

Aug. 3, 1937.

E. S. FOWLER

2,089,088

SYSTEM FOR DEHYDRATING TRAPPED AIR

Original Filed Jan. 5, 1934

2 Sheets-Sheet 1

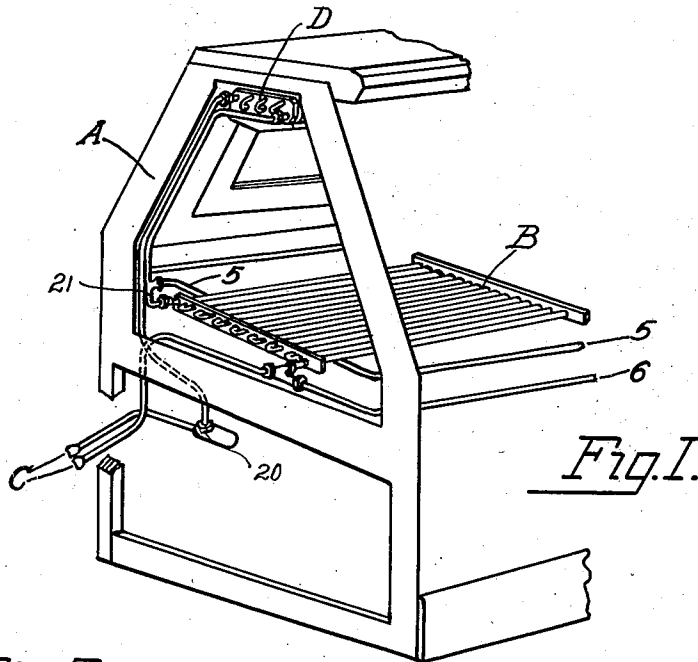


Fig. 1.

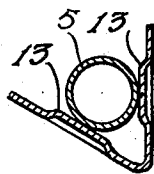
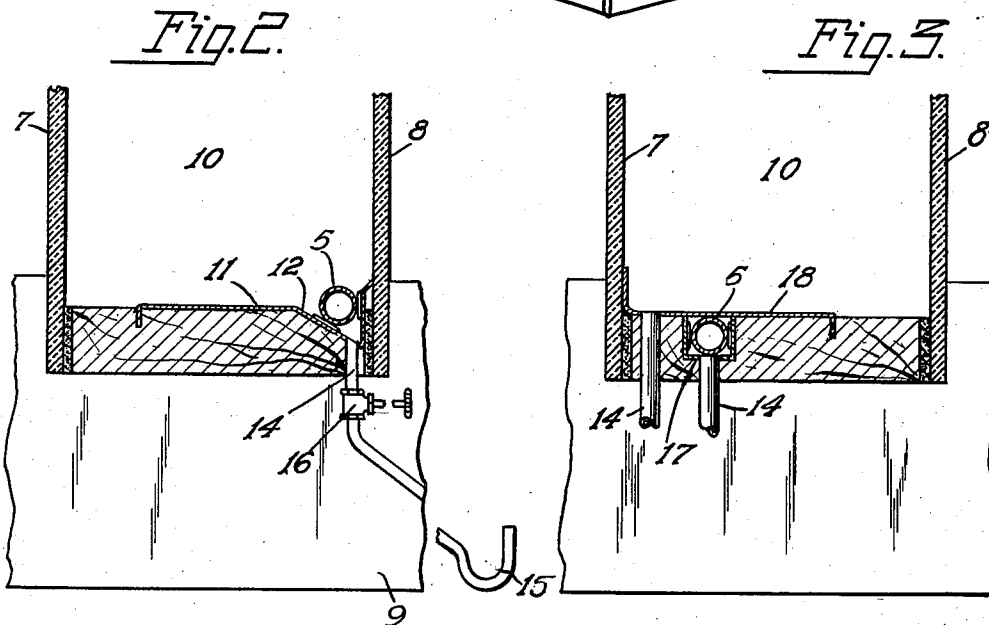


Fig. 4.

