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SNOW ELIMINATOR FOR SELF-SERVICE CASES

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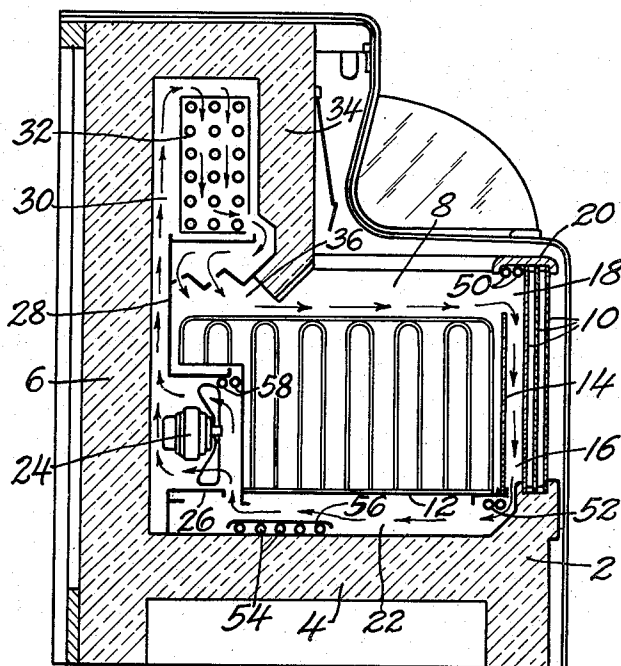


Fig. 1.

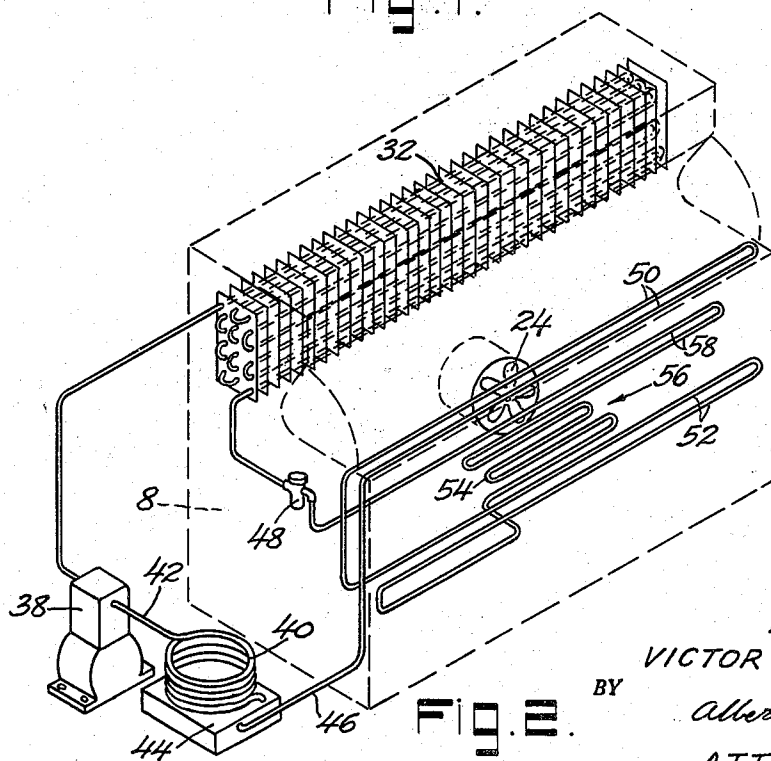


Fig. 2.

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SNOW ELIMINATOR FOR SELF-SERVICE CASES

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2 Claims. (Cl. 62—89.6)

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This invention relates to refrigerating systems for use in maintaining temperatures below freezing in open top self service display cases.

