April 26, 1932. V. P. WARREN. 1,856,008

SHOWCASE REFRIGERATOR

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Fig. 1.

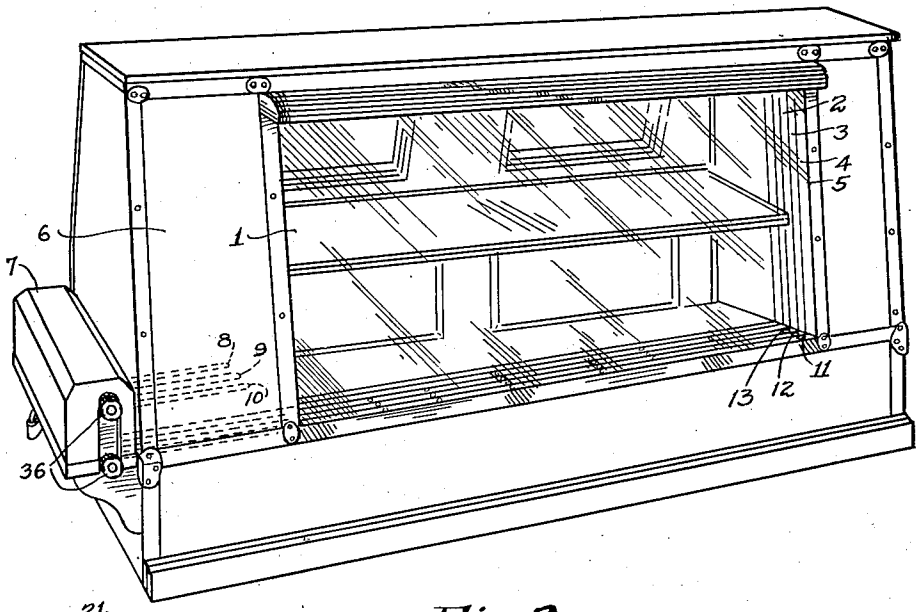

Fig. 2.

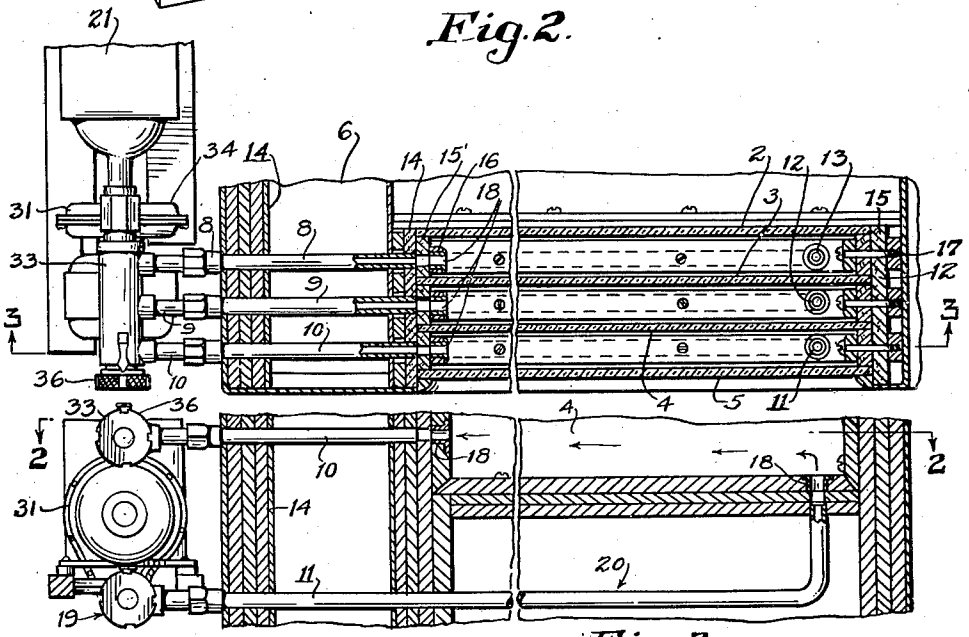

Fig. 8.

