Oct. 23, 1945. F. L. ROBISON 2,387,356

REFRIGERATOR

Filed March 10, 1944 2 Sheets-Sheet 1

Fig. 1.

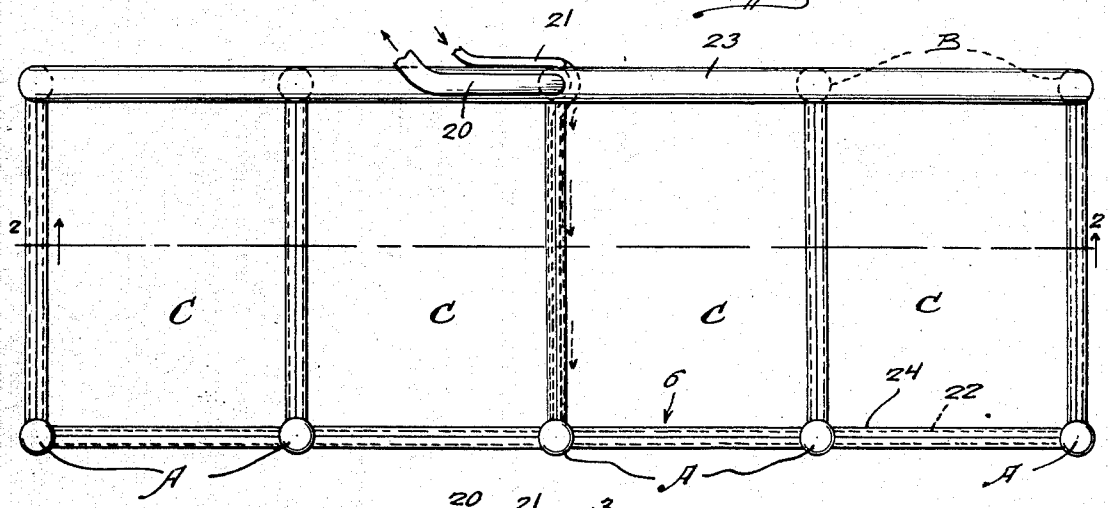


Fig. 2.

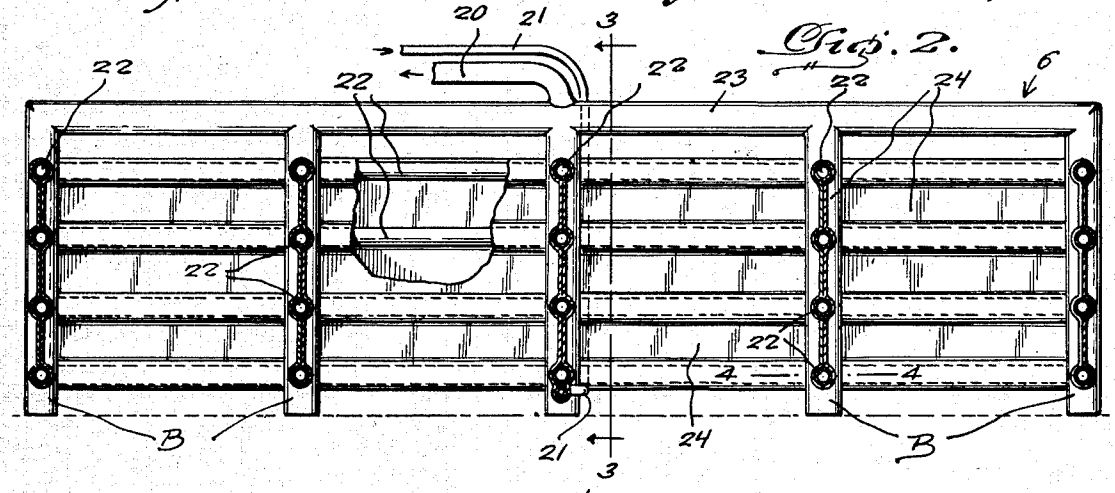


Fig. 3.

