Sept. 29, 1936. N. A. BAKER 2,055,994

REFRIGERATING APPARATUS

Filed July 30, 1934

Fig. 1.

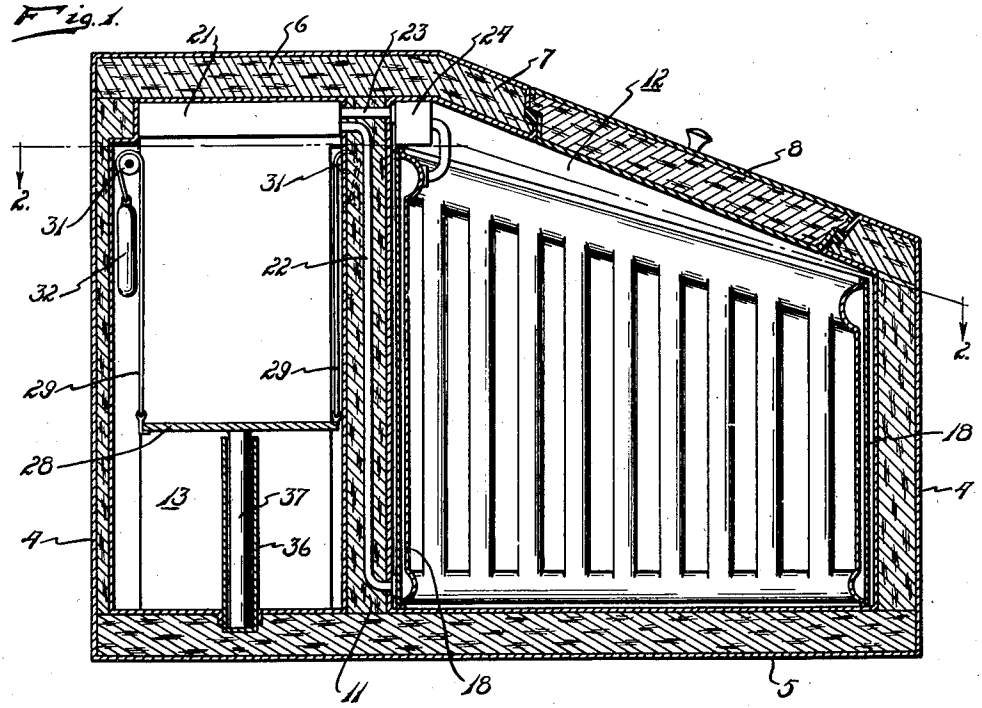
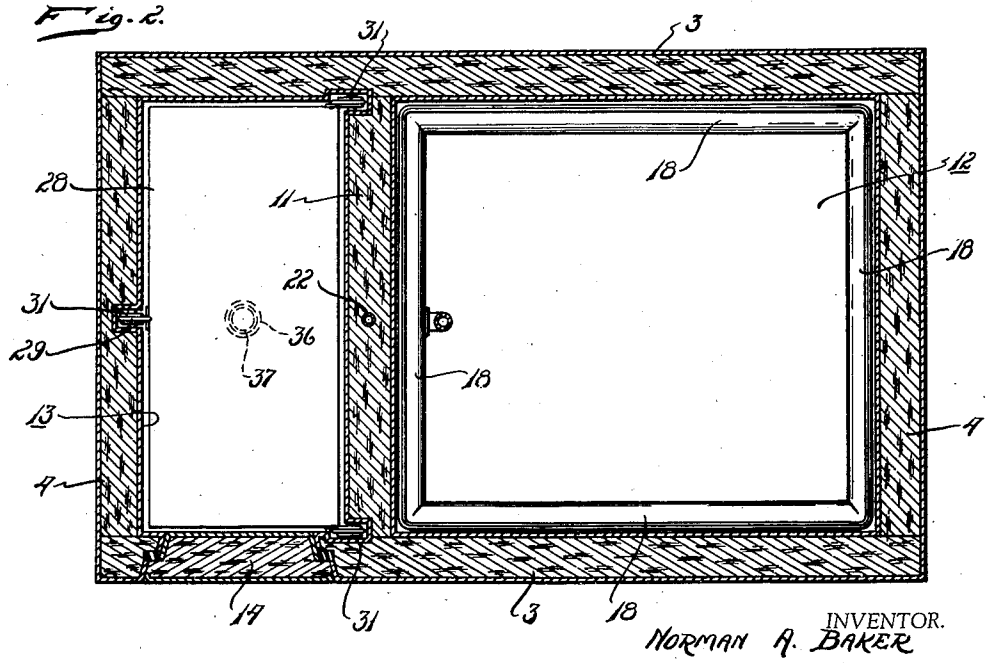


Fig. 2.