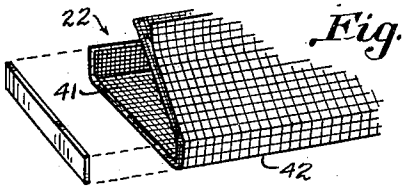

Fig. 3.

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SHOWCASE REFRIGERATOR

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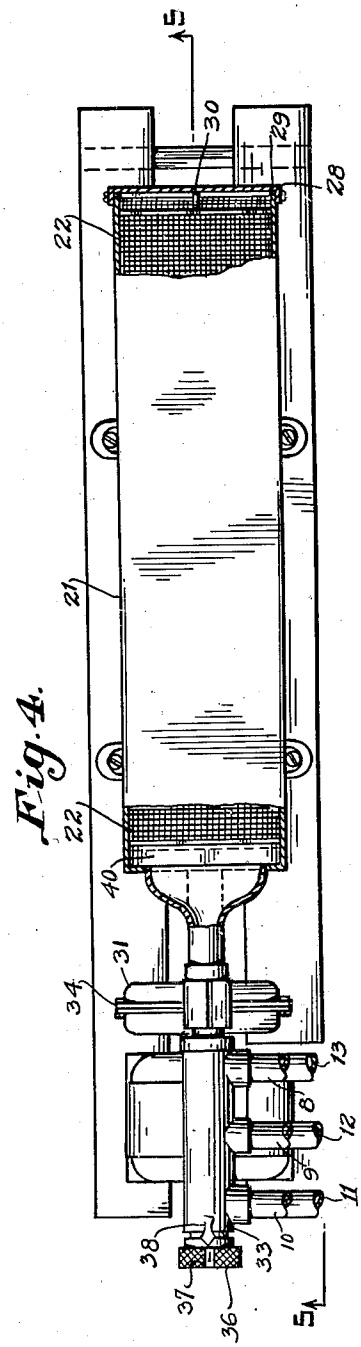

Fig. 4.

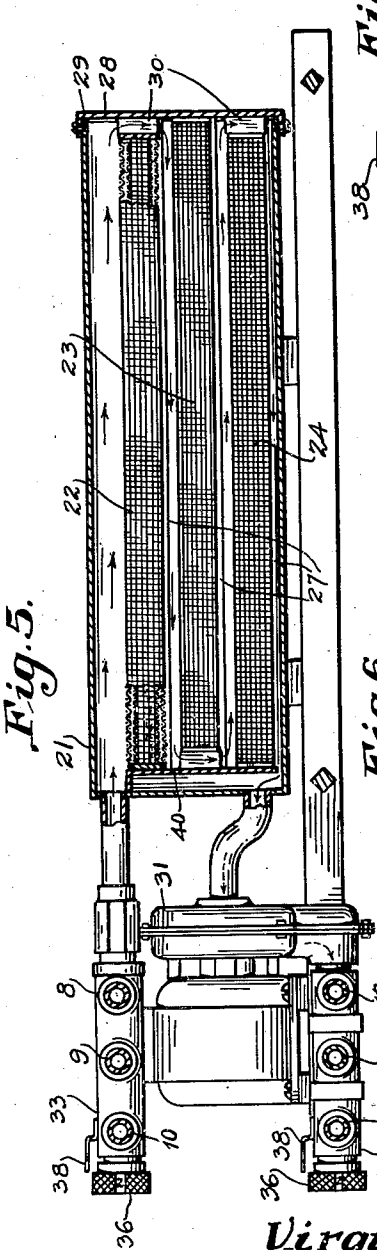

Fig. 5.

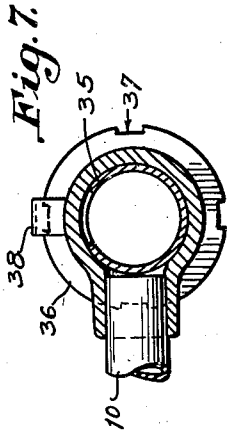

Fig. 7.

