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E. W. JARVIS  
REFRIGERATED SHOWCASE  
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2,287,997

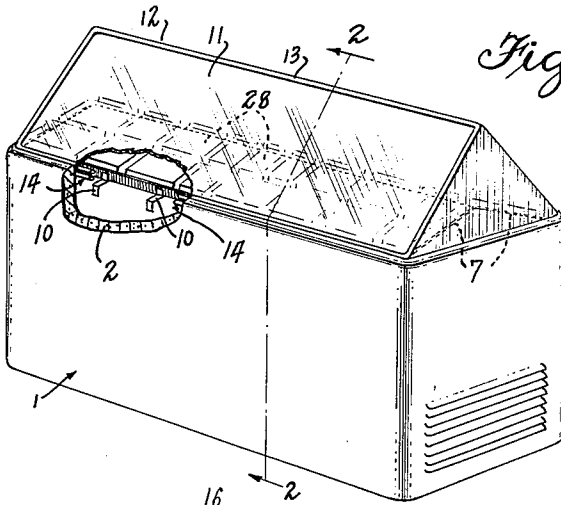


Fig. 1.

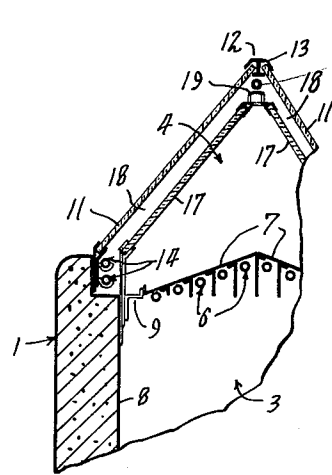


Fig. 3.

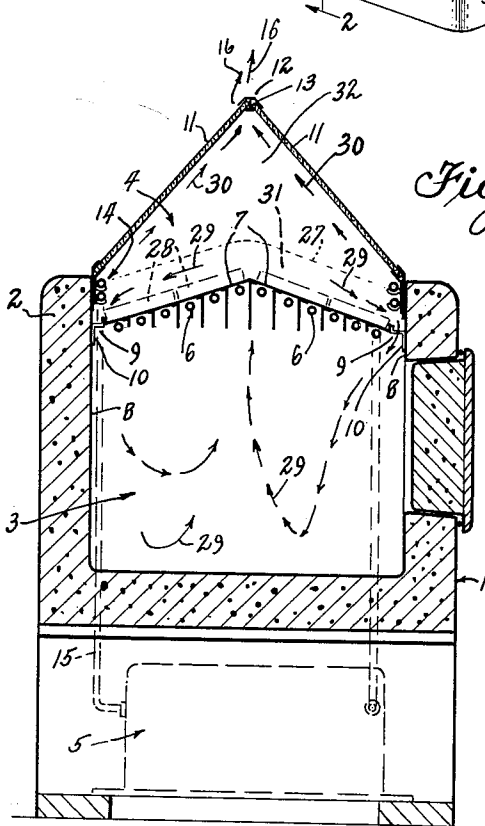


Fig. 2.

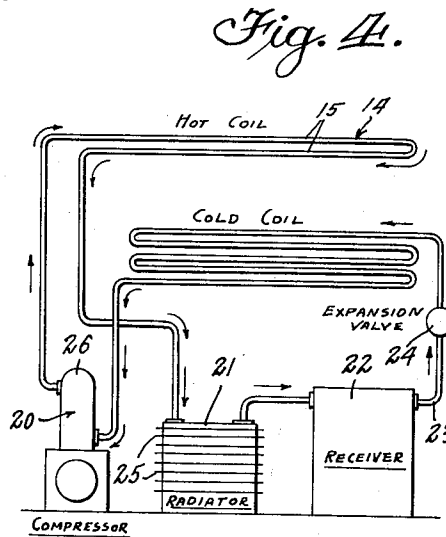


Fig. 4.

