Sept. 15, 1970 J. H. BRENNAN 3,528,258

REFRIGERATED DISPLAY CASE

Filed Oct. 8, 1968 3 Sheets-Sheet 1

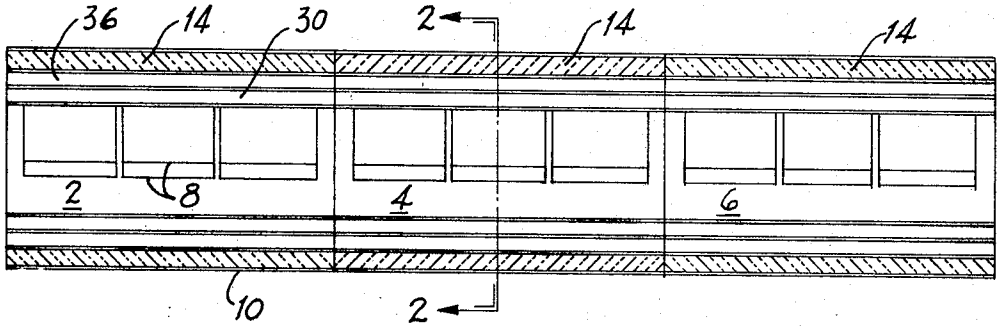


Fig_1_

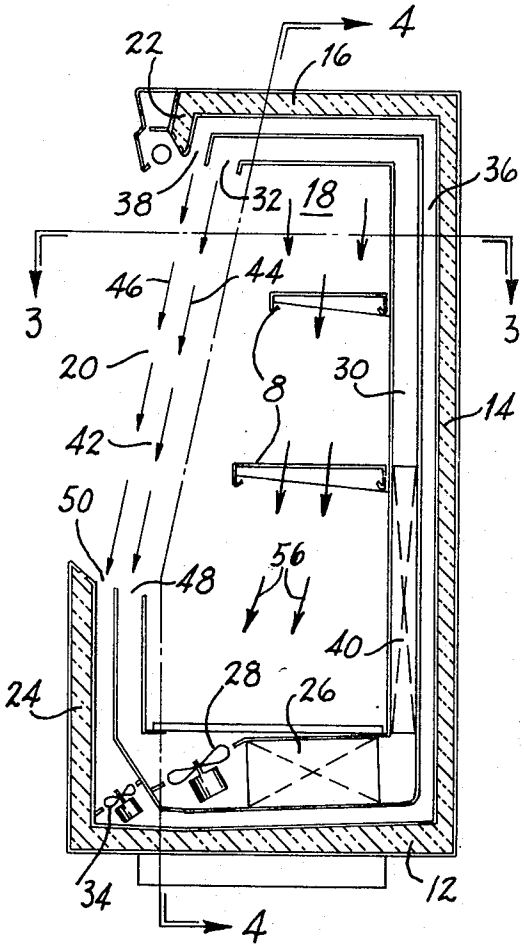


Fig_2_

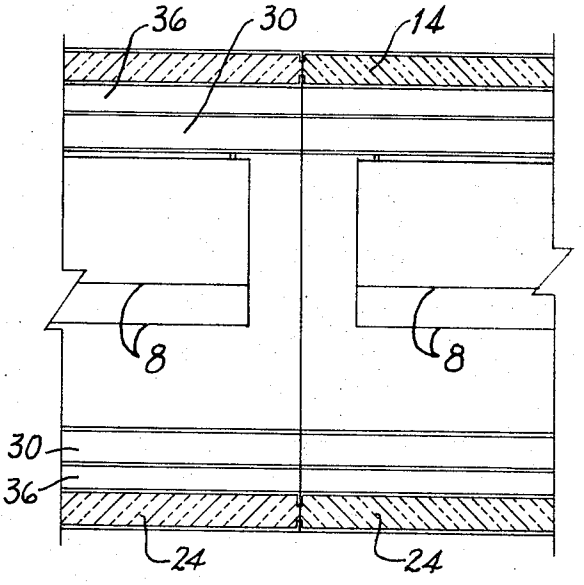


Fig_3_

INVENTOR.
JAMES H. BRENNAN
BY Sperry and Zoda
Attorneys