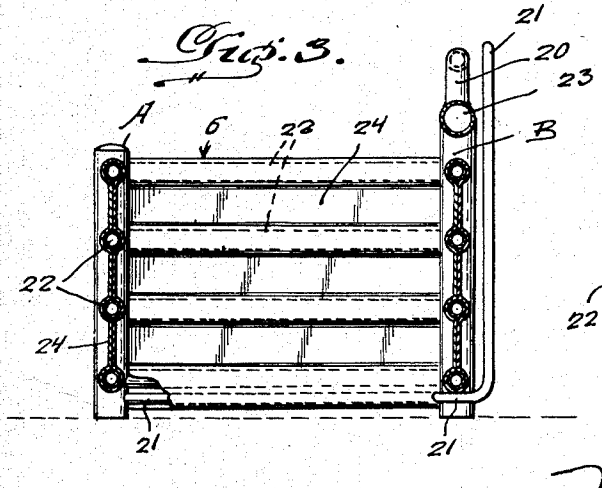
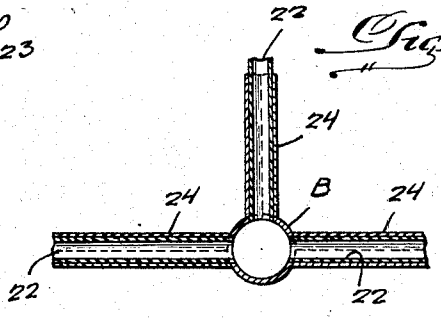


Fig. 4.



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Fig. 5.

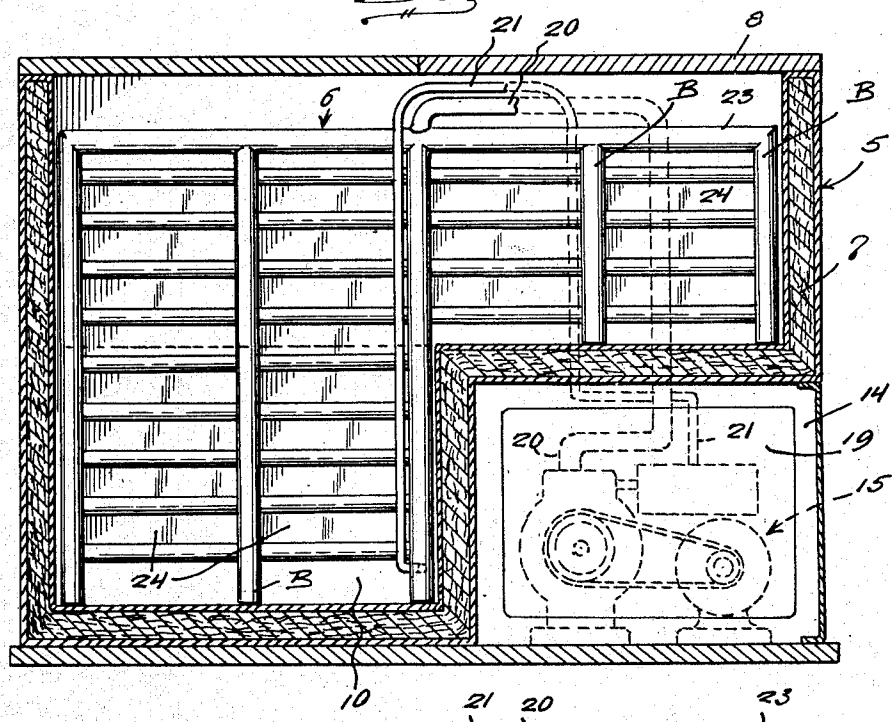
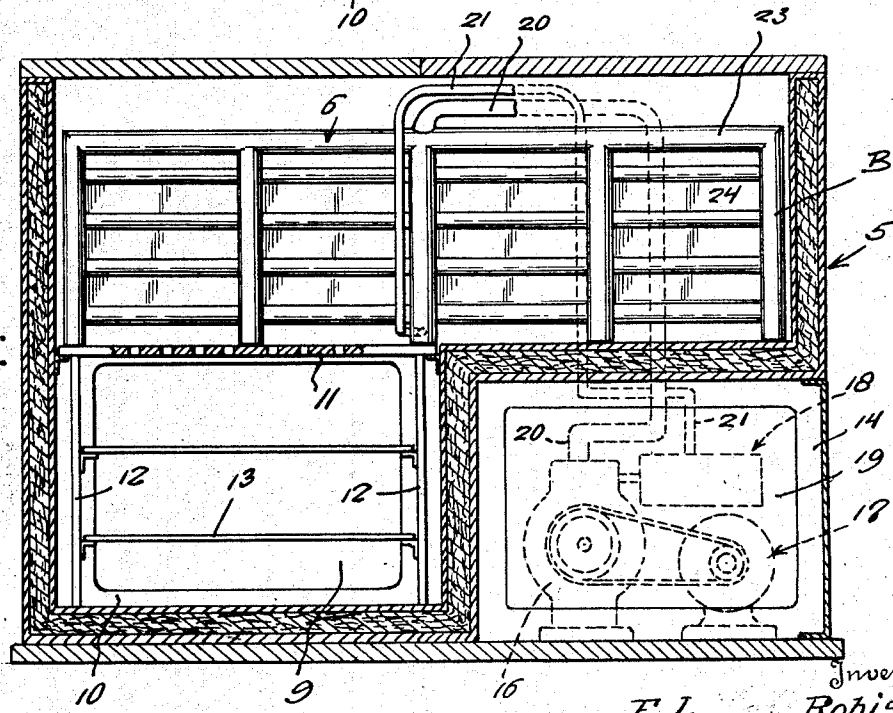


