June 5, 1934. W. E. HILL 1,961,901

REFRIGERATING DISPLAY CASE

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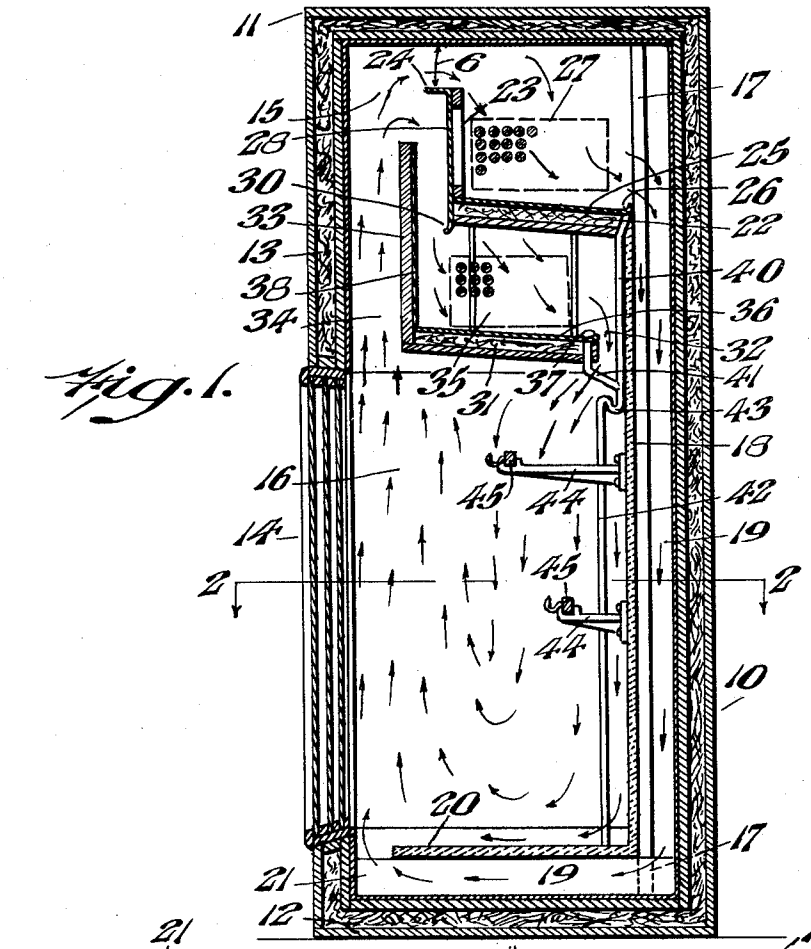


Fig. 1.

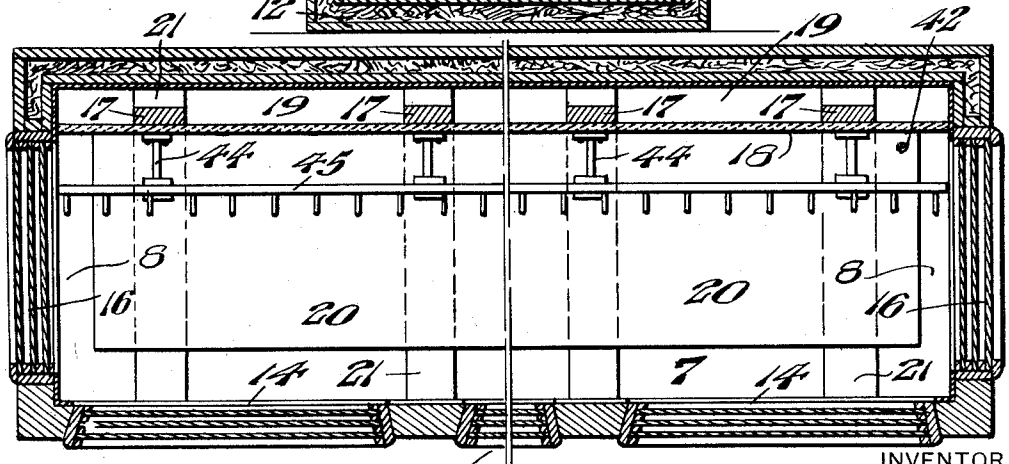


Fig. 2.

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REFRIGERATING DISPLAY CASE

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8 Claims. (Cl. 62—89.6)

This invention relates to refrigerating display cases, and particularly to wall or window display cases.

