# United States Patent

[11] 3,584,467


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[45] Patented **June 15, 1971**


[54] **COOKING STRUCTURE FOR AN OPEN ACCESS REFRIGERATOR**
**2 Claims, 4 Drawing Figs.**


[52] U.S. Cl. ..... **62/252,** 62/256
[51] **Int. Cl.** ..... **A47f 3/04**
[50] **Field of Search** ..... 62/251, 255, 256, 252



[56] **References Cited**

UNITED STATES PATENTS

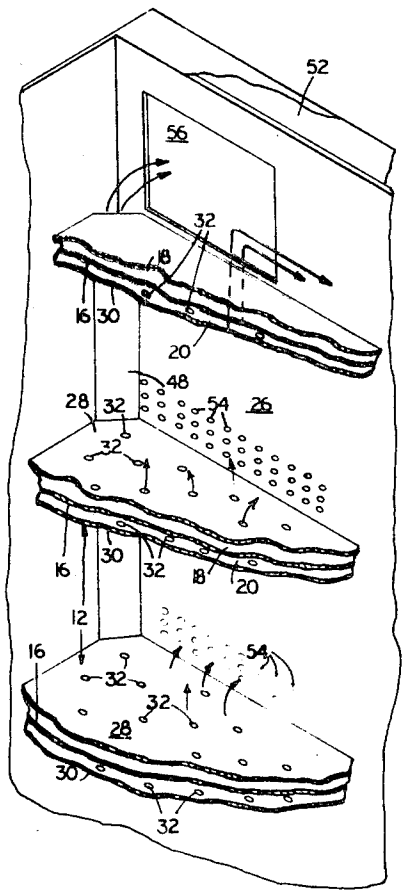
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**ABSTRACT:** An open-access refrigerator has a plurality of shelves, each having upper and lower compartments. Means are included for circulating refrigerated air upwardly from the upper compartment of each shelf, over products on the shelf, and into the lower compartment of the shelf directly above it. Means are also included for circulating refrigerated air upwardly and rearwardly from the upper compartment of each shelf, rearward of the open front of the refrigerator.

