

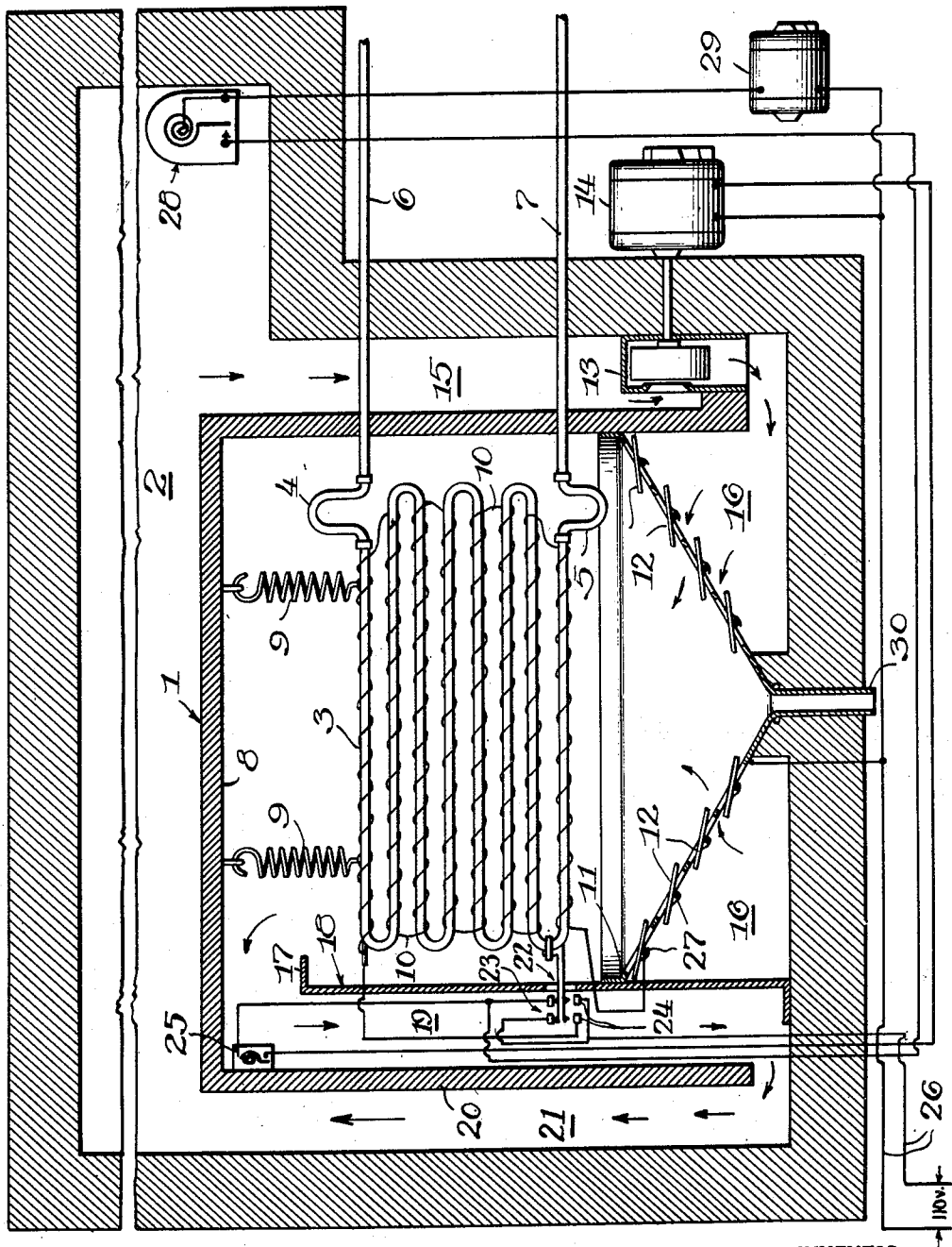
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HEAT DOME TRAP FOR DEFROSTING REFRIGERATORS

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HEAT DOME TRAP FOR DEFROSTING REFRIGERATORS

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The present invention relates to a defrosting heat trap construction and especially to a novel system and manner of defrosting refrigerators by employing a heat dome trap which isolates the defrosting chamber and quickly and effectively defrosts the expansion or cooling coils.

