Dec. 7, 1943. L. A. PHILIPP 2,336,418

REFRIGERATING APPARATUS

Filed July 30, 1934

Fig. 1.

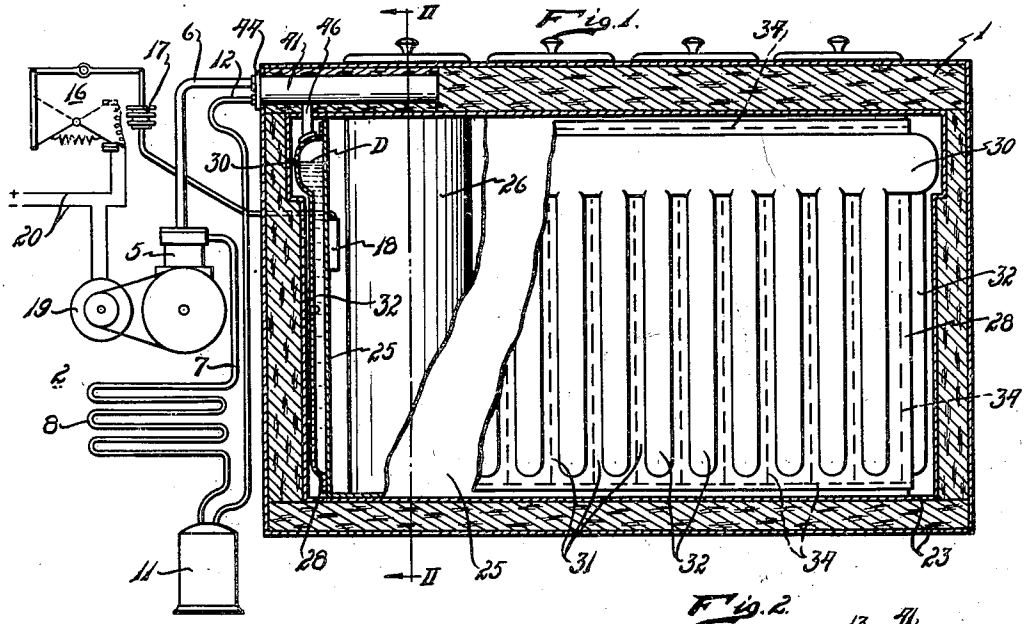


Fig. 2.

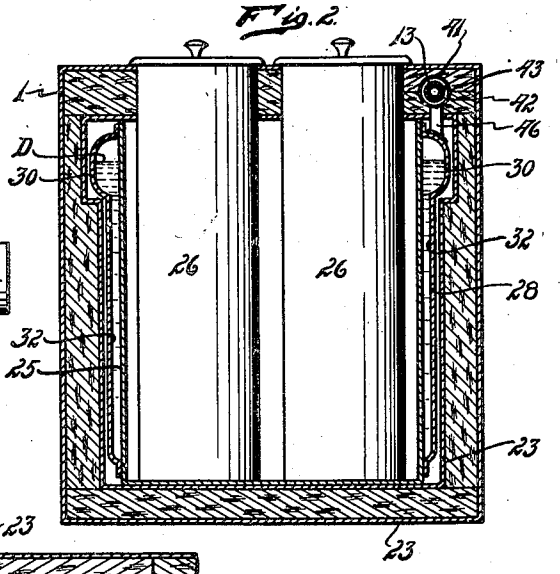


Fig. 4.

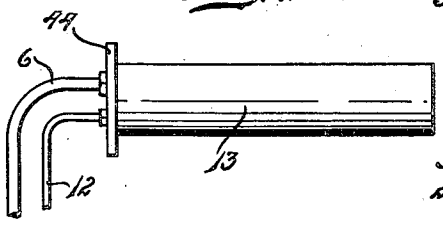
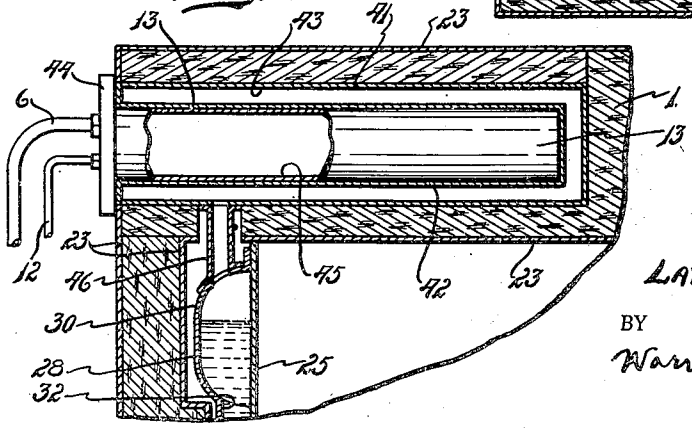


Fig. 3.



INVENTOR.
LAWRENCE A. PHILIPP

BY
Warren N. F. Schmeding
ATTORNEY.

