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C. A. STICKEL

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REFRIGERATING APPARATUS

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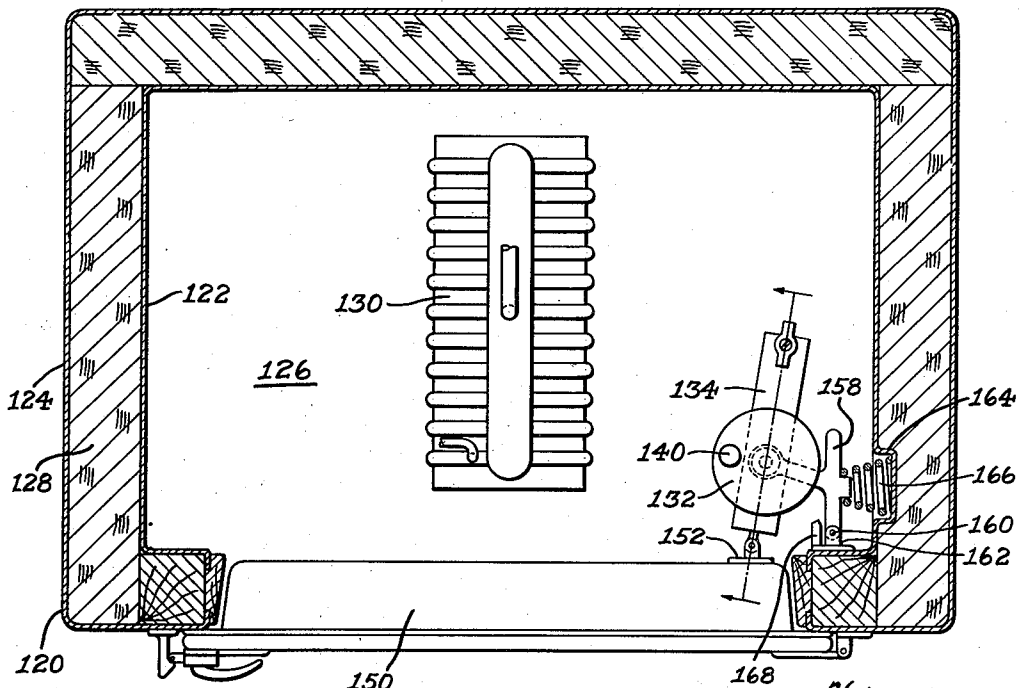


Fig. 3

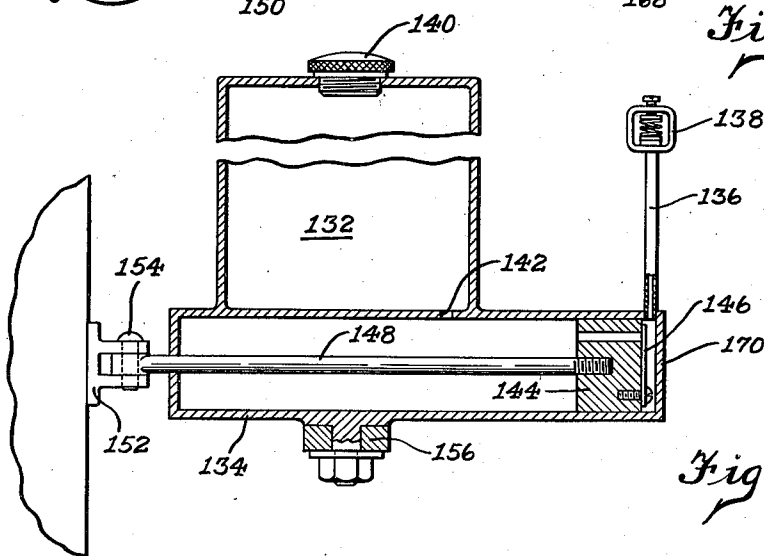


Fig. 4

INVENTOR.

Carl A. Stickel

BY

Spencer Hardman and John
ATTORNEYS

UNITED STATES PATENT OFFICE

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REFRIGERATING APPARATUS

Carl A. Stickel, Dayton, Ohio, assignor to General Motors Corporation, Dayton, Ohio, a corporation of Delaware

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This invention relates to refrigerating apparatus and more particularly to humidifying means for refrigerator cabinets.

