

July 30, 1940.

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HUMIDIFIER FOR MECHANICAL REFRIGERATORS

Filed Oct. 19, 1938

2 Sheets-Sheet 1

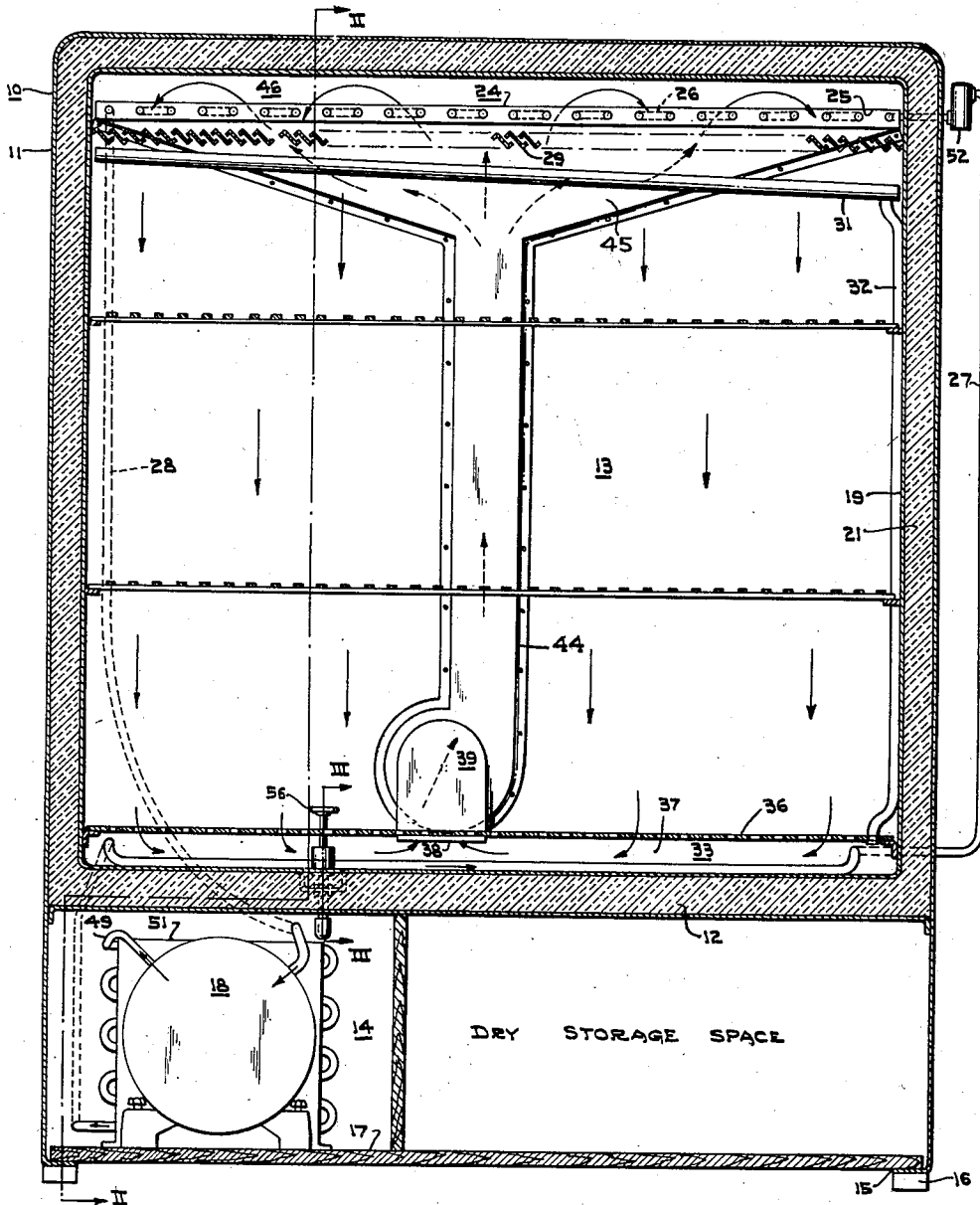


FIG. 1.

