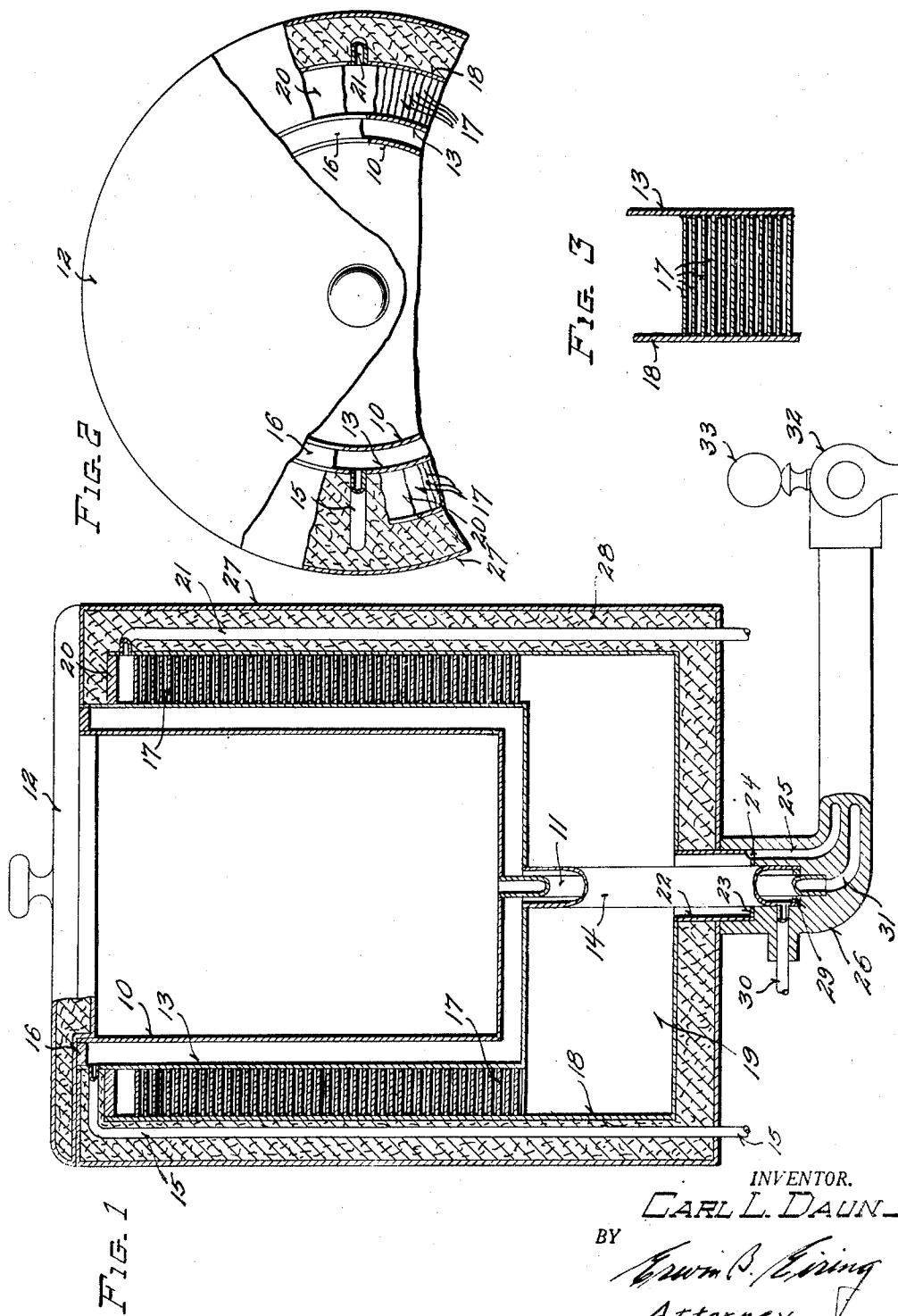


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HEAT EXCHANGE DEVICE

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HEAT EXCHANGE DEVICE

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This invention relates to heat exchange devices and more particularly to a device adapted to function to maintain two separate fluids at substantially the same temperature.

The primary object of the present invention resides in the provision of a new and improved heat exchange device comprising a plurality of nested containers adapted respectively to hold different fluids and arranged in a manner which permits a single refrigerant chamber to effectively reduce the temperatures of two separate fluids to a substantially equal temperature.

A further object of the present invention resides in the provision of new and improved means for maintaining two separate fluids at substantially the same temperature even though they be withdrawn from the unit separately or simultaneously at varying rates of draw.