It has been found that the addition of moisture to the atmosphere in refrigerator cabinets used for preserving foodstuffs makes it possible to better preserve the food and particularly prevents dehydration of the food. It, therefore, has been proposed to connect an atomized supply within refrigerator cabinets to one of the water pipes in the dwelling or building where the cabinet happens to be located. This, however, necessitates a plumbing connection which is often undesirable.

It is an object of my invention to provide an electric refrigerator with a self-contained atomizing device for humidifying the atmosphere within the refrigerator cabinets.

It is a further object of my invention to provide a self-contained atomizing device which will derive the power for its operation from one of the parts of the apparatus.

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 drawings:

Fig. 1 is a fragmentary sectional view of a portion of a domestic refrigerator embodying one form of my invention;

Fig. 2 is a sectional view of the atomizer nozzle proper, shown in Fig. 1.

Fig. 3 is a horizontal sectional view through a domestic electric refrigerator embodying another form of my invention; and

Fig. 4 is a sectional view of the atomizing device shown in Fig. 3.

Briefly, in Fig. 1, I have shown an atomizing device comprising a water reservoir, a pump and an atomizing nozzle in which the pump is operated by a volatile fluid which is in heat exchange relation with the refrigerant evaporating means so that its temperature is intermittently raised and lowered during the idle and operating periods of the intermittent refrigerating apparatus. The rise and fall of the temperature of the evaporating means increases and reduces the pressure of the volatile liquid so that the pump is operated to create a sufficient water pressure to provide an atomizing spray.

In Figs. 3 and 4, I have shown another form in which the piston of a pump is connected to the refrigerator cabinet door so that when the door is opened and closed, water is pumped from a

reservoir to an atomizer nozzle. The pump is resiliently mounted so that some of the energy used in closing the door is stored up in a spring which, through its resiliency, causes a further actuation of the pump after the door is closed.

Referring now to the drawings, and more particularly to Fig. 1, there is shown a refrigerating apparatus including an insulated domestic refrigerator cabinet 20 having inner metal walls 22 enclosing a food compartment 24 and outer metal walls 26 surrounding, but spaced from the inner metal walls 22. Insulating means 28 fills the space between the inner and outer metal walls to oppose heat leak into the food compartment. In order to cool the atmosphere within the food compartment 24, there is provided a refrigerant evaporating means 30 located directly within the food compartment 24, surrounded by the atmosphere thereof.

This refrigerant evaporating means 30 is connected to a refrigerant liquefying means 32 comprising a compressor 34 driven by an electric motor 36 for compressing the refrigerant and for forwarding the compressed refrigerant to a condenser 38 where the compressed refrigerant is liquefied and collected in a receiver 40. From the receiver 40, the liquid refrigerant is forwarded through a supply conduit 42 under the control of a suitable liquid cold control device 44 such as an elongated orifice or restrictor which controls the flow of liquid refrigerant to an evaporating means 30. The liquid refrigerant evaporates under reduced pressure within the evaporating means 30 and is returned to the compressor through the return conduit 46. The temperature of the evaporating means is intermittently reduced by the operation of the refrigerant liquefying means 32 which is under the control of a snap acting switch means 48 connected in series with the compressor motor 36 and operated by a thermostatic bulb 50 located in direct heat exchange relation with the evaporating means 30.

When the evaporating means 30 reaches a predetermined high temperature limit, the snap acting switch means 48 closes, causing the operation of the refrigerant liquefying means which continues until the evaporating means 30 has reached a predetermined low temperature limit. After the operation of the refrigerant liquefying means ceases, the temperature of the evaporating means 30 again rises and finally reaches the temperature at which the liquefying means is again operated. The evaporating means 30 may be provided with shelves for supporting ice trays 52 by which ice may be frozen. The evaporating means may

either operate above or below freezing temperatures except when it is desired to freeze ice which requires a freezing temperature.

The evaporating means in maintaining a desired low temperature of the atmosphere of the food compartment 24, necessarily must be at a lower temperature than the atmosphere of the food compartment 24 in order to remove heat therefrom. This causes the condensation of moisture and sometimes the frosting of the evaporator 30 to incidentally dehydrate or dry the atmosphere within the food compartment 24. This dehydration makes the atmosphere within the food compartment 24 undesirably dry for the preservation of most food stuffs.

According to my invention, I provide self-contained atomizing means for adding moisture to the atmosphere of the food compartment 24. My self-contained atomizing device avoids all plumbing connections. In Fig. 1 this takes the form of a unitary system including a reservoir 60 for water, a diaphragm pump 62 which is operated through the rise and fall in temperature of a thermostatic bulb 64 which is a part of a volatile fluid system connected to the pump by a tube 66. The operation of the diaphragm pump creates a water pressure which forces the water in the form of an atomizing spray from the atomizer nozzle 68.

