of the modified form shown in Figures 6, 7 and 8, chunks of ice 40 are formed in the pockets 36, which, upon de-energization of the refrigerating mechanism for a sufficient period of time, will melt free of the wall 12a and rise as individual chunks to the surface of the water 13. This eliminates the necessity of having to break up the ice when in the form shown at 30, and facilitates the cooling operation of the cooler, since the individual chunks of ice 40 readily rise to the surface of the water and become distributed over the surface without undue interference with the bottles of beverage which almost completely fill the tank of water 13, yet, due to the circulation of water induced by the rising ice, all bottles contained in the tank are subject to a substantially constant and equal temperature.

I have found that a cooler constructed as disclosed is very efficient in operation, and will chill bottles of beverage immersed in the water 13 in a minimum of time. A circulation or disturbance of the water, to prevent it from stratifying so that it is warm at the top and cool at the bottom, is automatically induced by the expedient of setting the controller A so that cyclically ice can be formed and then melted loose relative to the container or tank wall 12.

Forming pockets in the wall further makes it possible to form the ice and free it from the wall in the form of individual spaced chunks.

Forming the ice in this manner also prevents the bottles of beverage from being frozen to the walls of the tank. In the construction shown in Figure 9, by means of the dual expansion evaporator coil I am able to cool both the food compartment 44 and the tank 64 to such an extent that the tank forms crops of ice which are released as above set forth in connection with Figures 1 and 6 with but a single evaporator coil.

After the refrigerant leaves the expansion valve 20 it expands into the coil 56, and when it reaches the coil 58 it expands further, thus cooling the coil 58 which would have relatively warm refrigerant if it were of the same size as the coil 56.

The coil 58 mounted as disclosed in Figure 9 also helps to cool the compartment 44, but not sufficiently to do so without the use of the coil 56. In my experiments I have found that the coil 58 is insufficient for cooling the compartment 44, and accordingly extended a portion of the coil 58 into the compartment 44, but this would not operate satisfactorily until I used a coil 56 of smaller diameter than the coil 58.

I have provided a very effective control for this particular arrangement of evaporator coil which consists in mounting the bulb 24 of the switch A on the refrigerant return line 68. It is not mounted in thermal contact therewith, however, but a sleeve 70 of rubber or other heat insulating material is interposed between the two to delay the response of the bulb 24 to the temperature of the line 68. The bulb as thus located is also responsive to the temperature of atmosphere surrounding it.

By this means the differential of operation of the switch A is increased so that the bulb 24 is not too readily responsive to the temperature of the return line 68 and is also responsive in con-

junction with the temperature of the return line to the temperature of the atmosphere in the compartment 44. Especially when the door 72 is open, it is desirable to operate the refrigerating mechanism in order to pull the temperature of the box down again, which was increased by opening the door, and by locating the bulb as illustrated, the relatively warm air from outside the box will readily affect the bulb 24 whenever the door is opened.

I have found that it is necessary to provide the coil 56 in addition to the coil 58 when the construction of Figure 9 is used, as the coil 58 is insufficient to hold the temperature low enough in the compartment 44 to keep meats, milk, etc., from spoiling, and such an arrangement also would produce excessive moisture.

In Figure 13 I illustrate a box similar in construction to the one shown in Figure 9, with the exception that between the tank 64 and the compartment 44, a wall 74 of insulation is provided. This thermally isolates the compartments 42 and 44 so that the moisture collecting on the outer wall of the tank 64 does not drip into the compartment 44, and the entire cooling effect of the coil 58 acts upon the tank 42 instead of some of it acting on the compartment 44.

Some changes may be made in the construction and arrangement of the parts of my device without departing from the real spirit and purpose of my invention, and it is my intention to cover by my claims any modified forms of structure or use of mechanical equivalents, which may be reasonably included within their scope.

I claim as my invention:

1. In a cooler of the character described, a container for water, a dry compartment below said container, refrigerating mechanism having an evaporating coil provided with a portion for cooling said dry compartment and a portion surrounding said container and means for controlling said refrigerating mechanism to cyclically form ice on the inner wall of said container and then permit such ice to melt free of the wall and float to the surface of said water, said means comprising a controlling mechanism having a temperature responsive element responsive to the temperature of the return line of said refrigerating mechanism and to atmosphere in said dry compartment, and heat insulating means interposed between said return line and said temperature responsive element to increase the time of response of the element to the temperature of the return line.

2. In a cooler of the character described, a container for water, a dry compartment below said container and thermally separated from said container, refrigerating mechanism having an evaporating coil provided with a portion for cooling said dry compartment and a portion surrounding said container, means for controlling said refrigerating mechanism to cyclically form ice on the inner wall of said container and then permit such ice to melt free of the wall and float to the surface of said water, said means comprising a controlling mechanism having a temperature responsive element responsive to the temperature of the return line of said refrigerating mechanism and to atmosphere in said dry compartment.

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