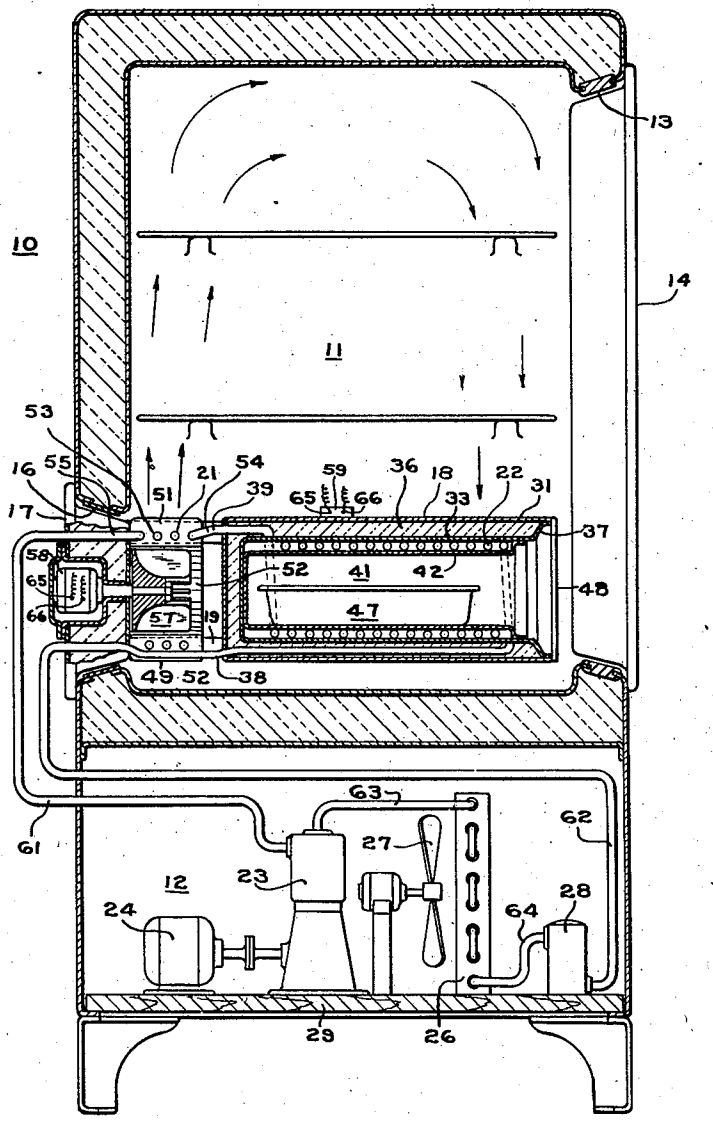
July 11, 1939. R. W. HASTINGS 2,165,480

REFRIGERATING APPARATUS

Filed Oct. 30, 1936



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Patented July 11, 1939 2,165,480

UNITED STATES PATENT OFFICE

2,165,480

REFRIGERATING APPARATUS

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Application October 30, 1936, Serial No. 108,344

9 Claims. (Cl. 62—116)

My invention relates to refrigerating apparatus and particularly to mechanical refrigerators having a plurality of heat absorbing elements.

It is an object of my invention to provide a mechanical refrigerator embodying means to absorb heat from the air in the food storage compartment and means to congeal liquids in a separate compartment without materially affecting the temperature of the air in the food storage compartment.

It is another object of my invention to provide a mechanical refrigerator in which the ice freezing compartment, the heat absorbing means and the air circulating means may be removed from or inserted into the food storage compartment as a unit.

It is a further object of my invention to provide a mechanical refrigerator in which the refrigerant circulating means and the heat absorbing means are removable from or replaceable in the cabinet as a unit without breaking the refrigerant connections therebetween.

These and other objects are effected by my invention as will be apparent from the following description and claims, taken in connection with the accompanying drawing, forming a part of this application, in which:

The single figure is a diagrammatic sectional view of a refrigerator embodying my invention.

Referring to the drawing for a detailed description of my invention, numeral 10 designates, generally, a refrigerator cabinet embodying a food storage compartment 11 and an apparatus compartment 12. The food storage compartment 11 is provided with an access opening 13 which is sealed by a closure member 14. A second opening 16, which is closed by a removable heat insulated wall portion 17, is provided in the food storage compartment 11 in the wall opposite the access opening 13.