Sept. 15, 1970 J. H. BRENNAN 3,528,258

REFRIGERATED DISPLAY CASE

Filed Oct. 8, 1968 3 Sheets-Sheet 2

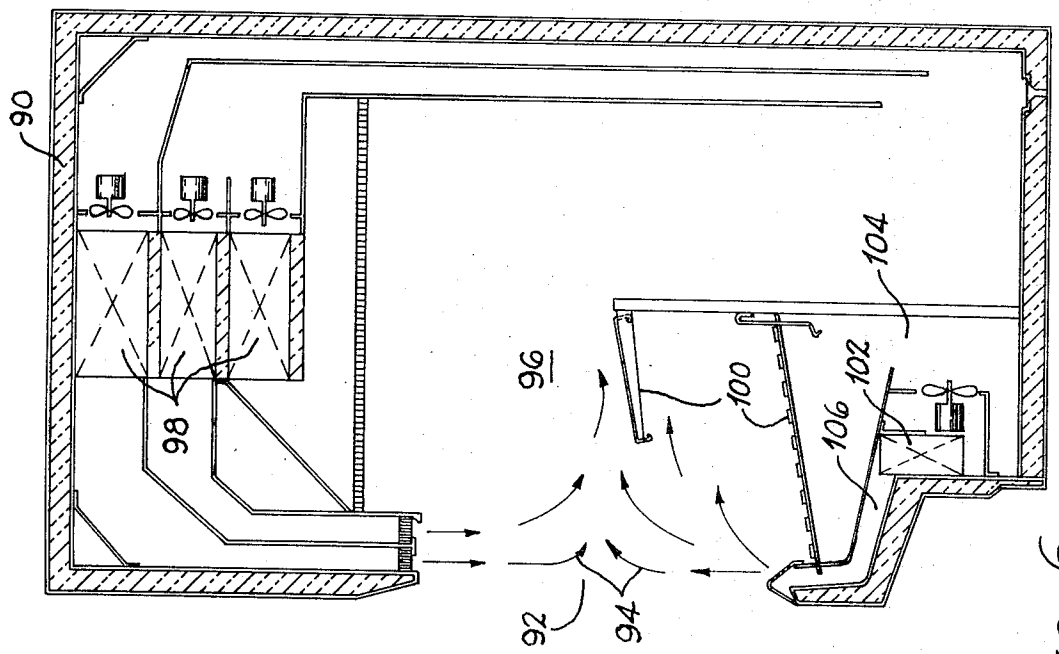


FIG-6

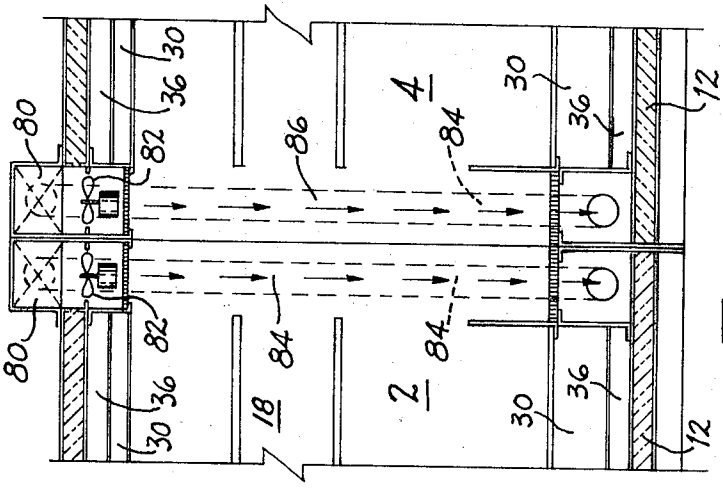


FIG-5

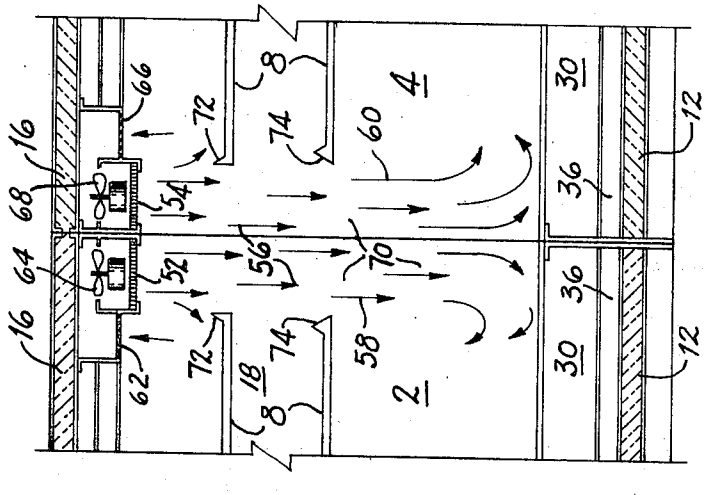


FIG-4

INVENTOR
JAMES H. BRENNAN
BY
Sperry and Zoda
Attorneys.