A further object of the present invention resides in the provision in a heat exchange device of means adapted to accelerate the refrigerating action on the fluid which is to be withdrawn at the greater rate of draw.

Another object of the present invention resides in the provision of a refrigerated storage space of ample capacity for the fluid which is to be withdrawn at the greater rate.

Another object of the present invention resides in the structural arrangement of the outlets for the two refrigerated fluids which insures their discharge at a substantially uniform and constant temperature.

A more specific object of the invention resides in the provision of a spirally formed fin cooperating with the refrigerant container and the wall of one of the fluid containers to form a continuous narrow passageway for the fluid of the last named container to insure the rapid and effective refrigeration of the fluid to compensate for the increased rate of withdrawal of this particular fluid above the rate of withdrawal of the other refrigerated fluid.

Other objects and advantages will become manifest from the following description of an illustrative embodiment of the invention shown in the accompanying drawing.

In the drawing:

Figure 1 is a vertical transverse sectional view taken through a heat exchange device constructed in accordance with the teachings of the present invention;

Fig. 2 is a fragmentary top plan view of the device shown in Figure 1; and

Fig. 3 is an enlarged fragmentary vertical sectional view showing the arrangement of a spirally

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shaped fin having definite heat exchange properties in a manner to delineate a continuous narrow passage for one of the fluids to be refrigerated.

As an illustrative embodiment of the present invention, I have chosen the application of the invention to a unit adapted to dispense a syrup and carbonated water either separately or simultaneously but by the very nature of their combination these fluids are drawn either at different rates or varying quantities to produce the desired delectable mixture.

Referring more specifically to Figure 1 of the accompanying drawing, it will be noted that the heat exchange device comprises essentially four separate containers arranged in nested relationship which permits a complete telescopic assembly of the containers into a single unit. The innermost or central container 10 is cylindrical in shape and is adapted to serve as a reservoir for one of the fluids to be refrigerated, in the present instance for the syrup. The container 10 is provided with a discharge pipe 11 extending downwardly from the center of the bottom of the container. The top of the container 10 is normally closed by the application of a lid or cover 12 which also forms a top for the complete unit. The second or refrigerant container 13 is slightly larger in diameter and greater in depth than the container 10 and hence is adapted to surround it to provide a compartment through which the refrigerant may flow. The refrigerant container is provided with an inlet pipe 14 depending from the bottom of the container and adapted to surround the discharge pipe 11 of the syrup container 10 in a manner to permit direct contact of the refrigerant with the wall of the syrup discharge pipe. A refrigerant discharge pipe 15 is connected adjacent the upper end of the refrigerant container 13 which is sealed by the application of a ring 16 which is soldered or brazed in position along the upper edges of the containers 10 and 13. A spirally shaped fin 17 is secured to the outer wall of the refrigerant container 13 for the purpose of materially increasing the effective contact area of the heat exchange surface adapted to contact the second fluid, in the present instance carbonated water. The outer edge of the fin 17 is adapted to contact the inner side wall of a container 18 which is also cylindrical in form and of greater depth than the refrigerant container 13 so as to provide a reservoir 19 disposed below the bottom surface of the refrigerant container. The carbonated water container 18 is closed at its upper end by the application of a

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ring 20 which is soldered or brazed to the wall of the container 13 and the upper edge of the container 18. An intake pipe 21 directs the carbonated water into the upper end of the container 18 in a manner which requires that the entire intake of fluid must pass through the elongated passage formed by the spiral fin 17 which cooperates with the walls of the containers 13 and 18 to form a narrow passage which insures the rapid exchange of heat from the water to the refrigerant as the water flows downwardly along the spiral path delineated by the fin 17 until it is discharged into the reservoir 19 of the container 18. The container 18 is provided with a discharge pipe 22 extending downwardly from the bottom of the container 18 and disposed in a manner to surround the refrigerant intake pipe 14 to insure the discharge of the carbonated water at a temperature substantially equal to that of the syrup. The lower extremity of the pipe 22 is provided with a closure plate 23 having a discharge opening 24 adapted to direct the carbonated water through a passage 25 formed in a nipple or casting 26 which is adapted to be secured in any simple manner to the lower extremities of the several pipes 11, 14 and 22. The carbonated water container 18 is surrounded by a container 27 which is of larger diameter and greater depth than the container 18 which it surrounds. The space between the containers 18 and 27 is filled with suitable insulating material 28 to prevent heat loss. It should be noted at this time that the lower end of the refrigerant pipe 14 is closed by a ring 29 which is soldered to the pipes 14 and 11. The intake for the refrigerant comprises a pipe 30 which leads into the pipe 14 through a suitable opening formed near the lower extremity of the pipe 14. The open end of the syrup discharge pipe 11 directs the syrup into a passage 31 also formed in the nipple 26. The passages 25 and 31 direct the carbonated water and syrup to a spigot or mixing valve 32 which is under manual control through the medium of an operating knob 33.

