March 5, 1963 R. C. BROWN ETAL 3,079,770

AIR FLOW THROUGH REFRIGERATOR CABINET MACHINE COMPARTMENT

Filed Dec. 21, 1961 2 Sheets-Sheet 1

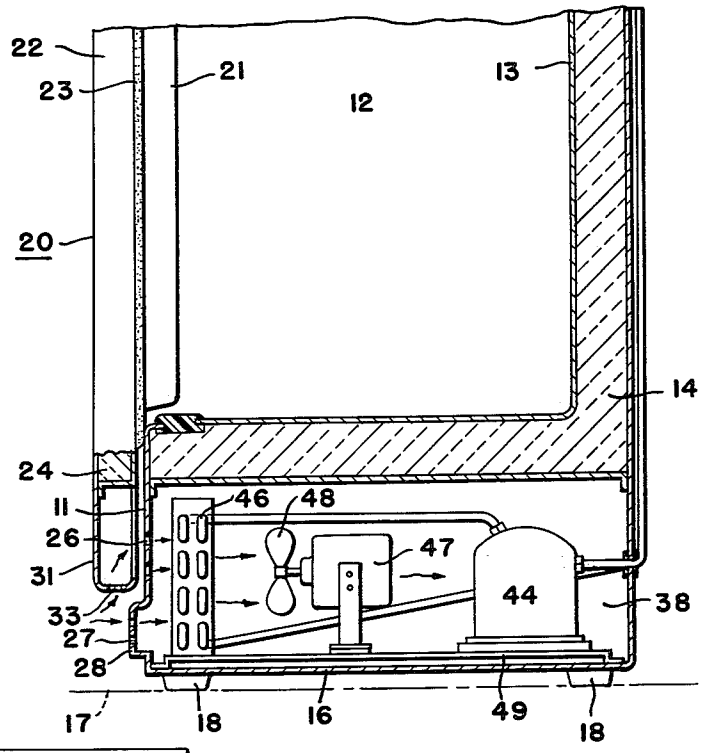


Fig. 2

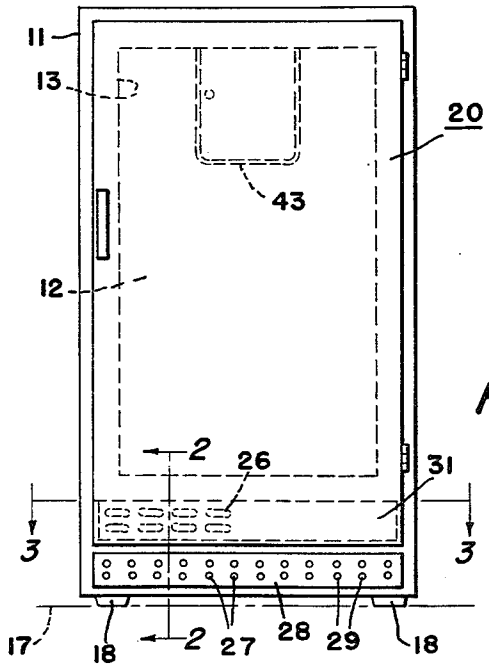


Fig. 1

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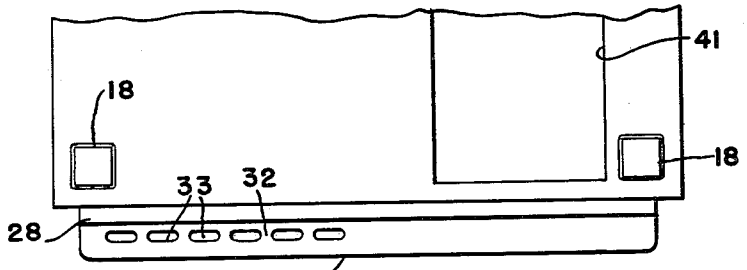


