June 20, 1939. H. H. GOALSTONE 2,163,031

METHOD AND APPARATUS FOR REFRIGERATING PERISHABLES

Filed Jan. 26, 1937

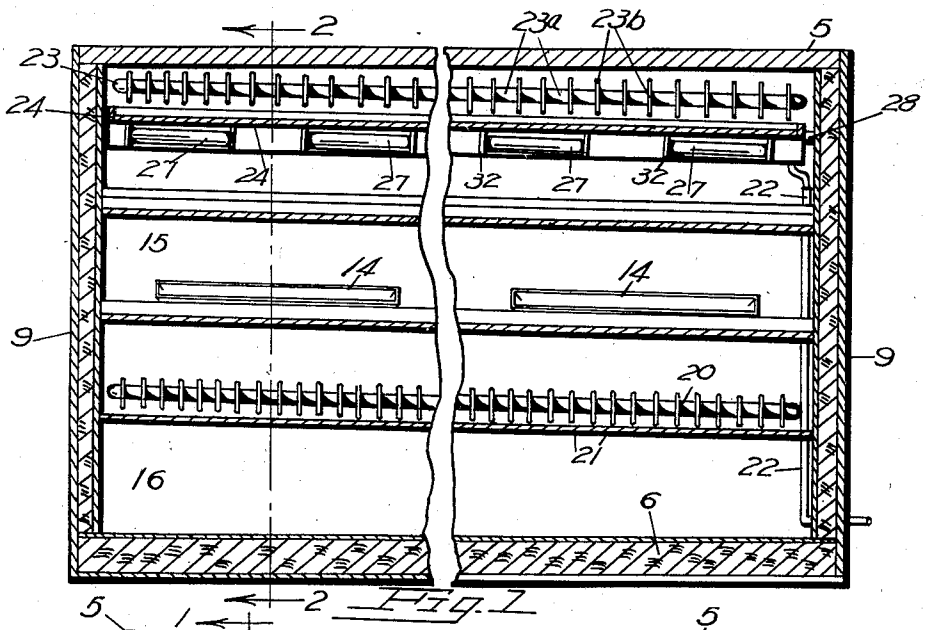


Fig. 1

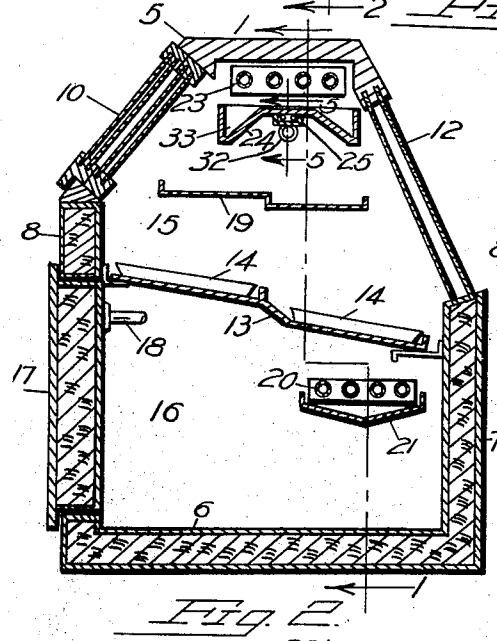


Fig. 2.

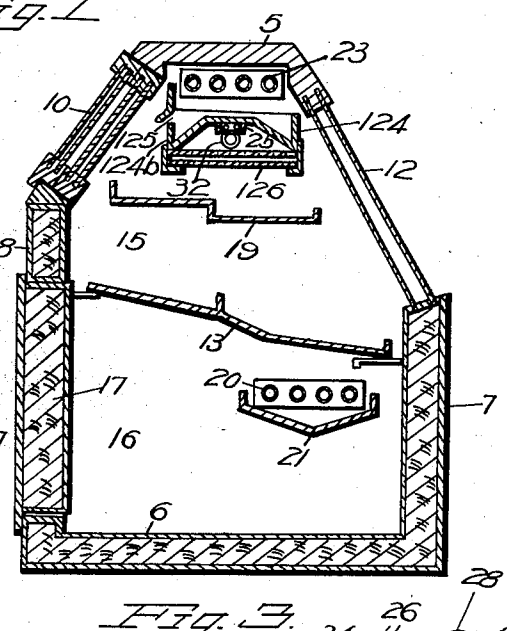


Fig. 3.