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REFRIGERATING APPARATUS

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6 Claims. (Cl. 62—91.5)

My invention pertains to a system comprising a primary refrigerant source and a secondary refrigerating system associated therewith, and more particularly to a refrigerating system for efficiently utilizing as a refrigerant source a very cold refrigerant for maintaining a relatively higher temperature in a storage compartment.

It is an object of my invention to provide means for efficiently utilizing a solidified refrigerant for cooling a storage compartment in conjunction with side charging means for automatically feeding refrigerant thereto.

Another object of my invention is to provide a refrigerant feeder shelf mounted upon multiple supports for continuously urging a solid refrigerant toward a member to be cooled, with a contact pressure which becomes greater as the block of refrigerant becomes smaller whereby efficient thermal contact is maintained at all times during the sublimation or melting of the refrigerant.

In accordance with my invention I provide a refrigerant chamber in which a solidified refrigerant may be conveniently inserted adjacent a food storage compartment to be cooled. A secondary refrigerating system is provided for transferring heat from the storage compartment to the refrigerant chamber and its condenser is mounted at the top of the chamber above the solidified refrigerant. The block of refrigerant rests upon a feeder shelf carried by multiple supports each of which includes gravity responsive means continuously urging the feeder shelf toward the condenser, with a constant upward force which becomes more effective as the block of refrigerant diminishes.

In this manner intimate thermal contact is maintained between the block of refrigerant while it is being converted to the gaseous or liquid state. A thermostatic valve is provided in the secondary refrigerating system to control the passage of refrigerant therethrough and it thus regulates the rate of heat transfer from the storage compartment.

The invention itself, however, both as to its organization and its method of operation, together with additional objects and advantages thereof, will best be understood from the following description of a specific embodiment, when read in conjunction with the accompanying drawing, in which:

Fig. 1 is a vertical sectional view of a cabinet refrigerated in accordance with my invention; and

Fig. 2 is a plan view thereof.

Referring more particularly to the drawing the cabinet comprises heat insulating side walls 3, end walls 4, a bottom wall 5, a horizontal top wall 6, and an inclined top wall 7. A removable cover 8 of heat insulating material is seated within a tapered seat in the inclined top wall 7 to provide convenient access to the interior of the cabinet. Within the cabinet a vertical partition wall 11 of heat insulating material is provided for dividing the enclosed space into a food storage compartment 12 under the inclined top wall 7, and a refrigerant chamber 13, on the opposite side of the partition. In order to provide access to the refrigerant chamber a removable door 14 is provided in one of the side walls thereof.

For the purpose of transmitting heat from the food storage compartment to the refrigerant chamber a secondary refrigerating system is provided of which the evaporator 18 comprises a double wall construction surrounding the walls of the food storage compartment. The condenser plate 21 of the secondary system is mounted at the top of the refrigerant chamber 13 and operatively interconnected with said evaporator through suitable conduits 22 and 23 comprising a gravity flow system. For controlling the flow of refrigerant, and hence the temperature within the storage compartment, a thermostatic valve 24 is interposed in the conduits between the condenser and the evaporator and is controlled by a thermo bulb in the food storage compartment.

Adjacent the bottom of the refrigerant chamber a movable refrigerant feeder-shelf 28 is provided to receive solidified refrigerant which may be introduced through the door 14 in the side wall. The feeder-shelf 28 is suspended on the plurality of flexible ropes 29 which extend upwardly over pulleys 31, journalled on rigid bearings in the upper portion of the refrigerant chamber, and which then extend downwardly to counterweights 32. As shown in the drawing, the shelf may be supported at three points one of which is arranged in the middle of the shelf while two other supports are provided at the opposite corners thereof. The counterweights 32 are selected to have a combined weight greater than the weight of the block of the solid refrigerant which may be inserted in the chamber. The weights 32 lift the shelf with a constant force which becomes more effective and holds the refrigerant against the condenser 21 with a higher contact pressure as the block becomes smaller and lighter. Suitable means is provided to guide the position of the shelf as it is lifted comprising a tubular guide member 36 projecting

upwardly from the bottom of the refrigerant chamber to receive a guide pin 37 which is rigidly secured to and projects downwardly from the shelf 28.