Fig. 5

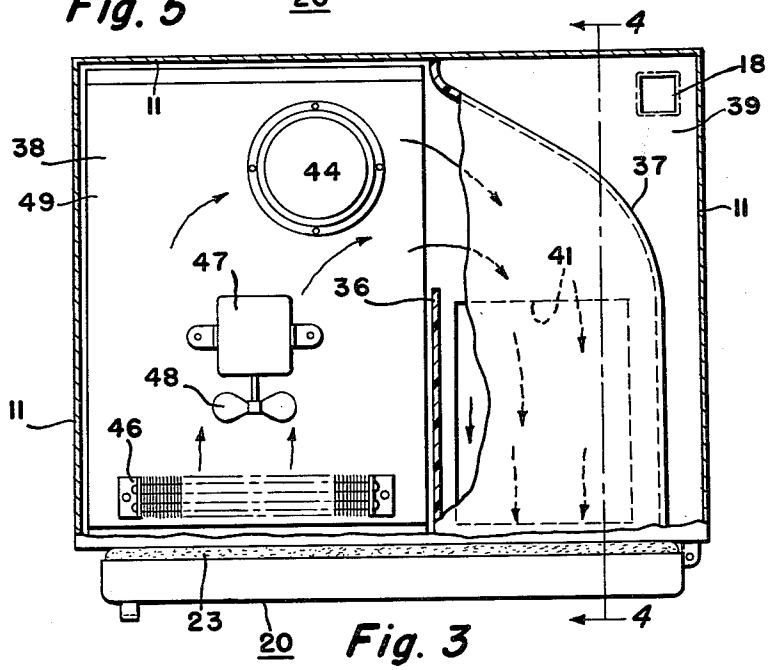


Fig. 3

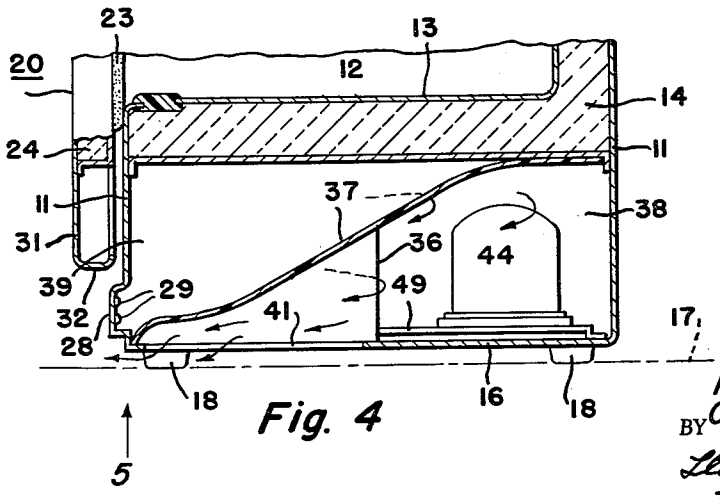


Fig. 4

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AIR FLOW THROUGH REFRIGERATOR CABINET MACHINE COMPARTMENT

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This invention relates to refrigerating apparatus and particularly to a household refrigerator cabinet having a refrigerating system associated therewith employing an air-cooled refrigerant condenser.

In the use of household refrigerators provided with a lower machine compartment wherein air after being circulated over a refrigerant condenser disposed in the compartment and heated thereby is discharged out of the front of the cabinet into a room in which the refrigerator is located, women, upon approaching the cabinet or upon opening and closing a refrigerated chamber door thereof, object to the blast or stream of heated air egressing from the lower machine compartment striking their legs. This has resulted in complaints being lodged with manufacturers of household refrigerators and we contemplate reducing or eliminating such objection.

An object of our invention is to provide an improved air cooling arrangement for a refrigerant condenser of a refrigerating system associated with a household refrigerator cabinet.

Another object of our invention is to provide an air cooling arrangement for a refrigerant condenser of a refrigerant translating device of a refrigerating system located in a lower machine compartment of a refrigerator cabinet which will cause the condenser cooling air after being heated by circulation thereof over surfaces of the condenser to be discharged from the compartment and diverted away from the cabinet in a direction toward the hingedly mounted door side of the cabinet at which side a woman infrequently stands during the act of transferring food to and from the refrigerator.

A further object of our invention is to provide an air ingress opening or openings in the front wall of a machine compartment of a refrigerator cabinet at least some of which openings are normally concealed from view by an extension formed on a door of a food storage chamber in the cabinet while permitting air to enter the machine compartment through the door extension when the door is closed.