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REFRIGERATING APPARATUS

Lawrence A. Philipp, Detroit, Mich., assignor, by mesne assignments, to Nash-Kelvinator Corporation, Detroit, Mich., a corporation of Maryland

Application July 30, 1934, Serial No. 737,539

8 Claims. (Cl. 62—125)

My invention relates to means for providing an efficient thermal coupling between refrigerating systems and compartments to be cooled thereby.

It is an object of my invention to provide a refrigerating apparatus in which the elements are arranged in a new and improved heat transfer relation.

It is also an object of my invention to provide refrigerating apparatus comprising primary and secondary refrigerating systems with an efficient detachable thermal coupling between the systems to provide for the ready removal of the primary cooling element and system from the apparatus.

Another object of my invention is to provide a refrigerating apparatus having primary and secondary refrigerating systems associated with a cabinet to efficiently and uniformly refrigerate the food storage compartment therein.

It is a further object of my invention to provide a quick detachable thermally efficient plug-in device for coupling refrigerating systems which may be made hermetically sealed each from the other.

More specifically, it is an object of my invention to provide a secondary refrigerating system comprising a shell surrounding the storage compartment to provide a sealed chamber for vaporizing a volatile secondary refrigerant enclosed therein, and to provide for the condensation of said secondary refrigerant by a primary refrigerating system including a sleeve having a chamber for vaporizing the primary refrigerant and adapted to be readily plugged into or removed from an annular chamber interconnected with said sealed secondary vaporizing shell.

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 specific embodiments, when read in conjunction with the accompanying drawing, in which:

Fig. 1 is a side view of a refrigerating apparatus, shown partly in cross section, partly in elevation and partly diagrammatic, embodying features of my invention;

Fig. 2 is an end sectional view on line II—II of Fig. 1 the ice cream cans being shown in elevation;

Fig. 3 is an enlarged fragmentary view partly in cross section and partly broken away, showing the cooling elements; and

Fig. 4 is a side view in elevation of the primary cooling element removed from the cabinet.

Referring more specifically to the drawing, my refrigerating apparatus comprises a cold storage cabinet 1 which is to be cooled by a primary refrigerating system 2.

In accordance with my invention any conventional primary refrigerating system may be used for abstracting heat from the cabinet. Such a primary system comprises as shown diagrammatically in Fig. 1, a compressor 5 which draws the vaporized primary refrigerant from a conduit 6 and compresses and delivers it through a conduit 7 into a condenser 8. As the refrigerant passes through the condenser 8 its latent heat of vaporization is dissipated and it is condensed, the liquid refrigerant passing into a receiver 11 from which it flows through a suitable conduit 12 into a quick detachable thermal coupling device 13 to cool the cabinet, in a manner to be subsequently set forth.

Preferably the operation of the primary system is controlled in response to changes in temperature of the refrigerant within the chambers by means of an automatic switch 16 which is actuated by means of a bellows 17 which in turn is controlled by pressure from the suction line or thermo bulb 18 associated with the storage compartment or other parts of the system in the well known manner. Preferably the bulb 18 is disposed within the cabinet and in good thermal contact with the refrigerant of the secondary system so that the fluid in the bulb 18 is responsive to changes in temperature of the refrigerant. The switch 16 is adapted to cut the motor 19 in and out of circuit with the power mains 20 in accordance with changes in temperature of the secondary refrigerant.

The cabinet 1 is preferably constructed of heat insulating walls covered inside and out with layers 23 of sheet metal or other material to provide a desirable finish. Within the cabinet a sheet metal liner or shell 25 provides a storage compartment for food articles, or one or more receptacles 26 in which ice cream or other material may be stored.

Secured in spaced relation encircling the outer side walls of the compartment shell 25 is a jacket member 28 also preferably formed of sheet metal. This jacket member is formed adjacent the top thereof with a bulbous portion or header 30 which encircles the shell 25 and is provided with spaced downwardly projected indented portions 31 which extend down from the bulbous portion 30 to a point adjacent the bottom of the shell. Thus when the jacket is secured to the shell in any suitable manner as by soldering or welding,

the indented portions 31 cooperate to form a plurality of downwardly projecting chambers or legs 32 extending from a main chamber of header 30. The shell 25 and the jacket 28 are preferably welded together at the top and bottom and between the indented portions, as indicated by the dotted lines at 34 to provide a fluid tight chamber for supporting the secondary refrigerant in close thermal association with the side walls of the food storage compartment.

As shown more clearly in Fig. 3, the condenser of the secondary system comprises a refrigerant vapor receiving chamber having a cooling recess therein and is preferably formed by two concentrically disposed cylindrical sleeves 41 and 42 arranged one within the other. The inner end of each of the sleeves is closed and the opposite ends are secured together, as by welding, to provide a sealed, fluid tight chamber 43 enclosed therebetween. The sealed chamber 43 is permanently mounted in an aperture in an upper corner of the cabinet walls, with the welded end of the sleeve members preferably arranged to be flush with the outer wall of the cabinet, as shown.