A refrigerating system associated with the refrigerator cabinet includes a first heat absorbing element 21 for absorbing heat from the ambient air in the food storage compartment 11 and a second heat absorbing element 22 for absorbing heat from a heat insulated ice freezing compartment 18 disposed in the lower portion of the food storage compartment 11. The heat absorbing elements 21 and 22 are of the evaporative type. A compressor 23 withdraws refrigerant vapor from the heat absorbing elements 21 and 22 and circulates it to a condenser 26, cooled by a fan 27, wherein it is condensed. An expansion device shown diagrammatically at 28 distributes the condensed refrigerant to the heat absorbing elements 21 and 22. The compressor 23, its driving motor 24, the condenser 26, the condenser fan 27 and the expansion device 28 are assembled on a base 29 disposed in the apparatus compartment 12. The base 29 with the apparatus assembled thereon is removable from or insertable in the apparatus compartment 12 as a unit thereby facilitating the service and repair of the apparatus.

The ice freezing compartment 18 is formed of a rectangular outer metal shell 31 and a similarly shaped smaller inner metal shell 33. The inner metal shell 33 is telescoped within the outer metal shell 31 and is positioned therein so as to provide a space between the two shells. A heat insulating material 36 is provided in the space between the shells 31 and 33 in order to reduce the heat transfer therebetween. A flared portion 37 of the inner shell 33 engages the wall of the outer shell 31 near its open end and is secured thereto, preferably by welding, in order to provide a moisture-proof joint between the shells. The second heat absorbing element 22, which is formed of a continuous copper tube of substantial length, is provided with an inlet 38 and an outlet 39 and is shaped to conform to the inner periphery of the inner shell 33 to provide a freezing chamber 41 within the ice freezing compartment 18. The heat absorbing element 22 is held in intimate contact with the inner shell 33 by a rectangular shell 42. A tray 47 containing liquids to be congealed is disposed in intimate thermal contact with the shell 42 and the heat absorbing element 22. A door 48 is movably secured to the outer shell 31 and provides a closure for the open end of the ice freezing compartment 18 so that it is accessible through the access opening 13. The construction of the ice freezing compartment 18 makes it possible to congeal liquids in the tray 47 at a rapid rate without materially affecting the temperature of the ambient air in the food storage compartment 11.

The first heat absorbing element 21 is positioned in the food storage compartment 11 between the ice freezing compartment 18 and the wall portion 17. The heat absorbing element 21 comprises a metal cage member 49 formed of a plurality of radially extending fins 51 with a cylindrical opening 52 through the center. A continuous copper tube 53, having an inlet 54 which is connected to the outlet 39 of the second heat absorbing element 22 and an outlet 55, passes through the fins 51, as shown in the drawing. A fan 57 is disposed within the cylindrical opening 52 in alignment with the heat absorbing elements 21 and 22, and with the freezing cham-

ber 18. The fan 57 is driven by a motor 58 which is supported by the wall portion 17 outside the food storage compartment 11. The fan 57 forces the air in the food storage compartment 11 over the heat absorbing element 21 and then toward the upper portion of the food storage compartment 11.

A temperature responsive device 59 is disposed within the food storage compartment 11 and is used to control the operation of the motor 58 in response to the temperature of the air in the food storage compartment 11. Corresponding electrical connections 65 and 66 on the temperature responsive device 59 and on the fan motor 58 are connected together (not shown). The operation of the motor 58 is independent of that of the motor 24 and is effected when the temperature of the air in the food storage compartment 11 reaches a predetermined upper limit. Operation of the motor 58 will be discontinued when the temperature of the air has reached a predetermined lower limit corresponding to the cut-out setting of the temperature of the temperature responsive device 59.

In accordance with my invention, the heat absorbing elements 21 and 22, the heat insulated ice freezing compartment 18 and the fan 57 are disposed in the food storage compartment 11 in alignment with the second opening 16. The heat absorbing element 21 and the ice freezing compartment 18 with the heat absorbing element 22 as a part thereof are supported by a bracket 19 which is rigidly secured to the wall portion 17. Thus the ice freezing compartment 18 with the heat absorbing element 22 associated therewith, the heat absorbing element 21, the fan 57 and the fan motor 58 assembled as a unit with the wall portion 17 may be easily removed from or inserted into the refrigerator cabinet thereby facilitating the service and repair of this apparatus when such is necessary.