Open self service display cases such as those shown in the patents to MacMaster No. 2,494,480 and MacMaster et al. No. 2,494,481 are frequently employed for the preservation and display of frozen food products while allowing free access to the customer through the open top of the case. In order to preserve the products effectively such cases are generally maintained at temperatures in the neighborhood of from $+10^{\circ}$ to -20° F. and in any event at temperatures well below freezing. However, because of the open top of the case and the circulation of air about the display space, relatively warm moist air from the room in which the case is located tends to become entrained in the circulating refrigerated air, especially when persons reach into the case to remove articles being purchased.

The moisture thus introduced into the air circuit is condensed suddenly into snow or ice crystals which accumulate on surfaces and about the blower decreasing the efficiency of heat exchange and in humid weather or climates they sometimes build up to such an extent that they interfere with the operation of the blower used to circulate the refrigerated air.

In accordance with the present invention the formation of such snow or ice crystals is reduced or eliminated completely and the efficiency of the refrigeration system is materially increased. These results are preferably attained by heating the air flowing to the refrigerating unit or evaporator from points where moisture generally enters the air stream. Such heat may be added by means of an electrical or other heating element but when the heat is derived from liquid refrigerant flowing from the condenser to the expansion valve the temperature of the refrigerant is lowered and the efficiency of the refrigerating cycle is increased.

One of the objects of the present invention is to provide means for reducing or eliminating ice or snow which tended to form from the entry of humid air or moisture into an air circuit maintained at temperatures below freezing.

Another object of the invention is to avoid the building up of frost or snow on surfaces of self service refrigerated display cases maintained at temperatures below freezing.

A further object of the invention is to increase the efficiency of refrigerating systems used in refrigerated display cases used for preserving frozen food products.

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These and other objects and features of the present invention will appear from the following description thereof in which reference is made to the figures of the accompanying drawing.

In the drawing:

Fig. 1 is a view in section illustrating a typical form of refrigerated display case embodying the present invention; and

Fig. 2 is a diagrammatic illustration showing certain elements of a refrigerating system embodying the present invention.

In the construction shown in Fig. 1, the display case has an insulated lower front wall 2, an insulated bottom 4 and an insulated rear wall 6. The end 8 is insulated and multiple glass panes 10 extend upward from the front wall 2 to provide a space which is thermally insulated about the bottom and sides but open at the top for access to customers. Within the space thus provided, there is an article support 12 spaced from the bottom 4 and provided with a front glass baffle 14 separated from the multiple glass panes 10 so as to form an air duct 16 with an inlet opening 18 adjacent but below the cap strip 20 extending along the top of the front edge of the case.

The duct 16 communicates with the space 22 below the article support 12 and air is caused to flow downward from the inlet 18 through the duct 16 between the glass panes 10 and front baffle 14 to the space 22 by means of a blower 24 located in a fan housing 26 in a rear baffle member 28. The baffle 28 is spaced from the rear wall 6 to provide an air duct 30 through which air is forced upward by blower 24 to an evaporator 32 located beneath the forward and downwardly extending hood 34. The air refrigerated by the evaporator issues from beneath the lower edge of hood 34 through outlet opening 36 and flows horizontally across the top of the display space in the form of a rapidly moving air curtain returning to the inlet opening 18 so as to be recirculated to maintain the articles on display at a temperature below freezing.

With this construction the articles in the display space are freely accessible to customers through the open top of the case but at the same time are protected against ready flow of warm moist air into the display space by the constantly maintained curtain of rapidly flowing air moving across the top of the display space from the air outlet 36 to the air inlet 18.

Some external moisture containing air is generally entrained by the rapidly flowing air curtain and additional moisture is introduced into

the air stream by persons reaching into the display space. This moisture tends to condense and freeze into snow and ice crystals which sometimes accumulate on the surfaces of the front baffle and multiple glass panes or on the bottom of the case, the article support or the fan housing or other surfaces. On damp, humid days and in moist climates these accumulations become troublesome, reducing the heat transfer from the articles and interfering with the operation of blower 24.

