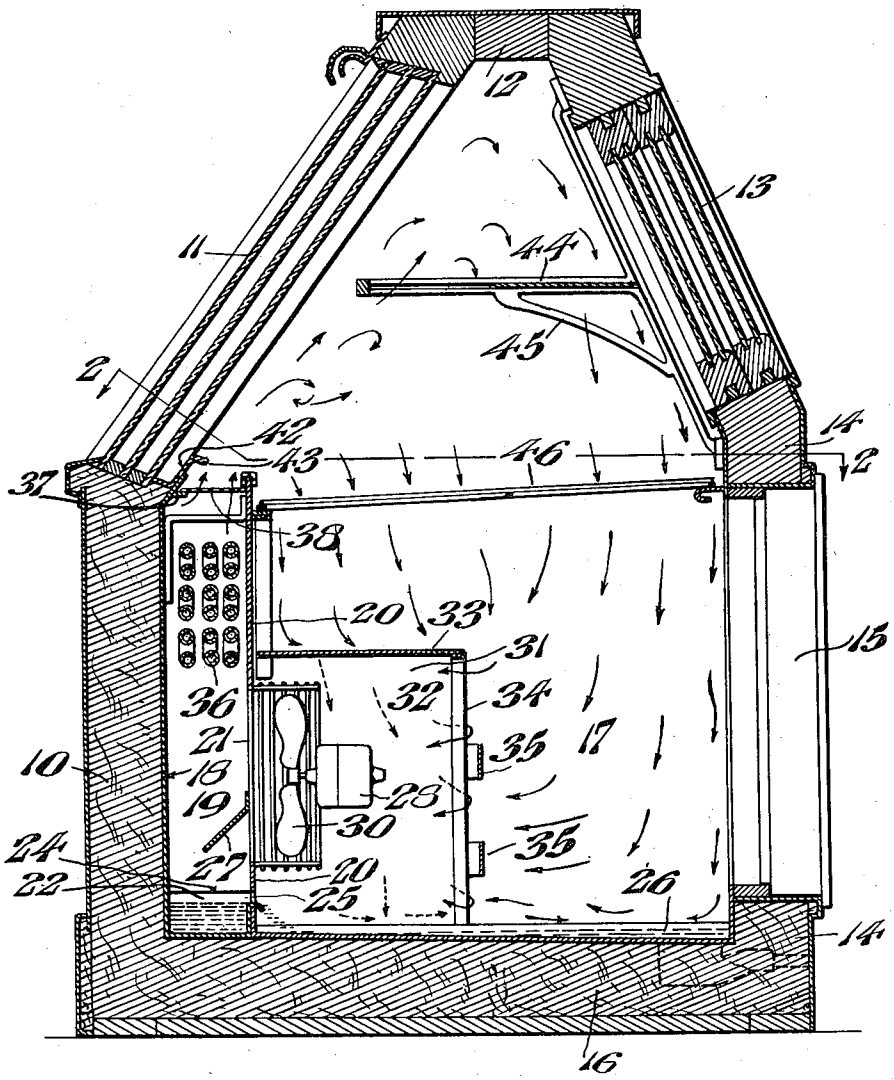
Feb. 5, 1935. R. E. FREDERICK 1,990,431

REFRIGERATING SHOW CASE

Filed April 13, 1932 2 Sheets-Sheet 1

Fig. 1.



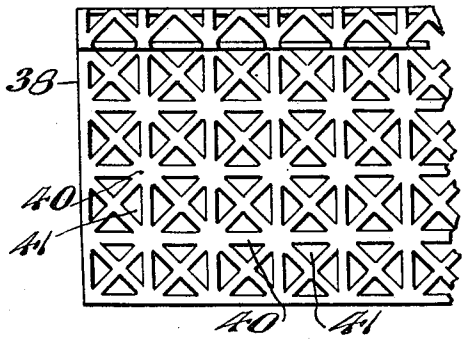


Fig. 4.

