Dec. 17, 1946. C. M. E. HOFFMAN 2,412,774

CONDENSER HEATED COMPARTMENT

Filed Sept. 10, 1943 2 Sheets-Sheet 1

Fig. 1

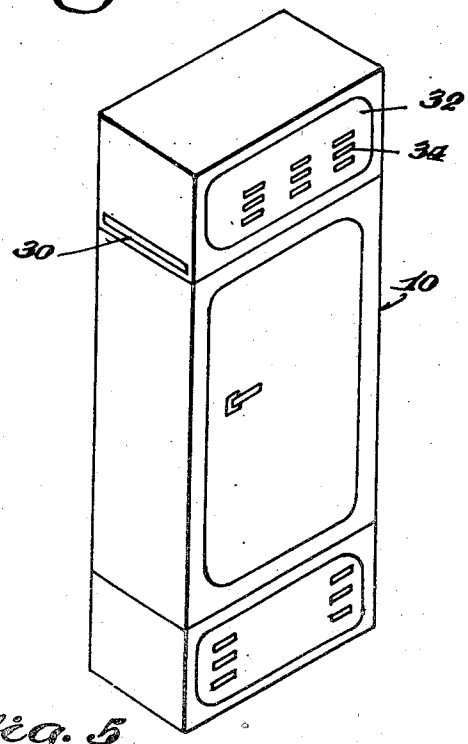


Fig. 2

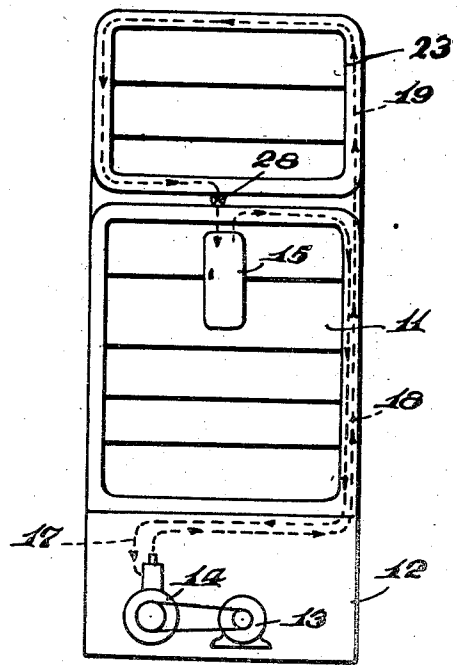


Fig. 5

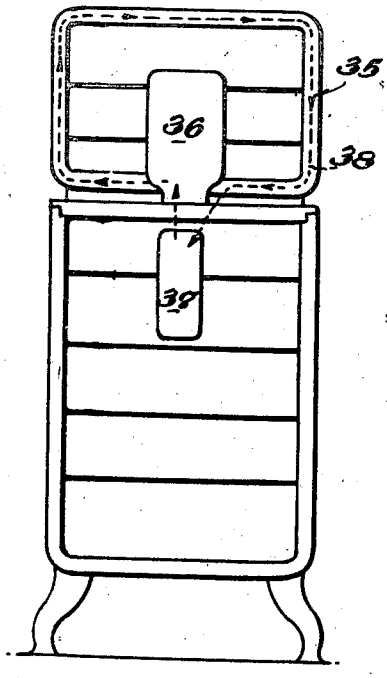
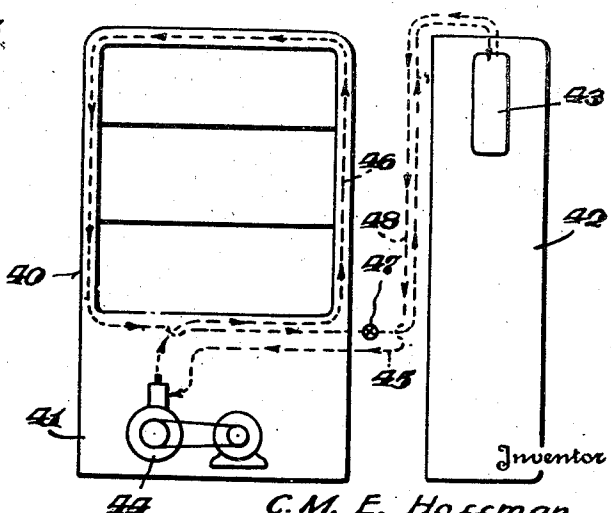