Sept. 15, 1970 J. H. BRENNAN 3,528,258

REFRIGERATED DISPLAY CASE

Filed Oct. 8, 1968 3 Sheets-Sheet 3

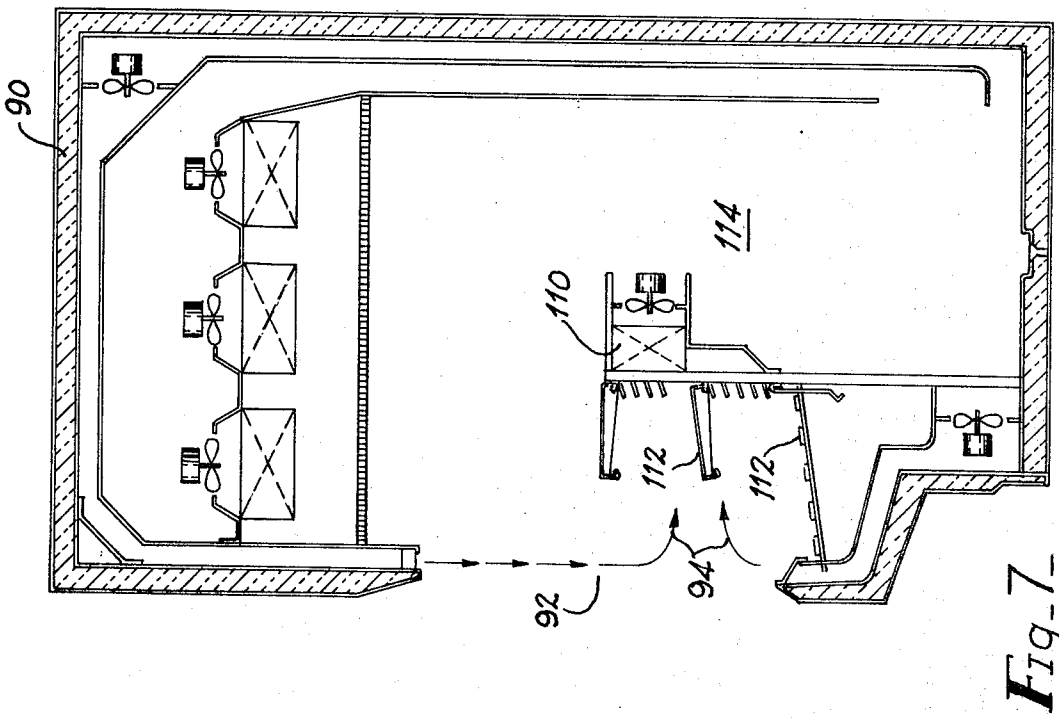


FIG. 7

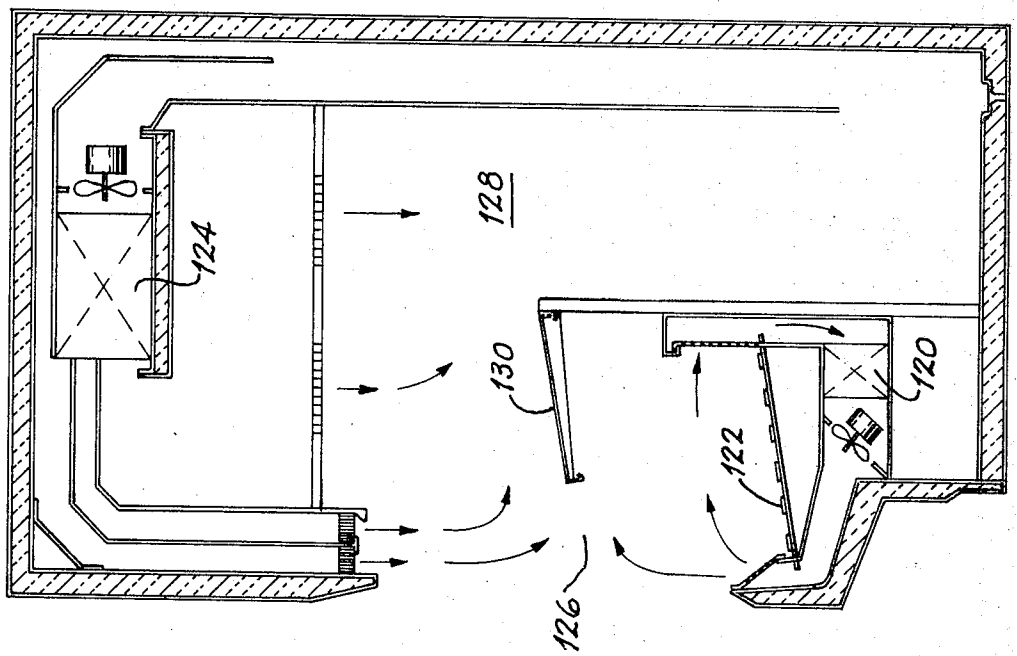


FIG. 8

INVENTOR.
JAMES H. BRENNAN
BY
Sperry and Zoda
Attorneys.

United States Patent Office 3,528,258
Patented Sept. 15, 1970

3,528,258

REFRIGERATED DISPLAY CASE

James H. Brennan, Trenton, N.J., assignor to Emhart Corporation, Bloomfield, Conn., a corporation of Connecticut

Filed Oct. 8, 1968, Ser. No. 765,753
Int. Cl. A47f 3/04
U.S. Cl. 62—256 9 Claims

ABSTRACT OF THE DISCLOSURE

Refrigerated display equipment having an access opening in the front thereof is provided with longitudinally adjacent areas which are maintained at different temperatures. An air curtain is established adjacent the access opening whereas other transversely extending air curtains are arranged at right angles to the access opening and between adjacent areas of the equipment permitting articles on display in such areas to be maintained at selected predetermined temperatures. The transverse air curtains preferably embody two parallel layers of air having temperatures substantially equal to the temperatures of the areas adjacent thereto.

FIELD OF INVENTION

It is common practice in food markets to arrange a series of refrigerated display cases or case sections in end-to-end relation to present an extended expanse of products in an attractive display. The most popular type of display cases in use today are those which are provided with a front access opening having an air curtain maintained in such opening to prevent the entry of warm ambient air into the display space. On the other hand, in order to permit products which require different degrees of refrigeration to be displayed in adjacent sections of such an assembly, it is necessary to provide a fixed barrier between the cases or case sections. Such barriers are sometimes formed of glass or transparent plastic material which permits the customers to see through the barrier from one case section to another. However, such transparent barriers tend to sweat and become fogged with moisture when adjacent sections are maintained at substantially different temperatures for the proper refrigeration of products such as frozen foods and meat or dairy products. Of course, it is possible to use thermally insulated barriers between the case sections but such barriers are not transparent with the result that the effectiveness of the whole display and sales appeal is lost.

