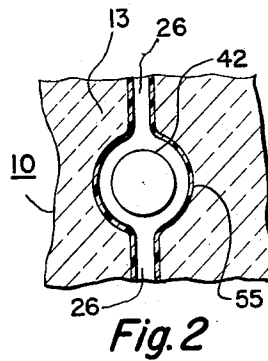


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O. V. SAUNDERS
REFRIGERATING APPARATUS
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REFRIGERATING APPARATUS

Orson V. Saunders, Dayton, Ohio, assignor to General Motors Corporation, Detroit, Mich., a corporation of Delaware

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This invention relates to refrigerating apparatus and particularly to household refrigerators of the multiple-compartment type.

More specifically the present invention has to do with the improving and simplifying of a household refrigerator of a type such as disclosed in the copending applications of Leonard J. Mann S.N. 633,109, filed January 8, 1957 and L. J. Mann and Edward C. Simmons S.N. 725,652, filed April 1, 1958 both assigned to the assignee of this application. These copending applications disclose a refrigerator capable of conveniently and economically providing a wide variety of refrigeration such as rapid food freezing, frozen food storage at about 0° F. and the keeping in food preserving temperatures above freezing of vegetables, fruits and left-over foods from a dinner table. In refrigerators of the type exemplified in these copending applications it has been necessary to associate an electric heater with one or the inner end of a condensate drain conduit leading from an upper food storage compartment thereof and to extend the conduit outside the rear portion of the refrigerator cabinet around a lower low temperature food storage compartment in order to prevent, under the extreme low temperature of this lower compartment, freezing of water received in the conduit. Such an electric heater adds an element to the refrigerator and consequently increases its retail price and also the cost to a purchaser thereof in operating the refrigerator. The extension of a drain conduit outwardly of the cabinet back wall around the lower freezing or frozen food storage compartment in addition to being unsightly also subjects the drain conduit to being damaged or fractured. I contemplate the elimination of an electric heater for a condensate water drain conduit of a refrigerator, the locating of such a conduit wholly within walls of the refrigerator cabinet and warming of the conduit so located by an essential heat dissipating element employed in the refrigerator to prevent water received in the conduit from being frozen therein. Briefly I accomplish this by utilizing heat generated by a motor of a fan or blower which circulates air within a refrigerated compartment of the refrigerator for warming a drain conduit thereof.

It is an object of my invention to provide an improved household refrigerator cabinet in which its condensate water drain conduit is warmed in a novel manner to maintain the same free or open for draining water from a compartment therein.

Another object of my invention is to arrange a heat dissipating element employed in a refrigerator cabinet in heat transfer relationship with a condensate water drain conduit thereof for heating the conduit.

A further object of my invention is to locate a motor of a household refrigerator which drives a fan or blower for circulating cold air in a refrigerated compartment of the refrigerator within a portion of a condensate water drain conduit thereof so that heat generated by operation of the motor will be dissipated therefrom into the conduit for warming same.

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A still further and more specific object of my invention is to locate a condensate water drain conduit for the upper compartment of a multiple-compartmented refrigerator cabinet wholly within walls of the cabinet which conduit extends around or across a lower low temperature compartment in the cabinet and to warm the conduit above freezing so that the extreme low temperature of the lower compartment will not freeze water received therein whereby to at all times maintain the conduit open.

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

In the drawing:

Figure 1 is a transverse vertical sectional view of a rectilinear shaped household refrigerator in which my invention is embodied; and

Figure 2 is a sectional view taken on the line 2—2 of Figure 1 showing an electric motor disposed in a portion of a condensate water drain conduit of the refrigerator.