A brief description of the operation of the heat exchange device will suffice to emphasize the numerous advantages of the device. With the refrigerant inlet and outlet pipes 30 and 15 respectively connected in the conventional manner to a suitable compressor, it is possible to circulate a refrigerant through the space between the inner wall of container 13 and the outer wall of container 18. The desired syrup may be placed in the container 18 and the carbonated water intake pipe 21 may be connected to the usual source to charge the container 18 with a fluid to be refrigerated to the same temperature as that of the syrup contained in the chamber 10. In the operation of the present unit it is to be understood that the volume of syrup drawn from the container 19 is considerably less than the volume of carbonated water drawn from the container 18. In view of this condition, it is necessary to provide a means which is effective to accelerate the refrigerating of the fluid which is withdrawn in greater volume. This mode of operation has been successfully accomplished by the inclusion of the means for exposing the carbonated water in minute quantities to the entire surface of the spiral fin 17 which has excellent heat exchange properties. The refrigerated carbonated water is discharged from direct contact with the continuous narrow passage into the reservoir 19 disposed at the bottom of the container 18. The action of the refrigerant upon the carbonated

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water in the reservoir 19 continues by its contact with the outer surface of the refrigerant intake pipe 14 and also with the bottom surface of the refrigerant chamber 13. By reason of the structure of the present unit gradual absorption of heat at the bottom of the reservoir 19 will cause rising currents of warming liquid. These rising currents of warming liquid will contact the bottom surface of the refrigerant container 13 and be promptly cooled and consequently descend again in the reservoir 19, thus creating pronounced convection currents which will materially aid in maintaining the supply of carbonated water at the desired temperature.

Since the volume of fluid or syrup in the chamber 10 is withdrawn in smaller quantities this fluid acts as a holdover during off-cycles of the compressor and thus retains or reduces the temperature of the carbonated water through conduction and convection through contact with the refrigerant chamber. By the same token, when the supply of syrup in the chamber 10 is replenished with a comparatively large amount of fluid, the cooled carbonated water will materially accelerate the cooling of the syrup since both the syrup and carbonated water chambers are in direct contact with the refrigerant chamber.

From the above detailed description of the present invention, it will be noted that a new and improved heat exchange device has been provided which will be effective to refrigerate two separate fluids to a substantially equal temperature and maintain them at an equal temperature in spite of the fact that they may be withdrawn from the unit at different rates.

While the invention has been described in considerable detail in the foregoing specification, it is to be understood that various changes may be made in its embodiment without departing from or sacrificing any of the advantages hereinafter claimed.

I claim:

1. A heat exchange device for maintaining two separate fluids at substantially the same temperature, said device comprising an inner container for one of the fluids to be refrigerated, an outer container for the other of the fluids to be refrigerated, and an intermediate container for a refrigerant, said intermediate container being shorter than said outer container and cooperating therewith to delineate a reservoir portion at the bottom of said outer container, a spiral fin disposed between the outer surface of said refrigerant container and the inner surface of said outer container, said fin serving to form a relatively long channel of small cross sectional area through which said fluid must pass in direct contact with the heat exchange surfaces of said fin and the outer wall of said refrigerant container, said channel discharging into said reservoir portion of said outer container the upper wall of which comprises the bottom of said intermediate refrigerant container, and inlet and outlet means for the fluid of each of said containers.

2. A heat exchange device for maintaining two separate fluids at substantially the same temperature, said device comprising a plurality of nested containers including an inner container for one of said fluids to be refrigerated, an outer sealed container for the other of the fluids to be refrigerated, and an intermediate sealed container for a refrigerant, said intermediate container being shorter than said outer container and cooperating therewith to delineate a reservoir portion at the bottom of said outer container, said re-

frigerant container having its inner wall delineating said inner container and having its outer wall delineating the inner wall of said outer container, a spiral fin disposed between the inner and outer wall of said outer container and adapted to delineate a relatively long channel of small cross sectional area through which the fluid of said container must pass in direct contact with the heat exchange surfaces of said fin and the outer wall of said refrigerant container, said channel discharging into said reservoir portion of said outer container, and inlet and outlet means for the fluid in each of said containers, said refrigerant inlet means being disposed to

surround said outlet means of said first container and be surrounded by said outlet means of said outer container.

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