May 17, 1938. L. A. PHILIPP 2,117,570

REFRIGERATING APPARATUS

Filed Nov. 1, 1935

Fig. 1.

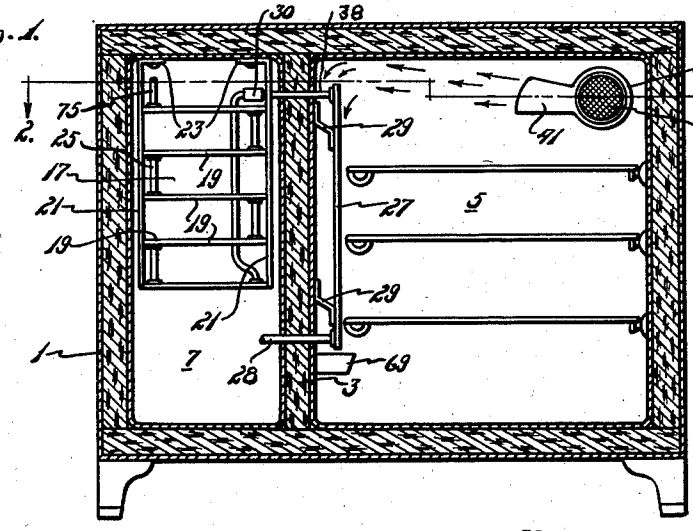


Fig. 4.

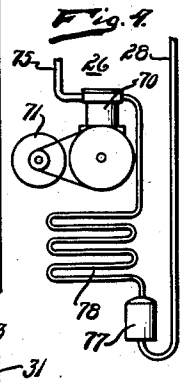


Fig. 2.

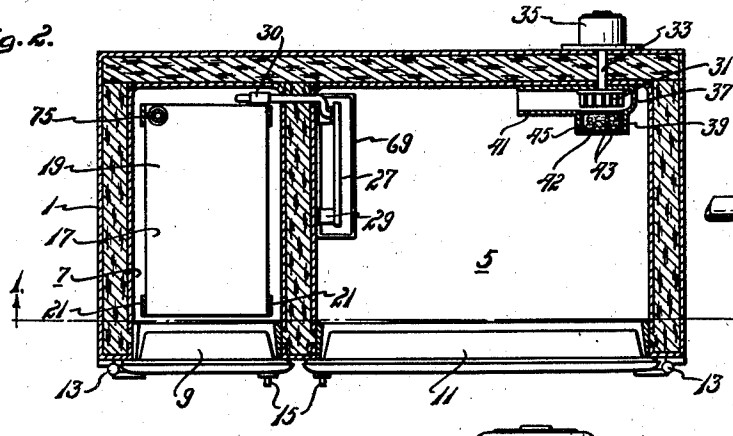
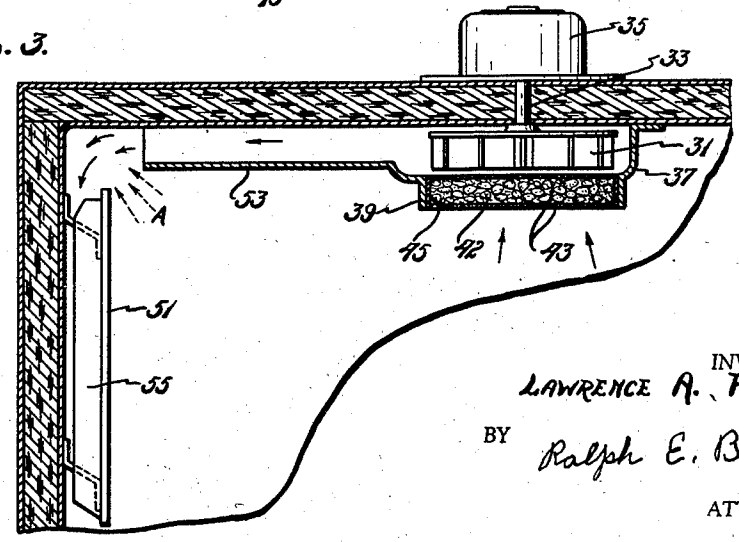


Fig. 5.

Fig. 3.



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REFRIGERATING APPARATUS

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Application November 1, 1935, Serial No. 47,747

3 Claims. (Cl. 62—102)

This invention relates to refrigerating apparatus.

In the storage of foods in refrigerator cabinets, it has been found that the foods give off odors. When the foods are first placed in the refrigerator, the odors generated thereby are not detectable until the odors generated reach a certain concentration at which time the odors are readily detectable and are objectionable.

One of the objects of my invention is to cool the foods in a refrigerator to lower the rate at which the odors are given off, and to remove the odors generated by the foods as fast, or faster, than the odors reach a concentration at which same are detectable.