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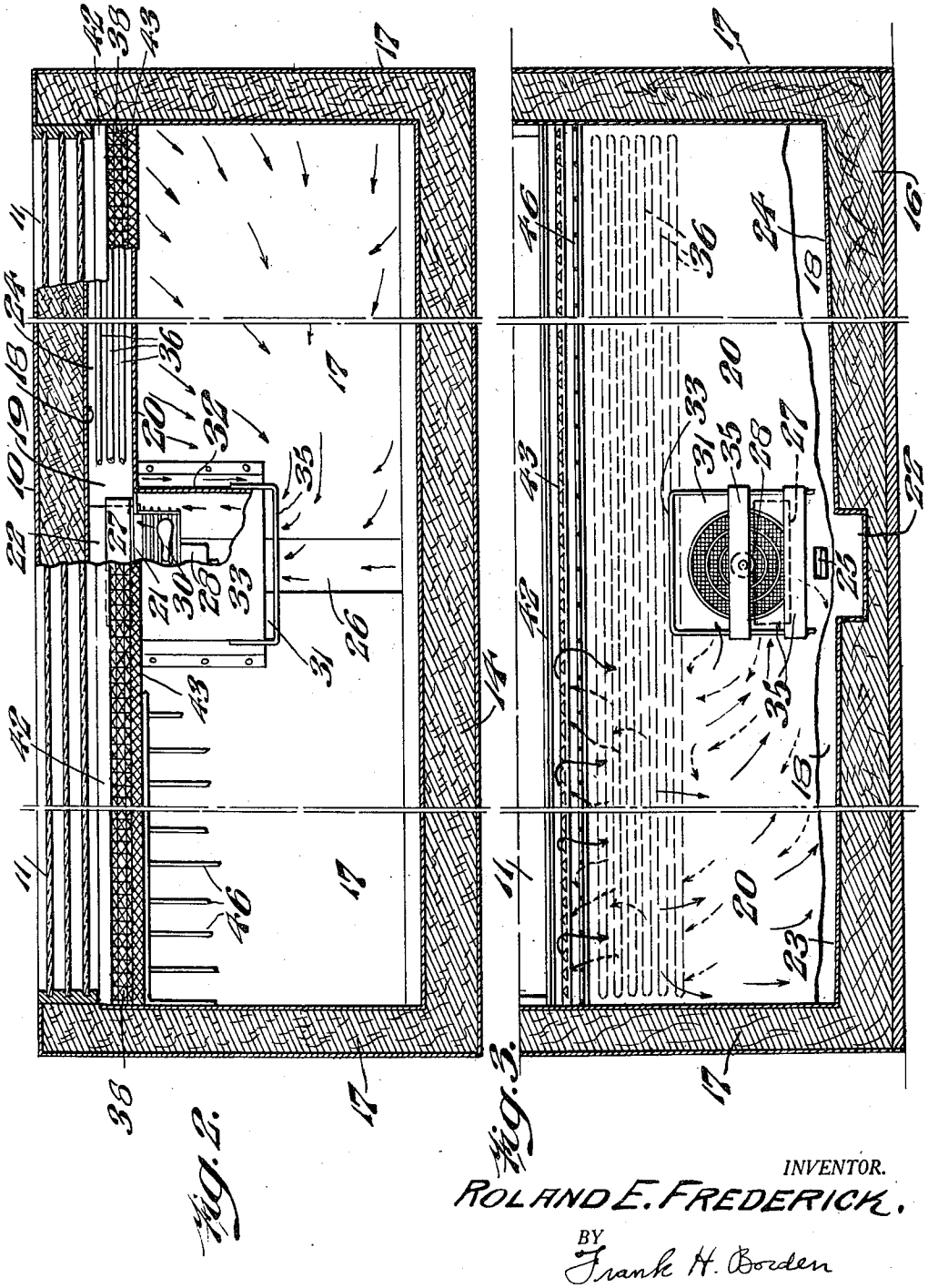


Fig. 2.