In the operation of the refrigerating apparatus embodying my invention, the compressor 23 withdraws refrigerant vapor from the heat absorbing element 21 and 22 through a conduit 61, which connects the outlet 55 of the heat absorbing element 21 with the suction side of the compressor. The compressed vapor refrigerant is condensed in the condenser 26 and is distributed by the expansion device 28 to the heat absorbing element 21 and 22 through a conduit 62 which connects the expansion device 28 with the inlet 38 of the heat absorbing element 22. The compressed refrigerant vapor is conveyed from the compressor 23 to the condenser 26 through a conduit 63. A conduit 64 conveys the liquid refrigerant from the condenser 26 to the expansion device 28. The liquid refrigerant entering the heat absorbing element 22 absorbs heat from the ice freezing compartment 18, and congeals the liquid in the tray 47 without materially affecting the temperature of the ambient air in the food storage compartment 11. From the heat absorbing element 22 a mixture of liquid refrigerant and refrigerant vapor passes in series to the heat absorbing element 21 to absorb heat from the air which is driven over the heat absorbing element 21 by the action of the fan 57 when refrigeration is required in the food storage compartment 11. The vaporized refrigerant then returns to the compressor 23 through the conduit 61 completing the cycle. When the temperature of the food storage compartment 11 has reached the lower limit for which the temperature responsive device 59 is set, the motor 58 will be deenergized and the fan 57 will no longer circulate air in the food storage compartment 11 over the heat absorbing element 21 and the cooling fins 51 with the result that the refrigerant passing through the heat absorbing element 21 will have little or no effect on the temperature of the food storage compartment 11.

The conduits 61 and 62, both of which pass out of the apparatus compartment 12 and upwardly along the outside of the refrigerator cabinet 10 into the food storage compartment 11 through the wall portion 17 to connect with the outlet 55 of the heat absorbing element 21 and the inlet 38 of the heat absorbing element 22 respectively, are preferably flexible and afford the removal from or replacement in the refrigerator cabinet of the plug 17 together with the elements associated therewith without breaking any of the physical connections between the respective elements or between the elements supported by the wall portion 17 and those elements disposed in the apparatus compartment. It is also possible to remove the base 29 with the apparatus assembled thereon from the apparatus compartment 12 at the same time that the wall portion 17 and its associated apparatus is removed from the refrigerator cabinet without disconnecting the conduits 61 and 62.

It will be apparent from the foregoing that I have provided a mechanical refrigerator in which a first heat absorbing element absorbs heat from the air in the food storage compartment and a second heat absorbing element congeals liquid in a separate compartment without materially affecting the temperature of the air in the food storage compartment. It is also apparent that the apparatus disposed in the apparatus compartment and that disposed in the food storage compartment may be removed from or replaced in the respective compartments without breaking any of the physical connections necessary for the operation of the apparatus.

While I have shown my invention in but one form, it will be obvious to those skilled in the art that it is not so limited but is susceptible of various changes and modifications without departing from the spirit thereof, and I desire, therefore, that only such limitations shall be placed thereupon as are imposed by the prior art or as are specifically set forth in the appended claims.

What I claim is:

1. In refrigeration apparatus, the combination of a refrigerator cabinet having an opening in a wall thereof, a removable heat insulated closure member for said opening, an ice freezing compartment disposed in said cabinet, a first heat absorbing element for abstracting heat for the preservation of food, a second heat absorbing element for abstracting heat from said ice freezing compartment to congeal liquids therein and a fan for circulating the air in said cabinet over said first heat absorbing element, said second heat absorbing element being supported by said ice freezing compartment, and said first heat absorbing element, said ice freezing compartment and said fan being removable from and insertable into the refrigerator cabinet as a unitary structure with said closure member.

2. In refrigeration apparatus, the combination of a refrigerator cabinet embodying a food storage compartment and an ice freezing compartment disposed within the food storage compartment, a first heat absorbing element for abstracting heat from the food storage compart-

ment, a second heat absorbing element for abstracting heat from said ice freezing compartment, a fan for circulating air over said first heat absorbing element in the food storage compartment, said food storage compartment having an opening therein, a removable heat-insulated closure for said opening, and a refrigerant condensing unit exterior of said food storage compartment and connected with said heat absorbing elements by refrigerant conveying tubes extending through said opening, said heat absorbing elements and said fan being insertable into and removable from said cabinet as a unit through said opening.

