

Dec. 8, 1953

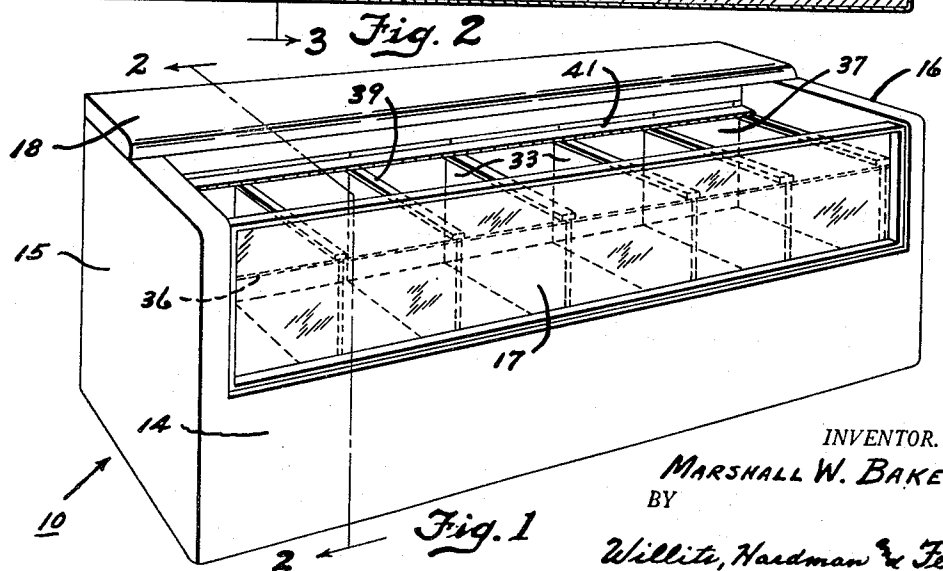
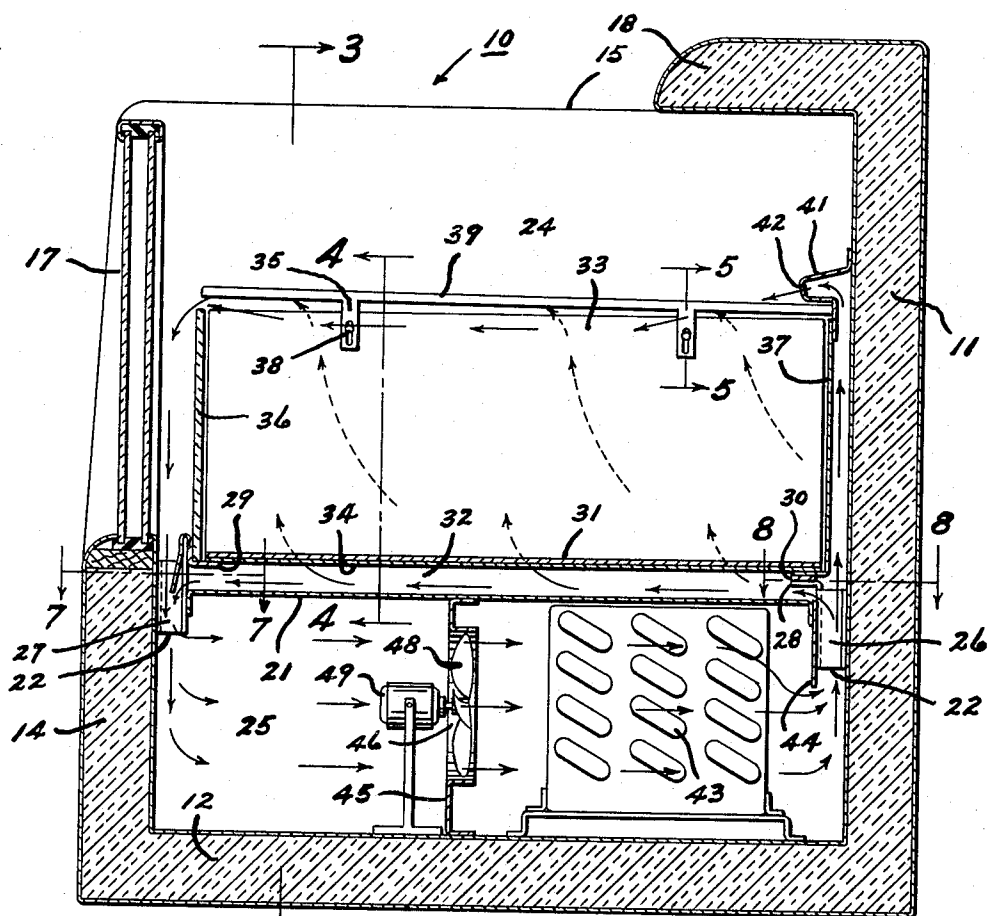
M. W. BAKER