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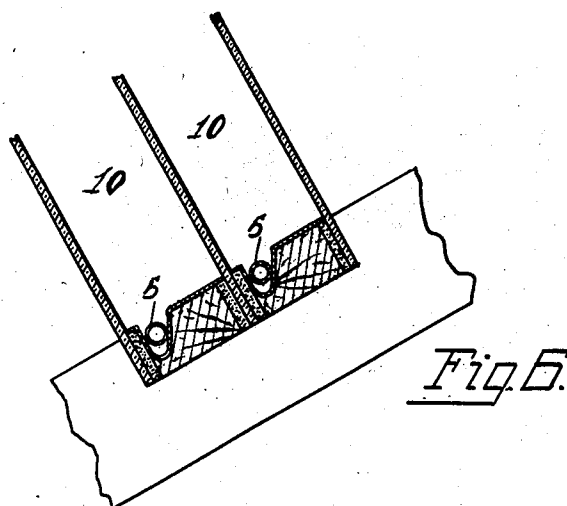
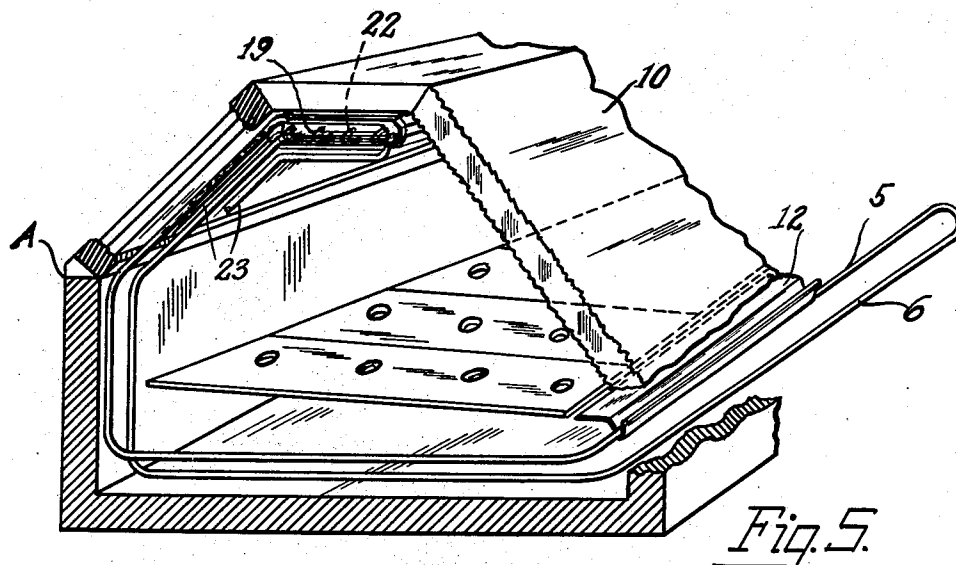
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SYSTEM FOR DEHYDRATING TRAPPED AIR

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2 Sheets-Sheet 2



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SYSTEM FOR DEHYDRATING TRAPPED AIR

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Application January 5, 1934, Serial No. 705,390

Renewed May 26, 1937

19 Claims. (Cl. 62—89.5)

My invention relates to a system for dehydrating trapped air and has to do more particularly for use in dehydrating trapped air between sealed windows where two lights are used for the purpose of insulation. In this connection it is applicable to refrigerator display cases, refrigerator display windows, large storage boxes and coolers, in air conditioned homes, refrigerated store front display windows, and in fact in all such places where two glasses hermetically or otherwise substantially sealed with air space between them are used for the purpose of insulating one surface from the other.

An object of my invention is to provide a system of the above character positive in operation, cheap to manufacture and easy to install, and low in cost of upkeep.

There are many other objects and these will be apparent from the ensuing part of the specification and claims.

Generally speaking, my invention is directed to a method of dehydrating trapped air in a chamber between sealed window lights consisting of cooling a surface within the chamber sufficiently below the temperature of the air and inner surfaces of the chamber to condense the moisture in the trapped air upon this surface and thus keep this condensation away from the window lights. One of the preferred forms in which this is accomplished is to provide in the chamber a metallic or similar surface which is cooled by a circulation of refrigerating fluid, such as, for instance, that which is used for refrigerating the display case, whereby it acts as a condenser and the moisture in the trapped air will condense upon this cooled surface instead of upon the window lights and the condensate then drawn off from the chamber. Or I may employ a separate system for circulating a cooling medium for reducing the temperature of the condenser.

The commercial embodiment of the invention has been found to successively prevent cloudiness or the undesired collection of moisture on the inside surface of the windows of a sealed air chamber, and has appeared to clear the surface of the glass to an even greater extent than may be accomplished by polishing the surface of the glass manually before assembling the glass windows into a frame and sealing the same therein.