More specifically, the reservoir 60 is provided with a removable lid 70 by which water may be added to the reservoir from time to time as may be necessary. The reservoir is connected by tubing 72 to the inlet sump or chamber 74 of the diaphragm pump 62. This sump or chamber 74 is provided with an outlet leading into the pumping chamber 78 controlled by a leaf spring type of flapper valve which acts as a check valve to control the flow of fluid into the water pumping chamber 78 of the diaphragm pump 62. The water pumping chamber 78 is operated from the fluid pressure chamber 80 by a diaphragm 82 of some suitable rubberlike material which may be provided with fabric or metal reinforcement. Preferably, this rubberlike material contains a polymer of chloro-2-butadiene-1,3 known commercially as "Duprene".

The fluid pressure chamber 80 is connected by the tube 66 to the thermostat bulb 64 which contains, as mentioned before, a volatile fluid. The rise in temperature of the evaporating means during the idle period of the liquefying means 32 expands the volatile fluid in the thermostatic bulb 64 and creates a pressure within the fluid pressure chamber 80 which forces the diaphragm 82 from its mid position toward the outer wall of the water pumping chamber 78 against the resilient force of the compression spring 84 to force water from the water pumping chamber out through the outlet controlled by the spring flapper valve 86. The spring flapper valve 86 acts as a check valve to control the discharge of fluid from the water pumping chamber 78 into the discharge valve chamber 88 which is connected by tubing 90 to the atomizer nozzle 68, from which the water pumped is sprayed into the atmosphere of the food compartment 24 in an atomizing spray.

When the liquefying apparatus again operates, the refrigerant evaporating means 30 is reduced in temperature, thus cooling the volatile liquid within the thermostatic bulb 64 and reducing the fluid pressure within the fluid chamber 80. This fluid pressure may be reduced below atmospheric, in which case the water from the reservoir 60

would enter the water pumping chamber 78 under the control of the valve 76 under atmospheric pressure. However, the spring 84 is provided for aiding the operation of the diaphragm, particularly in case the pressure within the fluid pressure chamber does not go below atmospheric. This reduction in pressure causes the diaphragm 82 to be moved toward the outer wall of the fluid pressure chamber 80 so that pumping chamber 78 is thus enlarged to draw water into it through its inlet valve 76. As outlined above, when the operation of the liquefying means is stopped, the pressure rises and the water is then expelled from the pumping chamber and conveyed to the atomizer nozzle.

The atomizer nozzle is better shown in Fig. 2 and is provided with a flanged seat 92 at the upper end of the pipe 90 upon which rests a spring loaded valve 94 held in position by a compressing spring 96, held at its upper end by a spring retainer 98 fastened to the lower end of an adjusting screw 102 supported by the yoke 104, which in turn is held by the flange 92 and the pipe 90. In the operation of this nozzle, when sufficient water pressure is created in the pipe 90, the valve 94 is lifted a slight amount off its seat 92 which permits a very fine and thin film of water to spread in all directions between the seating faces of the flange 92 and the valve 94 which provides an atomized spray. This atomized spray is taken up by the dehydrated atmosphere in the cabinet to humidify its atmosphere. Thus, I have provided a self-contained atomizing device which receives the energy required for its operation from the rise and fall in temperature of the evaporating means. However, if desired, the rising and falling temperature of the atmosphere itself in the food compartment may be used to operate the pump.

In Figs. 3 and 4, I have shown another form of my invention in which there is provided a cabinet 120 having inner metal walls 122 and outer metal walls 124 enclosing the food compartment 126 of a domestic electric refrigerator. Between the inner and outer walls, there is provided insulating means 128 for reducing the heat leak into the food compartment. Within the food compartment 126, is a refrigerant evaporating means 130 for removing heat from the atmosphere in the food compartment. Dehydration is incidentally performed causing the atmosphere thereof to be too dry for the ideal preservation of food. In order to add humidity to the atmosphere of the food compartment, I provide within the food compartment a water reservoir 132 which supplies water to a piston type pump 134 which has extending from its outlet a vertical pipe 136 provided with an atomizer nozzle 138 at its upper end, similar to that shown in Fig. 2. The reservoir 132 is provided with a filler cap 140 at its upper end. This reservoir 132 is cast integrally with the pump 134 and has an outlet 142 leading directly into the cylinder of the pump.