2,661,604

OPEN TOP DISPLAY REFRIGERATING APPARATUS

Filed Nov. 3, 1950

3 Sheets-Sheet 1



INVENTOR.  
MARSHALL W. BAKER.  
BY  
Willits, Hardman & Feher.  
HIS ATTORNEYS

**Dec. 8, 1953**

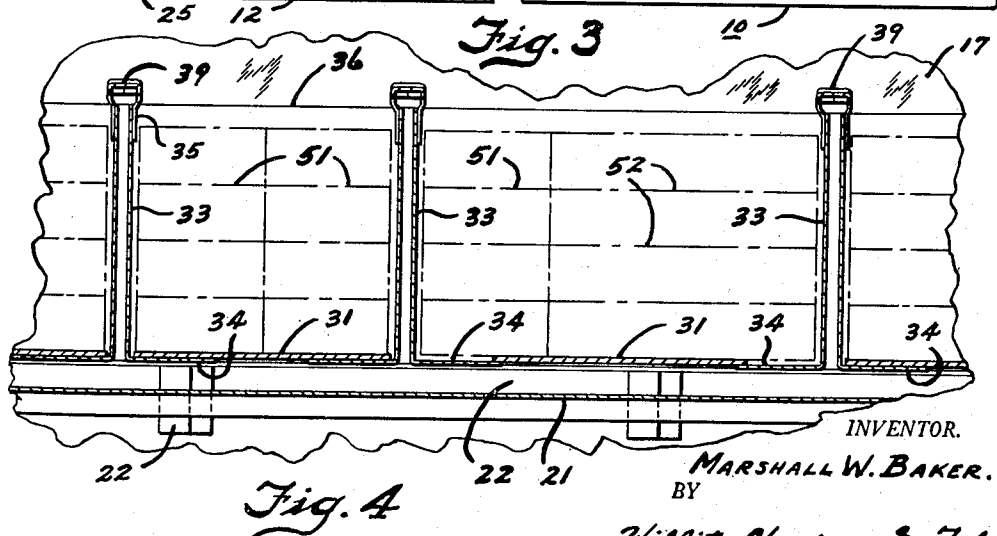
**M. W. BAKER**

**2,661,604**

OPEN TOP DISPLAY REFRIGERATING APPARATUS

Filed Nov. 3, 1950

3 Sheets-Sheet 2



Dec. 8, 1953

M. W. BAKER

2,661,604

OPEN TOP DISPLAY REFRIGERATING APPARATUS

Filed Nov. 3, 1950

3 Sheets-Sheet 3

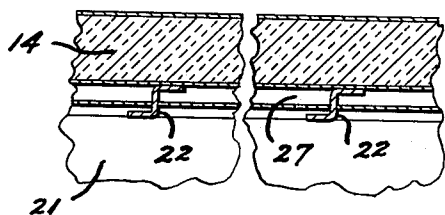


*Fig. 7*

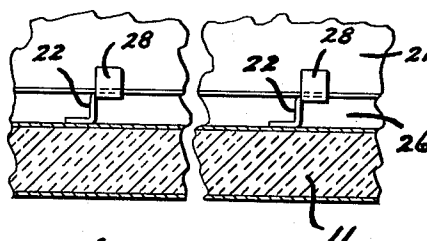


*Fig. 8*

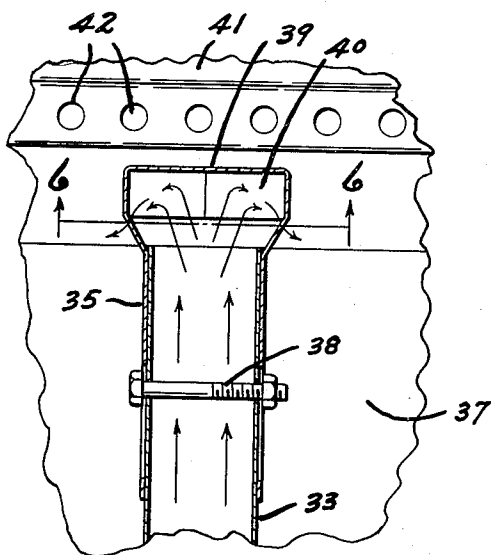


*Fig. 5*

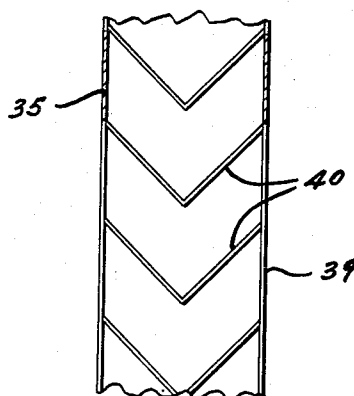


*Fig. 6*

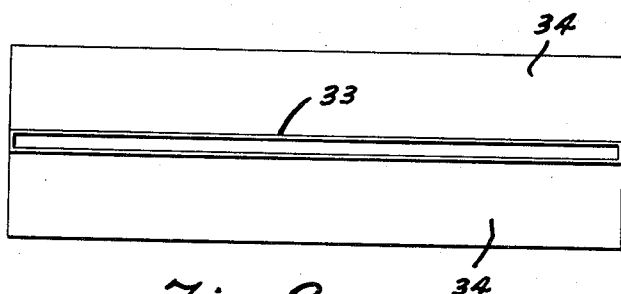


*Fig. 9*

INVENTOR.

MARSHALL W. BAKER.

BY

Willits, Hardman & Fehr.  
HIS ATTORNEYS

## UNITED STATES PATENT OFFICE

2,661,604

OPEN TOP DISPLAY REFRIGERATING  
APPARATUSMarshall W. Baker, Dayton, Ohio, assignor to  
General Motors Corporation, Dayton, Ohio, a  
corporation of Delaware

Application November 3, 1950, Serial No. 193,795

6 Claims. (Cl. 62-89.5)

1

My invention relates to refrigerated display cases.

An object of my invention is to provide a substantially open top display case with unique and improved forced circulation of air therein so as to obtain efficient and uniform chilling at a sub-freezing temperature of food products stored in the case.

Another object of my invention is to provide a substantially open top display case with a food supporting device including a plurality of food storage compartments and to circulate air in the case at a sub-freezing temperature along the bottom wall and all of the upright side walls of each of the compartments and also over certain upright walls thereof onto and in direct contact with foods stored therein.

A further object of my invention is to divide the interior of an elongated substantially open top display case into an upper chamber and a lower chamber and to provide a food supporting device within the upper chamber which comprises imperforate food supporting portions cooperating with the dividing means to form an air circulating passageway therebetween and which also comprises upstanding flues extending transversely of the case to form other air passages and double walled means for partitioning the length of the upper chamber into a plurality of food storage compartments.

In carrying out the preceding object it is a still further object of my invention to render the imperforate food supporting portions and the flues of the food supporting device separate from one another and adjustable relative to each other horizontally along the length of the elongated display case for varying the size of the food storage compartments.