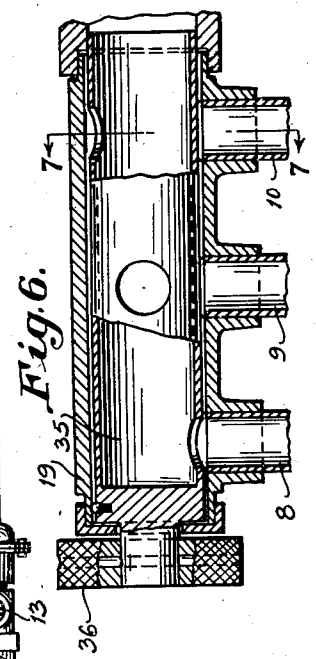

Fig. 6.

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UNITED STATES PATENT OFFICE

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SHOWCASE REFRIGERATOR

Application filed March 6, 1931. Serial No. 520,642.

This invention relates to showcase refrigerators, and it has for its principal object the provision, in a showcase of the type in which the window is constructed of several spaced layers of glass with insulating air spaces, of means for circulating the air within said spaces in moisture absorptive relation of a drying agent for the purpose of reducing the humidity of the air to such an extent as to prevent the condensation of moisture on the surface of the layers of glass.

Another object of the invention is the provision of means for selectively and individually circulating the air in any of the said air spaces in relation to the drying medium for the purpose of reducing the moisture and the humidity of each air body below the precipitation point related to the temperature of the glass with which said body is in intimate contact.

Other objects of the invention will appear as the following description of a preferred and practical embodiment thereof proceeds.

In the drawings in which the same characters of reference are used throughout the several figures to designate identical parts:

Figure 1 is a perspective view of a refrigerated showcase embodying the principles of the present invention;

Figure 2 is a horizontal section through the window of the showcase, taken along the line 2—2 of Figure 3, showing details of the invention;

Figure 3 is a vertical section taken along the line 3—3 of Figure 2;

Figure 4 is a plan view of the drier unit, parts being shown in section;

Figure 5 is a vertical section taken along the line 5—5 of Figure 4;

Figure 6 is a horizontal section taken through the distributing valve;

Figure 7 is a cross section taken along the line 7—7 of Figure 6, and

Figure 8 is a perspective view showing a portion of the cage for the drying chemical and indicating the manner in which it is constructed.

Referring now to the general ensemble of the showcase as illustrated in Figure 1, the window, designated by the reference character 1, is constituted by several layers or panes of glass 2, 3, 4 and 5 with intervening air spaces. The refrigerating coil may be housed in the compartment 6 at the side of the display portion of the showcase, the drier unit being enclosed within the casing 7 at the side of the showcase. The drier unit communicates with the intervening air spaces by pipes 8, 9 and 10 corresponding in number to the number of air spaces, through which pipes the air is drawn from said air spaces, preferably at the side of the showcase adjacent the drier, sucked through said drier unit by the motor driven impeller 34, and blown with some pressure into the showcase at the far end thereof through pipes 11, 12 and 13. The drier is power driven, at will, and as will be presently disclosed the suction pipes 8, 9 and 10 and the pressure pipes 11, 12 and 13 may be synchronously selectively put in circuit with their respective air spaces or cells by suitable valve mechanism.

Figures 2 and 3 show a window construction in which the layers or panes of glass are positioned between end walls 14 and 15, being spaced by vertically extending cork inserts 15′. The pipes 8, 9 and 10 of the drier unit enter through suitable apertures in the end wall 14 and preferably abut against the cork inserts which are suitably perforated at points in registry with said pipes. Battens 16 which are preferably of wood extend vertically in contact with the cork inserts, being screwed through said cork inserts and into the end wall 15 as indicated at 17 in Figure 2. The battens are perforated at points in registry with the axes of the pipes 8, 9 and 10 and for the sake of finish, metal ferrules 18 are inserted in the perforations in said battens. The construction is similar at the points where the pipes 11, 12 and 13 enter the air cells.

The details of construction just related refer to a practical form of showcase in connection with which the system of the present invention has been installed, but said details in no wise particularly concern the present invention, and any way of mounting the glass and providing for the communica-

tion of the pipes 8, 9 and 10 with the air cells may be substituted therefor without affecting the invention.