Fig. 3.

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REFRIGERATING SHOW CASE

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Application April 13, 1932, Serial No. 604,925

15 Claims. (Cl. 62—89.5)

This invention relates to refrigerating show cases.

With the advent of mechanical refrigeration, and with the low temperatures attained by coils and similar cooling elements it has been discovered that some of the advantages of the mechanized refrigeration have been more or less nullified by the dehydrating characteristics of the systems. The air circulating in the case relative to the very cold coils has deposited its excess moisture on the coils where it formed frost which through cumulative deposits eventually forms a substantially insulating layer requiring defrosting, which is a disadvantageous feature, but this is rendered more objectionable by the fact that the dehydrated air when contacting with moist food products proceeds to absorb moisture as the air is warmed by the contact, so that the cycle of dehydration, absorption from the preserved products and deposit on the coils is substantially continuous. The shrinkage and other deleterious actions and factors incident to this condition have proven hitherto to be unsurmountable. It is an object of this invention to maintain a circulation of relatively moist air which substantially precludes, or at least minimizes, absorption of moisture from goods in the case.

While refrigerating show cases as heretofore constructed were of various types and styles, it was universally a practice to build them too high as a necessary incident of the location of the cooling coils. It is an object of this invention to reduce the height of show cases so as to render their use more efficient.

It is among the further objects of the invention; to provide a show case with a mechanically actuated cooling unit which is not subject to the cumulative formation of frost; to provide a refrigerating show case in which the temperatures throughout the case are substantially uniform regardless of high and low points in the refrigerator; to provide a refrigerating show case in which the circulation of cooled air is substantially uniform throughout the case, having no "hot" or "cold" spots; to provide a circulating air stream in a show case with a humidifying source; to utilize in refrigerating show cases the moisture absorbed from the goods by the circulating air stream as a rehumidifying means for the circulating air stream; to increase the visibility of refrigerating show cases; to improve generally the construction of refrigerating show cases.

In the accompanying drawings:

Fig. 1 represents a transverse vertical section, partially in full lines through the show case of this invention, according to the preferred form,

Fig. 2 represents a horizontal section, partially broken away, and partially in full lines,

Fig. 3 represents a longitudinal vertical section, partially in full lines, and

Fig. 4 represents a fragmentary plan of an illustrative form of a retarding guard for the exit end of the air channel.

Referring now to Fig. 1, there is disclosed a show or display case of the refrigerating type having an insulated front wall 10, inclined "sight" window 11, insulated top 12, inclined service doors 13, insulated rear wall 14 containing the secondary service doors 15, insulated bottom wall 16, and insulated end walls 17. Owing to the fact that the cooling unit is not disposed in proximity to the top 12, the top may be relatively close to the bottom to form a case which has a reduced vertical height with a consequent increase in efficiency owing to the ability of the customer and the operator to see each other freely despite the existence of a case between them.

The insulated front wall 10 has an inner surface 18 which may form a wall of a conduit 19 of a guiding air channel for the circulating air stream to be described, and the other opposite wall of the conduit may be comprised of a removable plate 20 in parallel spaced relation to the surface 18. The plate 20 preferably extends for the length of the front wall and is disposed in substantially sealing engagement with the respective end walls 17, the enclosed portions of which with surface 18, and plate 20 delineate the substantially vertical conduit 19. The plate 20 has substantially an air tight fit at its ends and bottom, with the respective end and bottom walls of the case, and is pierced by a round fan or blower opening 21 longitudinally centrally disposed in the plate and spaced vertically a short distance from the bottom wall 16. The bottom of the case at the lower end of the vertical conduit provides a centrally disposed relatively shallow trough or reservoir 22, of restricted longitudinal extent, of, for example, substantially the length of the diameter of the fan to be described. This central reservoir is at the lowest point of two inclined bottom surfaces 23 and 24, leading to the reservoir from high points at the respective ends of the case and underlying the cooling unit to be described. The central reservoir 22 communicates through an overflow opening 25 in the plate 20, with an inclined channel 26 formed in the bottom of the case, from the lower end of which the overflow moisture (if any) may lead through suitable traps, and outlets, to the outside of the case.