Fig. 6



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Filed Sept. 10, 1943 2 Sheets-Sheet 2

Fig. 3

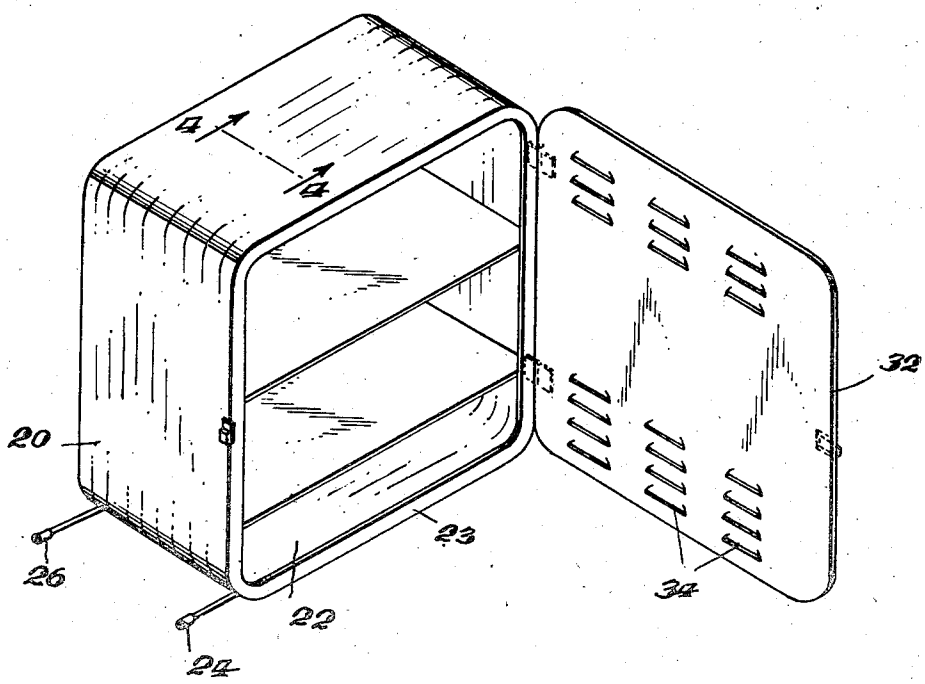
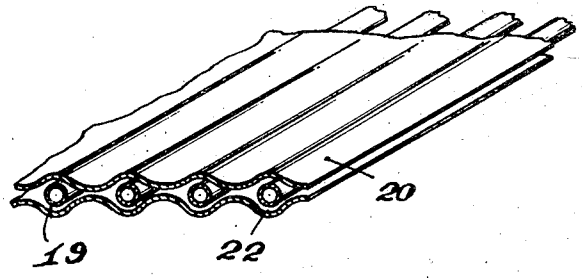


Fig. 4



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CONDENSER HEATED COMPARTMENT

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9 Claims. (Cl. 62—116)

1

This invention relates to improvements in cabinet construction and, with regard to its more specific aspects, to cabinets which are adapted to be heated by the so-called waste heat of refrigerator equipment.

The simple mechanical refrigeration system usually consists of a compressor which withdraws the refrigerant vapor from an evaporator, compresses it, and passes the compressed vapor to a condenser where it is cooled and liquefied. The liquid refrigerant then passes through an expansion valve or equivalent device and to the evaporator, where, in passing from its liquid to a vapor phase, it has the property of extracting heat from the cooling space or from a secondary refrigerating medium such as brine. As the refrigerant vapor is compressed, it becomes heated and usually this heat of compression is released in the condenser and dissipated to atmosphere as waste heat.

The present invention pertains to the utilization of this so-called waste heat, particularly for the purpose of preserving foods subject to spoilage or deterioration due to absorption of moisture in the atmosphere or other sources, it being a principal object of the invention to provide simple and effective means by which such waste heat of refrigerating equipment may be utilized to heat a storage space sufficiently to superheat the water vapor of the air within said space, irrespective of exterior atmospheric conditions. In its more specific aspects, the invention contemplates and seeks to provide a cabinet, which may be formed integral with or separate from the heat insulated chamber of a refrigerator, which is capable of being heated by the heat of compression given up by the compressed refrigerant in the condenser of the refrigerating apparatus. The invention has for a further object the provision of a cabinet whose construction readily lends itself to being heated by the condenser of refrigerating apparatus.