In order to overcome this difficulty heating means are located between the air inlet 18 and the blower to raise the temperature of the circulated air sufficiently to reduce or completely eliminate the formation of snow or ice crystals. The moisture is therefore carried to the evaporator where it is condensed and frozen into ice and finally discharged from the case on defrosting the evaporator.

Any suitable or preferred form of heating element may be used but a marked increase in efficiency of the refrigerating system is attained by circulating the liquid refrigerant passing to the evaporator into heat exchanging relation with the surfaces between the air inlet 18 and the blower 24 which are contacted by the air stream. In this way the liquid refrigerant is cooled to a temperature approaching that maintained in the display space before it is expanded in the refrigerating cycle.

As shown in Fig. 2 the refrigerating equipment includes a compressor 38 from which compressed and hot refrigerant vapor flows to a condenser 40 through the high pressure line 42. The refrigerant liquified in the condenser 40 flows to a receiver 44 from which the liquid refrigerant line 46 extends to the expansion valve 48 connected to the evaporator 32. The liquid refrigerant under pressure is passed adjacent those surfaces to be heated or warmed so that the temperature of the air will be raised sufficiently to prevent the formation or accumulation of ice crystals or snow on the surfaces contacted thereby. Thus the liquid line 46 may pass in a loop 50 beneath the cap strip 20 adjacent the air inlet 18. An extension of the line also may form a loop 52 adjacent the lower end of the front air duct 16 where frost and ice tend to build up. A further extension is formed in a series of loops 54 engaging a plate 56 directly in front of the fan housing 26 and a loop 58 may extend about the fan housing itself if desired. The liquid line then extends on to the expansion valve 48 or may be passed into contact with other surfaces on which snow or frost tends to collect.

Of course the position and arrangement of the various loops or turns of the liquid line may be varied, and if desired, the liquid may be conducted in parallel lines adjacent the various surfaces to be heated or warmed or into other locations where cooling of the liquid refrigerant can be effected to increase the efficiency of the refrigerating system.

If preferred, one or more of the heating elements employed may consist of an electrical resistance element connected to a suitable source of current. However, electrical heating means

require the expenditure of additional power and do not increase the over all efficiency of the system.

The passage of a heating element beneath the cap strip 20 has the advantage of warming the strip and thus renders it more comfortable to touch when reaching into the display space. The customers therefore do not receive the sudden chill and shock which is particularly startling when a frigid cap strip is touched with the bare arm on hot moist days. Moreover, the condensation of moisture from the external air on engaging the cap strip is reduced so that the tendency for it to become wet and to drip down the front of the case is practically eliminated.

While one preferred form of the present invention is shown in the drawings and described above it will be apparent that numerous changes and modifications may be made and will be required for adapting the invention to different styles and types of display cases. In view thereof it should be understood that the particular embodiment thereof shown and described is intended to be illustrative only and is not intended to limit the scope of the invention.

I claim:

1. A refrigerated display case having a display space which is open at the top for access to customers, means presenting surfaces forming an air duct located in heat exchanging relation with said display space and leading from an air inlet adjacent the top of said display space to a blower, thence to an evaporator and back to the display space, a compressor for supplying refrigerant to said evaporator and a conduit carrying compressed and relatively warm refrigerant from the compressor to the evaporator and passing first into heat exchanging relation with said surfaces adjacent said air inlet for raising the temperature of said surfaces and thereafter passing into heat exchanging relation with surfaces adjacent said blower for reducing the tendency for snow and ice crystals to accumulate thereon.

2. A refrigerated display case having a display space which is open at the top for access to customers, means presenting surfaces forming an air duct located in heat exchanging relation with said display space and leading from an air inlet adjacent the top of said display space to a blower, thence to an evaporator and back to the display space, a compressor for supplying refrigerant to said evaporator and a conduit carrying compressed and relatively warm refrigerant from the compressor to the evaporator and passing in heat exchanging relation with said surfaces adjacent said blower for raising the temperature of said surfaces and reducing the tendency for snow and ice crystals to accumulate thereon.

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