The novel invention comprehends isolating the expansion or cooling coils and so mounting these coils that defrosting is automatically accomplished when a predetermined weight of frost or ice collects on these coils, the heat generated during the defrosting operation being trapped and prevented from entering the refrigerated area. This isolation of the defrosting chamber is accomplished without the use of louvers or pressure-actuated air valves or other means, and by retaining the heat rising in the trap by natural convection assists in and expedites the defrosting operation.

The invention further comprehends a novel defrosting system and means for automatically initiating and performing the defrosting operation whenever the accumulation of frost or ice reaches a predetermined amount on the expansion or cooling coils.

A further object of the present invention is the provision of a novel control system for the defrosting heat trap construction whereby to automatically initiate the defrosting operation by heating the expansion or cooling coils when they have accumulated a predetermined weight of ice, and to automatically disconnect such heating means when the excess weight has been removed from the coils. The control system includes a novel system of switches so constructed and arranged as to positively control the blower and compressor whereby when heat is supplied to the cooling coils the circuit to the blower and compressor is automatically opened.

Further objects are to provide a construction of maximum simplicity, efficiency, economy and ease of assembly and operation, and such further objects, advantages and capabilities as will later more fully appear and are inherently possessed thereby.

The invention further resides in the construction, combination and arrangement of parts illustrated in the accompanying drawing, and while there is shown therein a preferred embodiment it is to be understood that the same is susceptible of modification and change and comprehends other details, arrangements of parts, features and constructions without departing from the spirit of the invention.

The drawing shows diagrammatically a de-

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frosting heat trap construction for a refrigerator or deep freeze unit of the type employed for storing and preserving food.

As shown in the drawing, the present novel heat dome trap for defrosting the refrigerator is shown as mounted within an enclosure 1 suitably insulated from the refrigerated area 2 for receiving and preserving foods or other perishables. This enclosure forms an insulated heat trap open only at the bottom and in which is mounted the expansion or cooling coils 3 connected through flexible connections 4 and 5 to the conduits or pipes 6 and 7, respectively, leading to the refrigerator condensing unit (not shown). These expansion or cooling coils are shown as suspended from the top 8 of the enclosure 1 by means of flexible mountings or springs 9 whereby these coils may move in accordance with their weight and that of any accumulated frost or ice collecting thereon. Encompassing or wrapped about these cooling coils is a heater coil 10 adapted to be energized to heat these cooling coils and to defrost them when a predetermined quantity or weight of frost or ice collects thereon. It is to be understood that any suitable heating means other than that specifically shown and described may be utilized to defrost the cooling coils.

Disposed below the cooling coils is a drain pan or collecting trough 11 provided in its side walls with a plurality of louvers or baffle plates 12 mounted and adapted to permit the passage of air from the refrigerated area 2 to the cooling coils and to prevent liquid, when defrosting the cooling coils, from entering the space 16 in a manner hereinafter described. A blower 13 is operated by its motor 14 to thereby draw air from the refrigerated area 2 downwardly through the passage 15 into the space 16 encompassing the lower portion of the drain pan 11, and then upwardly through the openings afforded by the baffles or louvers 12. This air is confined within the enclosure 1 and passes upwardly over the expansion or cooling coils and then over the upper end 17 of a baffle 18 disposed within the heat dome or trap and which restricts the flow of air so that it must flow over the cooling coils, and then downwardly through the passage 19 between the baffle 18 and wall 20 of the enclosure 1 and upwardly through the passage 21 to be again discharged in the refrigerated area containing the food or other perishables.

Mounted upon or associated with the cooling coils is a switch 22, the contacts of which are adapted to be moved into engagement with either set of contacts 23 or 24. Of the contacts 23, one

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is connected to a temperature controlled blower switch 25 and from it to the blower motor 14, and the other to one side of the supply line 26, while one of the contacts 24 is connected to the heater coil 10 which is connected in series with a heater coil 27 surrounding the drain pan 11 and then to one side of the electrical supply line and the other to the other side of the supply line.