Other objects will be in part obvious and in part hereinafter pointed out in connection with the following analysis of this invention wherein is illustrated an embodiment of the invention in detail.

In the drawings—

Fig. 1 is a perspective view of a refrigerator-heating cabinet combination according to the invention, in which the cabinet is mounted on the top of the refrigerator;

Fig. 2 is a more or less diagrammatic view of the interior of the refrigerator-heating cabinet combination illustrated in Fig. 1;

2

Fig. 3 is a perspective view of a condenser-heated cabinet, illustrating the connections by which the condenser may be connected to the refrigerating equipment;

Fig. 4 is a detail illustrating the construction of the cabinet wall;

Fig. 5 is a diagrammatic view of a modified arrangement of a refrigerator of the top sealed-unit type, with a heating cabinet enclosing the unit;

Fig. 6 is a diagrammatic view illustrating still another arrangement according to the invention of a heating cabinet separate from the refrigerator.

Referring to the drawings, wherein like reference characters designate like parts throughout the views, and particularly to the modification illustrated in Figs. 1–4, reference character 10 indicates generally one form of a refrigerator-heating cabinet combination according to the invention, in which the heating cabinet is mounted on the top of the refrigerator proper in such manner that the combination provides a single piece of household equipment. As illustrated in Fig. 2, the refrigerator proper provides a heat-insulated cooling chamber 11 mounted on a base 12 in which is disposed a motor 13 driving a compressor 14. While the details of the cooling chamber have not been illustrated, it will be understood that such may follow conventional construction of spaced inner and outer shells, and heat insulating material between the shells, the outer shell being extended downwardly to form the walls of the base compartment for the motor-compressor unit. As shown, an evaporator 15 is arranged in the upper central portion of the insulated chamber, the refrigerant vapor being withdrawn therefrom through tubing 17 by the compressor 14. The so withdrawn vapor is compressed in the compressor 14 and passed through tubing 18 to a condenser 19 wherein it is cooled and liquefied.

According to the invention, the condenser consists of a plurality of convolutions or coils of tubing disposed in rectangular fashion to extend between sheets 20, 22 of good heat-conducting metal, which may be corrugated as shown and which are shaped to form the side, top and bottom walls of an un-insulated cabinet generally indicated at 23. As shown in Fig. 2, the cabinet is mounted on the top of the heat-insulated cooling chamber, the condenser coil being connected to the tubing 18 by a suitable union 24 (Fig. 3), the cooled and liquefied refrigerant passing from the condenser coil through a union 26 to an

expansion valve 28 (Fig. 2) and thence to the evaporator. As indicated in Figs. 1 and 2, the outer shell of the refrigerator is extended upwardly to house the cabinet at its sides and to close the rear thereof, suitable openings 30 being provided in the shell sides to permit outside air to circulate around the cabinet. As shown, the cabinet front is closed by a hinged door 32 which provides access to the interior of the cabinet enclosure.

Due to the effective coiling of the condenser coil about the cabinet and the disposition of the condenser coil between the sheets 20, 22 forming the major walls of the cabinet, the condenser is in heat-exchange relationship both with the outer wall sheet 20, which is at about the temperature of the atmosphere, and with the inner sheet 22. As the result of this heat-exchange relationship, the condenser functions in usual manner to liquefy the compressed refrigerant vapor passing therethrough, and at the same time its heat of compression is withdrawn by at least the inner wall of the cabinet and utilized as a means of superheating the water vapor of air within the cabinet enclosure. Accordingly, the cabinet provides an effectively dry storage space for foods subject to spoilage or deterioration as a result of moisture absorbed by them from the atmosphere or other sources, the heat abstracted from the condenser serving to maintain in dry condition the air within the cabinet. To prevent over-heating of the cabinet space, the door 32 is preferably provided with louvres 34 through which relatively cool exterior air may pass into the cabinet.

According to the Fig. 5 modification, a condenser-heated cabinet 35 as described is positioned at the top of a refrigerator of the top sealed unit type and in enclosing relation about the sealed unit thereof. As with the Fig. 2 combination, the compressor 36 withdraws the refrigerant vapor from the evaporator 37 and passes it to the condenser 38 having heat-exchange relationship with the cabinet walls, wherein it is liquefied and cooled and its heat of compression utilized to heat the interior of the cabinet.