These and other objects of my invention include the specific object of providing a substantially open top display case structure in which a desired or predetermined air circulation therein will be maintained irrespective of the different positions of adjustment of the flues and the size of the compartments defined by the flues.

Additional features and advantages of my invention will appear in the following description in which reference is made to a preferred form of display case illustrated in the accompanying drawings wherein:

Fig. 1 is a perspective view of a substantially open top refrigerated display case;

Fig. 2 is an enlarged vertical sectional view of the case disclosed in Fig. 1 and is taken on the line 2-2 thereof;

2

Fig. 3 is a view partly in section, on the line 3-3 of Fig. 2, and partly in elevation;

Fig. 4 is an enlarged sectional view, taken on the line 4-4 of Fig. 2, of portions of a food support device in the case showing adjustability thereof;

Fig. 5 is an enlarged sectional view taken on the line 5-5 of Fig. 2 showing a baffle element associated with the upper end of a flue;

Fig. 6 is a view taken on the line 6-6 of Fig. 5 showing vanes angularly disposed within the baffle element;

Fig. 7 is a sectional view taken on the line 7-7 of Fig. 2 showing spaced apart brackets along the front wall of the case supporting a food storage device therein;

Fig. 8 is a sectional view taken on the line 8-8 of Fig. 2 showing similar brackets along the rear wall of the case; and

Fig. 9 is a top plan view of one of the flues in the display case.

In the form of my invention shown in the drawings the elongated display case, generally represented by the reference character 10, includes or is provided with a long side or rear vertical wall 11 (see Fig. 2), a bottom wall 12, a long side or front vertical wall 14 and vertical end walls 15 and 16 each of which is suitably insulated. All the vertical or upright walls of case 10 terminate in substantially the same horizontal plane. A multiple glass pane structure 17 forms the upper portion of the front wall 14 and extends from one end wall 15 to the other end wall 16 to provide a window through which foods or packaged food products on display in the case may be viewed. A semi-ceiling 18 extends from the long side or rear wall 11 forwardly a short predetermined distance relative to the other long side or front wall 14 to provide an opening at the top of case 10 in order that customers may reach into the case and remove articles therefrom which they desire to purchase. While I have shown the display case 10 as including the semi-ceiling 18 and the back and front walls 11 and 14 respectively, it is to be understood that my invention is equally applicable to a display case wherein the semi-ceiling 18 is omitted to provide access through the open top of the case from either long side thereof in which instance the designation of front and rear walls would be meaningless and the case would be located in a store to provide an aisle on either side thereof.

As shown in the drawings a sheet metal member 21 extends throughout the length of case 10 and is secured in any suitable or desirable man-

ner to a plurality of substantially Z-shaped or the like metal brackets 22, spaced apart along and mounted upon the long sides 11 and 14 of the case. Member 21 divides the interior of case 10, intermediate its open top and its insulated bottom wall 12, into an upper chamber 24 and a lower chamber 25 (see Fig. 2), for a purpose to be presently described. The brackets 22 extend inwardly of the side walls 11 and 14 of case 10 and space the edges of member 21 from the case side walls throughout the length thereof to provide an uptake-air passage 26 along wall 11 and a return-air passage 27 along wall 14. The air passages 26 and 27 provide communication between the upper and lower chambers 24 and 25 of case 10. An angle iron 29 extends along the long or front side of case 10 above member 21 and is secured to the horizontally spaced apart brackets 22 in any suitable or desirable manner. A thick flat metal strip 30 extends along the other long side or rear wall of case 10 above member 21 and is secured to an intumed ear portion 28 (see Fig. 8) on the horizontally spaced apart back brackets 22. The angle iron 29 and strip 30 form longitudinal mounting rails or the like for a food supporting device to now be described.