For a better understanding of my invention, reference is to be had to the accompanying drawings in which:

Fig. 1 shows a perspective view of a portion of a refrigerator display case showing one form of my dehydrating system applied thereto;

Fig. 2 is a cross-section through a portion of a display window, such as might be used in a refrigerator case display window, large storage box or cooler, etc.;

Fig. 3 is a cross-sectional view of such a display window with a modified form of dehydrating apparatus;

Fig. 4 is an enlarged section of the condenser trough and tube;

Fig. 5 is a sectional view of a modified form of circulating system; and

Fig. 6 shows the dehydrator applied to a case where triple windows are employed.

Referring now to the form of my invention as shown in Fig. 1, the usual refrigerator display case A is provided with a refrigerating system B supplied with refrigerant through the inlet and outlet C from a suitable circulating system. Connected to the refrigerating system are the dehydrating supply pipes 5—6 preferably connected in multiple with the refrigerating supply system C. However, these may be connected in series, or directly to the refrigerating unit, or in any other manner which will provide a suitable circulation of the cooling medium. A suitable expansion valve 20 is connected into the refrigerant inlet C (lefthand pipe shown in Fig. 1). The refrigerant travels through this conduit to the refrigerating section D in the top of the case, through D, and downwardly to a by-pass valve 21 (lefthand corner of section B) where a portion passes into the supply pipe 5, to pass there-through and return by the conduit 6.

In Fig. 2 I have shown an enlarged section through a display window such as would be provided in the case A having the front glass 7 and rear glass 8 suitably carried in a framework as 9, so that the air space or chamber 10 is hermetically or otherwise sealed and the trapped air held therein. In such cases, even though the windows are sealed, air is drawn in and out and moisture thus drawn into the chamber.

Within the chamber 10 I provide a surface capable of being cooled preferably to a temperature sufficiently below that of the trapped air and inner surfaces of the glass sides to condense the moisture in the air, and to this end I preferably provide a metallic strip 11 of stainless steel or other suitable material and against which the refrigerant conduit 5 is placed in contact. To this end I provide a channel 12 longitudinal of the metal strip so that the conduit is set into the channel. In order to permit the condensate to flow into the bottom of the channel so it may be drawn away, the conduit 5 rests against a series

of projections 13 formed in the walls of the channel. Leading from the channel is a pipe 14 having a bent-up portion 15 at its lower end so that there will always be a water seal therein. A
 5 suitable valve 16 may be provided in this pipe 14 so that the outlet may be closed and opened as desired.

In Fig. 3 I have shown a modified form in which the conduit 5 is placed within a water-
 10 proof channel 17 and the metal condensing strip 18 placed over the top of the conduit and in contact therewith.

As to the method of cooling the condenser plate or condenser surface within the chamber,
 15 any suitable means for this may be employed for lowering the temperature thereof sufficiently to condense the moisture in the trapped air. When the system is employed in connection with a
 20 refrigerating display case as A, I preferably connect the cooling conduit 5 to the refrigerant supply system and to this end it is connected in multiple with such system as indicated in Fig. 1. However, it may be connected in any other way
 25 as in series with the refrigerating coils or directly with the outside refrigerant supply system.

In the operation of the dehydrating system the cooling conduit 5 is brought down to a low
 30 temperature whenever the refrigerating circulating system B is operating, thereby also lowering the temperature of the condenser plate 11 so that the cooling surfaces will condense the
 35 moisture in the air thus drawing this moisture away from the windows where it would otherwise settle. If the temperature of the conduit 5 is low enough to freeze the condensate, this
 40 condensate remains frozen around the conduit but between runs of the refrigerant the frozen condensate will melt and flow into the channel 12 from where it is drawn off through the out-
 45 let 14 and into a pail or other receptacle which may be set beneath the end 15.

In the form shown in Fig. 3 the condenser plate 18 may be provided with a suitable outlet
 45 14 to draw off the water as it condenses on the plate.

In Fig. 5 I have shown a modified form of my invention in which I employ a self-contained
 50 circulating unit which may be used for circulating the cooling medium independent of the refrigerant circulating system. This form of my invention may be employed where ice is used
 55 for refrigerating purposes, or it may be used where the regular circulating system is employed. For the purpose of illustration, I have shown the cooling conduit resting in the con-
 60 denser plate 12 and connected to a storage or expansion tank 19 shown positioned inside of the display case, although this may be placed
 65 in any other suitable position inside or outside the case. When placed inside the case, this bulb 19 is preferably placed close to the refrigerating coil and this conduction contact would
 70 cool the fluid in the bulb. If ice were used in the display case, then this bulb would be placed underneath the chamber in contact with the ice or close enough to be cooled thereby. As heat
 75 always goes to cold, the important thing is to place the elements of this circulating system so that this change would cause a circulation in the cooling pipes 5 and 6 so as to cool the
 condenser plate 12 and effect a condensation of the moisture in the trapped air in the sealed window chamber.