In operation a large block of solidified refrigerant, such as carbon dioxide or ice is inserted through the side doorway of the refrigerating chamber where it rests upon the removable feeder-shelf 28. The counterweights 32 apply a substantially constant biasing force tending to lift the shelf 28 upwardly towards the condenser 21 thereby bringing the refrigerant into intimate thermal engagement therewith.

As the solid refrigerant sublimates or melts, the counterweights operate through the multiple supports to lift the feeder shelf 28 in accordance with the rate of conversion of the refrigerant. The weight of the solodified refrigerant on the shelf decreases as it is converted while the upward force supplied by the counterweights remains constant. Hence, the contact pressure between the block of refrigerant will become greater as it becomes smaller, and in this manner a more efficient thermal contact is provided as the quantity of refrigerant becomes less thereby maintaining a more nearly uniform condition of heat transfer.

It will be seen that I have provided an improved feeder arrangement for efficiently associating a solidified refrigerant with a secondary refrigerating system comprising means for applying a pressure to maintain intimate thermal contact between the refrigerant and the secondary system as the refrigerant is utilized, in combination with a structure wherein the condenser of the secondary refrigerating system is mounted in the top of the refrigerant chamber to provide an efficient gravity flow secondary system, and fresh refrigerant may be conveniently charged into the side of the cabinet or truck.

While it is necessary for the purposes of illustration to describe the several disclosed forms of my invention in detail, it will be apparent that the invention is not so limited, and that other forms and applications thereof are embraced within the scope of the appended claims.

I claim as my invention:

1. In combination a storage compartment to be cooled, a refrigerant evaporator in said compartment, a refrigerant condenser external to said compartment, conduit means operatively interconnecting said condenser and said evaporator, a movable refrigerant feeder disposed adjacent said condenser, a solidified refrigerant between said feeder and said condenser, and urging means for applying a substantially constant force to move said feeder toward said condenser.

2. In combination a storage compartment to be cooled, a refrigerant chamber, a refrigerant evaporator in said compartment, a refrigerant condenser in the upper portion of said chamber, conduit means operatively interconnecting said condenser and said evaporator in a gravity system, a movable refrigerant feeder shelf disposed under said condenser, and urging means for applying a substantially constant force to move said feeder shelf upwardly toward said condenser.

3. In combination a storage compartment to be cooled, a refrigerant chamber, a refrigerant evaporator in said compartment, a refrigerant condenser in the upper portion of said chamber, conduit means operatively interconnecting said condenser and said evaporator in a gravity system, a movable refrigerant feeder shelf disposed under said condenser, a solidified refrigerant disposed between said feeder and said condenser, and multiple supporting means for said feeder shelf including urging means for applying a substantially constant force to move said feeder shelf upwardly toward said condenser in accordance with the rate of conversion of said solidified refrigerant to maintain intimate thermal contact between the condenser and the refrigerant.

4. In combination a storage compartment to be cooled, a refrigerant chamber, a refrigerant evaporator in said compartment, a refrigerant condenser in the upper portion of said chamber, conduit means operatively interconnecting said evaporator and condenser in a gravity system, means interposed in said conduit for controlling the passage of refrigerant therethrough in accordance with the temperature in said compartment, a movable refrigerant feeder shelf disposed under said condenser, and multiple supports for said feeder shelf including gravity responsive means for lifting said feeder upwardly toward said condenser.

5. In combination a storage compartment to be cooled, a refrigerant chamber, a refrigerant evaporator in said compartment, a refrigerant condenser in the upper portion of said chamber, conduit means operatively interconnecting said evaporator and condenser in a gravity system, means interposed in said conduit for controlling the passage of refrigerant therethrough in accordance with the temperature in said compartment, a volatile refrigerant in said evaporator and condenser, a movable refrigerant feeder shelf disposed under said condenser, a solidified refrigerant disposed between said feeder and said condenser, and multiple supports for said feeder shelf including gravity responsive means for lifting said feeder upwardly toward said condenser to maintain intimate thermal contact between the condenser and the solidified refrigerant in accordance with the rate of conversion of the refrigerant.

6. In a side charging refrigerator the combination of, a storage compartment, a refrigerant chamber adjacent one of the side walls of said compartment, a member in the upper portion of said chamber thermally coupled with said compartment for cooling the same, a refrigerant feeder shelf movably disposed under said member, means for urging said shelf toward said member, and a removable closure member in a side wall of said refrigerant chamber through which refrigerant may be inserted between said feeder shelf and said member.

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