A food supporting device or structure is located in the upper chamber 24 of case 10 and rests on the longitudinal rails provided by the angle iron 29 and metal strip 30. This structure or device is coextensive with the member 21 and comprises a plurality of imperforate portions in the form of flat plates 31 spaced vertically from member 21 to form a passageway 32 therebetween which extends across the interior of the case and has an inlet communicating with the uptake-air passage 26 and an outlet communicating with or located adjacent to the return-air passage 27. The device also comprises a plurality of sleeve-like narrow elongated metal flues 33 extending transversely of the display case and being spaced apart along the length thereof. These flues provide double walled partitions dividing the interior of upper chamber 24 into a plurality of open top food receiving and storing compartments. The flues 33 are separate from the imperforate plate portions 31 and have outwardly directed feet 34 (see Fig. 4) located under the edges of the plate portions 31. The food supporting device also comprises a vertically disposed long glass plate 36 which rests upon the angle iron 29 at the one long side or front of case 10 and is supported in spaced relation to the window 17 from the front brackets 22.

A vertically disposed metal plate 37 has its inwardly bent lower edge portion secured to the flat strip 30 and is located in spaced relation to the long side or rear wall 11 of the case. The flues or partitions 33 form upright side walls for the plurality of food storage compartments and the glass plate 36 and metal plate 37 form upright front and rear walls respectively for the compartments and in addition form walls of the uptake-air passage 26 and the return-air passage 27. The upper open end of the flues 33 terminate below the top of the long side walls of case 10 and have a cap-like baffle element 39 located thereover and secured to the flues in any suitable or desirable manner. A plurality of substantially V-shaped vanes or fin-like portions 40 (see Figs. 5 and 6) within baffle element 39 are adapted to direct air egressing from the open upper end of the flues 33 laterally and downwardly from each side thereof onto and over

foods adapted to be located in the food storage compartments. The baffle elements 39 may be mounted on the flues 33 for vertical adjustment relative thereto. For example, I have shown the baffles 39 as having integral depending legs 35 which slip over the upper part of the flues 33 and which legs are provided with an elongated slot receiving a bolt 38, passed through the double walls of the flues. It will be understood that by loosening the bolts 38 the baffles 39 may be moved in a vertical direction relative to flues 33 to adjust their position with respect to the open upper end of the flues. A metal deflector 41 located above the metal plate 37 (see Figs. 2 and 3) covers the upper end of the uptake-air duct 26 and has a portion thereof disposed above the baffle elements 39 and which also extends over the back wall 37 of the food storage compartments. The projecting portion of deflector 41 is provided with a plurality of openings 42 of any suitable or desirable shape which are adapted to direct air from the uptake-air passage or duct 26 forwardly of the case onto and over foods in the food storage compartments. The flues at the ends 15 and 16 of case 10 are of single wall structure spaced from and secured to these case end walls. The cap-like baffle elements associated with the end flues in the case are provided with straight fin-like portions or vanes which are adapted to direct air egressing from these flues laterally from one side only thereof.

An elongated refrigerant evaporator 43, forming a part of a closed refrigerating system (not shown), is disposed within the lower chamber 25 of display case 10 and the refrigerating effect produced by evaporator 43 provides refrigerating means for cooling the air within the case to a sub-freezing temperature. A plate 44 forms an extension of the up-take air duct 26 into lower chamber 25 and causes air to be deflected downwardly prior to its entrance into passage or duct 26. A vertically disposed partition 45 within lower chamber 25 is provided with a plurality, preferably three, round openings 46. A fan or blower 48, each driven by an electric motor 49, is located in each of the openings 46 and these fans are employed to force or circulate air in the case 10 and over evaporator 43 for cooling the air. During operation of the refrigerating system to cause evaporation of refrigerant in evaporator 43, as is well known to those skilled in the art, each motor 49 is energized to rotate the fans 48. Rotation of fans 48 creates a low pressure area within chamber 25 in the vicinity of the return-air passage or duct 27 and draws air therefrom and circulates the air over the evaporator 43. Air cooled by evaporator 43 flows under plate 44 and upwardly through the uptake-air passage 26. The inlet end of horizontal passageway 32 communicates with the air duct 26, intermediate its ends, and some of the air flowing upwardly in this duct will enter the passageway 32. The low pressure area created in chamber 25 in the vicinity of passage 27, together with the air circulating downwardly through this passage from the upper chamber 24, creates a suction at the outlet end of passageway 32 and within this passageway to draw air therein from duct or passage 26. Air entering the passageway 32 is divided into a plurality of streams of air by the food supporting device or structure and one of these streams of air flows transversely across the display case, beneath the bottom walls 31 of the food storage compartments, toward the