PATENTED JUN 15 1971

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SHEET 1 OF 2

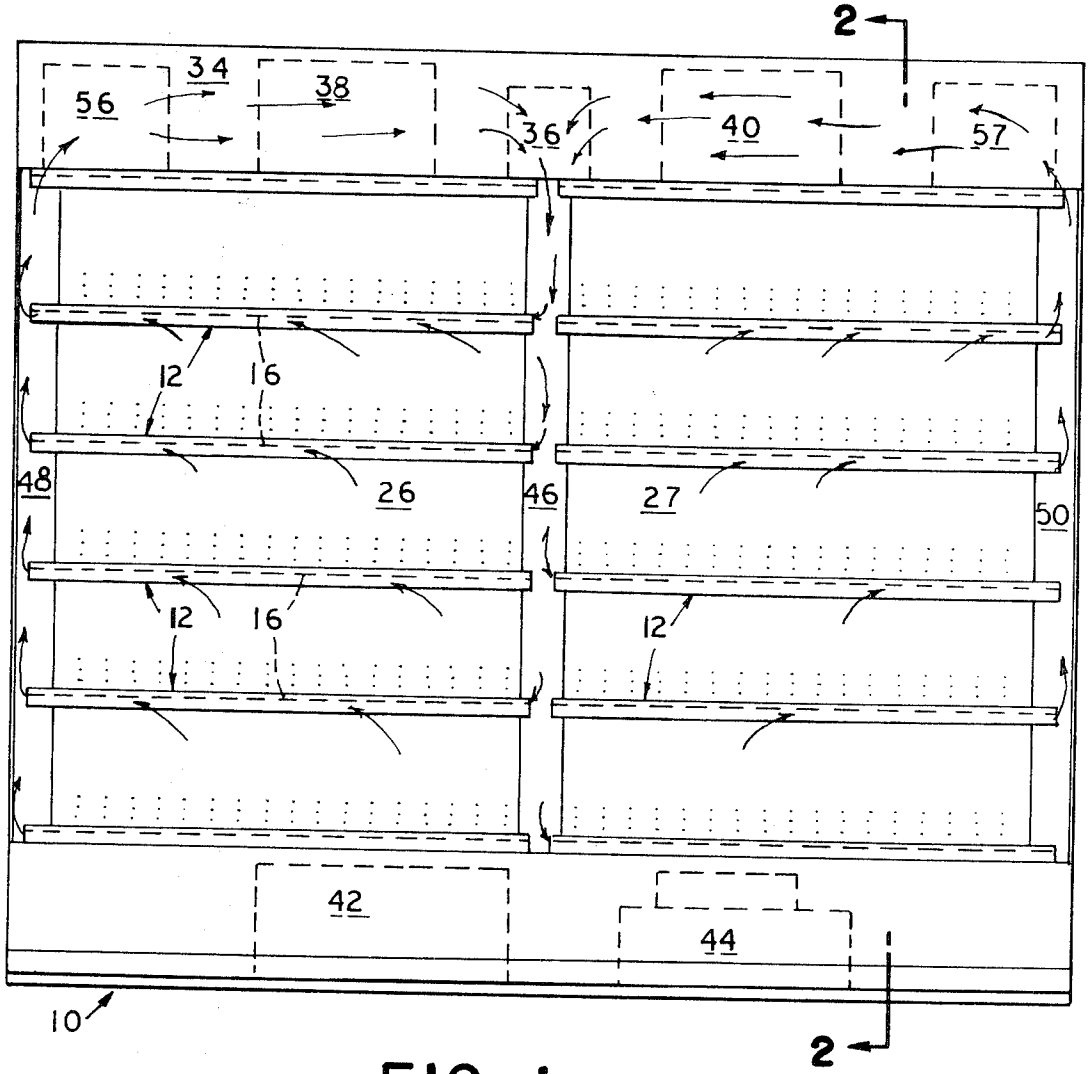



FIG_1

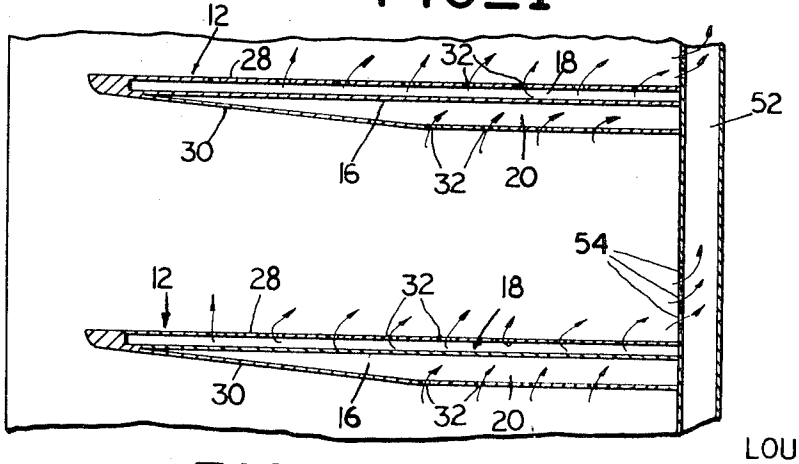



FIG_4

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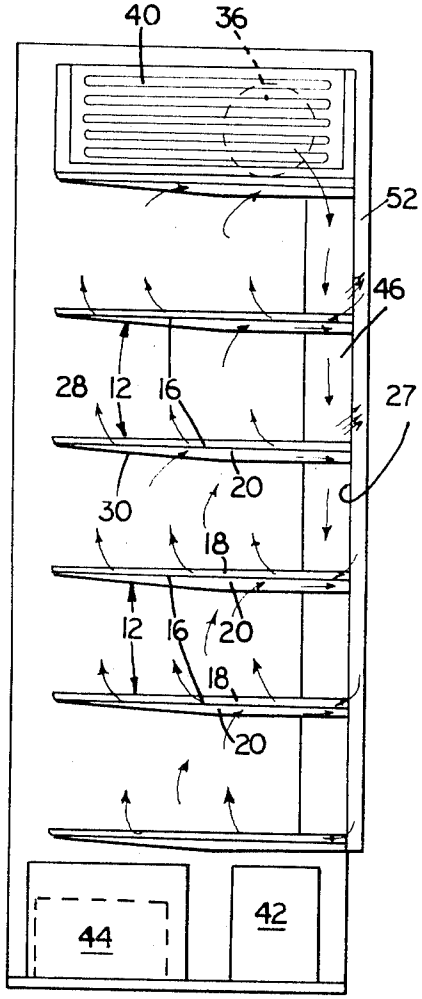