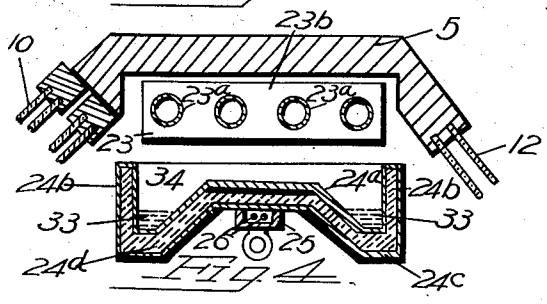


Fig. 4.

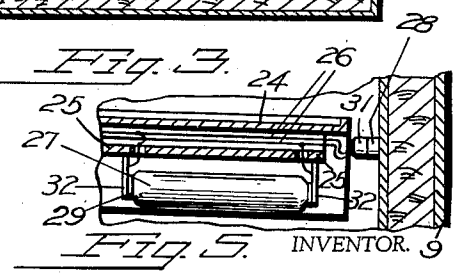


Fig. 5.

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METHOD AND APPARATUS FOR REFRIGERATING PERISHABLES

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13 Claims. (Cl. 62—89.5)

This invention relates to a refrigerating method and refrigerating display cases for perishables, and relates more particularly to artificially illuminated refrigerating cases.

It is a primary object of the present invention to utilize illuminating means with refrigerating means in a display case to produce an improved humidity and refrigeration control.

Another object of the invention resides in combining in a single element the functions of a reflector and drip pan.

A further object of the invention resides in directing heated air within a show case away from perishable merchandise to insure maintenance of the merchandise in a properly cooled condition at all times.

Other objects reside in novel steps and processes and novel combinations and arrangements of parts, all of which will appear more fully in the course of the following description.

In most enclosed display cases using refrigerating means, the continued operation of such means usually results in a considerable proportion of the moisture content of the air being deposited on surfaces within the case in the form of frost, and the circulation of cold, dry air over perishables in the case produces a drying action on such goods with deleterious effects.

The storage compartments of refrigerated display cases are frequently illuminated by concealed lamps located at different positions within the case. Lighting of this character presents difficulties. Heat generated by the lamps will have a deleterious effect on merchandise in the case unless some provision for heat removal is made.

The top of the case affords the most logical area for location of lights, but is objectionable for several reasons. If the heat from the lights is conducted through the top of the case, it prevents the top being used for the storage and display of foodstuffs, and such top also may become overheated to the extent it will cause injury to persons coming in contact therewith.

Further, placement of lights in the top of the case necessitates location of the coils of the refrigerating system in a position in which they will not interfere with the lighting. Again, the top of the case affords the best area for location of the coils as the cooled air will effectively blanket all the merchandise as it descends from such an elevated position.

The present invention utilizes the upper portion of the case for the location of the lights and coils, the lights being underneath the coils for proper light distribution and there is also provided a system of air circulation and heat transfer which constitutes the humidity and refrigeration control for the preservation of perishable merchandise.

In attaining the refrigeration and humidity control, the coils are located in the uppermost portion of the display compartment, and warm air in the case rises directly to and is acted on by the coils. Between the coils and the lights a heat-conductive element is fixed which serves as a reflector for the lights and also as a drip pan for the coils.

Being a good conductor, the element serves as a heat transfer unit, and the heat generated by the lamps, instead of spreading through the storage compartment, is directly and rapidly subjected to the influence of the refrigerating element and dissipated.

The heat exchange occasioned by the rising warm air, entering through the service doors, etc., and the operation of the lamps, is sufficient to decrease frosting of the coils, and results in the conversion of frozen matter to liquid, during the warmer periods of the refrigeration cycles.

This moisture drips onto the pan above the lights and passes slowly along the same to a drain at its low end, and during said movement contacts a considerable amount of air being subjected to the cooling influence of the coils, with the result that some of the moisture is taken up by the air and subsequently descends with the same to the perishables on display.

The continued circulation of cold air currents across the perishables, particularly meats, causes a heat withdrawal therefrom, which in time reduces the temperature of the meats below the temperature of at least a portion of the air contacting the same, and results in a condensation of moisture thereon.

Thus, we have a situation in which the circulating air, instead of withdrawing moisture from the perishables, is supplying moisture thereto, and such perishables may be stored in the case for several days without any appreciable dehydration such as is usually experienced in refrigerating display cases.