5

front of the case and into air circulating downwardly from the upper chamber 24 where it is admixed therewith and then flows downwardly through the return-air duct 27 into chamber 25 where it is again circulated over the evaporator 43 without exposure to air exteriorly of the case. However, due to the communication of the lower end of flues 33 with the horizontal passageway 32, some or the remainder of the plurality of streams of air will flow upwardly through the flues 33. Cooled air egressing from the flues 33 is directed laterally and downwardly from each side of the flues, by the vane or fin portions 40 in the cap or baffle elements 39, onto and over foods contained in the food storage compartments within upper chamber 24. Some of the upwardly circulated air in the uptake-air passage 26 flows to the top thereof and is also directed by the deflector 41 onto and over foods contained in the food storage compartments. The streams of air egressing from opposed flues 33 and from the deflector 41 flow toward the front of the case and over the top of glass plate 35 into the return-air passage 27. These streams of cooled air provide a film or blanket of air, at a below freezing temperature, over foods stored in the case. The return air which has been exposed to the atmosphere above the open top food storage compartments co-mingles or mixes with the cold recirculating air egressing from the passageway 32 and is partially cooled to the desired low temperature prior to again being passed over the evaporator 43. The air circulation described provides a flow of cold air along the bottom of the food compartments and also along all upright walls of the compartments as well as onto and over the packaged frozen food products within the compartments. In addition the air circulation described forms a forced air circuit including a recirculating or series flow path or portion unexposed to atmosphere exteriorly of the display case and a parallel path or portion which is exposed to the atmosphere exteriorly of the case. This improved air circuit provides for the recirculation of a relatively large mass of cold air which is not materially increased in temperature during its circulation and affords a means to substantially lower the temperature of air which has been increased in temperature prior to passing all of the circulating air over the refrigerating means.

As before stated the flues 33 are separate from the imperforate plate portions 31 of the food supporting device within display case 10 and both of these portions of the device may be shifted relative to one another as desired to change or vary the size of the food storage compartments in a direction longitudinally of the display case. For example, in Fig. 4 of the drawings, I show three of the vertical flues two of which are located so that the plate portions 31 of the food supporting device rests on the feet 34 of the flues 33 with the side edges of the plate portions 31 abutting the upright wall portions of the flues to provide a food receiving compartment of a predetermined minimum size. This compartment may receive stacks of frozen food packages or boxes of relatively small size as indicated at 51. Also in Fig. 4 of the drawings I show a flue 33 moved a predetermined distance away from an adjacent flue so as to locate the plate portion 31 therebetween out of abutting engagement with the upright wall portion of the flues whereby the compartments between these flues is enlarged in a horizontal direction along

6

the length of the display case. This larger compartment may receive stacks of the smaller frozen food packages or boxes 51 and also stacks of larger frozen food packages or boxes as indicated at 52. It should therefore be obvious that the size of the food receiving and storage compartments may readily be changed or varied to accommodate a plurality of groups of different size boxes or packages of frozen foods.

In view of the foregoing it should be apparent that I have provided a display case which has several structural features and advantages as well as an improved and efficient air circulation therein. In my improved display case the relatively uniform boxes or packages of frozen food products placed and stored therein are divided into separate groups by the plurality of flues or compartments and air at a sub-freezing temperature is circulated about or along all sides of each group or each compartment to insure proper cooling of the the foods throughout the entire length of an elongated chamber.