It is highly desirable that meats and similar perishable goods be displayed in such manner as to attract customers from the street. For this purpose certain display cases have been constructed for disposition inside of store windows, or attached and hanging upon a wall inside of the store, in which the perishable goods have been displayed, with associated refrigerating means, designed to preserve the foodstuffs and the like, while providing such glass or window area as to permit free inspection from front and sides. Unfortunately the very disposition of the cases has contributed to their universal failure, despite the great demand and high desirability of such cases. It must be appreciated that the heat coming in through the window of a store during hot weather is much more pronounced than it is further back in the store or market, or the like. Although it is sometimes possible to have insulation upon one end window of the case as well as upon the rear wall thereof, there is such area of glass and such high heat transmission as to render previous attempts in the art unavailing, so far as known, as far as securing efficient refrigerating action with a maximum of visibility.

It is among the objects of this invention; to provide a wall or window case of high efficiency; to provide a show case of simplicity and excellent appearance; to provide a window case so arranged that dehydration and shrinkage of the displayed perishables is minimized; to provide a refrigerator with two substantially independent airstreams, circulating one within the other; to provide in a display case two cooled airstreams of which one is moister than the other; to provide a relatively shallow case in which one chilled airstream absorbs heat entering through the front window, while another chilled and moistened airstream contacts with the displayed goods; to provide a case with two different circulating airstreams of relatively different speeds; to improve generally the art of display cases.

While the invention is specifically applied and disclosed as embodied in a relatively shallow elongated case having a side and front window, it will be understood to have general application to show cases broadly. In certain respects this invention constitutes an improvement on my earlier patent granted September 14, 1926, No. 1,599,891.

In the accompanying drawing:

Fig. 1 represents a vertical transverse section through the improved window show case, and

Fig. 2 represents a horizontal section taken on line 2—2 thereof.

The case may comprise an insulated rear wall 10, insulated top 11 and insulated bottom 12. The front wall of the case may be defined by the small refrigerant-concealing insulated section 13, and the windows or doors 14, preferably comprised of three spaced sheets of glass, as is common in show cases. The end walls of the case may comprise upper insulated sections 15, and lower glass sections 16. The windows and doors may be set in pillars at the corners and the like as may be necessary or desirable, so long as the visibility is not too sharply diminished. The several walls and windows define a substantially closed compartment in which the circulating air streams move, and in which the goods are displayed.

In spaced relation to the inner surface of the back wall 10, there may be a series of vertical joists or posts 17 in parallelism with the back wall, forming supports for the vertical division baffle 18, which extends longitudinally the full length of the case and terminates vertically short of the bottom wall, and has a substantially horizontal extension 20 terminating short of the front wall so as to leave an air channel space 7, and which extension extends longitudinally less than the length of baffle 18, so as to leave air channel spaces 8 adjacent the end walls or windows. The baffle and extension may also be supported upon horizontal girders or supports 21. The baffle 18 and extension 20 are preferably of glazed material such as a porcelain finished sheet material, or a mineral, as marble or vitriolite, or the like. It is of importance that it have an attractive, easily cleaned surface, as it forms the background against which the products are displayed. It will be observed that the division baffle and its extension are in such relation to the rear wall 10 and bottom 12 as to form a channel 19 for a circulating airstream. Preferably the end windows 16 have their rear edges advanced forwardly of the baffle 18, so as to conceal the side edges thereof. It will be observed that air channel spaces 7 and 8 are in communication with air channel 19, so that air passing downwardly between division baffle 18 and the rear wall 10, passes in greatest measure forwardly across the bottom wall and up through space 7 at the front edge of extension 20 while a smaller portion passes under the bottom edge of baffle 18 as well as under extension 20, and moves transversely and longitudinally of the case to emerge through spaces 8 adjacent the end windows of the case.