To afford a better understanding of the invention, reference will now be made to the accompanying drawing illustrating structures incorporating the several features of the invention, and in which

Figure 1 represents a broken section, taken along the line 1—1 of Figure 2;

Figure 2 is a section taken along the line 2—2, Figure 1;

Figure 3 is a sectional view corresponding to Figure 2, showing another embodiment of the invention;

Figure 4 is an enlarged fragmentary section illustrating the arrangement and construction of the refrigerating and lighting elements illustrated in Figure 2; and

Figure 5 is a section taken along the line 5—5, Figure 2 and drawn to an enlarged scale.

The display case illustrated in the drawing embodies the features described and claimed in U. S. Letters Patent Number 1,977,056 granted to Michael J. Goalstone, October 16, 1934, together with certain novel features which will be explained in detail. While these features have been illustrated in connection with the aforesaid construction, it will be understood that they are applicable to any display case of this general type, and the specific construction illustrated in the drawing is referred to merely to show an operative arrangement.

To this end the show case comprises a top 5, a base 6, front wall 7, rear wall 8 and end walls 9. These walls preferably comprise two spaced plates and a layer of heat-insulating material between the plates. Inclined service doors 10 are provided in the rear wall 8, and preferably are the double, sliding type. Windows 12 in the front wall 7 permit inspection of goods by customers.

A partition 13 provides a support for merchandise containers 14, and also divides the interior of the case into upper and lower stage compartments 15 and 16 respectively. Service doors 17, which may be the conventional hinged type, permit access to the lower compartment 16.

Electric lamps 18 are provided for lighting the compartment 16 when door 17 is opened, and preferably are in a circuit which is closed by opening the door and is opened by closing the door.

There is also provided a second merchandise support 19 located in compartment 15 at a distance above the containers 14.

A refrigerating element 20 is located beneath the partition 13 and a drip pan 21 is provided to carry off moisture dropping from the element 20. The element 20 and pan 21 slope from one end of the case to the other and the moisture collected by the pan is carried to a point of discharge, comprising a drain tube 22.

The construction thus far described is more or less conventional, and may be considerably modified in minor respects. The essential features of the present invention will now be described in connection with the aforesaid structure.

In the upper portion of compartment 15 in proximity to top 5, a refrigerating element 23 extends lengthwise of the case. While any suitable form of element may be used, I have found in practice that circulating coils 23*a* carrying fins 23*b* are very effective for this purpose. The element is connected with a suitable compressor (not shown) in a manner well known in the art.

A hood 24 extends lengthwise of the case beneath and in proximity to the element 23, and combines the functions of a reflector, a drip pan, a guide for circulating air, and a supplemental heat exchange element.

A modified construction of the hood is best illustrated in Figure 4, and comprises a central arched portion 24*a* and upright sides 24*b*. An essential feature of the hood is that it is a good heat conductor, and a metal of high thermal conductivity is preferably employed in its construction. Good results are attained when the hood is formed of a metallic cover 24*c* encasing a heat reflecting and moisture proof composition 24*d*, such as Reynolds "Metallation", for example.

A channel member 25 is detachably held on the underside of the arch portion 24*a* and houses the wiring 26 required for lamps 27 used to light compartment 15. The wiring connections are adapted to be connected in circuit through the provision of a "plug in" arrangement.

To this end, a plug 28 having suitable contacts is fixed on an end wall 9 of the case, the contacts being connected with conductors, adapted to connect with any suitable electric outlet in the room in which the case is installed in a manner well-known in the art. A separable portion 31 of plug 28 at an end of channel 25 is in conductive connection with wiring 26 and completes the circuit thereto.

Spring clips 32 project from channel 25 at intervals and support the lamps 27. The clips comprise a disk of insulating material having spring contacts 29 in which the electrodes (not shown) at the ends of lamps 27 are fitted, the contacts 29 being in conductive connection with wiring 26.

It will be understood that any suitable wiring circuit may be employed and the foregoing is described as a simple and effective arrangement giving good results. Lamps 27 may be removed and inserted readily for replacement purposes, and if any break in the wiring occurs, the channel member 25 together with the wiring may be taken from the case and the repairs made under proper working conditions.

The under surface of arch portion 24*a* serves as a reflector. The lamps 27 are concealed from persons standing in front of the case, and a pleasing and efficient lighting effect is attained by this arrangement.

The spaces between the arch portion 24*a* and the walls 24*b* provide basins 33 for moisture collecting from the elements 23. In order to prevent excessive accumulation of liquid the hood slopes gradually from one end wall to the other and is provided at each end with closures 34 to prevent escape of liquid from basins 33. At the lower end of hood 24, the basins have outlets connected with a drain pipe 22, which conducts the runoff to a sewer connection (not shown).