Figures 4 and 5 show that the drier consists of a casing 21 supporting a plurality of shallow trays or cages 22, 23 and 24, said cages preferably sliding upon tracks 27 and being removable from the front of the casing after the removal of the front face plate 28 which is bolted or otherwise secured in airtight manner against the face of the casing. Said cages contain a granulated or comminuted dehydrating chemical, such for instance as calcium chloride.

The cages 22, 23 and 24 are preferably formed of fine wire mesh fabric on all four sides and are preferably reinforced by an outer layer of wire fabric having a larger mesh.

The cages are arranged in staggered relation so that air blowing across the surface of the topmost cage circulates between the first and second cages and the second and third cages, coming into contact with the dehydrating chemical both along the upper and lower surfaces of all of the cages. The circulating air contacting with the wires of the larger mesh fabric, is thrown into turbulence, being thereby brought into more intimate contact with the dehydrating agent. Some of the air drifts depthwise through the chemical, further facilitating dehydration. The trays are so constructed that when the face plate 28 and gasket 29 are in position alternate trays are pressed against a baffle 40 lying parallel to the rear wall of the casing terminating short of the bottom thereof and separating the flow of air entering the drier from that leaving the drier so as to compel the air to travel circuitously about the several cages.

The three suction pipes 8, 9 and 10 are connected by way of a distributing valve 33 with the drier casing 21, and the latter is connected to the suction side of the impeller 31. The pressure side of said impeller is connected to the pipes 11, 12 and 13 through the intermediary of a distributing valve 19 similar to the valve 33.

The valves are so ported that when turned through a definite angle of rotation they sequentially close or open the pipes 8, 9 and 10 and the pipes 11, 12 and 13 respectively. The valves are so marked that they can be rotated through the same angle so as to open the avenue of communication between any one of the aid cells and the drier at the two places controlled by said valves or to close said avenue of communication at both of said places. The object of having the two valves is to completely isolate the air cells from one another particularly during the time when the dehydrator is not in operation so as to prevent the inter-mixture of the atmosphere between the several air cells, which might cause deposition of moisture upon the inner glasses.

While a showcase embodying the present invention is adapted to ordinary refrigerating temperatures it is particularly designed to maintain such low temperatures as are required for the preservation of foods preserved fresh by the new quick-freeze process in which a refrigerator temperature approximating zero F. is considered essential.

It is of course well known that the dew point of humid air varies according to the temperature differential between the air and the surface which it contacts, and that air which has been dehydrated to a sufficient extent to prevent moisture condensation on a surface only slightly colder than itself may still have enough moisture left to condense on a surface that is considerably colder. It is is to be understood in this connection that the inner-most pane 2 which is closely adjacent the refrigerated chamber will be colder than the pane 3, and so on, the outer pan 5 being in general only slightly colder than the atmosphere of the room in which the showcase is located. A degree of dehydration which would be sufficient to prevent moisture condensing on the pane 4 might still be insufficient to prevent condensation on the pane 2. For example, if air were forced simultaneously from all of the air cells to the drier, the average temperature of the mixed air returned to the showcase would be considerably higher than the normal temperature of the air in the cell between the panes 2 and 3 and consequently, unless dehydration were carried to an excessive degree, moisture condensation might be expected to occur on the surface of the pane 2. For this reason it is highly desirable to dehydrate the air bodies in the several air cells selectively and individually, even if the air was dry enough to avoid condensation on the panes 3 and 4. The distributing valve 33 therefore, has the barrel 35 so ported as to open alternatively and successively to the several eduction pipes 8, 9 and 10. The handles 36 of the valves 33 and 19 as hereinbefore stated are provided with indicia as indicated at 37 in Figure 4, cooperating with pointers 38 so that an operator can determine which of the pipes 8, 9 or 10 and 11, 12 or 13 are being opened to the drier and also to enable the operator to turn each valve to the same index so as to open or close the ports establishing communication between any one of the air cells and the drier, at the same time. It may be that moisture is starting to condense only on the pane 2. The operator then turns the valve handle 36 of both valves until the pipes 8 and 11 are opened to the drier as determined by the index. The bodies of air in the cells between the panes 3, 4 and 5 are then excluded from the circulation system and the drying function is concentrated on the body of air between the panes

2 and 3 alone. If moisture is starting to collect on the pane 3, the valves are turned until only the cell between panes 3 and 4 is in communication with the drier. The cells between the other panes are then excluded from circulation.