A rearwardly inclined preferably insulated de-

flector 22 is mounted in the respective end wall sections 15 and connects, in substantially air-tight relation, with the upper edge of the division baffle 18. At the forward edge the deflector 22 has a substantially vertical plate or baffle 23 terminating in a forwardly extending horizontal lip 24. The upper edge of plate or baffle 23 is vertically spaced from the inner surface of the top wall 11 to form a throat or duct 6 through which warm air may pass in the course of circulation in the case. The deflector 22 has a metallic covering sheet 25 terminating in the gutter or lip 26 arranged to catch moisture which may drop from the elongated cooling coils or unit 27 which latter extends longitudinally of the case above the deflector 22 in a space communicating at the front with duct 6, and at the rear with channel 19. The vertical baffle plate 23 comprises an opening framework or other reinforcing, carrying a layer of sheet metal 28 terminating in the slightly flared small lower lip 30 and which layer 28 is preferably close enough to cooling unit 27 or otherwise arranged as to be chilled thereby. In the normal operation of the parts so far described, it will be observed that a normal closed cycle of continuously circulating air is had by the air passing through the coil 27, being chilled thereby, striking the deflector 22 and being propelled toward the rear of the case over the gutter or lip 26 down behind the division baffle 18 in the channel 19 to the bottom of the case, then toward the front and ends of the case beneath horizontal extension 20 of the division baffle then upwardly through spaces 7 and 8 sweeping past the heat transmitting windows and doors 14 and end windows 16, and absorbing heat units passing therethrough, then up within the front wall 13 through a duct 34 to be described to passage through the duct or throat 6 defined by the lip 24 and upper edge of the vertical wall 23, thence through the cooling coil 27. It will be observed that the circulation just described, which may be characterized as the primary circulation, while having no direct refrigerating action so far as contacting with the displayed goods is concerned, yet has an important practical function by providing a highly effective insulating medium to prevent the transmission of heat from outside of the case into the refrigerating secondary airstream, to be described, by capturing, or absorbing, the heat units entering through the windows as the primary airstream circulates. It will be observed that this primary insulating airstream is in direct contact with the top and bottom as well as the front, side and rear walls to effectively shield the refrigerating circulation to be described. The primary airstream is relatively dry and relatively rapid, and is preferably purely thermal relying upon the elevation of the temperatures of air adjacent the front and end windows to cause upward flow, while air chilled by the coil seeks a lower level.

A secondary rearwardly inclined deflector 31 is mounted longitudinally of the case below and in substantially parallel but staggered relation to the deflector 22, and has its inner or rear edge spaced from the adjacent surface of the division baffle 18 so as to form a cold air duct 32 for the secondary or refrigerating airstream. A vertical guide plate or baffle 33 is mounted on the forward end of deflector 31 in parallel spaced relation to but of greater vertical extent than the plate 23 and in somewhat greater parallel spaced relation to the inner surface of the front wall 13. The vertical baffle plate 33 thus described forms with the front wall 13 a vertical duct or throat 34 upwardly through which the substantially stratified primary and secondary airstreams may pass in the operation of the case. The secondary cooling coil 35 is arranged to extend longitudinally of the case and slightly above the secondary deflector 31 in parallel, but preferably forwardly staggered relation to refrigerating coil 27. Deflector 31 has a sheet metal covering 36 including a gutter or lip 37, and the plate 33 has a sheet metal facing 38 on its inner or rear surface preferably in integral or thermally conductive relation to sheet metal covering 36 and so arranged as to be chilled by the secondary cooling unit 35. Suitable drainage and overflow conduits 40 and 41 connect with an outlet 42 containing the trap 43. Suitable brackets 44 carrying the longitudinal hook bars 45 are mounted on the division baffle 18 in any suitable manner as by bolts extending into the vertical studs 17. The goods to be refrigerated may be disposed on suitable platter trays on the horizontal extension 20 and also may be supported upon the hooks of the hook bars 45.

It will be clear that the upward passage of the primary airstream around the end of horizontal extension 20 will exert a suction or injector action upon the upper surface of the extension 20 so that the secondary airstream passing through coil 25 and then down through the throat 32 down the front of divisional baffle 18 will in some measure at least descend to the horizontal extension 20 and then move toward the front of the case, owing to the aforementioned injector action, and will then rise behind the strata of the ascending primary airstream to pass with the primary airstream upwardly through the throat 34 and over the top of vertical baffle 33 and downwardly between baffles 33 and 23 through the secondary cooling coil 35. It will be understood that as an incident of heat absorption from the refrigerated goods, there will be a dispersion of the cooling air through the entire space of the displayed perishable goods so that warm spots and pockets of warm air will be avoided. This is facilitated by the insulated deflector 31 directing ascending air toward the throat 34.

It will be understood that there will be a cycle of operation of the cooling coils as is common in such display cases inasmuch as the coils are arranged to function between maximum and minimum temperatures. This is accomplished either by thermostat or pressure responsive devices so that upon the lowering of the temperature of the coil to a desired point, the compressor is stopped. The temperature of the coil will obviously slowly rise thereafter until the desired predetermined temperature is reached, at which point the compressor is started to again lower the temperature of the coils. While it is not so important that the moisture content of the primary airstream be maintained at a high point, it is desirable that the secondary airstream be appreciably moist. To this end the metal sheet 28 having the lip 30 on the vertical baffle 23 is so arranged as to cause condensation of moisture on its forward or outer surface as the secondary airstream moves relative thereto as an incident to its chilling by cooling unit 27. At the coldest point in the cycle this moisture deposition on the surface 28 and on the surface 38 of the baffle 33 may form frost, but the constant circulation of the secondary airstream during the warming period of the freezing cycle

causing the condensed moisture to be reabsorbed to maintain the humidity of the secondary airstream. This is facilitated not only by the presence of the uninsulated sheet metal layer 28 and sheet metal layer 33, but also by the slightly inclined metal surface 36 of the secondary deflector which catches moisture dropping from coil 35 and through contact by the secondary airstream moistens said stream.