WITNESSES:

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2 Sheets-Sheet 2

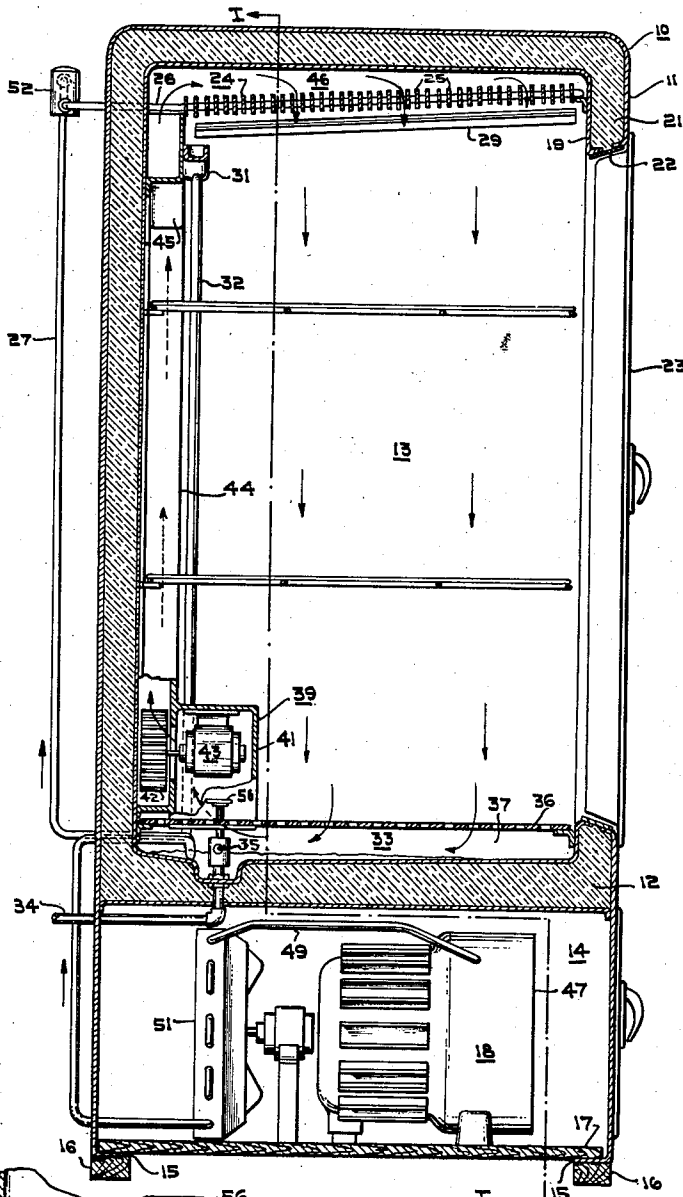


FIG. 2.

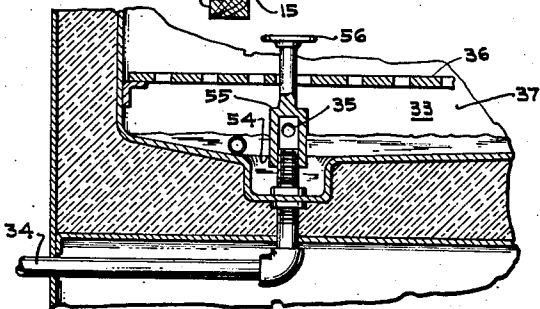


FIG. 3.

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## UNITED STATES PATENT OFFICE

2,209,431

## HUMIDIFIER FOR MECHANICAL REFRIGERATORS

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Application October 19, 1938, Serial No. 235,733

8 Claims. (Cl. 62-103)

This invention relates to mechanical refrigerators and more especially to a means for increasing and regulating the humidity of the refrigerated chamber. The invention is a continuation in part of my copending application, Serial No. 218,270, filed July 9, 1938 and assigned to the Westinghouse Electric & Manufacturing Company.

One object of the invention is to provide a means for increasing the humidity of the refrigerated chamber by raising the temperature of an exposed body of water therein.

Another object is to provide a means for regulating the humidity of the refrigerated chamber by controlling the exposed surface of a body of water therein.

These and other objects are effected by my invention as will be apparent from the following description and claims taken in connection with the accompanying drawings, forming a part of this application, in which:

Fig. 1 is a vertical section through the cabinet on the line I—I of Fig. 2, looking in the direction of the arrows;

Fig. 2 is a vertical section through the cabinet on the line II—II of Fig. 1, looking in the direction of the arrows; and,

Fig. 3 is a vertical section through the adjustable drain on the line III—III of Fig. 1, looking in the direction of the arrows.

Referring now to the drawings, numeral 10 designates a cabinet of conventional construction which comprises an outer shell 11 and a horizontal partition 12 therein. The partition 12 divides the cabinet 10 into an upper refrigerated food storage chamber 13 and a lower machine compartment 14. The bottom edges 15 of the shell 11 are turned inwardly and blocks 16 are secured to their lower surfaces to form feet on which the cabinet 10 rests. On the upper surfaces of the intumed edges 15 is a platform 17 upon which is secured a refrigerant liquefying unit 18 of the well-known compressor-condenser type.