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## UNITED STATES PATENT OFFICE

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## REFRIGERATED SHOWCASE

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6 Claims. (Cl. 62—89.5)

This invention relates to refrigerated show-  
cases, and more particularly to a refrigerated  
show and storage case including a display or  
window section.

In the storage and display of refrigerated  
foods, and particularly in the display and stor-  
age of frozen foods, great difficulty has been en-  
countered in maintaining a proper display of  
these foods while maintaining the requisite low  
degree of temperature due to the formation of  
frost or condensation upon the display windows  
or transparent sections of such a case. In order  
to overcome this difficulty, there have been used  
in the art multiple glass display sections, in-  
cluding three or more separate panes of glass in  
an effort to prevent the condensation of liquid  
from the air which interferes with free vision  
through the transparent window sections.

It is an object of this invention therefore to  
provide a refrigerated display case adapted for  
the maintenance of refrigerated food at low tem-  
peratures and which includes a display or win-  
dow section, and wherein means are provided  
for preventing the formation of frost or the con-  
densation of liquid upon such window or display  
sections in such manner as to interfere with free  
vision of the foods as displayed within the case.

Another object of this invention is to provide  
a refrigerated showcase adapted for the display  
of foods at reduced temperatures and including  
a display section, a window section, and means  
within the display case for the maintenance of  
a stratified air condition, including a cold or  
refrigerating air section and a warm or heated  
air section immediately adjacent the window or  
display section.

Another object of this invention is to provide  
a refrigerated showcase having a means for the  
maintenance of hot air adjacent the interior of  
the display window or transparent section of the  
case to prevent the formation of frost or the  
condensation of liquid thereon.

Another object of this invention is to provide  
a refrigerated case including a storage and a dis-  
play section, and means for maintaining the  
requisite degree of reduced temperature within  
such case, and a means operably associated with  
the reduced temperature maintaining means for  
maintaining heated air adjacent the transparent  
display section.

Other objects and advantages of this inven-  
tion it is believed will be apparent from the fol-  
lowing detailed description of a preferred em-  
bodiment thereof as illustrated in the accom-  
panying drawing.

In the drawing:

Figure 1 is a perspective view of a refriger-  
ating showcase embodying my invention.

Figure 2 is a sectional view taken on the line  
2—2 of Figure 1.

Figure 3 is a fragmental sectional end view of  
a modified form of construction embodying my  
invention.

Figure 4 is a diagrammatic illustration of the  
refrigeration and air heating means embodied in  
my invention.

In the preferred embodiment of my invention  
illustrated in the accompanying drawing, I il-  
lustrates an insulated cabinet which may be of  
any suitable form of construction, including side  
and end walls which are provided with any  
suitable form of insulating material 2 and which  
cabinet provides within its interior a refrigeration  
storage space 3 and a display section 4.

While the structure as herein illustrated is  
generally of rectangular shape, it will be ap-  
parent that my invention is in no way limited to  
the shape characteristics illustrated.

Mounted within the confines of the cabinet  
1 is a refrigeration unit 5 which may be of any  
suitable or desirable construction, and which  
provides a means of circulating a refrigerant  
through coils 6 supported below the display racks  
7 in the display section 4. The racks 7 are as  
illustrated inclined upwardly toward the center  
of the display section so as to enhance the  
display characteristics of the case from the op-  
posite sides thereof. The racks 7 terminate short  
of the side inner walls 8 of the cabinet 1 to pro-  
vide air passages 9. The racks are supported in  
position by means of spaced brackets 10 which  
are secured to the side walls 8 and to the ends  
of the racks 7.

Means are provided which may be of any de-  
sired form of construction for supporting window  
sections 11 above the display racks 7, preferably  
with the panes of glass or other material form-  
ing the transparent sections inclined upwardly  
to a peak 12 which terminates approximately  
centrally of and above the display section 4.