Simply for purposes of illustration, I have

shown in Fig. 5, a refrigerating coil 22 at the top of the display case adjacent the tank 19. The coil 22 connects directly with an ordinary
 5 refrigeration system through inlet and outlet pipes 23. It is understood, of course, that the size of the refrigeration coil 22 may be varied as desired, and the position of the coil, as well as the tank 19, may be changed without depart-
 10 ing from the principle of my invention.

In Fig. 6 I have shown the dehydrator applied
 10 to a case where double chambers 10 are employed in the display case. In such installation, two cooling tubes 5 are employed or the complete return may be employed, that is, tube
 15 5 in one chamber 10 and tube 6 in the other.

Thus by said method of dehydration I provide a system which maintains a dry air between
 15 the window lights and operates automatically so long as the refrigerator display case is in use. Accordingly, in display cases of this character
 20 I avoid the use of perforated containers filled with dehydrating chemical or substances and exposed dehydrating elements heretofore employed. Also I obviate the necessity of watching
 25 such material and replacing the same.

The invention of course is not limited to use on display cases for meats, vegetables and other
 30 perishable articles, but may be applied to any structure where trapped air between glass windows is utilized for insulation and must be dehydrated to preserve the maximum visibility
 35 through the windows.

Although I have illustrated and described the preferred forms of my invention I contemplate
 35 using it in other ways than those shown as will be readily apparent to those skilled in the art, and I, therefore, do not desire to be limited to the exact systems or methods disclosed, but aim
 40 to cover all that which comes within the spirit and scope of the appended claims.

What I claim as new and desire to protect by Letters Patent of the United States is:

1. A system for dehydrating trapped air in a chamber between sealed window lights including
 45 a condenser strip extending along inside the chamber, and a conduit for cooling material extending along said strip to cool the same to con-
 50 dense the moisture in the air in the chamber.

2. A system for dehydrating trapped air in a chamber between sealed window lights including
 50 a condenser strip extending along inside the chamber and having a channel longitudinal there-
 55 of, and a conduit for cooling material extending along in said channel to cool the strip to con-
 60 dense the moisture in the air in said chamber, and means for conducting the condensate away from the channel.

3. A system for dehydrating trapped air in a chamber between sealed window lights includ-
 60 ing a condenser strip extending along an inside wall of the chamber, and a refrigerant conduit beneath but close to the condenser strip for cool-
 65 ing the strip to condense the moisture in the air in the chamber.

4. In a refrigerator display case having refrig-
 65 erating coils therein and a display window with a sealed chamber between lights thereof, means for dehydrating the air in said chamber includ-
 70 ing a condenser strip and refrigerant conduit therefor with means for connecting said conduit with the refrigerating system of the display case.

5. In a refrigerator display case having a dis-
 75 play window with a sealed chamber between lights thereof, means for dehydrating the air in said chamber including a condenser strip within

the chamber, and a refrigerant conduit cooperating with the condenser strip for lowering the temperature thereof to condense moisture in the air in said chamber thereon.

6. A system for dehydrating trapped air in a chamber between sealed window lights including a metal condenser strip extending along the chamber at the bottom thereof, and a conduit for cooling material extending along said metal condenser strip and close thereto to cool the strip to condense the moisture in the air in the chamber.

7. A system for dehydrating trapped air in a chamber between sealed window lights including a condenser strip extending along the chamber at the bottom thereof having a substantially V-shaped channel longitudinally of the strip to carry therein a conduit for cooling material to cool the strip to condense the moisture in the air in the chamber.

8. In a refrigerator display case having a refrigerating system including refrigerating coils carried in said case, a display window having a sealed chamber between lights thereof, means for dehydrating the air in said chamber, said means including a metal condenser strip along the bottom of the chamber, and a refrigerant conduit extending from the refrigerating system carried on the metal condenser strip for cooling said strip to condense moisture in the air in said chamber thereon.

9. A refrigerator display case having a display window with a sealed chamber between lights thereof, a condenser in said chamber and a cooling conduit therefor, a refrigerating medium in said case, and a self-contained system in the case including a storage tank for a cooling medium connecting with said cooling conduit, with said system utilizing the cold air from the refrigerating medium in the case for circulating the cooling medium through the cooling conduit to cool the condenser.