While the form of embodiment of the invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted, as may come within the scope of the claims which follow.

What is claimed is as follows:

1. In a refrigerated display case, an elongated open top cabinet including a bottom wall, upright side walls and upright end walls, a member spaced vertically from said cabinet bottom wall and extending from one end wall to the other end wall of said cabinet to divide the interior thereof into an upper chamber and a lower chamber, a food supporting device inset within said upper chamber and mounted in spaced relation to said member to form a horizontal passageway therebetween, said device being spaced from said cabinet side walls to provide a passage at the front and at the back thereof, said device including a plurality of vertical flues extending transversely thereacross and being longitudinally spaced apart throughout the entire length of said cabinet, said flues dividing said device into a plurality of open top food storage compartments, said flues having their lower end communicating with said horizontal passageway, said member being spaced from the side walls of said cabinet to provide said horizontal passageway with an outlet adjacent the front side wall of said cabinet and an inlet at the back side wall thereof, means for circulating air downwardly from said upper chamber through the passage at the front side wall of said cabinet past the outlet of said horizontal passageway into said lower chamber, transversely across said lower chamber and upwardly therefrom into the passage at the back side wall of said cabinet, the circulation of air past the outlet of said horizontal passageway creating a suction therein and causing some of the air circulated into the passage at the back side wall of said cabinet to flow into said horizontal passageway through its inlet, said device dividing the air entering said horizontal passageway into a plurality of streams of air one of which flows transversely across the cabinet beneath said food storage compartments while others flow upwardly through said transverse longitudinally spaced apart flues, the stream of air flowing transversely across said cabinet in said horizontal passageway being discharged from the outlet thereof into and mixed with air circulating downwardly from said upper chamber as it flows into said lower chamber, and refrigerating means within said lower chamber

in the path of mixed air flowing thereacross for cooling the same.

2. In combination, a substantially open top elongated display case including a bottom wall, long upright side walls and upright end walls, a member extending throughout the length of said case intermediate its open top and said bottom wall, said member dividing the interior of said case into an upper chamber and a lower chamber, said member being spaced from each of the long upright side walls of said case, a device inset within said upper chamber, said device comprising an upright wall spaced from one of the long upright side walls of said case and another upright wall spaced from the other of the long upright side walls of said case to provide a vertical air passage along each of the long upright side walls, said device also comprising a plurality of food supporting plate portions and a plurality of longitudinally spaced apart flues extending transversely across said upper chamber throughout the entire length of the case, said plate portions and said flues cooperating with said upright walls of said device to form a plurality of open top food storage compartments, means for supporting the device in said case with said plate portions thereof spaced vertically from said member to provide a horizontal passageway therebetween, the lower end of said flues communicating with said horizontal passageway, means for circulating air downwardly from said upper chamber through one of said passages past one side of said horizontal passageway into said lower chamber, transversely across said lower chamber and upwardly therefrom into the other of said passages, the circulation of air past said one side of said horizontal passageway creating a suction therein and causing some of the air circulated into said other passage to flow into said horizontal passageway, said device dividing the air entering said horizontal passageway into a plurality of streams of air one of which flows transversely across the cabinet beneath said food storage compartments while others flow upwardly through said transverse longitudinally spaced apart flues, the stream of air flowing across said cabinet in said horizontal passageway being discharged into and mixed with air circulating downwardly from said upper chamber as it flows into said lower chamber, refrigerating means within said lower chamber in the path of mixed air flowing thereacross for cooling the same, and means for directing air egressing from said other passage and from said flues onto and over foods stored in said compartments.