Mounted within the refrigerated area or chamber 2 is a thermostat switch 28 for controlling the operation of the compressor motor 29. In normal operation the thermostat 28 operates the compressor 29 whenever the temperature in the chamber or refrigerated area 2 becomes sufficiently high or reaches a predetermined point, and this motor operates the condensing unit for the refrigerator for reducing the temperature of the expansion or cooling coils 3. When the air beneath the insulated dome in the enclosure 1 is reduced to the proper temperature, the temperature controlled blower switch or thermostat control 25 operates to energize the blower motor 14 and blower 13 circulates air from the refrigerated area 2, down the passage 15 and into the space 16, from where it must pass over the cooling coils 3, end 17 of the baffle 18, down the passage 19, upwardly into the passage 21 and back into the refrigerated area to complete its cycle. Thus whenever the temperature within the insulated heat trap or dome in the enclosure has been reduced to the proper value, the thermostat switch 25 operates to energize the blower motor 14 to cause the above circulation.

After an accumulation of ice or frost collects on the expansion or cooling coils in such an amount as to weigh down the coils sufficiently to trip the switch 22 from the position shown in the drawing, the switch is opened or disengaged from the contacts 23 and thereby breaking its connection to the fan motor 14 and to the compressor motor 29. The compressor motor 29 is shown connected through one lead to one side of the current supply 26 and its other lead is connected through the thermostat 28 and its lead wire to one of the contacts 23 so that when the switch 22 engages the contacts 23, the circuit of the compressor motor 29 is closed to the current supply through the thermostat 28. At the same time that the contacts 23 to the fan and compressor motors are opened, the contacts 24 are closed by the switch 22 and the heater wires or coils 10 and 27 connected in series and wrapped around the cooling coils 3 and drain pan 11 are energized. Upon energizing these heater coils, the cooling coils, drain pan and louvers are heated and the ice or frost is melted off of the cooling coils and drips in the form of water into the pan 11. By maintaining this pan and louvers, heated during the defrosting operation, any water dropping therein will not freeze but drains through the outlet or pipe 30 and is conveyed from the refrigerator and the positioning and size of the louvers 12, disposed in the openings in the drip pan, are such as to prevent the liquid falling from the cooling coils from entering the space 16 therebelow. It is to be noted that during this defrosting operation the fan motor 14 and compressor motor 29 are prevented from operating as they are disconnected by the switch 22.

Any heat generated by the heating coils 10 and 27 rises by natural convection to the top of the heat dome or trap and is there retained and prevented from entering the refrigerating area 2 because the inlet and the outlet to the enclosure are located at the lower portion thereof. As this

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dome or trap is insulated by the enclosing walls, no heat is transferred therefrom but is retained and assists in the defrosting operation.

When sufficient frost or ice has melted from the cooling coils or evaporator 3, this resiliently mounted coil assembly returns to its normal position as shown in the drawings and the switch 22 opens the contacts 24 to deenergize the heating elements 10 and 27 and closes the circuit through the contacts 23 whereby contact is again established with the fan motor 14 and the compressor motor 29, and the latter will begin operation provided the temperature in the refrigerated area has reached such a value high enough to actuate the thermostat 28. When the temperature in the refrigerated area 2 increases sufficiently, the compressor motor starts and operates the condensing unit to reduce the temperature of the cooling coils or evaporator 3 and when they have reduced the temperature of the air under the heat dome or trap to the desired amount, thermostat switch 25 operates to energize the motor 14 and start the circulating fan or blower 13 in the manner heretofore described. Thus none of the heat trapped or collected within the dome during defrosting can enter the refrigerated area as the thermostat switch 25 prevents the blower 13 from operating until the temperature of this trapped air is reduced to the desired value.

It is to be understood that the particular thermostatic controls shown and described may be modified to a certain degree as, for example, by placing the blower motor 14 under control of both of the thermostats without departing from the spirit of the invention, or it may under certain conditions be desirable to eliminate one or the other of the thermostats.

In addition, the particular location of the blower or air circulating means 13 and baffle 18 is not critical in that the blower may, for example, be disposed at the opposite or outlet side of the enclosure and the baffle may be positioned to direct the incoming air upward and then downward over the cooling coils toward the outlet or be in any other suitable location.