Referring to the drawing, for illustrating my invention, I show in Figure 1 thereof a multiple-chambered refrigerator cabinet 10 having suitable insulated walls defining an upper unfrozen food storage compartment 11 and a lower frozen food storage compartment 12 therein and isolated or insulated from one another. Insulation 13 within walls of cabinet 10 may be of any desired or conventional material. Upper compartment 11 is cooled to a temperature above freezing such, for example, as between 37° and 43° F. by a plate-like refrigerant evaporating means or evaporator 14 of a closed refrigerating system associated with the refrigerator. Lower compartment 12 is cooled to a temperature well below 32° F. and preferably between 0° and 10° F. by another evaporator or refrigerant evaporating means 15 of the refrigerating system associated with cabinet 10 for freezing foods, storing frozen foods and/or for freezing water in freezing devices into ice blocks for table use in chilling salads or the like and drinks in glasses. A door 16 hingedly mounted on cabinet 10 closes the access opening of food storage compartment 11 and another separate door 17, also hingedly mounted on cabinet 10, closes the access opening of the lower frozen food storage compartment 12. Both the upper and the lower compartments 11 and 12 respectively may be provided with sliding shelves or the like which are not, for the sake of simplicity, shown in the drawing. Compartment 11 is provided with a false rear wall 18 behind which is a vertical air passage 19 containing the plate-like evaporator 14. The bottom of air passage 19 is provided with a fan or blower 21 having its inlet communicating with compartment 11 and its outlet discharging air from compartment 11 into the passage 19. An electric motor 22 operates or drives fan or blower 21. The top of passage 19 is provided with an outlet device 23 at an opening in wall 18 which spreads air cooled by evaporator 14 and discharged from the passage 19 into the top portion of compartment 11. Since compartment 11 is maintained above freezing temperatures no frost will form therein but frost may form on evaporator 14. If any moisture should condense within compartment 11 or the evaporator 14 be defrosted the condensate or defrost water may flow from passage 19 through an outlet 24 provided in the liner of compartment 11 and into a non-metallic drain conduit 26, connected to the outlet 24, for conducting this water out of the upper food storage compartment. A strap 28 of high heat conductive metal is secured to electric motor 22 and surrounds or is wrapped about the top portion of conduit 26 in contact therewith so as, in

accordance with my invention, to transmit heat generated by this motor to the upper portion of the conduit to prevent freezing of water therein at this point.

The compartment 12 beneath food compartment 11 includes a box-like liner having integral top, side and rear walls 31, 32 and 33 respectively and a bottom wall 34. Bottom wall 34 is inclined downwardly from the front to the rear of compartment 12 and serves to drain water from this compartment to a drain conduit 36. Wall 34 supports the vertically finned refrigerant evaporating conduit means or evaporator 15 and its fins extend from the front to the rear thereof. The evaporator 15 in turn supports a false bottom 37 provided with an integral upright rear portion 38 forming an inlet shroud for a fan or blower 39 located behind an aperture 41 in wall 33. Fan or blower 39 is directly connected to an electric motor 42 located outside compartment 12 for driving or operating same. The inlet shroud 38 for fan 39 is secured or sealed to rear wall 33 of compartment 12. The fan 39 is surrounded by a shroud 43 which is spaced from but joined to the rear wall 33 of compartment 12 to provide a discharge passage 44 therebetween. Air is drawn from compartment 12 through openings 45 in the front portion of the compartment walls 31 and 32 by way of a suitable inverted U-shaped manifold 46 over evaporator 15 by fan or blower 39 whereby the air is cooled to an extremely low temperature. Fan or blower 39 discharges the air cooled by evaporator 15 into passage 44 and forces this air therefrom through openings 47 near the top of compartment 12 thereinto over and around packages of frozen food stored therein. The refrigerator 10 includes suitable controls, such as those diagrammatically illustrated in the L. J. Mann copending application hereinbefore identified, for the refrigerating system associated therewith to periodically start and/or stop blowers 21 and 39 and the compressor driving motor of the system. These controls function to cause evaporator 15 to maintain a temperature of approximately 5° F. within compartment 12 and to alternately lower and raise the temperature of evaporator 14 below and above freezing, which is now conventional in the art, whereby evaporator 14 is self-defrosted. The condensate or defrost water flows out of passage 19 into compartment 11 and enters drain conduit 26 by way of the outlet 24. In other words evaporator 14 is cyclically defrosted to increase the air cooling efficiency thereof while evaporator 15 maintains compartment 12 at its predetermined low temperature. A suitable timer or the like may be employed to energize a sheathed electric heater 51, located in the upper portion of notches provided in the fins of evaporator 15, to periodically defrost evaporator 15 say, for example, once each day. The bottom wall 34 of compartment 12 drains defrost water from evaporator 15 into a combined drain and water seal device 52. Device 52 includes the tube 36 and other associated elements as shown and more fully described in the Mann and Simmons copending application hereinbefore identified. Tube 36 of device 52 is provided with a connection to the lower end of drain conduit 26.

Due to the close proximity of drain conduit 26 relative to walls of the low temperature or freezing compartment 12 of cabinet 10 water received in this conduit may be frozen therein and will block or obstruct flow thereof therefrom into drain device 52. In accordance with my invention I augment the warming of conduit 26 by motor 22 and the metal strap 28 to prevent freezing of water received in the conduit with heat dissipated from an essential heat generating element employed in cabinet 10. Drain conduit 26 is preferably constructed or formed of non-metallic molded plastic material and is provided, intermediate its upper and lower ends, with an enlarged circular portion 55 (see Figure 2). Motor 42, for driving or operating blower 39, is disposed within the enlarged portion 55 of drain conduit 26 and may be sup-