A still further and more specific object of our invention is to provide a household refrigerator cabinet wherein air heated in its passage over a refrigerant condenser located in a lower machine compartment of the cabinet is discharged forwardly thereof through an open portion of the compartment bottom wall in a direction paralleling a floor upon which the cabinet is supported or in substantially the same plane of the floor to prevent the stream of heated discharging air from being directed against and over the legs of a person standing in front of the refrigerator.

Other objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein a preferred embodiment of the present invention is clearly shown.

In the drawings:

FIGURE 1 is a front elevational view of a refrigerator cabinet having our invention embodied therein;

FIGURE 2 is a fragmentary vertical sectional view taken on the line 2—2 of FIGURE 1 with the refrigerator cabinet door shown partly in elevation and partly in section;

FIGURE 3 is a horizontal sectional view taken on the line 3—3 of FIGURE 1 through the lower machine compartment of the refrigerator cabinet partly in section and partly in elevation;

FIGURE 4 is a vertical sectional view through one portion of the machine compartment taken on the line 4—4 of FIGURE 3 showing egression of air therefrom; and

FIGURE 5 is a fragmentary bottom view of the refrigerator cabinet taken in the direction of the arrow 5 in FIGURE 4 showing an air outlet in one portion of the lower wall of the machine compartment of the cabinet.

Referring to the drawings, for illustrating our invention, we show in FIGURE 1 thereof a refrigerating apparatus of the household type including a cabinet having a plurality of metal walls 11 forming or enclosing a food storage chamber 12 bounded by a metal liner member 13 and surrounded by suitable or desirable insulating material 14 (see FIGURE 2). The outer cabinet walls 11 depend below the insulated chamber 12 to form a machine compartment in the lower-most portion of the cabinet. Upright depending walls 11 form the front, back and sides of a machine compartment which is also provided with a bottom wall 16. These walls may be fabricated from a shell or separate panels as is conventional in the cabinet art and are herein illustrated integral with one another for the sake of simplicity. The refrigerator cabinet is supported upon and spaced above a floor, indicated by the line 17, by suitable adjustable levelling supports or feet 18 depressed from corner portions of the machine compartment bottom wall 16. Food storage chamber 12 may contain a conventional shelving arrangement and is provided with an access opening in the front of the cabinet which is normally closed by a door structure generally represented by the reference numeral 20 hingedly mounted at one side of the cabinet for horizontal swinging movement relative thereto. Door 20 comprises spaced apart inner and outer pans or panels 21 and 22, respectively, preferably provided with a magnet containing gasket 23 attracted to metal walls of the cabinet for sealing the chamber access opening and insulating material 24 is disposed between the door panels in the vicinity of the food chamber 12. The upright cabinet wall 11 at the front of the machine compartment is provided with an opening or spaced apart sets of a plurality of openings 26 and 27 throughout one-half of the width of the cabinet on the side thereof opposite the hinge side of door 20 (see FIGURES 1 and 2). Here, it is to be understood that our improvement is entirely feasible irrespective of whether or not we employ the lower-most opening or set of openings 27 in the machine compartment upright front wall 11 since they may be omitted without departing from the scope of our invention. The lower set of openings 27 are located in a forwardly extended or embossed rectangular part 28 of cabinet front wall 11 and the other or right-hand half, as viewed in FIGURE 1 of the drawings, of wall part 28 is provided with a plurality of closed depressions 29 (see FIGURES 1 and 4) conforming to or matching the openings 27 to thereby form a substantially uniform patterned appearance along the length of wall part 28. It is to be noted that the outer metal panel 22 of food chamber door structure 20 has a portion 31 depending from the insulated portion thereof provided with an integral horizontal flange 32 (see FIGURES 4 and 5) inturned toward the front of the refrigerator cabinet. A plurality of apertures or openings 33 (see FIGURES 2 and 5) are provided in flange 32 of the depending portion 31 of door panel 22 on the one side thereof below the set of openings 26 in front wall 11 of the machine compartment. Depending portion 31 of door 20 conceals the set of openings 26 from view exteriorly of the