From the foregoing it will be apparent that a means for defrosting the evaporator for a refrigerated chamber has been provided which is devoid of any necessity for special doors or movable sealing devices during the defrosting operation and that the heat applied for defrosting is not transferred to the refrigerated chamber to thereby minimize temperature fluctuations therein.

Having thus disclosed my invention, I claim:

1. In a refrigerating system including a refrigerated chamber, a compressor motor, a blower and expansion coils for cooling the air circulated thereover by the blower, an enclosure for the expansion coils, thermostatic controls in the refrigerated chamber for controlling the operation of the compressor motor and in the enclosure for controlling the operation of the blower, and means for automatically defrosting the expansion coils when a predetermined quantity of ice or frost collects thereon and opening the circuit to the blower and compressor motor during such defrosting, whereby the heat incident to the defrosting operation rises within the enclosure but is entrapped and prevented from escaping into the refrigerated chamber.

2. In a refrigerating system including a refrigerated chamber, a blower, a compressor motor and expansion coils for cooling the air circulated thereover by the blower, an insulated enclosure for the expansion coils, thermostatic controls

in the refrigerated chamber for controlling the operation of the compressor motor and in the enclosure for controlling the operation of the blower, and means for automatically heating and defrosting the expansion coils when a predetermined quantity of ice or frost collects thereon and opening the circuit to the blower and compressor motor during such defrosting, whereby the heated air in the enclosure rises and is entrapped within the dome of the enclosure, the thermostatic control for the blower delaying operation of the latter until the temperature of this air is cooled sufficiently to be returned to the refrigerated chamber.

3. In a refrigerating system including a refrigerated compartment and cooling coils for cooling air circulating thereover, a blower for drawing air from the refrigerated compartment and forcing it over the cooling coils and back to the compartment, an enclosure for isolating the cooling coils during defrosting thereof, and means for automatically heating the cooling coils and simultaneously disconnecting the blower for defrosting the coils when a predetermined quantity of ice or frost collects thereon, said enclosure receiving and entrapping the heated air resulting from defrosting.

4. In a refrigerating system including a refrigerated area and cooling coils for cooling air circulating thereover, a blower for drawing air from said refrigerated area and blowing it over the cooling coils and back to the refrigerated area, an enclosure open only at the bottom for isolating the cooling coils from the refrigerated area and provided with a heat trap in the dome of the enclosure, means actuated by the coils when a predetermined quantity of frost or ice collects thereon for opening the circuit to the blower to stop further circulation of the air from the refrigerated area and for supplying heat for defrosting the coils, the heated air resulting from defrosting collecting in the dome of the enclosure and being trapped therein, and means for delaying the operation of the blower until such time as the temperature of the air in the enclosure is lowered to a predetermined value.

5. In a refrigerating system of the type employing a refrigerated food storage compartment and cooling coils over which the air from the latter is circulated, a heat dome trap providing a chamber disposed below and insulated from the food storage compartment and enclosing the cooling coils, means for circulating the air from the refrigerated compartment to the chamber, over the cooling coils and back to the refrigerated compartment, means for heating and thereby defrosting the cooling coils, and means for operating the heating means when a predetermined quantity of frost or ice accumulates upon the coils and simultaneously stopping the air circulating means whereby the heat resulting from such defrosting is entrapped within the chamber and prevented from entering the refrigerated compartment.

6. In a refrigerating system of the type employing a refrigerated chamber and cooling coils over which the air from the refrigerated chamber is circulated, a heat dome trap providing an enclosure disposed below the refrigerated chamber and enclosing and insulating the cooling coils from the refrigerated chamber except for an inlet and an outlet adjacent the lower end of the trap, means for circulating the air from the refrigerated chamber through the inlet to the enclosure, over the cooling coils, through the

outlet and back to the refrigerated chamber, and means for automatically defrosting said coils when a predetermined quantity of ice or frost accumulates on the coils and interrupting said air circulating means during such defrosting whereby the heat resulting from the defrosting operation is prevented from leaving the trap.