The slope of the basins 33 is relatively slight to give the collecting moisture a slow travel in its passage to the drain 22. As a result, the moisture contacts the dried air circulating over the hood, and some of the chilled liquid vaporizes and subsequently passes with the air onto the merchandise being displayed in compartment 15. This constitutes the humidity control of the case.

The lamps 27 emit heat which is conducted along the overhanging surfaces of hood 24. The surfaces of the hood immediately underneath and exposed to the element 23 are chilled by heat transfer with the element and as these surfaces are also part of the hood, a rapid heat exchange is effected, the hood functioning in this respect as a supplemental heat exchange element. In this connection it will be understood that the bodies of chilled liquid in basins 33 also function as part of the supplemental heat exchange system.

Any warm air collecting under arch 24*a* is either dissipated by the heat exchange action of the hood or will ascend around the same and pass into the sphere of influence of element 23. Like-

wise warm air entering the case through the doors 10 or 17 ascends along wall 8 and passes into the sphere of influence of element 23.

From the foregoing it will be apparent that warm air at any position in the case is free to travel directly to the upper portion of the same where it is subjected to the heat exchange action already described.

In Figure 3 another embodiment of the hood construction is illustrated. The hood 124 is of the same general construction as hood 24 (Figure 1) with the exception that the wall 124b is slotted as indicated at 125, the portion of the wall above the slot flaring outwardly to provide a louver.

With this arrangement, ascending heated air is directed against the coils 23a before it reaches the top of the case and thereby has a longer heat exchange contact therewith.

There is also provided a closure 126 comprising one or more panes of glass extending the length of the case and engaging the end walls 9 thereof at its ends. Preferably a plurality of panes in spaced relation will be employed in order to provide a dead air insulating space between the panes.

If desired, the space between the panes at each end of the case, may be connected by passages (not shown) with the atmosphere, and in this way a circulation of air between the panes will be effected.

With both arrangements, air warmed by contact with the lamps 27 cannot escape from the enclosure and the heat so generated is dissipated by the conductive action of hood 124. While glass is the preferred composition for use as a closure, it will be understood that any transparent substance satisfactory for the purpose may be used in place thereof.

Either the louver arrangement or the closure may be used separately, if desired, or both may be used in the manner illustrated.

In the drawing the lamps 27 as illustrated are of the tubular type, but it will be understood that any type of illuminating means located in the case in the manner described is within the spirit and scope of the invention.

Preferably both the hood 24 and the channel 25 are detachably suspended or supported in the compartment 15 to permit separate removal, or removal as a unit. With this arrangement, when repairs are necessary, either or both of these elements may be removed from compartment 15 while the work is being done, without disturbing the refrigerating action, as would occur if the doors 15 remained open until the work was completed.

Changes and modifications may be availed of within the spirit and scope of the invention as defined in the claims.

What I claim and desire to secure by Letters Patent is:

1. In a display case of the character described having a refrigerating element in its upper portion, a combined drip pan and light-reflector beneath the refrigerating element, comprising a body extending beneath the element lengthwise of the case, having a central arched portion and having upright sides, each of the sides forming with the arch a basin therebetween, and the under surface of the arched portion defining the light-reflector.

2. In a display case of the character described having a refrigerating element in its upper portion, a combined drip pan and light-reflector beneath the refrigerating element, comprising a body sloping beneath the element lengthwise of the case, having a central arched portion and having upright sides, each of the sides forming with the arch a basin therebetween, and the under surface of the arched portion defining the light-reflector, and a drain at the lower end of the basin.

3. In a display case of the character described having a refrigerating element in its upper portion, a combined drip pan and light-reflector beneath the refrigerating element, comprising a body extending beneath the element lengthwise of the case, having a central arched portion and having upright sides, each of the sides forming with the arch a basin therebetween, and the under surface of the arched portion defining the light reflector, one of the sides being slotted to form a louver for the passage of air therethrough.

4. In a refrigerated display compartment, heat-absorbing means in the upper portion of the compartment, a heat-conductive trough element positioned below and in proximity to said means and having an air-passage therethrough spaced from its bottom, and a source of light disposed adjacent the under surface of the trough element.

5. The improvement in refrigerating display cases or the like, in which the interior of such case is illuminated by a light source located within the enclosure of the case, which comprises passing a stream of air through a zone therein in heat-exchange relation with a refrigerant intermittently evaporated to produce a temperature thereof tending to cause a sub-freezing temperature within said zone, illuminating the interior of the case by the operation of a light source therein, applying the resultant heat from said source to retard congealing of moisture in said zone during the periods of refrigerant evaporation and between the said periods to melt frost formed during such periods, and circulating air through the enclosure over goods therein and through such heat-exchange zone.