In accordance with the present invention such open front display equipment is provided with transversely extending air curtains between adjacent portions or sections of a continuous assembly whereby the sections may be refrigerated to different tempeartures so that frozen foods, meats, dairy products and vegetables can all be displayed in longitudinally adjacent locations while each is maintained at the proper and most satisfactory temperature for the preservation of the products. The transverse air curtains between the cases or sections are positioned substantially at right angles to the access opening and at the same time the cases or case sections also have air curtains established in the front access opening thereof. The latter air curtains in each section may comprise layers of air including an inner layer corresponding in temperature to that at which the products displayed therein are to be preserved. However, in some instances supplemental refrigerating means may be located in one or more sections or parts thereof to maintain a localized area of the assembly at a temperature differing from that of the inner layer of air forming the air curtain adjacent the access opening in the front of the case.

THE DRAWINGS

FIG. 1 is a diagrammatic plan view of typical equipment embodying the present invention;

FIG. 2 is a vertical sectional view through the equipment illustrated in FIG. 1, taken on the line 2—2 thereof;

FIG. 3 is an enlarged horizontal sectional view of a portion of the equipment illustrated in FIGS. 1 and 2, taken on the line 3—3 of FIG. 2;

FIG. 4 is a vertical sectional view taken on the line 4—4 of FIG. 2;

FIG. 5 is a diagrammatic illustration of an alternative construction embodying the present invention; and

FIGS. 6, 7 and 8 are diagrammatic vertical sectional views of the equipment illustrated in FIG. 1 wherein supplemental refrigerating means are employed.

PREFERRED EMBODIMENTS OF THE INVENTION

In that form of the invention chosen for purposes of illustration in FIGS. 1 to 4 the refrigerated equipment embodies a plurality of cases or case sections indicated at **2**, **4**, and **6** in FIG. 1 arranged in end-to-end relation. Each section is provided with one or more article supporting shelves **8** which preferably are so arranged as to present a continuous expanse of displayed and refrigerated articles which can be viewed throughout its length by customers standing at any point along the front **10** of the assembly. The case sections may be of any preferred construction or design but as shown by way of illustration in FIG. 2 are of the general type shown and described in U.S. Pat. No. 3,365,908. In this construction each section includes a thermally insulated base or bottom **12**, a back wall **14** and a top **16**. The enclosure thus provided has a display space **18** therein provided with an access opening **20** in the front thereof below an upper front wall portion **22** and above a lower front wall portion **24**.

The display space and the articles therein are refrigerated by means of a refrigerating element including an evaporator **26**. A blower **28** serves to force air over the evaporator **26** through an inner air duct **30** to an air discharge opening **32** located adjacent the upper edge of access opening **20**. At the same time a blower **34** serves to force air through an outer air duct **36** to an air discharge opening **38** which is also located adjacent the upper edge of the access opening **20**. The inner air duct **30** is in heat exchanging relation with the display space **18** and may if desired, have additional evaporator coils **40** located therein. The outer air duct **36** is in heat exchanging relation with the inner air duct **30** but the air circulated through the outer air duct **36** is not cooled to the same low temperatures as the air circulated through the inner duct **30**.

The air from both of the ducts **30** and **36** is utilized in establishing an air curtain **42** for opposing the entry of warm, moist ambient air through the access opening **20** into contact with the articles on display on the shelves **8** within the display space **18**. The air issuing from both of the discharge openings **32** and **38** is directed downward in two parallel layers **44** and **46** across the access opening **20** to the return air inlets **48** and **50** which communicate with the blowers **28** and **34** respectively. In this way the inner refrigerated layer of air **44** through the inner air duct **30** and across the access opening **20** is maintained at the low temperature required to assure the desired refrigeration of the articles on display in the display space **18**. The outer layer of air **46** directed downwardly from the outer air duct **36** is cooled to a lesser extent and serves as a protective air layer which shields inner layer **44** from undesired mingling of the warm moist ambient air therewith.