The pump is provided with a piston 144 provided with a spring leaf type of piston valve 146. The piston 144 is connected by a piston rod 148 to the refrigerator cabinet door 150 which is pinned to the piston rod 148 by the pin 154. The reservoir 132 and the pump 134 are rotatably mounted by a rotatable connection 156 with a Y-shaped arm 158 which is pivotally connected by the pivotal connection 160 to the bracket 162 fastened to the inner wall of the food compartment 126. Between the arm 128 and a recessed portion 160 of the inner wall of the food com-

partment is a conical compression type coil spring 166 which urges the arm 158 in a counter-clockwise direction about its pivotal connection 162 so that the spring 166 tends to urge the piston 144 to the head end 170 of the cylinder.

When the door is opened, the piston rod 148 is pulled outwardly and the spring 166 forces the arm 158 to rotate in a clockwise direction about its pivotal connection 160 until the arm 158 engages the stop 168, after which the piston 144 is drawn through the cylinder of the pumping chamber so that water passes through the piston under the control of the valve 146 and enters the space between the piston and the cylinder head 170. The piston 144 may be drawn all the way to the opposite end of the cylinder, but the location of the outlet 142 of the reservoir 132 limits the amount of water that may be trapped in a pumping chamber so as to limit the amount of water to be pumped and the pressure created when the door is closed.

When the door is closed, the water is trapped between the piston 144 and the cylinder head 170 and a pressure is created within the pumping chamber which causes a resistance to further movement of the piston 144 with respect to the cylinder head 170 so that the Y-shaped arm 156 is moved in a clockwise direction to compress the spring 166. This creates a water pressure which forces water out from the atomizer nozzle 138, thus providing an atomizing spray for the atmosphere within the cabinet each time the door is closed. After the door is closed, the spring 166 moves the cylinder and cylinder head 170 with respect to the piston to force water from the pumping chamber out from the atomizer nozzle until the spring 166 has reached substantially its full limit of expansion. This provides a very simple means for providing an atomizing device in a refrigerator. The reservoir may be filled from time to time as necessary. The evaporating means 130 may be kept at any desired temperature above or below freezing. Of course, a higher evaporator temperature is preferred providing it is sufficient to maintain the food compartment at the proper temperature.

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, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. Refrigerating apparatus including an insulated refrigerator cabinet means having a door and a door opening, a cooling means in heat exchange relation with the interior of the cabinet, means for intermittently reducing the temperature of said cooling means, an atomizer within

said cabinet means energized by the variations in temperature of said cooling means for spraying an atomized liquid within said cabinet means.

2. Refrigerating apparatus including an insulated refrigerator cabinet means having a door and a door opening, a cooling means in heat exchange relation with the interior of the cabinet, means for intermittently reducing the temperature of said cooling means, a self contained atomizer within the cabinet means including a supply reservoir, a pump having its inlet connected to said supply reservoir, an atomizer nozzle connected to the outlet of said pump, said pump including means operated by the variations in temperature of said cooling means for pumping a liquid from the supply reservoir to the atomizer nozzle.

3. Refrigerating apparatus including an insulated refrigerator cabinet containing a compartment to be kept cool, a cooling means in heat exchange relation with said compartment, and an atomizer energized by temperature variations within said cabinet for spraying a liquid in atomized form within said compartment.

4. Refrigerating apparatus including an insulated refrigerator cabinet containing a compartment to be kept cool, a cooling means in heat exchange relation with said compartment, means for intermittently reducing the temperature of said cooling means, and an atomizer energized by temperature variations in said compartment for spraying a liquid in atomized form into said compartment.

5. Refrigerating apparatus including an insulated refrigerator cabinet containing a compartment to be kept cool, a cooling means in heat exchange relation with said compartment, and means energized by temperature variations in said cabinet for humidifying said compartment.

6. A storage cabinet including a closed compartment, means for varying the temperature of said compartment, and pump means energized by said temperature varying means for humidifying said compartment.

7. A storage cabinet including a closed compartment, means for varying the temperature of said compartment, and pump means energized by the varying temperature in said compartment for humidifying same.

8. Refrigerating apparatus including an insulated refrigerator cabinet containing a compartment to be kept cool, a cooling means in heat exchange relation with said compartment, means for cyclically reducing the temperature of said cooling means, and means energized by the cycles of said temperature reducing means for humidifying said compartment.

CARL A. STICKEL.