Within the conduit space 19, defined, as noted, by the inner surface 18 of the front wall and the plate 20, and the end walls 17, a horizontal downwardly projecting deflecting baffle 27, extending across and at each end slightly beyond the blower opening 21, is attached to the inner surface of plate 20 at a line approximately one third of the diameter of the opening 21 above the bottom thereof, and the free edge of which is lo-

cated substantially in the center of the conduit space 19. The free edge of the deflector baffle is spaced vertically above the level of liquid in the reservoir 22. A blower unit which includes a motor 28, and fan, or the like 30, of any preferred or desired type is disposed on suitable supports, (not shown) so that its axis is concentric with the blower opening 21. A shield comprised of side walls 32, and preferably flat top wall 33, and forming a duct, 31 attached in preferably tight relation to the plate 20, with adequate clearance from the blower opening 21 and extends rearwardly of the plate 20 to terminate in an entrance opening 34 disposed approximately in the center of the case midway between the rear wall and the plate 20. The opening 34 may be provided with transverse guards 35 for safety. It will be observed that the substantially horizontal duct 31 communicating through blower opening 21 with conduit space 19, forms with the conduit a guiding air channel, and that the opening of the conduit is of appreciably greater length than the mouth 34 of the duct, and that the opening 34 of the duct is rearwardly disposed in appreciably spaced vertical relation to the mouth of conduit 19.

The cooling unit comprises a coil 36 of conventional construction, the individual pipes of which may be provided with radiating fins, if desired, and preferably are so closely disposed as to slightly restrict or retard air flow vertically of the coil. The coil is connected with a conventional compressing unit, with suitable controls for regulating the temperature of the coils, either in response to variation of pressure in the coils, or in response to variation of temperatures, all as is well known in the art of refrigeration. Preferably the cooling unit has a cycle of operation wherein the compressor functions to lower the temperature in the coil to a predetermined point (which in contrast to conventional temperatures of perhaps 20°, may be lowered to but 28° or 30°) and thereafter will go out of operation until a second predetermined condition (at a higher temperature) occurs, to restart the compressor. For purposes of this invention it will be observed that the coils extend longitudinally and horizontally for substantially the length of the conduit space 19, have their lowermost pipes disposed slightly above the upper edge of the blower opening 21 on plate 20, and have their uppermost pipes disposed slightly below the upper edge of the plate 20, and also slightly below the lower edge of the sight window 11. Owing to the retardation offered by the coils, and the consequent tendency to build up a slight "back pressure" the cooling unit comprises a primary dispersion element, urging the circulating air to spread longitudinally of the conduit space. Mounted removably upon the upper edge of the plate 20, or other suitable support, and extending over the entire upper end of the conduit space 19, supported on suitable supports 37, is the reticulated retarding closure or guard 38. As shown in detail on Fig. 4, this closure element is comprised of solid material 40, having in effect a substantially continuous surface, but having numerous apertures or openings 41 through which circulating air may pass. In effect this closure constitutes a secondary retarding element, of which the primary is the cooling coil itself. A deflector 42 having an inwardly directed lip 43 is mounted above the closure element 38, in slightly spaced relation to the lower edge of the inner surface of the sight window 11. The lip 43 of the deflector terminates in a line substantially in vertical alignment with the longitudinal median line of the closure element 38.