FIG_2

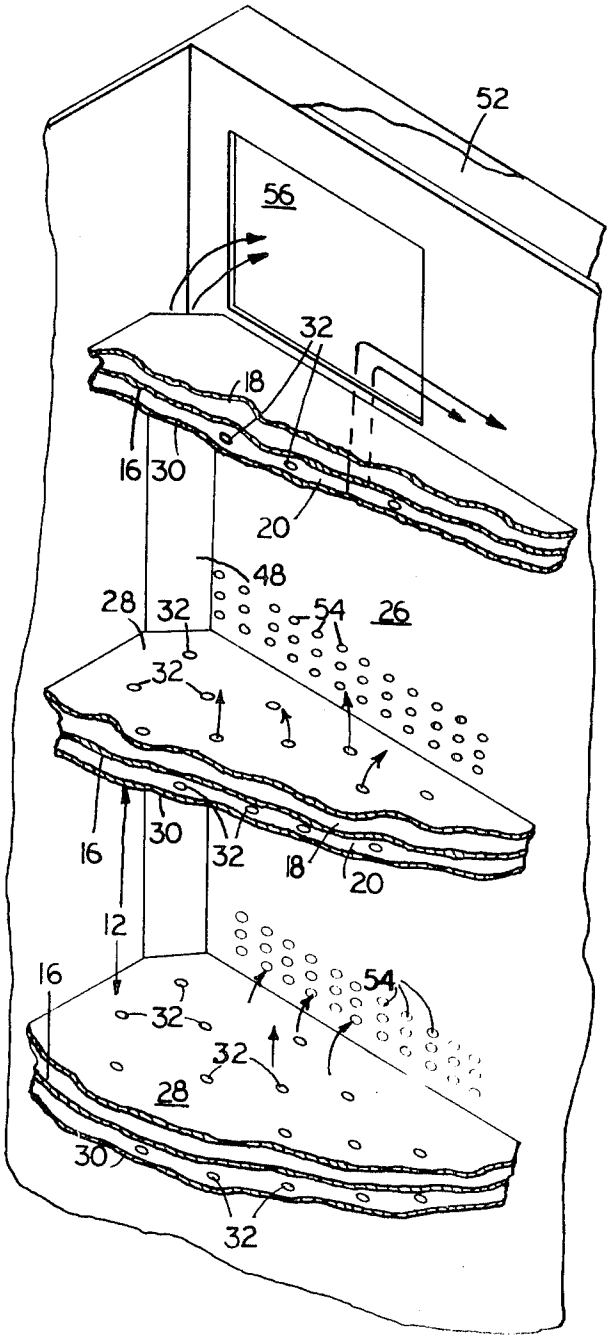



FIG_3

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# COOKING STRUCTURE FOR AN OPEN ACCESS REFRIGERATOR

## BACKGROUND OF THE INVENTION

This invention relates to refrigerating apparatus, and, more particularly, to means for circulating air in an open-access refrigerating apparatus.

In my U.S. Pat. No. 3,090,211, I disclose an open refrigerating apparatus having a series of divided shelf structures, and operating so as to pass refrigerated air upward from the upper compartment of one shelf into the bottom compartment of the superjacent shelf. Such refrigerated air, of course, cools products on the shelves.

While such a system has been found to be quite efficient, without a great deal of cool air being wasted, a certain amount of refrigerated air, of course, escapes from the open front of the refrigerating apparatus. While such a loss in an open-front refrigerator can never be completely eliminated, improvements in efficiency, by means of reducing this loss, are of course being sought.

It is an object of this invention to provide open-access refrigerating apparatus which utilizes the flow of refrigerated air more efficiently than in my U.S. Pat. No. 3,090,211.

It is a further object of this invention to provide open-access refrigerating apparatus which, while fulfilling the above object, is extremely simple in design and construction.

## SUMMARY OF THE INVENTION

In an open-access refrigerating apparatus having a shelf the front of which is open and the upper surface of which is perforated, with refrigerated air flowing upwardly from the upper surface of the shelf through such perforations, means directly above the upper surface of the shelf for receiving refrigerated air flowing directly upwardly from the upper surface of the shelf. Included are means rearwardly of and above the upper surface of the shelf for receiving refrigerated air flowing rearwardly of and upwardly from the upper surface of the shelf. Means are included for moving a portion of the refrigerated air directly upwardly into the means directly above the upper surface of the shelf. Means are included for moving a portion of the refrigerated air flowing upwardly from the upper surface of the shelf rearwardly of and upwardly into the means rearwardly of and above the upper surface of the shelf.

## BRIEF DESCRIPTION OF THE DRAWINGS

These and other objects of the invention will become apparent from a study of the following specification and drawings, in which:

FIG. 1 is a front elevation of a preferred embodiment of the refrigerating apparatus;

FIG. 2 is a sectional view taken along the line 2–2 of FIG. 1;

FIG. 3 is a perspective view of a portion of the refrigerating apparatus showing shelves and the back panel thereof;

FIG. 4 is an enlarged view of a portion of the structure as shown in FIG. 2.

## DESCRIPTION OF THE PREFERRED EMBODIMENT

Shown generally in FIGS. 1 and 2 is a free-standing, open front-access refrigerating apparatus 10 comprising a plurality of compartmentalized shelves 12. Each shelf 12 is divided by an imperforate member 16 into upper and lower air compartments 18, 20. These shelves 12 are supported by back panels 26, 27, which run from the top to adjacent the bottom of the apparatus 10, and the fronts of these shelves 12 are open (FIG. 2). The upper surface 28 of each shelf 12, as well as the lower surface 30, is perforated by means of openings 32 therethrough. Such perforations allow the passage of air from the upper compartment 18 of one shelf 12 directly upward through a shelf space and into the lower compartment 20 of a shelf 12 directly above.