refrigerator cabinet while door 20 is closed and yet permits ingress of air to the machine compartment through apertures or openings 33 and 26, respectively. A combined partition and air tunnel forming member is suitably secured within the machine compartment of the refrigerator cabinet. This member may be a single molded plastic element or it may be formed of fastened-together molded plastic elements and includes a vertical part 36, located in the center of the machine compartment, and a downwardly and forwardly curved part 37 (see FIGURES 3 and 4) extending laterally from its vertical part across the one side of the machine compartment at a point therein in back of the hinged mounting of door 20 upon the refrigerator cabinet. The combined partition and air tunnel forming member divides the machine compartment into two sections 38 and 39 (see FIGURE 3) communicating with one another. The front edge of the curved part 37 of the combined partition and tunnel member is terminated in the front lower corner of section 39 of the machine compartment at the junction of upright wall 11 with the compartment bottom wall 16 (see FIGURE 4). Machine compartment bottom wall 16 is provided with an open or apertured portion 41 (see FIGURES 3, 4 and 5) located in the front part of section 39 of the compartment for egress of air therefrom.

A refrigerating system is associated with the refrigerator cabinet and has a refrigerant evaporator 43 (see FIGURE 1) for cooling the interior of food storage chamber 12, a refrigerant translating device including a casing 44 containing a refrigerant compressor and an electric motor for driving the compressor and an air cooled refrigerant condenser 46. Casing 44 and condenser 46 are mounted upon a platform 49 located in section 38 of the machine compartment of the refrigerator cabinet. The elements 43, 44 and 46 of the refrigerating system are connected to one another by conduits in closed refrigerant flow relationship as is conventional and well known in the art. Any suitable or desirable thermostatic switch or the like (not shown) and also well known to those skilled in the art may be employed to energize and/or de-energize the motor is casing 44 for starting and stopping operation of the refrigerant compressor in the casing. Refrigerant compressed by the compressor is directed into the condenser 46 to be cooled and liquified prior to its circulation into the evaporator 43 for evaporation therein. In order to cool and liquify refrigerant received in condenser 46, we provide an electric motor 47 for driving a blower or fan 48 located in the machine compartment which forces air over the condenser 46. The condenser may be of any conventional type and is herein shown as being of the finned tube character. Motor 47 may be energized simultaneously with energization of the electric motor which drives the refrigerant compressor.

Operation of the refrigerating system and of motor 47 causes fan or blower 48 to draw air into the machine compartment of the refrigerator cabinet through the inlet opening or openings 27 and opening or openings 26 by way of the apertures 33 provided in flange 32 of extension 31 on food chamber door 20. This incoming air to section 38 of the machine compartment flows over the refrigerant condenser 46, over casing 44 and is directed downwardly in section 39 of the compartment by the combined partition and air tunnel forming member 36—37, to cool condenser 46 and casing 44. The combined partition and tunnel member then directs the air, warmed by removing heat from condenser 46 and casing 44, outwardly of the machine compartment through the open portion 41 in its bottom wall 16 forwardly of the front of the refrigerator cabinet substantially at the plane of the floor 17 and intermediate the floor and the height of the inlet opening or openings 26, 27 and 33 at the front of the machine compartment. Warmed or heated air is discharged from the lower machine compartment only at the front side of the refrigerator cabinet to which the food chamber door 20 is hingedly mounted. A great percent of usage of the refrigerator by a housewife does not necessitate her standing at this point in front of the cabinet because during such usage the refrigerator cabinet door is only partially opened, in the transition of food products to and from the refrigerated food storage chamber, and the housewife usually stands adjacent the front side of the refrigerator opposite the side thereof to which door 20 is mounted. Thus during this usage of the refrigerator cabinet a housewife is not at all subjected to heated air emitted from the lower machine compartment thereof. Furthermore, and by virtue of discharging heated air out of the machine compartment of the refrigerator cabinet near or adjacent the floor upon which the cabinet is supported, even if the heated air flows outwardly of the cabinet throughout the entire width of the front thereof, the air does not strike the ankles of a housewife's legs and, therefore, is not objectionable since it is admixed with room air and is of infinitely small temperature differential relative thereto before rising and contacting her legs. By our invention, we provide an improved air cooling arrangement for a refrigerant condenser located in a lower machine compartment of a refrigerator cabinet which eliminates objections to former arrangements incorporated in such refrigerators and increases saleabiilty of refrigerators employing a circulation of air into and out of the front of a machine compartment thereof.

While the embodiments of the present invention as herein disclosed constitute preferred forms, it is to be understood that other forms might be adopted.