In order to permit adjacent sections of the assembly to be maintained at different temperatures each section

may be provided with an air barrier extending transversely thereof and substantially at right angles to the access opening. Such air barriers may be established at one or both ends of each section as desired and for this purpose, an air curtain is provided by the discharge of air downward at the end of the section. As shown in FIG. 4, a downwardly directed air discharge opening **52** extends transversely along the end of the case section **2** whereas a similar downwardly directed air discharge opening **54** extends transversely of the case section **4**. Since the two case sections are connected together in end-to-end relation the discharge openings **52** and **54** are positioned in side-by-side relation to provide an air curtain **56** between the case sections which is composed of two parallel layers of air **58** and **60**.

Further, as shown in FIG. 4 the air forming the layer of air **58** associated with the case section **2** may be received from display space **18** of case section **2** through a transversely extending inlet **62** located adjacent the top of the display space **18**. A blower **64** serves to cause air drawn through the inlet **62** to be forced outward and vertically downward through the opening **52** to establish the layer **58** of the transverse air curtain **56**. In a similar way air from the display space **18** of adjacent case section **4** may be drawn inward through inlet **66** of case section **4** by blower **68** so as to be forced outward and downward through discharge opening **54** adjacent the end of case section **4**. In this way the layer of air **60** of air curtain **56** is established and the temperature of the layer of air in the air curtain **56** adjacent the end of each section will be substantially the same as the temperature of the display space **18** therein. The temperature of the layers of air **58** and **60** will also be substantially the same as the inner refrigerated layer of air utilized in establishing the air curtain **42** directed across the front access opening **20** of that section. Further as shown in FIG. 4 the air directed downwardly in forming the layers **58** and **60** of transverse air curtain **56** may diffuse laterally into the lower portion of the display space **18** in the respective section to aid in cooling the articles therein to the desired temperature.

In order to provide an unobstructed path for the flow of the transverse air curtain downward adjacent the ends of the case sections, the shelves **8** in each section terminate short of the ends of the sections so as to leave a space **70** between the ends of the shelves **8** in the section **2** and the adjacent ends of the shelves **8** in the section **4**. However, if desired the ends of the shelves **8** adjacent the space **70** may be provided with outwardly inclined deflectors **72** for causing a portion of the air forming the transverse air curtain **56** to be directed inward into the display space **18** and over the shelves **8** and the articles displayed thereon. In the alternative, the ends of the shelves **8** adjacent the space **70** may be provided with inwardly inclined deflectors **74** for confining the air curtain **56** to the space **70** and opposing the inward diffusion of air from the air curtain into the display space **6**.

In any event, whether the deflectors **72** or **74** are employed or not, the construction described serves to permit each section of the assembly to be refrigerated to the proper temperature to preserve the articles therein at the optimum temperature for the preservation thereof. At the same time the ends of the cases or case sections are not visibly obstructed and the desired continuous and extended expanse of refrigerated products of various types may be displayed in a most attractive manner.

While the construction shown in FIGS. 3 and 4 contemplates the use of blowers **28** and **34** refrigerating means **26** for cooling and circulating the air employed in establishing both the air curtain **42** directed across the front access opening **20** and the air curtain layers **58** and **60** established at the opposite ends of the case sections **2** and **4**, the invention is not limited to such constructions. Thus, as shown diagrammatically in FIG. 5 the transverse air curtains may be provided with separate refrigerating means **80** and blowers **82** which are included in closed air circuits **84** establishing air curtain layers **84** and **86** independent of the means employed for establishing the air curtain **42** which is directed across the front access opening **20** of each case section.

Further, as shown in FIGS. 6, 7 and 8, the present invention is adapted for use in various types of refrigerated equipment such as that illustrated and described in copending application, Ser. No. 693,200. Moreover, the constructions illustrated in FIGS. 6, 7 and 8 are adapted for use in providing localized low temperature areas within localized areas of individual refrigerated case sections.