It is a feature of importance that although the secondary airstream in its circulation rises vertically behind the insulating strata of the primary airstream it tends to avoid dispersion and admixture with the primary airstream and to maintain the stratification even during its upward passage through throat 34 so that the secondary airstream tends to remain an independent unmerged independently circulated stream distinct from the primary airstream. This has been shown by smoke tests in actual operation. This is not to say that there may not be some occasional transfer of air from one stream to the other, but such transfer is a minimum. It is believed that part of this phenomena is attributable to the higher relative humidity of the secondary airstream. This latter would account also for the fact that the ascending moisture laden air, being heavier than the primary airstream, and being slower, is by-passed or shunted beneath the lip 24 to the secondary cooling coil, while the lighter warm air of the primary airstream rises to the top of the case and goes over said lip 24. Thus there is provided two substantially independently circulating airstreams, one of which circulates within the other and is, of course, insulated by the other.

It has been discovered that despite the presence of elevated temperatures surrounding the case, and despite the high visibility afforded by the case, the display case of this invention will maintain meats and similar perishable goods in a substantially perfect condition of refrigeration, with a minimum of shrinkage, and is efficient, economical and highly useful.

I claim:

1. In a show case, a primary cooling unit, means defining a channel from said unit down and across said case, a secondary cooling unit, means defining a channel spaced from said first mentioned channel for a secondary cooling airstream, and means defining a channel common to both said streams.

2. In a display case, a divisional baffle in parallel spaced relation to a wall of said case, a horizontal extension on said divisional baffle in vertically spaced relation to the bottom of said case, a primary cooling unit, a deflector beneath said unit having a mouth delivering to the space between said divisional baffle and said wall, a vertical baffle on said deflector spaced from the upper part of said case.

3. In refrigerators, a case having walls defining a compartment, a primary cooling unit, means defining a path for a primary airstream communicating with said unit, said primary airstream arranged to flow in contact with the top, rear, bottom, front and a side wall of the case, a secondary cooling unit, and means defining a partial path of a secondary airstream communicating with the secondary unit, said secondary airstream arranged to circulate in spaced relation to all of the numerated walls of the case.

4. In display cases, means defining a compartment, means defining a vertical throat at the front of the compartment, means defining a primary air channel at the top, rear and bottom of the compartment, a cooling unit in said primary air channel, means defining a secondary air channel from said throat to said primary channel defining means, and a secondary cooling coil in said secondary cooling channel.

5. In a refrigerator having a rear wall, side walls, and a front wall, a division baffle spaced from and substantially parallel with the rear wall and abutting the end walls, a substantially horizontal extension for the baffle having clearance from the front wall and an end wall, means for passing a chilled circulating airstream between the rear wall and said baffle, and means for passing a secondary chilled circulating airstream along the other surface of said baffle.

6. In refrigerators, a display case including front, top, rear, bottom and end walls, a division baffle extending longitudinally of the case between the end walls in substantial parallelism with and spaced from the rear wall, an extension extending substantially parallel with the bottom wall and spaced therefrom, the extension terminating short of the front wall and an end wall, so as to leave spaces therebetween, a cooling unit in communication with the space between the baffle and the rear wall, means for directing rising warm air to said cooling unit, the arrangement being such that descending chilled air passes out from under said extension and rises adjacent said end wall and said front wall.

7. In refrigerators, means for directing a primary circulating airstream about the inner surfaces of the top, rear, bottom, end and front walls, a cooling coil in said airstream, and means for securing a secondary circulating airstream inwardly of all of said walls, and a cooling coil in said secondary airstream.

8. In display cases, means defining a shallow elongated compartment, said means having a front and a side window, two cooling coils in the upper part of the compartment extending longitudinally thereof in parallel vertically staggered spaced relation, a deflector baffle extending longitudinally of the case between the coils, a vertically extending plate mounted on said baffle terminating in an edge spaced from the upper wall of the compartment, a division baffle extending from the baffle downwardly in the compartment in substantially parallel spaced relation to the rear wall thereof, an extension mounted on said division baffle in spaced relation to the bottom of said compartment and having a space between its front edge and the front wall of the compartment, said extension also forming a space with an end wall thereof, a secondary deflector baffle disposed below the lowermost coil and terminating at the rear edge in spaced relation to the division baffle, and a vertical plate mounted on the front part of the secondary deflector baffle in parallelism substantially with the first mentioned plate and terminating in an edge below the edge of the first mentioned plate and forming with the front of the compartment a throat.

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