What is claimed is as follows:

1. A refrigerating apparatus comprising in combination:

(*a*) a cabinet provided with a plurality of walls defining the top, bottom, unpright front, back and sides of a food storage chamber and a machine compartment therein below said chamber,

(*b*) said chamber having a single access opening in the upright front wall of said cabinet extending substantially entirely thereacross,

(*c*) a door hingedly mounted on said cabinet adjacent one upright side wall thereof for closing the chamber access opening,

(*d*) the bottom wall of said compartment being spaced by means thereat supporting said cabinet upon a floor,

(*e*) a refrigerating system associated with said cabinet having an evaporator cooling the interior of said chamber, a refrigerant translating device including a refrigerant condenser within said compartment and conduits connecting said evaporator, said device and said condenser in refrigerant flow relationship,

(*f*) the upright back and side walls of said machine compartment together with that portion of the front wall thereof extending substantially from a point centrally of the width of said cabinet to its one side upon which said door is hinged being closed,

(*g*) the other portion of said compartment front wall being provided with an inlet opening,

(*h*) a front part of said compartment bottom wall behind and adjacent said closed portion of its front wall being open for egress of air from the compartment,

(*i*) means for forcibly circulating air into said machine compartment and outwardly thereof,

(*j*) said condenser being located within walls of the compartment immediately behind the inlet opening in said front wall thereof whereby the condenser is wholly disposed in the path of air as it enters said compartment before the incoming air contacts other heat dissipating elements therein, and

(*k*) the air circulated by said circulating means being

discharged downwardly out of said compartment at a height below said inlet opening close to said floor intermediate same and the compartment bottom wall in a direction forwardly of said cabinet along said closed portion of said compartment front wall.

2. A refrigerating apparatus comprising in combination:

(*a*) a cabinet provided with a plurality of walls defining the top, bottom, upright front, back and sides of a food storage chamber and a machine compartment therein below said chamber,

(*b*) said chamber having an access opening in the upright front wall of said cabinet,

(*c*) a door hingedly mounted on said cabinet for closing the chamber access opening,

(*d*) a refrigerating system associated with said cabinet having an evaporator cooling the interior of said chamber, a refrigerant translating device including a refrigerant condenser within said compartment and conduits connecting said evaporator, said device and said condenser in refrigerant flow relationship,

(*e*) the front upright wall of said machine compartment being provided with an opening for admission of air into the compartment,

(*f*) said door having an outer panel depending therefrom below said chamber and concealing the air inlet opening in said upright front wall of said compartment,

(*g*) said depending portion of the outer door panel having a horizontal flange inturned toward the front wall of said cabinet and provided with apertures therein for flow of air to the opening in said compartment front wall, and

(*h*) means for forcibly circulating air through the apertures in said door flange while the door is closed and through the opening in said front wall of the machine compartment over said condenser therein thence out of said compartment by way of an opening in another wall thereof.

3. A refrigerating apparatus comprising in combination:

(*a*) a cabinet provided with a plurality of walls defining the top, bottom, upright front, back and sides of a food storage chamber and a machine compartment therein below said chamber,

(*b*) said chamber having an access opening in the upright front wall of said cabinet,

(*c*) a door hingedly mounted on said cabinet for closthe chamber access opening,

(*d*) a refrigerating system associated with said cabinet having an evaporator cooling the interior of said chamber, a refrigerant translating device including a refrigerant condenser within said compartment and conduits connecting said evaporator, said device and said condenser in refrigerant flow relationship,

(*e*) the front upright wall of said machine compartment being provided with an opening for admission of air into the compartment,

(*f*) said door having an outer panel depending therefrom below said chamber and concealing the air inlet opening in said upright front wall of said compartment,

(*g*) said depending portion of the outer door panel having a horizontal flange inturned toward the front wall of said cabinet and provided with apertures therein for flow of air to the opening in said compartment front wall,

(*h*) a front part of the compartment bottom wall being open for egress of air therefrom,

(*i*) means for forcibly circulating air through the apertures in said door flange while the door is closed and through the opening in said front wall of said machine compartment over said condenser therein, and

(*j*) said circulating means discharging air out of said compartment through the open part of its bottom wall forwardly of the front of said cabinet below said door closely adjacent said floor.

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