The food storage chamber 13 comprises an inner shell 19 and heat insulating material 21 between adjacent portions of the inner shell 19 and the outer shell 11 and between the inner shell 19 and the partition 12. An opening 22 in the front wall and a hinged door 23 therein provide for access to the chamber 13. A cooling unit 24 or evaporator is located in the upper portion of the storage chamber 13 which unit 24 is secured in the food storage chamber 13 in a slightly inclined position. The cooling unit 24 comprises a series of parallel and spaced apart fins 25

through which a tube 26 passes back and forth. The tube 26 communicates through ducts 27 and 28 with the refrigerant liquefying unit 18.

Below and parallel to the cooling unit 24 is a series of Z-shaped channels 29 which channels overlap but are spaced from one another to permit the passage of air therebetween. These channels 29 catch the water which condenses and drops from the cooling unit 24 and conducts this water to a trough 31 from which it drains through a tube 32 passing through the refrigerating chamber 13 into a reservoir 33 formed in the bottom of the inner shell 19. A drain pipe 34 connects with this reservoir 33 but has its entrance opening 35 located somewhat above the bottom of the reservoir 33 so that the latter retains a small amount of water to humidify the refrigerated chamber 13.

A foraminated false bottom 36 is supported above the surface of the water to provide a space 37 through which air may be circulated. Connected with this space 37 is an inlet conduit 38 of a blower element 39 comprising a casing 41, a fan 42 and a motor 43 for driving the fan 42. The fan 42 draws the air from the space 37 and passes it through a vertical duct 44 located in the refrigerated chamber 13, through a divergent adapter 45 to the larger end of the tapered air space 46 above the cooling unit 24. From here the air flows through the cooling unit 24 through the space between the Z-shaped channels 29, through the refrigerated chamber 13, through the foraminations in the false bottom 36, over the water in the reservoir 33 where it is humidified and then recirculated by the fan 42.

The humidity obtained by this device, however, is usually not sufficient and means are, therefore, provided to slightly heat the water in the reservoir 33 to increase the evaporation thereof. This is done most economically by utilizing the heat of the liquid refrigerant as it leaves the compressor, as will be explained presently.

The refrigerant liquefying unit 18 comprises a casing 47 enclosing a motor-driven compressor (not shown) which withdraws refrigerant vapor from the evaporator 24 through a tube 28, compresses it, and passes it through a tube 49 to the condenser 51 wherein it is cooled and liquefied and then passes it through a tube 27 to an expansion valve 52 and thence to the evaporator 24. The refrigerant liquid in the tube 27 is still considerably above room temperature and a portion of this tube 27 is led through the water reservoir 33 to heat the water therein.

It will be observed that there is substantially no decrease in the efficiency of the refrigerating

cycle by heating the water in the reservoir 33 in this manner as the heat remaining in the liquefied refrigerant is usually dissipated by evaporation of or cooling by refrigerant in the system.

- It is also desirable to provide for varying the humidity of the food chamber 13. This is accomplished by sloping the bottom of the reservoir 33 upwardly from the portion of the tube 27 passing therethrough, as best shown in Fig. 2.
- The height of the entrance opening 35 of the drain pipe 34 is made adjustable by providing a cup-shaped depression 54 in the bottom of the reservoir 33 near the portion of the tube 27 in the reservoir 33 and arranging the drain pipe 34 so that a threaded portion of this pipe 34 projects upwardly through the bottom of the cup 54. An internally threaded hollow member 55 engages the thread of the drain pipe 34 and is provided with an opening 35 in its side which forms the entrance opening 35 referred to above. The hollow member 55 is also provided with a handwheel 56 by means of which it may be screwed upwardly or downwardly on the threaded end of the drain pipe 34 to change the elevation of the entrance opening 35 and thereby change the height of the water in the reservoir 33. The change in height of the water results in a change in the exposed surface of the water in the inclined bottom of the reservoir 33 and hence in the humidity of the food chamber 13 of the refrigerator.

From the above it will be apparent that this invention provides an efficient means for increasing the humidity of the food chamber of a mechanical refrigerator and further provides a means for regulating this humidity.

While I have shown my invention in but one form, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various changes and modifications therein without departing from the spirit thereof, and I desire, therefore, that only such limitations shall be placed thereupon as are imposed by the prior art or as are set forth in the appending claims.