7. In a refrigerating system employing coils for cooling a refrigerated compartment, a chamber having an inlet and an outlet at the lower portion thereof, refrigerating means including cooling coils mounted within the chamber and upon which ice or frost accumulates, a blower for circulating air from the refrigerated compartment through the inlet and to and over the cooling coils, through the outlet and back to the compartment, means for automatically heating and defrosting the cooling coils when a predetermined quantity of ice or frost collects on these coils and stopping operation of the blower and circulation of the air, whereby the heat resulting from the defrosting operation is entrapped within the chamber and prevented from entering the refrigerated compartment, and means for preventing operation of the blower when the temperature in the chamber is above a predetermined value.

8. In a refrigerating system including a refrigerated food storage chamber, an enclosure separated from the chamber and having a substantially imperforate top and side walls provided at the lower portion thereof with a pair of apertures constituting an inlet and an outlet opening in communication with said chamber, a baffle disposed in said enclosure separating the inlet and outlet openings, an evaporator in said enclosure for cooling air therein and upon which moisture accumulates, a compressor motor, a blower for circulating air from the refrigerated chamber through the enclosure and over the evaporator for cooling and back to the refrigerated chamber, switch means for terminating the operation of the blower and the compressor motor when a predetermined quantity of frost has accumulated on said evaporator, and heating means operative when said switch means is operated to apply heat to said evaporator to defrost the same, the top and side walls of said enclosure being utilized to restrict the flow of heat therefrom during the defrosting operation.

9. In a refrigeration system including a refrigerated food storage chamber, a compressor motor, a thermostatic control responsive to the temperature in the chamber for controlling the operation of the compressor motor, an evaporator adapted to cool said chamber and upon which moisture collects, an enclosure surrounding said evaporator having an inlet and an outlet disposed in the lower portion thereof in communication with said chamber, a blower for withdrawing air from said chamber and circulating the same over said evaporator and back to the chamber, a control for the blower disposed in the enclosure, heating means for the evaporator, switch means responsive to the accumulation of frost on said evaporator for terminating the operation of the compressor motor and the blower and causing operation of the heating means to remove the moisture from the evaporator, said enclosure being so positioned with respect to the chamber that the heat in said enclosure is not transferred to the chamber, and means for conducting the moisture from said enclosure, said switch means being operative upon removal of the accumulation of frost from the evaporator to terminate the heating of the evaporator and to condition

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the compressor motor and blower for operation.

10. In a refrigerating system including a refrigerated food storage chamber, a compressor motor, a thermostatic control responsive to the temperature in said chamber for controlling the operation of said compressor motor, an evaporator adapted to cool said chamber and upon which moisture accumulates, an enclosure surrounding said evaporator and having an air inlet and an air outlet disposed at the lower portion of said enclosure, a drain plate having a drain passage disposed below said evaporator, a blower for withdrawing air from the chamber and circulating the same through said enclosure and back to the chamber, a heater for said evaporator and said drain pan, switch means responsive to the accumulation of a predetermined quantity of moisture on said evaporator for terminating operation of the compressor motor and the blower to thereby isolate the enclosure from the chamber and operative to energize the heater causing heating of the evaporator and the drain pan to remove moisture from the former and prevent freezing of the same to the latter, and said switch means being responsive by the removal of moisture to deenergize the heater and to condition the compressor motor and blower for operation, and means responsive to the temperature in the enclosure for delaying the operation of the blower until the enclosure temperature has reached a predetermined low value.

11. In a refrigerating system including a refrigerated food storage chamber, a compressor motor, a thermostatic switch responsive to the temperature in said chamber for controlling the operation of said compressor motor, an evaporator adapted to cool said chamber and upon which moisture accumulates, an enclosure surrounding the evaporator to isolate the same from said chamber, said enclosure being provided with an air inlet and an air outlet below the evaporator, a slotted drip pan disposed under said evaporator, a blower for circulating air from the chamber through the enclosure back to the chamber, a control device for controlling the operation of said blower, electric heating means for the evaporator and the drip pan, switch means responsive to the accumulation of moisture on the evaporator for temporarily terminating operation of the compressor motor and the blower and for energizing said heating means to defrost the evaporator and maintain the drip pan above the freezing temperature of water, and responsive upon the removal of moisture from the evaporator to deenergize the heating means and to condition the compressor motor and the blower for operation, and said blower control device being so adjusted as to prevent operation thereof until the temperature in said enclosure has reached a predetermined low value.