In the construction illustrated in FIG. 6 the display case **90** is provided with an access opening **92** in the front thereof, and an air barrier **94** is established adjacent the access opening to oppose the entry of ambient air into the display space **96** through the access opening. The case may if desired, be provided with a transverse air curtain at one or both ends thereof as described in connection with FIGS. 1 to 5 of the drawings. Refrigerated air from the coils **98** is circulated through the display space **96** and over articles on the shelves or supports **100**. However, in order to further reduce the temperature of the air circulated over one or more of the shelves **100**, supplemental refrigerating means **102** are located in the space **104** below the shelves **100** to reduce the temperature of the air circulated upward through the duct **106** and over at least the lowermost shelf **100** upon which articles are displayed. In this way it is possible to refrigerate a localized area within the display equipment sufficiently to permit different types of products, such as frozen foods and dairy products, under properly refrigerated conditions within a single case or case section of an extended assembly and display of products.

The construction of FIG. 7 utilizes a supplemental refrigerating element **110** which may be positioned above and at the rear of the shelves **112** so as to receive refrigerated air from the service area **114** within the equipment to further refrigerate such air and discharge it over and about articles in a localized zone within the case.

In a similar way the construction illustrated in FIG. 8 is provided with supplemental refrigerating means **120** for cooling and circulating low temperature air over the lower shelf **122** within the equipment while air refrigerated by the element **124** is circulated through the display area **126** and service area **128** so as to cool the articles on the upper shelf **130** to a temperature somewhat above that at which articles on the lower shelf **122** are maintained.

The refrigerated equipment of each of FIGS. 6, 7 and 8 may be provided with transversely extending air curtains of the opposite ends thereof whereby the invention renders it possible to maintain any section or a part of any section within an extended display of products at selected and predetermined temperatures. At the same time the display is unobstructed by any apparent dividers or partitions between the zones of the assembly which are maintained at substantially different temperatures.

Each of the forms of the invention shown and described affords a greatly increased flexibility in the operation and use of display equipment while presenting a greatly improved appearance and attractiveness in the display of food products.

I claim:

1. Refrigerated equipment embodying an insulated enclosure having a refrigerated space therein provided with an access opening in the front thereof, means for refrigerating said space, means for establishing an air curtain directed across said access opening and serving to oppose the passage of ambient air through said access opening into said refrigerated space, and other means for establishing another air curtain within said refrigerated space and directed substantially vertically in a plane extending substantially at right angles to said access opening, the

latter air curtain serving to divide said refrigerated space into separate longitudinally adjacent zones.

2. Refrigerated equipment as defined in claim 1 wherein supplemental refrigerating means are associated with one of said longitudinally adjacent zones for maintaining said one zone at a different temperature than another of said zones.

3. Refrigerated equipment as defined in claim 1 wherein means are provided for maintaining articles in said adjacent zones at different temperatures.

4. Refrigerated equipment as defined in claim 1 wherein said transversely extending air curtain embodies at least two layers of air at different temperatures.

5. Refrigerated equipment having an insulated bottom, an insulated back wall and an insulated top extending about a display space, said display space being open at the front and also open at one end thereof, means establishing an air curtain adjacent the open front of said display space, means for establishing a transverse air curtain adjacent the open end of the display space, and means for refrigerating articles in the display space.

6. Refrigerated equipment as defined in claim 5 wherein both ends of said display space are open and have a transverse air curtain established adjacent each of said ends.

7. Refrigerated equipment as defined in claim 5 wherein said display space embodies a plurality of longitudinally adjacent zones, and means are provided for maintaining articles in said zones at different temperatures.

8. Refrigerated equipment as defined in claim 5 wherein at least one of said air curtains each embodies at least two layers of air maintained at different temperatures.

9. Refrigerated equipment as defined in claim 5 wherein the equipment embodies a plurality of sections arranged in end-to-end relation to provide a continuous extended display space having a plurality of zones therein which are separated from each other by said transversely extending air curtains, and means for maintaining articles in said different zones at predetermined but different temperatures.

References Cited

UNITED STATES PATENTS

2,594,066	4/1952	Pabst	62—255
3,044,274	7/1962	Mathis	62—256
3,103,796	9/1963	Dickson	62—256
3,186,185	6/1965	Bently	62—256
3,304,736	2/1967	Brennan	62—256

WILLIAM J. WYE, Primary Examiner

U.S. Cl. X.R.

98—36