Apparatus 10 includes an enclosed air compartment 34 within which is included a blower 36, and evaporator coils 38, 40, At the base of the apparatus 10 are included a compressor 42 and a condenser coil and fan 44.

A passage 46 leads downward from blower 36, and communicates only with the upper air compartments 18 of the shelves 12. Passages 48, 50, adjacent the sides of the apparatus 10, each communicate only with the lower air compartments 20 of the shelves 12. The lower surfaces of the lowermost shelves 12 are blank (i.e., not perforated), and the upper surfaces of the uppermost shelves 12 are blank (i.e., not perforated).

The apparatus 10 thus far described, it will be seen, is similar to that described in my U.S. Pat. No. 3,090,211 It will be seen that, similar to the apparatus of that patent, refrigerated air flows downward from blower 36, through passage 46 and into the upper air compartments 18 of the shelves 12. The air then flows upwardly from the upper surfaces 28 through perforations 32 therein, and directly upwardly through the perforations 32 in the lower surfaces 30 of the shelves 12 thereabove, into lower air compartments 20. From these lower air compartments 20, the air, warmed to an extent, flows into passages 48, 50, and upwardly therein, into air compartment 34, and over evaporating coils 38, 40 by which it is refrigerated. The air then flows into blower 36, by which it is recirculated.

Back panels 26, 27, it will be seen, actually together make up one wall of a duct 52 of rectangular cross section. Such back panels 26, 27 run along the rear edges of the shelves 12, and between the shelves 12 from the top shelves 12 to the bottom, and have perforations 54 therethrough. The perforations 54 associated with any given shelf 12 are above and adjacent the rear edge of that shelf 12. Such perforations 54 are rearward and upward of the shelf 12 associated therewith.

Back panels 26, 27 have openings 56, 57 therein adjacent the tops thereof which lead into air compartment 34. Such particular construction results in a portion of the air flowing upward from the upper surfaces 28 of the shelves 12 into the lower air compartments 20 of the shelves 12, and a portion of the air flowing rearwardly and upwardly therefrom through the perforations 54 on back panels 26, 27 and into duct 52. From such duct 52, the air flows through openings 56, 57, into air compartment 34, and over evaporating coils 38, 40. The air then flows into blower 36, by which it is recirculated.

By inducing refrigerated air to flow rearward as well as upward, it has been found that extremely efficient cooling of products on the shelves takes place (i.e., the refrigerated air is used extremely efficiently). By having air flow rearward as well as upward from the shelves, a minimum of refrigerated air flows outwardly through the open front of the apparatus. By having the perforations in the back panels adjacent and above each shelf, it is ensured that the refrigerated air flowing rearwardly flows through and between products on the shelf, and is more efficient in cooling said products.

Overall, it will be seen that the refrigerating apparatus disclosed herein is extremely simple and efficient in design, construction and operation.

I claim:

1. An open-access refrigerating apparatus having a plurality of vertically spaced shelves therein divided into upper and lower noncommunicating compartments, the fronts of said shelves being open and the upper surfaces being perforated along a substantial extent from the rear to the front thereof thus providing communication with said upper compartments, said apparatus comprising:

cold air circulation means communicating with said upper compartments for introducing cold air therein and out of said upper surface perforations;

perforating means associated with the lower surfaces of at least some of said shelves communicating with their lower compartments for receiving at least a portion of said cold air exiting from the perforations in the upper surface of a subadjacent shelf;

warm air removal means communicating with at least some of said lower compartments for removing said air therefrom at a lower temperature and recirculating said air back through said cold air circulation means;

cooling means associated with said warm air removal means for cooling said warmed air prior to recirculating said air into said cold air circulation means; and

panel means rearwardly of and above the upper surfaces of said shelves having a plurality of perforations therethrough directly above the rear edge of said shelves and in communication with said cold air exiting from the upper surface perforations for receiving at least a portion of said cold air exiting from the perforations in the upper surfaces of said shelves, said panel means communicating with said cooling means.



2. Apparatus according to claim 1 wherein said panel means includes a panel running between the rear edges of vertically adjacent shelves.

# UNITED STATES PATENT OFFICE

# CERTIFICATE OF CORRECTION

Patent No. 3,584,467 Dated June 15,1971

Inventor(s) Louis F. Barroero

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

On the cover sheet "[54]" and Column 1, lines 2 and 3, "COOKING STRUCTURE FOR AN OPEN ACCESS REFRIGERATOR", each occurrence, should read -- COOLING STRUCTURE FOR AN OPEN-ACCESS REFRIGERATOR --.

Signed and sealed this 22nd day of February 1972.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents

FORM PO-1050 (10-69)

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* U.S. GOVERNMENT PRINTING OFFICE : 1969 O—366-334