12. In a refrigerator, the combination of a food storage chamber, refrigerating means including an evaporator adapted to cool the chamber, control means responsive to the temperature in said chamber for operating the refrigerating means, an enclosure of insulating material disposed about said evaporator and having a pair of openings therein and in direct communication with the chamber below the evaporator and providing a trap for the air therein, a blower for circulating air from said chamber through one of said openings and over the evaporator in said enclosure, a temperature control device disposed in the enclosure for controlling the operation of said blower, heating means in said enclosure, and

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means for interrupting the operation of the blower and the refrigerating means independently of the control device and for energizing the heating means to apply heat to said enclosure for defrosting said evaporator, the openings in the enclosure being so positioned that the heat for defrosting is not transmitted therethrough to the chamber, said last mentioned means being operated upon removal of a substantial portion of frost to terminate operation of the heating means and to reestablish the control to the blower and refrigerating control means, and said blower control device being so adjusted as to prevent blower operation until the temperature in the enclosure has reached a predetermined low value.

13. In a refrigerator, the combination of a refrigerated food storage chamber, refrigerating means including an evaporator adapted to cool the chamber and upon which moisture accumulates, control means for operating the refrigerating means, an enclosure separate from the chamber and disposed about the evaporator, said enclosure having an air inlet and an air outlet in the lower portion thereof in communication with the chamber and being substantially imperforate elsewhere, a drip pan disposed below the evaporator, a heater for removing moisture from the evaporator, means for applying heat to the drip pan to prevent freezing of moisture falling from the evaporator, a drain opening for conducting moisture from the drip pan, a blower for circulating air from the chamber through the enclosure for cooling and back to the chamber, and control means for the blower for terminating operation of the same when the temperature in the enclosure is above a predetermined high value.

14. In a refrigerator, the combination of a refrigerated food storage chamber, refrigerating means including an evaporator adapted to cool the chamber and upon which moisture accumulates, control means for operating the refrigerating means, an enclosure separate from the chamber and disposed about said evaporator, said enclosure being provided with a drain opening and an air inlet and an air outlet in communication with the chamber, a blower for circulating air from the chamber through the enclosure for cooling and back to the chamber, switch means for controlling the operation of said refrigerating means and blower, a heater disposed in said enclosure for applying heat to the evaporator and lower portion of the enclosure for defrosting, said heater being energized by the switch means upon the accumulation of a predetermined quantity of moisture on the evaporator, whereupon the operation of the blower is terminated and the lower portion of the enclosure is heated to prevent moisture removed from the evaporator from freezing thereat and permit the same to flow through the drain opening, said switch means being operative upon the removal of a substantial portion of the moisture from the evaporator to terminate operation of the heating means and to condition the refrigerating means and blower for operation, and control means for the blower retarding the operation of the same until after the refrigerating means has been put into operation to cool the enclosure.

15. In a refrigerator, the combination of an upper refrigerated food storage chamber, a lower compartment constituting an enclosure insulated from the chamber and having an air inlet and an air outlet to provide for communication between the chamber and compartment, refriger-

ating means including an evaporator disposed in the enclosure, a blower for circulating air to be cooled from the chamber through the inlet of the enclosure, over the evaporator, through the outlet and back to the chamber, and thermostatic means in the enclosure and responsive to the temperature of the air therein for controlling the operation of the blower and preventing its operation when the temperature of the air in the enclosure is above a predetermined value.

16. In a refrigerating system including a refrigerated food storage chamber and cooling coils over which air from the food storage chamber is circulated, a blower for circulating air from the food storage chamber to and over the cooling coils and back to the chamber, an enclosure for the cooling coils separating the latter from the chamber except for an inlet and an outlet opening for circulation of the air when the blower is

operating, and thermostatic control means in the enclosure and responsive to the temperature of the air therein for controlling the operation of the blower and preventing its operation until the temperature in the enclosure reaches a predetermined low value.

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