3. In refrigeration apparatus, the combination of a refrigerator cabinet embodying a food storage compartment an ice freezing compartment and an apparatus compartment, a first heat absorbing element for abstracting heat from the food storage compartment, a second heat absorbing element for abstracting heat from said ice freezing compartment, a fan for circulating air over said heat absorbing element in the food storage compartment, said food storage compartment having an opening therein and a heat insulated closure for said opening, said heat absorbing elements, said ice freezing compartment and said fan being insertable into and removable from said cabinet through said opening.

4. In refrigeration apparatus, the combination of a refrigerator cabinet embodying a food storage compartment and an ice freezing compartment disposed within the food storage compartment, a first heat absorbing element for absorbing heat from the food storage compartment, a second heat absorbing element for absorbing heat from the ice freezing compartment, said food storage compartment having an opening therein and a removable heat insulated closure for closing said opening, said first heat absorbing element and said ice freezing compartment being horizontally aligned with each other and said heat absorbing elements being insertable into and removable from said cabinet through said opening.

5. In refrigeration apparatus, the combination of a refrigerator cabinet embodying a food storage compartment an ice freezing compartment disposed within the food storage compartment, a first heat absorbing element for absorbing heat from the food storage compartment, a second heat absorbing element for absorbing heat from the ice freezing compartment, a fan for circulating air over the heat absorbing element in said food storage compartment, said food storage compartment having an opening therein and a removable heat insulated closure member for closing said opening, said first heat absorbing element, said fan and said ice freezing compartment being in alignment with one another and said heat absorbing elements being insertable into and removable from said cabinet through said opening.

6. In refrigeration apparatus, the combination of a refrigerator cabinet embodying a food storage compartment and an ice freezing compartment disposed within the food storage compartment, a first heat absorbing element for absorbing heat from the food storage compartment, a second heat absorbing element for absorbing heat from the ice freezing compartment, a fan for circulating air over the heat absorbing element in said food storage compartment, said food storage compartment having an opening therein and a removable heat insulated closure member for closing said opening, said first heat absorbing element being supported by said heat-insulated closure member, and being in horizontal alignment with said fan and said ice freezing compartment, and said heat absorbing elements being insertable into and removable from said food storage compartment through said opening.

7. In refrigeration apparatus, the combination of a refrigerator cabinet embodying a food storage compartment and an ice freezing compartment disposed in said cabinet, a first heat absorbing element for absorbing heat from the food storage compartment, a second heat absorbing element supported by said ice freezing compartment for absorbing heat therefrom, a fan for circulating air over the heat absorbing element in the food storage compartment, said food storage compartment having an opening therein and a removable heat insulated plug for closing said opening, said fan, said first heat absorbing element and said ice freezing compartment being supported by said plug and being insertable into and removable from said cabinet as a unit through said opening.

8. In refrigerating apparatus, the combination of a cabinet structure having a plurality of insulating walls for defining a space therebetween, one of said walls having an opening formed therein, an insulating closure for said opening, an insulated structure defining a low temperature zone and disposed within said space, an evaporator disposed within said insulated structure, a second evaporator disposed in heat transfer relation with the air in said space, and a refrigerant condensing unit exterior of said space and connected with said evaporators by refrigerant conveying tubes extending through said opening, said second evaporator being disposed intermediate the closure and the insulated structure and in alinement with the opening in the cabinet wall, said insulated structure and first and second-named evaporator being removable from said cabinet structure through said opening without disconnecting said tubes.

9. In refrigerating apparatus, the combination of a cabinet structure having a plurality of insulating walls for defining a space therebetween, one of said walls having an opening formed therein, an insulating closure for said opening, an evaporator for abstracting heat from said space, a structure defining a low temperature zone and including a second evaporator, said first-mentioned evaporator and said low temperature structure being carried by the closure and removable from the cabinet therewith as a unit, a fan for translating air within the space in heat transfer relation with the first evaporator, a motor for driving the fan and carried by the closure on the outer side thereof and means responsive to the temperature of the air in the space for controlling the circulation of air by said fan, said temperature responsive means being removable from the cabinet with said closure.

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