Fig. 6.



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Patented Oct. 23, 1945 2,387,356

UNITED STATES PATENT OFFICE

2,387,356

REFRIGERATOR

Floyd L. Robison, Fort Smith, Ark.

Application March 10, 1944, Serial No. 525,923

6 Claims. (Cl. 62—126)

This invention relates to refrigeration and more particularly to an open top cabinet type refrigerator especially adapted for the accommodation of perishable materials of considerable bulk and quantity, and the primary object of the invention is the provision of a device of the above stated character which will efficiently maintain the materials at a desired temperature to prevent spoiling and will permit the materials to be conveniently placed therein and removed therefrom.

Another object of this invention is the provision of a refrigerator of the stated character employing an improved heat exchanger or cooling unit which may be conveniently arranged in a cabinet of the specified kind and which will provide therein a multiplicity of material compartments, the walls of which are chiled to efficiently preserve perishable materials located therein.

A further object of the invention is the provision of a cooling unit or heat exchanger which will successfuly operate in conjunction with the conventional mechanical refrigerating apparatus associated with the cabinet and includes in its construction provision for longitudinal and vertical flow of the refrigerant agent having a series of vertical risers and horizontal flow tubes coacting in forming the material compartments within the cabinet.

With these and other objects in view as will become more apparent as the description proceeds, the invention consists in certain novel features of construction, combination and arrangement of parts as will be hereinafter more fully described and claimed.

For a complete understanding of my invention, reference is to be had to the following description and accompanying drawings, in which

Figure 1 is a top plan view illustrating a cooling unit or heat exchanger forming a part of the present invention.

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

Figure 3 is a sectional view taken on the line 3—3 of Figure 2.

Figure 4 is a fragmentary sectional view taken on line 4—4 of Figure 2, showing the connection between one of the vertical risers and a plurality of horizontal flow tubes.

Figure 5 is a vertical sectional view illustrating a refrigerator cabinet constructed in accordance with the present invention and showing one form of heat exchanger or cooling unit therein.

Figure 6 is a view similar to Figure 5 showing another form of heat exchanger or cooling unit arranged in the cabinet and the latter also provided with a chilling compartment provided with removable shelves accessible by a movable door provided in one of the vertical walls of the cabinet.

Referring in detail to the drawings, the cabinet of this invention is indicated in entirety by the character 5 and the heat exchanger or cooling unit therefor is indicated in entirety by the character 6. The cabinet is preferably of a double wall construction thoroughly insulated, as shown at 7, and is fully open at its upper end being normally closed by a removable cover 8 so that access to the interior of the cabinet may be readily had. The cabinet may be slightly modified, as shown in Figure 6, by having a removable door 9 in one of the vertical walls thereof so as to give access to the stepped down chamber 10 of the cabinet from one side thereof. When the door 9 is employed the stepped down chamber 10 has removably mounted therein a perforated plate 11 to allow air circulation from the upper portion of the cabinet to the lower portion and also has a rack 12 therein provided with removable shelves 13. The rack and its removable shelves facilitates the accommodation of perishable merchandise below the perforated plate obtainable through the opening of the door 9.