A feature of novelty and utility is comprised in the upper sliding shelf 44, mounted for horizontal guiding support in brackets 45 suitably supported in the case below the top thereof, but in vertically spaced relation to the racks or wire shelves 46 which removably support the trays carrying the goods for display. The brackets 45 are substantially twice the length of the sliding shelf so that when in normal position in juxtaposition to the service door 13, there is no part of the upper shelf obstructing the line of sight of the observer gazing through the sight window 11, to prevent him from seeing the entire surface of the wire shelves 46, while at the same time every part of the shelf 44 is visible. Upon a selection being made by observer of a desired article on the shelves 46, the operator has in at access thereto upon opening the service doo 13, and if necessary, owing to arrangement o. articles by sizes, temporarily sliding the shelf 44 toward the front part of the case. The article is then easily withdrawn from shelves 46, through door 13, behind the rear edge of the sliding shelf. Before final closing of the service door 13, the sliding shelf 44 is retracted to its normal position out of the line of sight. It will be understood that it is not normally necessary to disturb shelf 44 while securing free access to trays on the wire shelves 46.

The operation of the display case of this invention and the advantageous features thereof in the light of the operation will now be discussed. It is usually desirable that the reservoir 22 be filled with water before beginning the use of the case. The compressor system is started so that the temperature of the coil 36 is lowered to a desirable point. For example between 28° and 32°. After the coil is chilled to a desirable point, the blower motor 28 is started and the fan 30 projects a main body of air against the inner surface 18 of the front wall 10. A smaller portion of air from the fan, say for example perhaps one third thereof, impinges against the deflecting baffle 27, by which it is deflected downwardly against the upper surface of the water in the reservoir 22, and from which it absorbs a certain amount of water to cause the air, about to be cooled, to be humidified.

It will be understood that as the air stream is started by the fan its only course of egress is upwardly through the cooling unit. Owing to the restricting action of the coil, it is easier for the air stream to spread out longitudinally under the cooling unit and to build up a slight pressure before a perceptible flow through the cooling unit is accomplished. In its substantially horizontal dispersion, the main air stream is joined by the upwardly moving humidified air, passing vertically between the free edge of the baffle 27 and the front wall 10, to form a moistened whole. Owing to the dispersion incident to the retardation offered by the coil, the stream which moves upwardly through the coil is substantially uniform in pressure through the entire longitudinal extent of the conduit space 19. The secondary retarding agent, the reticulated element 38, causes still further dispersion so that both the pressures and the temperatures of the upwardly directed air stream are substantially uniform at all points along the guard 28.

In order to avoid "short circuiting" of the refrigerating air stream, by impingement against

the inner surface of the sight windows, the deflecting device 42, with its lip 43 is provided to cause a sharp deflection of part of the ascending air stream to mergence with the undeflected part, to form a general turbulence creating a favorable rearward dispersion of the air stream, without appreciable loss of refrigerating efficiency by direct contact with and impingement against the sight window. In order further to avoid shunting of the circulation, the duct 31 plays an important part. If it or its equivalent were missing, the suction on the rear part of the blower, with the natural tendency of cold air to fall, would cause the rear part of the case to be unaffected by the circulation. The rearward dispersion achieved by the deflecting lip 43 is enhanced by having the opening to the blower (the mouth 34 of the duct 31) well to the rear of the case. It being understood that as the flow of air upwardly through the guard element 38 on top of the conduit space 19 is substantially uniform throughout its entire length, the descending cold air passes downwardly about the trays on the wire shelves 46, and through the shelves themselves, substantially uniformly. Those portions of the air stream close to the ends of the case descend to the bottom and are pulled toward the orifice 34 in the shield at the same time that the more central portions of the air stream descend along the back wall toward the bottom before passing again through the blower or fan.