Another object of my invention is to circulate the air in a food storage compartment, employing the aforesaid odor remover, over a non-frost cooling element so as to provide for absorbing some of the aforesaid odors by conducting the absorbed moisture on the cooling element to a drip collector where the odors are absorbed in the water in said collector.

Other objects and advantages will be apparent from the following description, reference being had to the accompanying drawing.

In the drawing:

Fig. 1 is a front elevational view partly sectional showing a two temperature non-frosting refrigerator arranged with forced convection odor absorbing means in accordance with my invention;

Fig. 2 is a sectional view on line 2—2 thereof;

Fig. 3 is a sectional view partly broken away illustrating a modified embodiment of my invention;

Fig. 4 is a diagrammatic illustration of a refrigerant condensing element used in connection with the apparatus shown in Fig. 1; and

Fig. 5 is an enlarged view of a refrigerant control valve embodying features of my invention.

Referring more particularly to Figs. 1 and 2 of the drawing, my refrigerator comprises a heat insulating cabinet 1, the interior of which is divided by a partition wall 3, preferably of heat insulating material, to provide a food storage compartment 5 and a cold freezing compartment 7. The cabinet has two doors 9 and 11 whereby the two respective compartments 7 and 5 are separately accessible. The refrigerator doors are hinged along the outer edges thereof by hinges 13 of suitable construction, and latching means 15 may be provided for securing the opposite edges thereof in a well known manner.

The cold freezing compartment 7 is provided with a heat absorbing unit 17 which is mounted in the upper portion thereof. The freezing compartment cooling unit 17 is preferably composed by assembling a plurality of horizontally disposed vertically spaced freezing plates 19 which comprise shelves for receiving trays of water or other material to be frozen.

The freezing shelves 19 are secured within a supporting enclosure 21 which is supported by laterally projecting flanges 23 abutting the upper wall of the freezing compartment and to which they may be fastened by suitable screws or other fastening means passing therethrough. Each individual freezing shelf 19 may comprise a plate to which a refrigerant receiving conduit is secured in serpentine coils in intimate heat exchange relation, as by soldering, thereto, for example, or, if desired, a flat hollow casing may be utilized. The freezing shelves 19 are interconnected by means of suitable interconnecting conduits 25 to receive refrigerant therethrough in series relation from a condensing element 26.

To cool the food storage compartment 5 sufficiently to maintain proper temperatures for the storage of food articles therein, I provide a vertically disposed plate evaporator 27 therein. The plate evaporator is mounted by suitable bracket means 29 in spaced relation from the heat insulating partition wall 3 at the end of the storage compartment 5 preferably adjacent the upper wall. The plate 27 comprises a flat metallic plate to which coils of refrigerant receiving conduit are secured, as by welding or soldering, or the plate may be a flat hollow casing in which a volatile liquid refrigerant is vaporized to cool the food storage compartment, as will be readily understood. A suitable inlet 28 and outlet conduit means 38 are connected to plate evaporator 27.

In order that the food storage compartment may be sufficiently cooled to a temperature preferably between 40 and 46 degrees Fahrenheit by evaporators 27, while the platelike evaporator 19 is operated near or above the freezing temperature of water, I provide a valve or fixed restriction 30. In order to keep uniform temperatures in compartment 5, I provide an air deflecting blower or fan 31 which is mounted in the upper portion of a remotely disposed corner of the compartment. The fan 31 is operatively secured upon the end of shaft 33 which extends through an aperture in the side wall of the cabinet for driving connection with a small electric motor 35 which is mounted on the outside of the wall. The motor 35, if desired, may be located within compartment 5. The blower is preferably of the cen-

trifugal type and is enclosed within an air deflecting housing 37 providing an air inlet 39 through which the air enters the blower and forming an outlet nozzle 41 for blowing the air in a direction which is slightly inclined upwardly toward the upper edge of the plate evaporator 27 at the opposite end of the compartment. When the blower operates, the air is drawn from the bottom of the compartment and circulated at high velocity over the top of the plate evaporator 27 whereby the compartment is sufficiently cooled and stratification is eliminated, substantially uniform temperatures being maintained in all positions in the compartment.

In order that air which is circulated by the blower 31 may be simultaneously filtered and deodorized, a suitable absorbent material, such as activated charcoal 42, is supported within the inlet channel 39 of the blower between a pair of foraminous screenlike members 43. The screens 43 for supporting the charcoal may be secured together by an annular member 45 concentrically fitting into the air inlet 39, whereby the filter unit comprises a conveniently replaceable cartridge. In this manner, the filter material may be conveniently replaced, or it may be readily removed for heating to reactivate the charcoal if desired.

The air convection motor 35 may be connected for energization simultaneously with the condensing element 26, or it may be connected directly to the line for continuous operation, as will be readily understood.