The primary cooling element 13, shown in Fig. 4, is adapted to be readily inserted within or removed from the recess within the inner sleeve 42. The primary cooling element 13 comprises a sleeve preferably formed of sheet metal to telescope snugly within the chamber 42, and it may be provided with a face plate 44. Although substantially cylindrical, the cooling element 13 and the inner sleeve 42 may be slightly tapered to provide efficient thermal, coupling therebetween. The primary cooling element 13 provides an evaporator chamber 45 for the primary refrigerant which is delivered thereto from the primary system 2 through the conduits 6 and 12 which may be flexible to facilitate plugging the cooling element into the recess in the secondary condenser.

The header or main chamber 30 is in communication with the annular sealed chamber 42 which comprises a condensing chamber for the secondary system through a tubular conduit 46 which is securely welded therebetween.

Within the chambers enclosed by the jacket 28 surrounding the food storage compartment shell 25 a secondary refrigerant is provided to a suitable level as indicated at D to leave space for vaporization and condensation.

A secondary refrigerant, such as ether for example, is put into the chamber, enclosed between the jacket and the shell, the air removed, and the system then sealed.

As the secondary refrigerant absorbs heat from the food storage chamber, it boils in the chamber surrounding the storage compartment and the vapor goes into the annular chamber 42 surrounding the primary cooling element 13. The secondary refrigerant is then condensed by and gives up its latent heat of vaporization to the primary cooling element 13 and returns to the chamber around the storage compartment in its liquid state. When it is desired to separate the cabinet and the primary refrigerating system it is only necessary to remove the primary cooling element 13 from its receptacle 42. It will be understood that the evaporator which I have provided surrounding the storage compartment may also be advantageously utilized for primary refrigerant if it is desired to omit the secondary refrigerant.

While it is necessary for the purpose of illustration to describe the disclosed form of my invention in detail, it will be apparent that the invention it 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. Refrigerating apparatus comprising in combination a cabinet having a shell enclosing a compartment for the storage of food to be refrigerated, a chamber for holding a secondary refrigerant in good thermal contact with the shell enclosing the food storage compartment, means providing a condensing chamber for said secondary refrigerant, and a readily removable primary cooling element associated with said condensing chamber for condensing said secondary refrigerant.

2. Refrigerating apparatus comprising in combination a cabinet constructed of heat insulating walls having a food storage compartment and a chamber associated therewith for a secondary refrigerant, means providing a condensing chamber for said secondary refrigerant disposed in a recess in a wall of the cabinet to provide a secondary refrigerant condensing chamber into which a primary cooling element may be conveniently inserted.

3. A quick detachable thermal coupler comprising a cylindrical sleeve closed at one end and open at the opposite end, a larger cylindrical sleeve closed at one end and open at the opposite end, means for hermetically securing the open ends of said sleeves together with the sleeves in concentrically disposed relation whereby a condensing chamber is enclosed therebetween to receive refrigerant vapor, conduit means extending from the larger sleeve in interconnected relation with the enclosed chamber and a cylindrical cooling element insertable into the first mentioned cylindrical sleeve.

4. Refrigerating apparatus comprising in combination a cabinet constructed of heat insulating walls, a sheet metal shell lining said cabinet, a sheet metal jacket hermetically secured to said shell in spaced relation, a bulbous header portion extending around the upper edge of said jacket, a sealed chamber disposed in a recess in a wall of the cabinet, said chamber providing a thermal coupling portion for receiving a cooling element in convenient plug-on relation, and conduit means for operatively interconnecting said chamber with the space enclosed between said jacket and shell.

5. Refrigerating apparatus comprising in combination a cabinet constructed of heat insulating walls, a sheet metal shell lining said cabinet, a sheet metal jacket hermetically secured to said shell in spaced relation, a bulbous header portion extending around the upper edge of said jacket, and vertical corrugations in said jacket providing spaced refrigerant receiving legs extending downwardly from said header between vertical shell abutting portions, a sealed chamber disposed in a recess in a wall of the cabinet, said chamber providing a thermal coupling portion for receiving a cooling element in convenient plug-on relation, and conduit means for operatively interconnecting said chamber with the space enclosed between said jacket and shell.

6. A refrigerator comprising a cabinet having a compartment, a lining of heat conducting material forming the inner wall surface of said compartment, a sealed system for heat transfer fluid having a heat absorbing portion and a heat rejecting portion, said heat absorbing portion being in thermal contact with said lining so that

heat from air in said compartment flows through said lining to said heat absorbing portion, and a removable cooling element in heat exchange relation with said heat rejecting portion.

7. A refrigerating machine including a cabinet having thermally insulated walls providing a compartment to be cooled, a liner for said compartment, and means including an evaporator comprising a sheet of metal secured face to face with said liner for cooling said compartment, said sheet having indentations therein providing a header and refrigerant passages between said sheet and said liner.

8. A refrigerating machine including a cabinet having thermally insulated walls providing a compartment to be cooled, a liner for said compartment, and means including an evaporator comprising a sheet of metal secured face to face with said liner for cooling said compartment, said evaporator comprising a header and refrigerant conduits arranged between said sheet and said liner.

LAWRENCE A. PHILIPP.