ported therein in any suitable or desirable manner. The motor 42 is substantially sealed and drain water flowing into contact therewith and thereover will not impair its operation. A part of motor 42 projects through an opening in conduit 26, opposite enlarged portion 55 thereof, and walls of this opening may fit snugly against or be sealed to the motor casing. By this construction the motor 42 of blower 39 and also the motor 22 of blower 21 is in heat transfer relationship with the condensate water drain arrangement within refrigerator cabinet 10 and both motors 22 and 42 warm substantially the entire length of conduit 26. In other words heat generated by motor 22 is transferred, by metal conduction strap 28, to the upper portion of conduit 26 and heat generated by motor 42 is dissipated directly into drain conduit 26. By warming conduit 26 in this manner I prevent condensate water received therein from freezing under the influence of the extreme low temperature of compartment 12. Condensate water is drained out of compartment 11 and flows through conduit 26 into the tube 36 of the drain and water seal device 52. Defrost water from evaporator 15 also flows into tube 36. The water accumulates in device 52 and overflows a lower tube arrangement at the bottom thereof. Water conducted out of the insulated wall portion of cabinet 10 is directed into an evaporating pan 56 located in a machine compartment at the bottom of the cabinet which compartment normally houses a refrigerant superheat removing conduit coil 57, a refrigerant condenser 58 and a motor-compressor unit 59 of the closed refrigerating system associated with the refrigerator. Heat dissipated from these elements of the refrigerating system will evaporate the defrost or condensate water out of pan 56 into air ambient the refrigerator cabinet 10. Tube 36 and other elements of drain and water seal device 52 are constructed of rubber-like material and absorb heat dissipated from the elements in the machine compartment of the refrigerator cabinet to prevent freezing of water received in device 52.

From the foregoing it should be apparent that I have provided an improved refrigerator construction wherein drain conduits are confined within walls of the cabinet and are heated in a novel manner to prevent freezing of water received in the conduits. By utilizing heat generated by essential elements employed in the refrigerator for warming drain conduits therein I eliminate the necessity of providing electrically energized heating elements associated with such conduits and consequently the resultant expense of energizing heating elements during use of the refrigerator cabinet. The drain and water seal device in the present arrangement serves to seal both drain conduits for the upper and the lower food storage compartments and thus eliminates the necessity of providing separate air, vermin or insect traps for the two conduits. The drain conduits are confined within insulated walls of the cabinet to thereby eliminate extension thereof out of the cabinet walls where they may become damaged in shipping the cabinet or in moving same from one locality to another.

While the form of embodiment of the invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted, as may come within the scope of the claims which follow.

What is claimed is as follows:

1. In combination, a refrigerator cabinet having insulated walls defining an upper food storage compartment and a lower food storage compartment therein isolated from one another, a refrigerating system associated with said cabinet including a first refrigerant evaporating means for cooling said upper compartment to a temperature above 32° F. and a second refrigerant evaporating means for cooling said lower compartment to a temperature well below 32° F., a fan for circulating air in said lower compartment over said second refrigerant evaporating means, a motor for driving said fan, a

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drain conduit for conducting condensate water out of said upper compartment, said conduit being confined within walls of said cabinet and extending downwardly from said upper compartment across said lower compartment, and said fan motor being disposed in heat exchange relationship with said drain conduit whereby heat generated by the motor warms same to prevent the low temperature of said lower compartment from freezing water received therein.

2. In combination, a refrigerator cabinet having insulated walls defining an upper food storage compartment and a lower food storage compartment therein isolated from one another, a refrigerating system associated with said cabinet including a first refrigerant evaporating means for cooling said upper compartment to a temperature above 32° F. and a second refrigerant evaporating means for cooling said lower compartment to a temperature well below 32° F., a fan for circulating air in said lower compartment over said second refrigerant evaporating means, a motor for driving said fan, a drain conduit for conducting condensate water out of said upper compartment, said conduit being confined within walls of said cabinet and extending downwardly from said upper compartment across said lower compartment, and said fan motor being disposed within a portion of said drain conduit whereby heat generated by the motor is dissipated into said conduit to warm same and prevent the low temperature of said lower compartment from freezing water received therein.

3. In combination, a refrigerator cabinet having insulated walls defining an upper food storage compartment and a lower food storage compartment therein isolated from one another, a refrigerating system associated with said cabinet including a first refrigerant evaporating means for cooling said upper compartment to a temperature above 32° F. and a second refrigerant evaporating means for cooling said lower compartment to a temperature well below 32° F., a fan for circulating air in said lower compartment over said second refrigerant evaporating means, a motor for driving said fan, a drain conduit for conducting condensate water out of said upper compartment, a drain conduit for conducting condensate water out of said lower compartment, said first named conduit being connected to said second named conduit within an insulated wall of said cabinet, and said motor being arranged in heat transfer relationship with one of said drain conduits so as to be heated thereby.