It will be understood that although the cooling unit is not maintained (in the preferred use of the device) at a low temperature, the rapidity of circulation possible with the blower arrangement shown at higher coil temperatures is such, as to compensate for and equal in refrigeration efficiency a slower thermal circulation with a coil below the freezing point. It will be the case therefore that there can be no appreciable formation of frost on the coil although there may be a deposition of moisture or even, temporarily, a slight edge frosting. Continuation of the circulation during that part of the cycle in which the temperature of the coil rises slightly, causes the circulating air to melt and to absorb the moisture embodied in the frost. However, when enough moisture condenses on the coils the surplus drops down either directly into the reservoir, or indirectly through impingement upon the inclined bottom walls, so that the level of the moisture in the reservoir is maintained. Owing to the relative humidity of the circulating air, through its not being subjected to the dehydrating action of a coil at appreciably below freezing temperatures, the shrinkage of meats and the like in the case is sharply minimized. As, in the cycle of operation of the case, the temperature of the coil rises, then continued circulation of the air causes the absorption of moisture both from the reservoir and from the coil itself, with a beneficial action upon the non-absorption of moisture from the displayed goods.

I claim:

1. A refrigerating show case comprising means defining a substantially vertical channel extending longitudinally of the case, said channel comprised of a lower dispersion chamber and an upper cooling chamber, a cooling unit disposed in the cooling chamber and restricting the flow of air through the cooling chamber, means for discharging a circulating air stream into the dispersion chamber and the arrangement being such as to cause dispersion of the air stream longitudinally of the case in said dispersion chamber so as to cause substantially uniform pressure of air passing upwardly through the cooling chamber.

2. In show cases, means defining a substantially vertical channel, a cooling unit in said channel, means for causing a circulation of air in the case upwardly through the channel, a deflecting shield having an angular lip disposed in the path of air discharged from the channel, the lip and shield causing turbulence and rearward dispersion of the air stream, a duct formed toward the bottom of the case and communicating with said second mentioned means and having an inlet substantially midway between the front and rear of the case.

3. In combination, a case having a front wall, a secondary wall in spaced relation to the front wall having an opening and defining with said wall a substantially vertical channel, said channel comprising an upper cooling chamber and a lower dispersion chamber, a blower operatively associated with the opening to force air into the dispersion chamber in which it spreads longitudinally of the case, a cooling unit in said upper chamber, a humidifying reservoir in the dispersion chamber in the path of air forced into said chamber, means for securing flow of air out of the upper end of said channel which is substantially uniform throughout its longitudinal extent, means for creating dispersing turbulence of said air stream emitted from the channel, means for concentrating returned circulating air substantially centrally of the case so as to secure substantially uniform circulation through the case.

4. In show cases, a guiding air channel comprised of a substantially restricted duct and a conduit having an elongated longitudinal mouth of appreciably longer extent than the diameter of the opening of the duct, means for forcing air through the air channel, cooling means in the air channel, humidifying means in the channel, and means at the top of the conduit and overlying said cooling means for substantially equalizing the pressure of air passing upwardly through the mouth of the conduit.

5. A refrigerating show case comprising means forming a compartment for refrigerating display purposes including front and rear walls, and an inclined window in the front wall, means defining with the front wall below the window, a conduit, the upper mouth of which extends for substantially the longitudinal extent of the case, a duct communicating with the conduit and having a mouth of restricted diameter disposed in appreciably spaced relation to both front and rear walls, the duct and conduit forming a guiding air channel, a blower unit operatively associated with the channel to force air therethrough, a cooling unit operatively associated with the channel to cool air passing therethrough, and means to maintain uniformity of pressure emitted from the mouth of the conduit.

6. A refrigerating show case comprising means forming a compartment for refrigerating display purposes including front and rear walls, and an inclined window in the front wall, means defining with the front wall below the window, a conduit, the upper mouth of which extends for substantially the longitudinal extent of the case, a duct communicating with the conduit and having a mouth of restricted diameter disposed in appreciably spaced relation to both front and rear walls, the duct and conduit forming a guiding air channel, a blower unit operatively associated

with the channel to force air therethrough, a cooling unit operatively associated with the channel to cool air passing therethrough, means to maintain uniformity of pressure emitted from the mouth of the conduit, a water reservoir in the channel, and means for directing a portion of the forced air stream to contact with the water reservoir.