10. In a refrigerator display case having a refrigerating system including refrigerating coils carried in said case, a display window having a sealed chamber between the lights thereof, means for dehydrating the air in said chamber, said means including a metal condenser strip along the bottom of the chamber having a substantially V-shaped channel extending the length thereof, a refrigerant conduit, extending from the refrigerating system, carried in the channel of said strip for cooling said strip to condense the moisture in the air in said chamber thereon, and means for removing the moisture from said channel.

11. A refrigerator display case having a display window with a sealed chamber between lights thereof, a condenser in said chamber, a refrigerating medium within the display case, and a self-contained cooling system for said condenser having a cooling medium therein, with said system mounted in the display case and utilizing the cold air from the refrigerating medium in the case for circulating said cooling medium in the system to cool the condenser.

12. In combination with a refrigerator display case having a plurality of glass display windows in spaced relation to form dead air spaces therebetween, means for removing moisture from the dead air spaces which comprise hollow tubes in said air spaces, means for flowing a cooling medium through said tubes to cool the outside surfaces of said tubes and condense moisture in the air between the glass windows thereon, and

means for collecting the condensed moisture as it drips from said tubes.

13. In combination with a refrigerator display case having a display window on one side thereof and said window comprising glass panes in spaced relation to form a dead air insulation space between two adjacent panes, means for preventing condensation of moisture on an inside surface of said panes which means comprises a hollow tube in said dead air space, refrigeration coils in said display case, and means for connecting said tube with said refrigeration coils to flow part of the refrigerant through said tube and thereby condense any moisture in the dead air space on the tube.

14. In combination with a refrigerator display case having a display window on one side thereof including a plurality of glass display panes in spaced parallel relation and sealed in said case to form a dead air space between each consecutive two panes to insulate the interior of the refrigerator case from the outside atmosphere without obstructing a view of the inside of the case, means positioned along the edges of said windows in each said space to remove moisture from the dead air space comprising a drier coil fed with a cooling means to cool the outside surfaces of the coil below the dewpoint of the air to condense the moisture in the air thereon, and water collecting means for collecting the condensed moisture as it drips from the cooled coil.

15. Apparatus for preventing moisture condensation on the glass windows of mechanical refrigerator display cases having said glass windows including spaced apart glass panes on an outside portion of said case to form a relatively narrow chamber between said panes, which apparatus comprises a metal tube in close proximity to said panes and in said chamber, expansion coils for compressed refrigerant to cool the interior of the display case, means for connecting said tube with one of said expansion coils so that refrigerant is passed through the tube, means for controlling the amount of refrigerant flowing through the tube and expansion coils to prevent said tube from being cooled below the freezing point of the water condensed thereon, and water collecting means for collecting the water condensed on the tube as it drips therefrom.

16. The combination of an insulating window having two spaced panes of glass relatively close together and means substantially sealing the narrow space between said glass to form a dead air insulating space, and a drier for the air in said space comprising a cooled member positioned at the bottom thereof to extend a cooling effect along said bottom edge, and a cooling coil for cooling said member to condense the moisture in the air in said space but maintain said air therein substantially quiet.

17. An insulating window to prevent heat transfer through the area of said window including two panes of glass in parallel relation and spaced relatively close together, means providing substantially a seal around the edges of said window to provide a closed chamber between the panes with substantially quiescent air therein, means for removing the moisture from said substantially quiescent air to prevent said moisture from collecting on the inside of one of said panes and obscuring vision therethrough, said means including a cooling conduit positioned substantially at the bottom of said chamber whereby its cooling of the air in said chamber to condense the moisture therefrom does not aid the

circulation of said air, and covering means in said chamber concealing said cooling conduit from view.

18. The method of removing moisture from a
5 sealed chamber formed by spaced apart panes of glass, with substantially quiescent air containing moisture in said chamber, which method includes providing a moisture condensing surface at the bottom of said chamber, cooling said surface
10 below the dewpoint of the air therein to condense the moisture from the air in the environs of said surface, and continuing the condensing action for moisture removal, said continuing condensing action occurring without aiding the
15 movement of air in said chamber.

19. An air dehydrating method which comprises passing through a conduit arranged along one edge of dead air spacing in a hermetically sealed unit made up of panes of glass arranged in relatively close spaced relation one behind another, a refrigerant at a velocity and temperature to keep such conduit at a temperature below the dew point of the air in such spacing; extending without substantial diminution the effect of such refrigerant along an area at a boundary
10 of such spacing, and maintaining in the meantime the air in such spacing out of communication with air outside of said spacing.

EMORY S. FOWLER. 15