4. In combination, a refrigerator cabinet having insulated walls defining an upper food storage compartment and a lower food storage compartment therein isolated from one another, a refrigerating system associated with said cabinet including a first refrigerant evaporating means for cooling said upper compartment to a temperature above 32° F. and a second refrigerant evaporating means for cooling said lower compartment to a temperature well below 32° F., a fan for circulating air in said lower compartment over said second refrigerant evaporating means, a motor for driving said fan, a drain conduit for conducting condensate water out of said upper compartment, a drain conduit for conducting condensate water out of said lower compartment, said drain conduits being confined within walls of said cabinet and said first named conduit extending downwardly from said upper compartment across said lower compartment, said first named conduit having a connection to said second named conduit within an insulated wall of said cabinet, and said fan motor being disposed in heat exchange relationship with said first named drain conduit whereby heat generated by the motor warms same to prevent the low temperature of said lower compartment from freezing water received therein.

5. In combination, a refrigerator cabinet having insulated walls defining an upper food storage compartment and a lower food storage compartment therein isolated

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from one another, a refrigerating system associated with said cabinet including a first refrigerant evaporating means for cooling said upper compartment to a temperature above 32° F. and a second refrigerant evaporating means for cooling said lower compartment to a temperature well below 32° F., a fan for circulating air in said lower compartment over said second refrigerant evaporating means, a motor for driving said fan, a drain conduit for conducting condensate water out of said upper compartment, a drain conduit for conducting condensate water out of said lower compartment, said drain conduits being confined within walls of said cabinet and said first named conduit extending downwardly from said upper compartment across said lower compartment, said first named conduit having a connection to said second named conduit within an insulated wall of said cabinet, and said fan motor being disposed within an enlarged portion of said first named drain conduit whereby heat generated by the motor is dissipated thereinto to warm the interior thereof and prevent the low temperature of said lower compartment from freezing water received therein.

6. In combination, a refrigerator cabinet having insulated walls defining an upper food storage compartment and a lower food storage compartment therein isolated from one another, a refrigerating system associated with said cabinet including a first refrigerant evaporating means for cooling said upper compartment to a temperature above 32° F. and a second refrigerant evaporating means for cooling said lower compartment to a temperature well below 32° F., a fan adjacent the back wall of said lower compartment for circulating air over said second refrigerant evaporating means, a motor confined within the insulated back wall of said cabinet and directly connected to said fan for operating same, a drain conduit also confined in the insulated back wall of said cabinet for conducting condensate water out of said upper compartment downwardly around the back of said lower compartment in close proximity thereto, and at least a portion of said conduit being arranged in heat transfer relationship with said motor.

7. In combination, a refrigerator cabinet having insulated walls defining an upper food storage compartment and a lower food storage compartment therein isolated from one another, a refrigerating system associated with said cabinet including a first refrigerant evaporating means for cooling said upper compartment to a temperature above 32° F. and a second refrigerant evaporating means for cooling said lower compartment to a temperature well below 32° F., a fan adjacent the back wall of said lower compartment for circulating air over said second refrigerant evaporating means, a motor confined within the insulated back wall of said cabinet and directly connected to said fan for operating same, a drain conduit also confined in the insulated back wall of said cabinet for conducting condensate water out of said upper compartment downwardly around the back of said lower compartment in close proximity thereto, at least a portion of said conduit being enlarged relative to other portions thereof, and said fan motor being disposed within said enlarged conduit portion for dissipating heat generated thereby into the conduit.

8. In a refrigerator, a cabinet having a plurality of insulated walls defining a food storage compartment therein, a refrigerating system including a refrigerant evaporator for cooling said compartment, a blower for circulating air in said compartment over said evaporator, a motor for operating said blower, a conduit depending from said compartment through the insulation in a wall of said cabinet for draining condensate water out of the compartment, means for warming said drain conduit to prevent freezing of water received therein, said means comprising a metallic member secured to said motor and contacting said conduit whereby heat generated by the motor is conducted to the conduit, and said conducting member being embedded in said insulation

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and isolated from cool air circulated in said compartment by said blower.

9. In a refrigerator, a cabinet having a plurality of insulated walls defining a food storage compartment therein, a refrigerating system including a refrigerant evaporator for cooling said compartment, a blower for circulating air in said compartment over said evaporator, a motor for operating said blower, a conduit depending from said compartment through the insulation in a wall of said cabinet for draining condensate water out of the compartment, and said motor being disposed within said

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drain conduit for dissipating heat generated thereby to the interior of the conduit to prevent freezing of water received therein.

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