7. A refrigerating show case comprising means forming a compartment for refrigerating display purposes including front and rear walls, and an inclined window in the front wall, means defining with the front wall below the window, a conduit, the upper mouth of which extends for substantially the longitudinal extent of the case, a duct communicating with the conduit and having a mouth of restricted diameter disposed in appreciably spaced relation to both front and rear walls, the duct and conduit forming a guiding air channel, a blower unit operatively associated with the channel to force air therethrough, a cooling unit operatively associated with the channel to cool air passing therethrough, means to maintain uniformity of pressure emitted from the mouth of the conduit, a water reservoir in the channel, means for directing a portion of the forced air stream to contact with the water reservoir, and means for directing condensation from the cooling unit to said reservoir.

8. In a show case, means defining a substantially vertical channel, a cooling unit therein, means for causing a circulation of air in the case upwardly through the channel, and a deflecting shield having an angularly disposed lip positioned in the path of air discharged from the channel, said lip and shield causing turbulence and rearward dispersion of the air stream.

9. A refrigerating show case, comprising an air channel, a cooling unit therein, a water reservoir, blower means for moving air relative to said cooling unit, baffle means for directing a portion of the air stream from said blower against the water in the reservoir to humidify said air stream, and perforate means at the top of the cooling unit whereby the pressure of air passing through said unit is equalized.

10. In a show case, a substantially rectangular conduit having a substantially restricted inlet duct and a mouth of appreciably longer extent than the width of the duct, means for forcing air through said conduit, humidifying means in the conduit and a baffle deflecting at least part of the air entering said conduit into contact with the humidifying means and causing dispersion of the same longitudinally of the conduit.

11. In a show case, a substantially rectangular conduit, a substantially restricted inlet duct and a mouth of appreciably longer extent than the width of the duct, means for forcing air through said conduit, humidifying means in the conduit, a baffle deflecting at least part of the air entering said conduit into contact with the humidifying means and causing dispersion of the same longitudinally of the conduit, and perforated means at the top of the conduit for substantially equalizing the pressure of air discharged from the mouth thereof.

12. A refrigerating show case comprising means defining a substantially vertical channel toward the front of the case, a cooling unit in said channel, blower means for forcing air vertically upward through the channel, a deflecting shield in the path of air passing through the channel arranged to deflect a portion at least laterally of its path to cause dispersion of the air stream rearwardly of the case, and guide means for leading said air stream to supply said blower in a closed circulation.

13. A refrigerating show case comprising means defining a substantially vertical channel toward the front of the case, a cooling unit in said channel, blower means for forcing air vertically upward through the channel, a deflecting shield in the path of air passing through the channel arranged to deflect a portion at least laterally of its path to cause dispersion of the air stream rearwardly of the case, guide means for leading air stream to supply said blower in a closed circulation, said guide means having an entrance in rearwardly spaced relation to the vertical channel.

14. In show cases, a guiding air channel comprised of a substantially restricted duct and a conduit having an elongated extending mouth extending transversely of the duct and of appreciably longer extent than the diameter of the opening of the duct, means for forcing air through the air channel, cooling means in the air channel, humidifying means in the channel, and means for substantially equalizing the pressure of air passing through the mouth of the conduit.

15. In show cases, a guiding air channel comprised of a substantially restricted duct and a conduit having an elongated longitudinal mouth of appreciably longer extent than the diameter of the opening of the duct, means for forcing air through the air channel and vertically upward through the conduit, cooling means in the air channel, means for substantially equalizing the pressure of air passing through the mouth of the conduit, the mouth of the conduit being appreciably spaced out of vertical alignment with the opening of the duct, so that chilled air forced out of the mouth of the conduit must move horizontally in the case before entering the opening of the duct to insure proper dispersion of circulating air in the case and to maintain an approximately uniform temperature throughout the case.

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