6. The improvement in refrigerating display cases or the like, in which the interior of such case is illuminated by a light source located within the enclosure of the case, which comprises passing a stream of air through a zone therein in heat-exchange relation with a refrigerant intermittently evaporated to produce a temperature thereof tending to cause a sub-freezing temperature within said zone, illuminating the interior of the case by the operation of a light source therein, applying the resultant heat from said source to retard congealing of moisture in said zone during the periods of refrigerant evaporation and between the said periods to melt frost formed during such periods, and inducing movement of cooled air from said heat-exchange zone onto goods in the case contemporaneously with the movement of warmer air from said goods to the heat-exchange zone.

7. The improvement in refrigerating display cases or the like, in which the interior of such case is illuminated by a light source located within the enclosure of the case, which comprises passing a stream of air through a zone therein in heat-exchange relation with a refrigerant intermittently evaporated to produce a temperature thereof tending to cause a sub-freezing temperature within said zone, illuminating the interior of the case by the operation of a light source therein, applying the resultant heat from said source to retard congealing of moisture in said zone during the periods of refrigerant evapo-

ration and between the said periods to melt frost formed during such periods, and causing cooled air from the heat-exchange zone to descend by gravity through the interior of the case onto goods therein contemporaneously with the movement of warmer air from the interior into the heat-exchange zone.

8. In a refrigerating display case or the like, a storage compartment for perishable merchandise, supports for the storage and display of perishables below the upper portion thereof, a refrigerating element located in the upper portion of the compartment and adapted for cyclic operation, a heat-conductive hood beneath the element in heat-exchange relation thereto, and a source of artificial light at the underside of the hood in heat-exchange relation thereto, whereby heat generated at the source of light is utilized to retard formation of frost on the refrigerating element during periods of its operation and to melt frost formed on the element between such periods.

9. In a refrigerating display case or the like, a storage compartment for perishable merchandise, supports for the storage and display of perishables below the upper portion thereof, a refrigerating element located in the upper portion of the compartment and adapted for cyclic operation, a heat-conductive hood beneath the element in heat-exchange relation thereto and provided with a light-reflecting surface on its underside, and a source of artificial light at the underside of the hood in heat-exchange relation thereto, whereby heat generated at the source of light is utilized to retard formation of frost on the refrigerating element during periods of its operation and to melt frost formed on the element between such periods.

10. In a refrigerating display case or the like, a storage compartment for perishable merchandise, supports for the storage and display of perishables below the upper portion thereof, a refrigerating element located in the upper portion of the compartment and adated for cyclic operation, a heat-conductive hood beneath the element in heat-exchange relation thereto and adapted to contain a liquid on its upper surface, and a source of artificial light at the underside of the hood in heat-exchange relation thereto, whereby heat generated at the source of light is utilized to retard formation of frost on the refrigerating element during periods of its operation and to melt frost formed on the element between such periods.

11. In a refrigerating display case or the like, a storage compartment for perishable merchandise, supports for the storage and display of perishables at different elevations therein, a refrigerating element located in the upper portion of the compartment and adapted for cyclic operation, a heat-conductive hood beneath the element in heat-exchange relation thereto, and a source of artificial light at the underside of the hood in heat-exchange relation thereto, whereby heat generated at the source of light is utilized to retard formation of frost on the refrigerating element during periods of its operation and to melt frost formed on the element between such periods.

12. In a refrigerating display case or the like, a storage compartment for perishable merchandise, supports for the storage and display of perishables below the upper portion thereof, a refrigerating element located in the upper portion of the compartment and adapted for cyclic operation, a heat-conductive hood detachably held beneath the element in heat-exchange relation thereto, and a source of artificial light at the underside of the hood in heat-exchange relation thereto, whereby heat generated at the source of light is utilized to retard formation of frost on the refrigerating element during periods of its operation and to melt frost formed on the element between such periods.

13. In a refrigerating display case or the like, a storage compartment for perishable merchandise, supports for the storage and display of perishables below the upper portion thereof, a refrigerating element located in the upper portion of the compartment and adapted for cyclic operation, a heat-conductive hood beneath the element in heat-exchange relation thereto, a transparent closure at the underside of the hood, and a source of artificial light within the enclosure in heat-exchange relation to the hood, whereby heat generated at the source of light is utilized to retard formation of frost on the refrigerating element during periods of its operation and to melt frost formed on the element between such periods.

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