It is not essential in my construction that the  
means provided for supporting the panes of glass  
or other transparent material be such as to  
avoid the passage of air between the edges of  
the said transparent material and their support-  
ing means, and in fact it is preferable that the  
supporting means 13 for the upper adjacent  
edges of the panes 11 be such as to permit flow  
of air outwardly from the display section for the

reasons which will hereinafter be presently set forth.

Mounted within the display section preferably immediately adjacent but above the passages 9 are air heating means 14 which, in this case, are illustrated as conduits 15 through which a heated medium is circulated in order to heat the air to cause the heated air to rise in the display section 4 along and immediately adjacent the under surface of the panes 11 so that it will pass out through the loose connection provided by the support 13 in a direction as substantially indicated by the arrows 16.

In the modified form of my invention as illustrated in Figure 3, there is only one difference in construction illustrated and that is the positioning in the display section 4 of a second sheet or pane of transparent material 17 immediately below the panes 11 in order to form a stratified air passage 18 through which the heated air must flow in rising along the under surface of the panes 11 and passing out through the supporting means 13.

This second pane of glass may or may not be employed, as desired, but when employed, slightly increases the efficiency of the structure as maintaining the heated air immediately below the panes 11 to prevent the formation of frost or the condensation of water thereon.

The two sections of transparent material 17 may be joined together near the apex of the showcase by a connector 19 which also permits flow of air upward between the upper edges of the transparent member 17 so that it may flow out of the case.

In order to maintain a circulation of heated fluid through the coil 15, and also to increase the efficiency of the refrigerating unit 5, I prefer to employ a refrigerating unit which includes a compressor 20, a heat extracting radiator 21, a refrigerant receiver 22 connected through a conduit 23 having an expansion valve 24 therein, with the refrigerating coil or coils 6. This type of refrigerating unit is commonly employed in the art and employs one of many forms of compressible gas refrigerants which on expansion take heat from the surroundings. The expanded refrigerant is drawn from the coil 6 into the compressor 20 and is there compressed.

Normally in the operation of these units, the compressed refrigerating gas passes through the radiator 21 where the heat is extracted therefrom by the flow of air over the fins 25 and then the relatively cool refrigerant is returned to the receiver 22 before passing through the conduit 23 and expansion valve 24. The work required to be performed by the radiator 21 is therefore to extract the heat from the refrigerant which has been taken up by the refrigerant in the expansion coils 6 and which heat is also imparted to the refrigerant during its compression by the compressor 20.

In the preferred embodiment of my invention, the compressed refrigerant gas is taken from the head 26 of the compressor at which time it contains the maximum of heat and is circulated through the heating coil 15 to provide the heating means 14 for heating the air immediately adjacent the lower edge of the transparent panes 11. The heated refrigerant thus gives up a portion of its heat to the cooler air at this point increasing the efficiency of the refrigerating unit by reducing the amount of work, required to be done by the radiator 21, and at the same time provides the heat required for heat-

ing the air immediately adjacent and below the transparent pane sections 11. After circulating through the hot coils 15, the then relatively cool refrigerant is returned to the radiator 21 which then may act as far as required, to extract further heat from the compressed refrigerant before it is delivered to the receiver 22.

The display racks 7 provide the means upon which the articles to be displayed, such as frozen foods, are supported.

I have discovered that by the maintenance of air circulation within the cabinet 1 that I am able to maintain a condition of stratification so that below a certain position as indicated for example by the dotted line 27, I am able to maintain temperatures requisite for the maintenance of the frozen food indicated at 28 upon the racks 7, maintaining the temperature near 0° F., or at such temperature as may be desired or required for the maintenance of the food in its frozen condition. This I am able to accomplish because the natural circulation of air is such that the relatively cold air produced because of the refrigerating coil 6 tends to flow downwardly and will thus flow in the direction indicated by the arrows 29 downwardly and through the air passages 9 into the storage compartment 3 where it will apparently, as its temperature rises, rise upwardly near the center of the storage section, the circulation being maintained at both sides of the storage space 3 in substantially the same manner.