In accordance with my invention, air in the compartment is thus circulated rapidly over the upper edge of the plate evaporator 27, either continuously, or intermittently, as condensing element 26 is operated. In this manner, the temperature of the air within the storage compartment is maintained substantially uniform at all levels and stratification is avoided.

Since the required degree of refrigeration is obtained from the evaporator 27 while it is operated at temperatures above freezing, moisture which condenses thereon will not freeze and will be partially reabsorbed by the circulating air. Since the moisture is not frozen out of the air but substantially returns therethrough as the air is simultaneously filtered and circulated to eliminate stratification, the dehydration of food products is thus avoided, and the proper conditions for the preservation of food are substantially maintained. As shown in Fig. 3, the air convection forcing blower 31 may be mounted on the side wall of the compartment at a position which is nearer the evaporator plate 51 with nozzle 53 of the fan enclosing housing extended toward the edges of the cooling plate. By this arrangement of the blower, a larger portion of the filtered air is circulated at high velocity between the cooling plate and the adjacent side wall and a portion of additional air is drawn into the stream of air passing behind the evaporator plate, as indicated by the dotted arrows at A. By providing heat conductive fins 55 on the back of the refrigerated plate 51 adjacent the side wall, the thermal coupling of the circulated air with the plate may be substantially increased.

In this manner, the desired degree of refrigeration may be obtained from a smaller evaporating plate or one which is operated at a substantially higher temperature. A similar activated charcoal filter cartridge is provided in the air inlet aperture for filtering the air as it enters the fan whereby it is simultaneously purified and distributed uniformly throughout the compartment. In either arrangement, the natural circulation of air is not obstructed and if the convection fan is turned off, the box can still be cooled by natural convection.

In practice, I have found that by the use of a fan with the proper odor absorber, such as charcoal, it is possible to absorb the odors given off by the foods in compartment 5 at a rate faster than the odors are generated above a detectable stage. This is accomplished by first cooling the air to lower the rate at which the odors are given off and operating the fan at a predetermined speed and utilizing a certain amount of odor absorbing material and so positioning the odor absorbing material that all of the forced air passes through said material. By "detectable stage," means where the user of the apparatus is by his ordinary senses, such as smelling, able to detect the presence of odors.

By the use of the fixed restriction 30, it is possible to operate plate evaporator 27 at a temperature above that which will cause the collection of frost thereon all of the time, or at least part of the time, depending upon the on-phase of the refrigerating cycles of condensing element 26, and due to said restriction the evaporator 19 operates at freezing temperatures. When moisture is condensed on evaporator 27, it is conducted to a suitable drip collector 69 where some of the odors are absorbed or dissolved in the water collected in the drip container.

Preferably, the system is intermittently operated. Any suitable control, such as a thermostat responsive to changes in temperature in evaporator 27, may be used to control the operation of the condensing element 26 in the well known manner. The condensing element 26 may be of any suitable construction desired. As herein shown, the element 26 includes a compressor 70 operatively connected with motor 71. The compressor withdraws evaporated refrigerant from evaporator 19 through a suction return line 75, compresses the evaporated refrigerant and delivers it to a condenser 78 wherein it is liquefied and from which it is delivered to a high side float mechanism 77. Liquid refrigerant is delivered from float 77 to evaporator 27 through conduit 28 under the control of float 77.

Although only a preferred form of the invention has been illustrated, and that form described in detail, it will be apparent to those skilled in the art that various modifications may be made therein without departing from the spirit of the invention or from the scope of the appended claims.

I claim:

1. In a refrigerator consisting of a storage chamber, a cooling means disposed in said storage chamber, and a combined fan and odor removing means located within the storage chamber and at a side thereof from said cooling means, said fan being so positioned and arranged as to maintain the air in the storage chamber in forced circulation within said chamber, and to draw the air from the cooling means and through the storage chamber to the odor removing means and then deliver the purified air to and over the cooling means.

2. A refrigerator having a compartment for the storage of odorous foods, a refrigerant evaporating element attached to one of the walls of said compartment, a fan housing within said compartment, having an air inlet and an air outlet nozzle, said outlet nozzle being so positioned as

to direct a stream of air over the evaporating element, an odor removing means mounted within said compartment and located adjacent the air inlet of the fan housing and a fan mounted within the fan housing for drawing the air from the compartment through said odor removing means and into the fan housing whereupon said air is delivered from said housing by the fan through the outlet nozzle.

3. A refrigerator cabinet having a compartment for the storage of odorous foods, a refrigerant cooling unit mounted at one side of said compartment, a fan and odor removing means mounted in said compartment and located at a side of the compartment from that of said cooling unit, said fan drawing the air from the cooling unit and storage compartment through the odor removing means, and delivering at a high velocity the purified air from the odor removing means to the cooling unit, said fan causing some of the air in said compartment to be delivered to the cooling unit with the purified air.

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