What I claim is:

1. In a mechanical refrigerator, the combination of an insulated chamber, a water pan therein, an evaporative cooling unit for said chamber, means for conveying the condensate from said cooling unit to said water pan, a condenser exterior of the insulated chamber for condensing the refrigerant evaporated by said cooling unit, a tube for conducting the condensed refrigerant from said condenser to the evaporative cooling unit, said tube being in heat exchange relationship with the water normally in the water pan to increase the vaporization of said water and thereby increase the humidity of the air in the insulated chamber.
2. In a mechanical refrigerator, the combination of an insulated chamber, a water pan therein, an evaporative cooling unit for said chamber, means for conveying the condensate from said cooling unit to said water pan, means for circulating the air in said chamber over the surface of the water normally in the water pan, a condenser exterior of said insulated chamber for condensing the refrigerant evaporated by said cooling unit, a tube for conducting the condensed refrigerant from said condenser to the evaporative cooling unit, said tube being in heat exchange relationship with the water normally in the water pan to increase the vaporization of said water and thereby increase the humidity of the air in the insulated chamber.

3. In a mechanical refrigerator, the combination of an insulated chamber providing a storage compartment, a water pan therein, an evaporative cooling unit for said chamber, means for conveying the condensate from said cooling unit to said water pan, means for circulating the air in said chamber first over the cooling unit, then through the storage compartment, and, thereafter, over the surface of the water normally in the water pan, a condenser exterior of said insulated chamber for condensing the refrigerant evaporated by said cooling unit, a tube for conducting the condensed refrigerant from said condenser to the evaporative cooling unit, said tube being in heat exchange relationship with the water normally in the water pan to increase the vaporization of said water and thereby increase the humidity of the air in the insulated chamber.

4. In a mechanical refrigerator, the combination of an insulated chamber providing a storage compartment, a water pan therein and adjacent to and covering substantially the entire bottom wall of said chamber, an evaporative cooling unit for said chamber, means for conveying the condensate from said cooling unit to said water pan, means for circulating the air in said chamber first over the cooling unit, then through the storage compartment, and, thereafter, over the surface of the water normally in the water pan, a condenser exterior of said insulated chamber for condensing the refrigerant evaporated by said cooling unit, a tube for conducting the condensed refrigerant from said condenser to the evaporative cooling unit, said tube being in heat exchange relationship with the water normally in the water pan to increase the vaporization of said water and thereby increase the humidity of the air in the insulated chamber.

5. In a mechanical refrigerator, the combination of an insulated chamber, a cooling unit and a water pan therein, said water pan having an inclined bottom, means for conveying the condensate from said cooling unit to said water pan, a drainage opening near the lower portion of the inclined bottom of said water pan, means for varying the elevation of said drainage opening progressively to vary the height and thereby the exposed surface of the water normally in said pan to control the evaporation of said water in order to regulate the humidity of the air in the insulated chamber.

6. In a mechanical refrigerator, the combination of an insulated chamber, a cooling unit and water pan therein, said water pan having an inclined bottom, means for conveying the condensate from said cooling unit to said water pan, means for circulating the air in said cabinet over the surface of the water normally in the water pan, a drainage opening near the lower portion of the inclined bottom of said water pan, means for varying the elevation of said drainage opening progressively to vary the height and thereby the exposed surface of the water normally in said pan to control the evaporation of said water in order to regulate the humidity of the air in the insulated chamber.

7. In a mechanical refrigerator, the combination of an insulated chamber, a cooling unit and a water pan therein remote from said cooling unit, said water pan having an inclined bottom, means for conveying the condensate from said cooling unit to said water pan, means for circulating the air in said chamber over the cooling unit and over the surface of the water normally in the water pan, a drainage opening near the

lower portion of the inclined bottom of said water pan, means for varying the elevation of said drainage opening to vary the height and thereby the exposed surface of the water normally in said pan to control the evaporation of said water in order to regulate the humidity of the air in the insulated chamber.

8. In a mechanical refrigerator, the combination of an insulated chamber, an evaporative cooling unit and water pan therein, said water pan having an inclined bottom, means for conveying the condensate from said cooling unit to said water pan, a drainage opening near the lower portion of the inclined bottom of said water pan, means for varying the elevation of

said drainage opening to vary the height and thereby the exposed surface of the water normally in said pan, means for circulating the air in said chamber over the cooling unit and over the surface of the water normally in the water pan, a condenser for condensing the refrigerant evaporated by said cooling unit, a tube for conducting the condensed refrigerant from said condenser to the evaporator, said tube passing through the water normally in the water pan to transfer some of the heat of the condensed refrigerant to said water to increase the vaporization of the water and thereby increase the humidity of the air in the insulated chamber.

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