By this means it is only necessary to carry the dehydration of each body of air down to the point at which no moisture will form on the colder pane bounding that particular cell.

The question may arise why after one single dehydration of the air in the several cells, it ever becomes necessary to repeat the dehydration process. The answer to this is that it is impractical to make a perfect hermetic seal between the air in the several cells and air from an external source. The reason for this is that if a perfect seal were produced at normal room temperature for instance, the contraction of the air when brought into cooling relation to the refrigerating chamber would cause atmospheric pressure to crush in the glass. Opportunity must be provided for the air in the cells to breath in and out according as it contracts and expands under temperature variations. It is not necessary to provide any specific means to permit this breathing function since almost any sealing means which may be provided for the cells will be imperfect enough to permit the leaking in and out of a sufficient amount of compensating air. However, since the air in the refrigerated chamber is already less humid than the average room atmosphere it is preferred to make an absolutely tight seal between the outer pane of glass and the room atmosphere so as to cause such breathing as must occur, to take place between the cells and the atmosphere of the refrigerated chamber.

From the above description it is apparent that I have devised a system of stage dehydration of the air between the panes of a refrigerated showcase window of multi-ply construction in such a manner that the panes may all be kept clear of moisture condensation and thus be perfectly transparent regardless of the low temperature of the refrigerated chamber; and that I have improvised a system which, by permitting selective dehydration of the individual cells, more rapidly removes the condensation from the panes of said cells. Since repeated dehydration is necessary only to take care of the small volume of air which enters the system during its breathing periods, the virtue of the dehydrating medium is perpetuated through the term which may be as long as several years, although it is very inexpensive to replace said medium when depleted.

While I have in the above disclosure described what I believe to be a preferred and practical embodiment of my invention, it is to be understood that numerous changes in the construction and arrangement of the several elements which cooperate in the realization of the inventive concept, may be made without departing from the spirit and scope of the invention as claimed.

What I claim is:

1. Condensation preventing and removing system for the spaced-ply windows of showcase refrigerators, comprising a drier, a closed circulation system including said drier and the air cells between the plies of said window, means for inducing a flow of the air through said circulation system, and means for selectively intercalating any of said cells in said circulation system.

2. Condensation preventing and removing system for the spaced-ply windows of showcase refrigerators comprising a window constituted by spaced glass panes defining air cells therebetween, a closed air circulation system of which said air cells form parallel branches, including a drier, an air impeller and conduits for forcing air into and withdrawing it from said air cells, and a distributing valve in said system for opening any one of said air cells to said circulation system.

3. In a showcase refrigerator of the type having a window formed of spaced panes of glass with intervening air cells, means for selectively and independently dehydrating the air in said cells comprising a closed circulation system of which said air cells form parallel branches, a common drier in said system and a distributing valve for placing said air cells selectively and independently into active communication in said circulation system.

4. Condensation preventing and removing system for the spaced-ply windows of showcase refrigerators, comprising a window constituted by spaced glass panes defining air cells therebetween, a closed air circulation system of which said air cells form parallel branches, including a drier, an air impeller and conduits for forcing air into and withdrawing it from said air cells, and distributing valves in said conduits controlling both the induction and eduction of air from said cells for opening any one of said air cells to said circulation system.

5. In a showcase refrigerator of the type having a window formed of spaced panes of glass with intervening air cells, means for selectively and independently dehydrating the air in said cells comprising a closed circulation system of which said air cells form parallel branches, a common drier in said system, and distributing valves controlling said branches adjacent their points of communication with said refrigerator, for placing any one of said air cells selectively and independently into active communication with said circulation system exclusive of said other cells.

In testimony whereof I affix my signature.

VIRGIL P. WARREN.