In the modification illustrated in Fig. 6, the condenser-heated cabinet 40 is arranged as a unit separate from the insulated cooling chamber 42. According to the modified construction, the cabinet 40 is mounted on a base 41 housing the motor-compressor unit, the separate insulated chamber 42 containing the evaporator 43. The compressor 44 withdraws the refrigerant vapor through a tubing 45 and passes it through the condenser coil 46 having heat-exchange relationship with the walls of the cabinet 40, from whence the liquefied and cooled refrigerant passes through tubing 47 and expansion valve 48 to the evaporator. Due to the physical separation of the insulated chamber 42 of the refrigerator or ice-box from the condenser cabinet and the fact that the tubing 45, 47 extending therebetween may have unlimited length, the modified arrangement permits of a high degree of flexibility in the relative positioning of the condenser cabinet and the refrigerator.

While in the above description and accompanying drawings the refrigerating equipment has been illustrated and described as being of the compressor-condenser-evaporator type, in which the waste heat of compression is utilized as a source of heat for the cabinet, it is to be understood that the invention contemplates the utilization of the waste heat of refrigerating systems of

the absorption type as well to heat drying cabinets associated therewith. For example, the waste heat from the gas-flame or the kerosene-flame of the so-called gas refrigerator may be so utilized, by properly directing the vent therefor through a suitable heat exchanger disposed in heat exchange relationship with a storage space provided as by a cabinet construction having composite walls as aforesaid.

It is to be observed, further, that cabinets heated by the waste heat of refrigerating equipment may be usefully employed for purposes other than for the preservation of food stuffs which are subject to deterioration by moisture in the air. Accordingly, it will be understood that the invention is directed broadly to the heating of an enclosed space and/or to the drying of air within such space by the so-called waste heats of refrigerating apparatus, regardless of the purpose for which the space is ultimately employed.

As many changes could be made in carrying out the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

I claim:

1. In a mechanical refrigerator, the combination of refrigerant condensing means, a cabinet having un-insulated walls providing an enclosure, said walls comprising spaced sheets of heat conductive material, and said condensing means extending into the space between said sheets and having heat exchange relationship therewith.

2. In a refrigerator, in combination, a heat insulated chamber, cooling means therefor including an evaporator and a condenser, a cabinet providing an enclosure, the walls of the cabinet being formed from sheets of heat-conductive material disposed in spaced relation, and said condenser extending into the space between said sheets and having heat exchange relationship therewith.

3. A refrigerator-heating cabinet combination as set forth in claim 2, wherein the cabinet is disposed on the top of the heat-insulated chamber.

4. A refrigerator-heating cabinet combination as set forth in claim 2, wherein the cooling means includes a top sealed unit disposed on the top of the insulated chamber, and wherein the cabinet, also disposed on the top of the chamber, encloses said sealed unit.

5. A refrigerator-heating cabinet combination as set forth in claim 2, wherein the cabinet and condenser are arranged as a separate unit from the insulated chamber and the evaporator therefor.

6. In a cabinet adapted to be heated by the condenser of a refrigerating apparatus, the combination of cabinet having its major walls formed of heat-conductive material, and a condenser coil coiled about and having heat exchange relationship with said walls, said coil having connections with the compressor and evaporator of said apparatus.

7. In a cabinet adapted to be heated by the condenser of a refrigerating apparatus, the combination of spaced inner and outer sheets of conductive material shaped to form the major walls of said cabinet, and a condenser coil disposed between and in heat exchange relationship with both the outer and inner sheets, said coil having

connections with the compressor and evaporator of the apparatus.

8. In a mechanical refrigerator, the combination of refrigerant condensing means, a cabinet having uninsulated walls providing an enclosure, and said condensing means being effectively coiled about said cabinet in heat exchange relationship with said walls and being thereby operative to heat the air within the enclosure.

9. In the combination with a refrigerating system incorporating a source of waste heat, a cabinet providing an enclosure and having its major walls formed by spaced sheets of heat-conductive material, and means providing a connection between said source and said walls, the construction and arrangement being such that said walls utilize the waste heat from said source to heat the air within the enclosure.

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