By referring to Figure 6 it will be seen that the heat exchanger occupies a space in the cabinet above the perforated plate 11 while in Figure 5 the heat exchanger is slightly modified so that it may extend downwardly in the stepped down portion 10 of the cabinet. The stepped down portion of the cabinet only takes in a part of the lower portion of the cabinet leaving a chamber or space 14 for the accommodation of the refrigerating apparatus 15 which is of a conventional construction including a compressor 16 driven by an electric motor 17 and a receiver-condenser unit indicated by the character 18. One wall of the cabinet 5 may be removable and is designated by the character 19 to give access to the chamber 14 when inspection or repairs are necessary to the refrigerating apparatus 15.

Conduits 20 and 21 lead from the chamber 14 into the interior of the cabinet 5 preferably close to the rear wall of the cabinet and the conduit 20 is connected to the compressor while the conduit 21 is connected to the receiver-condenser unit 18. The purpose of the conduits 20 and 21 is to permit the flow of the refrigerant agent from the refrigerating apparatus to the heat ex-

changer and return to the refrigerating apparatus.

The heat exchanger or cooling unit 6 is of a portable construction and easy to handle so that its arrangement within the cabinet is convenient to carry out and includes groups of tubular shaped rigid risers designated by the characters A and B and a plurality of horizontal flow tubes 22 connected thereto and in such a way as to form a plurality of material compartments designated by the character C. The flow tubes between the groups of vertical risers extend both transversely and longitudinally. The vertical risers A, when the unit 6 is arranged in the cabinet, are positioned adjacent the front wall of the cabinet while the group of risers B are arranged adjacent the rear wall of the cabinet and connect with a header 23 also of a rigid tubular stock and is connected intermediate its ends with the output pipe 20 of the refrigerating apparatus 15. Both the longitudinal and transverse flow tubes are of tubular shape, and may be of a lighter stock than the vertical risers and header 23.

By referring to Figures 1 to 3, inclusive, it will be seen that the flow tubes and headers coact in forming the heat exchanger or cooling unit of a frame like construction and applied to the flow tubes are vertically arranged wall plates 24 coacting therewith in forming the walls of the material compartments C. The flow of tubes which coact with the wall plates in forming the heat exchanger or cooling unit with the material compartments C will be arranged in superposed relation in forming each wall of the material compartments and that the wall plates 24 are grouped in pairs and each plate has formed therein concaved grooves, so that when the pairs of plates are grouped together the grooves match and form seats to tightly receive the flow tubes and are soldered or otherwise secured thereto strengthening the flow tubes throughout their lengths.

It is preferable that the flow tubes as well as the plates be constructed of copper or any other metal having high thermal conductivity. The risers also may be constructed of a similar material. The size of the wall plates is such as to tightly fit against the vertical risers and may be soldered thereto as well as being soldered to the flow tubes. Also it is preferable that the plates only extend above and below the flow tubes so that they will efficiently cover the flow tubes permitting a free circulation of air above and below the uppermost and lowermost flow tubes which provides for efficient air circulation throughout the entire areas of the material compartments C.

As shown in Figure 5, certain of the vertical risers may be of a greater length than the other vertical risers and have applied thereto an additional number of flow tubes so that the heat exchanger or cooling unit may have a portion that will extend into the well 10 of the ice box if desired, it being understood that when this form of heat exchanger is employed, the rack 12 and perforated plate 11 are removed. Further, it will be seen that this type of heat exchanger provides several material compartments of greater depth than the other material compartments.

The pipe 21 connects to the lower end of one of the vertical risers of the group A delivering the cooling agent to the heat exchanger in such a way that the cooling agent will flow longitudinally as well as vertically in order to reach the header 23 which assures complete and even distribution of the refrigerant agent to all walls of each material compartment which provides for more efficient chilling of the contents of said compartments. If desired, a portion of the input pipe 21 may extend between said pipe walls 24 to protect that portion of the pipe 21 from damage or injury. It is preferable that the lowermost flow tubes be arranged a selected distance above the lower ends of the vertical risers so that the walls formed thereby with the wall plates will be spaced a selected distance from the supporting walls of the cabinet when the heat exchanger is arranged within said cabinet. This will permit the cabinet to be readily cleaned without the removal of the heat exchanger therefrom and also will provide for an efficient circulation of air in the cabinet about the heat exchanger and through the compartments thereof.