3. In combination with a substantially open top refrigerated display case having the display section thereof divided into compartments by a vertical hollow flue member through which cold air is circulated upwardly from below the compartments and is discharged over and upon food products stored therein, an air deflecting cap positioned over the upper open end of said flue member, said cap including an imperforate top wall and spaced side walls depending therefrom with their lower edge terminating in spaced relation to the top edge of walls of said flue member to provide an outlet opening along each side of said flue member for directing air out of the same, means permitting adjustment of said cap vertically with respect to the upper open end of said flue member to vary the size of said outlet openings, and means for locking said cap to said flue member in any one of its adjusted positions.

4. In combination with a substantially open

top refrigerated display case having the display section thereof divided into compartments by a vertical hollow flue member through which cold air is circulated upwardly from below the compartments and is discharged over and upon food products stored therein, an air deflecting cap positioned over the upper open end of said flue member, said cap including an imperforate top wall and spaced side walls depending therefrom with their lower edge terminating in spaced relation to the top edge of walls of said flue member to provide an outlet opening along each side of said flue member, a plurality of angularly disposed vanes in said cap intermediate the side walls thereof for directing air laterally out of said flue member through said outlet openings, means permitting adjustment of said cap and said vanes therein vertically with respect to the upper open end of said flue member to vary the size of said outlet openings, and means for locking said cap to said flue member in any one of its adjusted positions.

5. In a refrigerated display case, an elongated open top cabinet including a bottom wall, upright side walls and upright end walls, a member spaced vertically from said cabinet bottom wall and extending from one end wall to the other end wall of said cabinet to divide the interior thereof into an upper chamber and a lower chamber, a food supporting device inset within said upper chamber and mounted in spaced relation to said member to form a horizontal passageway therebetween, said device being spaced from said cabinet side walls to provide a passage at the front and at the back thereof, said device including a plurality of vertical flues extending transversely thereacross and being longitudinally spaced apart throughout the entire length of said cabinet, said flues dividing said device into a plurality of open top food storage compartments, said flues having their lower end communicating with said horizontal passageway, said member being spaced from the side walls of said cabinet to provide communication of the passages at the front and at the back of said cabinet walls with said upper and said lower chambers respectively, means for circulating air downwardly from said upper chamber through the passage at the front side wall of said cabinet into said lower chamber, transversely across said lower chamber and upwardly therefrom into the passage at the back side wall of said cabinet, some of the air circulated into the passage at the back side wall of said cabinet flowing into said horizontal passageway, said device dividing the air entering said horizontal passageway into a plurality of streams of air one of which flows transversely across the cabinet beneath said food storage compartments while others flow upwardly through said flues, said one stream of air by-passing upward circulation thereof through said device and being directed downwardly out of said horizontal passageway into said lower chamber, and refrigerating means within said lower chamber for cooling the air circulated by said circulating means.

6. In combination, a substantially open top refrigerated display case including a bottom wall, long upright side walls and upright end walls, a device inset within said case dividing the upper portion thereof into a plurality of open top food storage compartments, said device including a plurality of vertically disposed longitudinally spaced apart flues extending transversely across the case and a food supporting plate between each of said flues, mounting rails extending along each

of said long upright side walls of the case intermediate the open top and said bottom wall thereof, said flues and said plates having their ends supported upon said rails, said flues being in the form of narrow sleeve-like elements provided with a foot projecting outwardly from each side thereof, said plates overlapping and engaging a foot on flue elements adjacent thereto whereby said elements cooperate with said food supporting plates to reinforce and prevent bowing thereof intermediate their supported ends, and said flue elements and said plates being separate from one another and adjustable relative to each other

hoirzontally along the length of said case for varying the size of said food storage compartments.

MARSHALL W. BAKER.

References Cited in the file of this patent

UNITED STATES PATENTS

| Number    | Name          | Date          |
|-----------|---------------|---------------|
| 1,770,942 | Morris -----  | July 22, 1930 |
| 2,528,916 | Shreve -----  | Nov. 7, 1950  |
| 2,531,506 | Genecke ----- | Nov. 28, 1950 |
| 2,574,242 | Brill -----   | Nov. 6, 1951  |