As air is heated by the heating means 14, which may be of any suitable or desirable character sufficient to transmit sufficient heat to the air at this point, the heated air rises upwardly in the cabinet, tending to follow the under surface of the inclined transparent panes 11, passing out of the cabinet through the supporting panes 11 in the direction indicated by the arrows 16.

The direction of circulation of the heated air is indicated in the cabinet by the arrows 30.

The cabinet, and particularly the display section, is not airtight because of course with circulation of air out of the cabinet it must be possible for air from the exterior to circulate into the cabinet to replace that which passes out. Therefore the connections of the panes 11 at their lower ends may also be such as to permit air circulation around the lower ends of the panes 11. Circulation also may be permitted at any other point into the display section 4. The return circulation of the cold air as indicated by the arrows 29 is permitted at the ends of the cabinet 1 and the display racks 7 terminate short of the ends to provide an air passage at this point.

In actual practice I have found that I am able by this method to maintain the stratified zones of temperature within the display section 4 including the freezing zone 31, which is below the dotted line 27, and a relatively hot section 32 above the dotted line 27. As the air on the opposite sides of the panes 11 may therefore approximate the same temperature or be above the temperature at which condensation of moisture from the air, of course it will be apparent that the panes 11 themselves are not cooled to such a degree that condensation will form upon either their interior or exterior surfaces.

The specific example of my invention herein set forth I have found to be efficient in carrying out my invention. It will be apparent, however, that this is merely an illustration of a specific

construction in that my invention is not in any way limited to the use of one or more angularly disposed display racks and is also not limited to the construction of a display cabinet or section permitting vision from both sides.

The specific illustration of the invention given also includes the particular spacing of the display racks in order to obtain a particular type of air circulation. This is advantageously employed in this type of structure but is not essential to the operation. I am able to obtain a stratification of the temperature zones above the display rack even where the display racks extend to the side and end walls, preventing the type of circulation as shown.

Having fully described my invention, it is to be understood that I do not wish to be limited to the details herein set forth, but my invention is of the full scope of the appended claims.

I claim:

1. In a refrigerated display case, the combination of a display rack, transparent members disposed over the display rack, refrigerating means disposed below the display rack, the display rack being positioned in the case to provide an air passage at its edge adjacent the inner wall of the case, the transparent members being inclined upwardly over said display rack, and means for heating the air adjacent the lower position of the transparent members so that heated air flows upwardly along the inner surface of the transparent members.

2. In a refrigerated display case, the combination of a display rack positioned within the display case in an elevated position and spaced from the side walls thereof, said display rack being composed of a pair of supporting shelves angularly disposed downwardly from the center of the rack, refrigerating means mounted below the display rack, the case having a transparent display section above the display rack, said transparent display sections being positioned in angular relation with the apex of their angle disposed

over the display rack, and means located adjacent the lower portion of the display sections for heating air so that the same will flow upwardly along the inner surface of the transparent display section.

3. In a refrigerated display case, the combination of a display rack positioned in said case in position below a window section, refrigerating coils below the display rack, means within the case for heating air adjacent the window sections, and means for venting the heated air.

4. In a refrigerated display case, the combination of a display rack positioned in said case in position below a window section, refrigerating coils below the display rack, a refrigerating unit including means for circulating and permitting expansion of a gas refrigerant to said refrigerating coils, means for compressing the expanded refrigerating gas, and means for circulating the hot compressed refrigerating gas adjacent the lower portion of the window section, and returning the same to the refrigerating gas circulating means.

5. In a refrigerated display case, the combination of a display rack positioned in said case in elevated position and spaced from the side walls thereof, refrigerating means below the display rack, air heating means above the display rack and in position to heat air adjacent the display sections of the case, and means for venting the heated air.

6. In a refrigerated display case including a cabinet providing display and storage spaces, an inclined display rack positioned in the display section, refrigerating means positioned immediately below the display rack, the display rack having a window section permitting viewing of articles upon the display rack, a heating means positioned in the display section for heating the air adjacent the display window, and means near the upper end of the window section for venting the heated air.

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