The construction of heat exchanger or cooling unit described and shown in the drawings will successfully operate in conjunction with a conventional type of refrigerating apparatus and may be known as the flood type heat exchanger or cooling unit and will assure a complete flow of refrigerant agent throughout all walls of the material compartments formed within the heat exchanger or cooling unit and it is to be understood that this device may be constructed to have as many material compartments as desired and of any selected dimensions most suitable for the particular purpose that the heat exchanger or cooling unit is to be employed for.

Further, it will be seen that a device constructed in accordance with the foregoing description and the showing made by the drawings will be extremely durable and rigid, still permitting comparatively light stock to be employed in the construction of the flow tubes to increase their thermal conductivity.

While I have shown and described the preferred embodiment of my invention, it will be understood that minor changes in construction, combination and arrangement of parts may be made without departing from the spirit and scope of the invention as claimed.

Having thus described the invention, what I claim is:

1. In combination with an open top cooling cabinet, a cooling unit within said cabinet, means for circulating a cooling agent through the unit, the unit consisting of a plurality of vertical risers and a plurality of longitudinally arranged flow tubes connected thereto and coacting therewith in forming the unit with a plurality of material compartments, wall plates grooved to form seats and arranged in pairs to receive the flow tubes and secured thereto and coacting therewith in completing the walls of the material compartments of substantially solid formation and to strengthen the flow tubes permitting comparatively light stock to be employed in the construction of said tubes.

2. In combination with an open top cooling cabinet, a cooling unit within said cabinet, means for circulating a cooling agent through the unit, the unit consisting of a plurality of vertical risers and a plurality of longitudinally arranged flow tubes connected thereto and coacting therewith in forming the unit with a plurality of material compartments, wall plates grooved to form seats and arranged in pairs to receive the flow tubes and secured thereto and coacting therewith in completing the walls of the material compart-

ments of substantially solid formation and to strengthen the flow tubes permitting comparatively light stock to be employed in the construction of said tubes, said risers extending above and below the flow tubes and arranged in groups, and a header connected to one group of vertical risers and having said means connected thereto.

3. In combination with an open top cooling cabinet, a cooling unit within said cabinet, means for circulating a cooling agent through the unit, the unit consisting of a plurality of vertical risers and a plurality of longitudinally arranged flow tubes connected thereto and coacting therewith in forming the unit with a plurality of material compartments, wall plates grooved to form seats and arranged in pairs to receive the flow tubes and secured thereto and coacting therewith in completing the walls of the material compartments of substantially solid formation and to strengthen the flow tubes permitting comparatively light stock to be employed in the construction of said tubes, said risers extending above and below the flow tubes and arranged in groups, and a header connected to one group of vertical risers and having said means connected thereto, certain of said vertical risers being of greater length than the other vertical risers with an increased number of flow tubes connected thereto to provide one portion of the cooling unit of a greater height than the other.

4. In a cooling unit, groups of vertically arranged risers, horizontal flow tubes connected to said risers and arranged in transverse and longitudinal groups coacting with the risers in forming a frame-like construction and providing therein a plurality of compartments, vertically arranged pairs of wall plates grooved to receive the flow tubes therebetween and secured thereto and coacting therewith in forming the compartments of substantially solid wall construction.

5. In a cooling unit, groups of vertically arranged risers, horizontal flow tubes connected to said risers and arranged in transverse and longitudinal groups coacting with the risers in forming a frame-like construction and providing therein a plurality of compartments, pairs of wall plates grooved to receive the flow tubes therebetween and secured thereto and coacting therewith in forming the compartments of substantially solid wall construction, a header connected to one group of risers and including an output pipe connected to a refrigerating apparatus, and an input pipe of the refrigerating apparatus connected to the lower end of one of the vertical risers.

6. In combination with an open top cooling cabinet having one portion thereof of greater depth than the other portion, a perforated plate removably mounted in the cabinet within the portion of the greatest depth, a rack underlying said perforated plate and including removable shelves, a cooling unit arranged in the cabinet and supported by the latter and the perforated plate and including vertical risers and horizontal flow tubes connected thereto providing a compartment-like construction, wherein each wall of each compartment includes flow tubes, a header connected to certain of said risers and to a refrigerating apparatus, and an input pipe connected to the refrigerating apparatus and to the lower end of one of the vertical risers.

FLOYD L. ROBISON.