

March 9, 1948.

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2,437,452

FORCED AIR CIRCUIT REFRIGERATING APPARATUS

Filed June 12, 1944

4 Sheets-Sheet 1

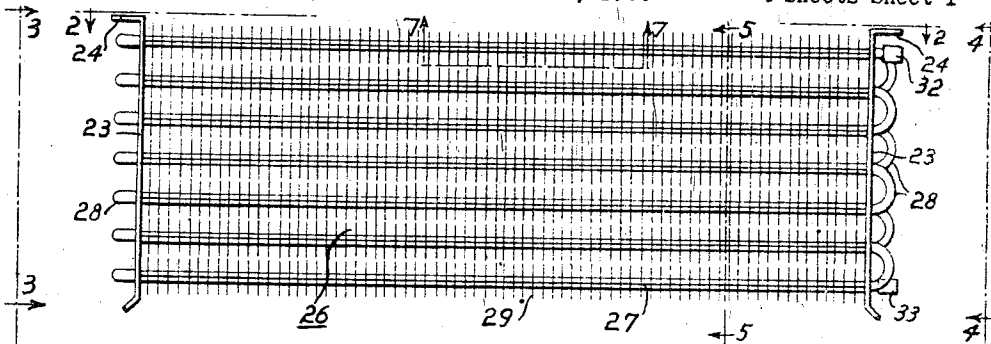


Fig. 1.

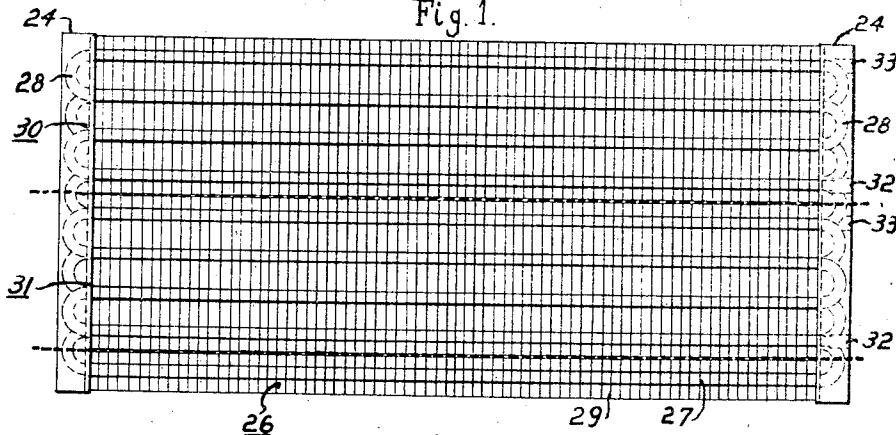


Fig. 2.

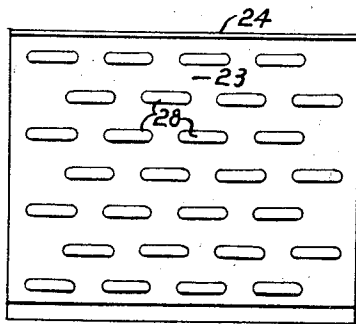


Fig. 3.

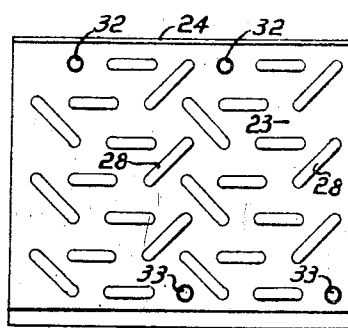


Fig. 4.

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4 Sheets-Sheet 2

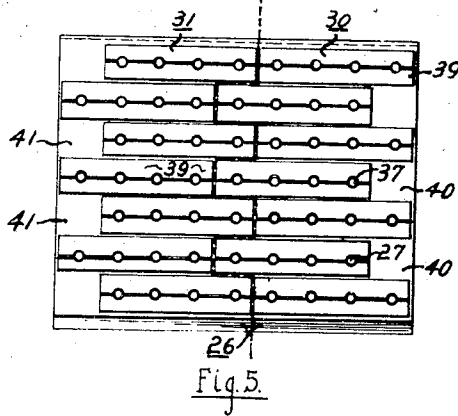


Fig. 5

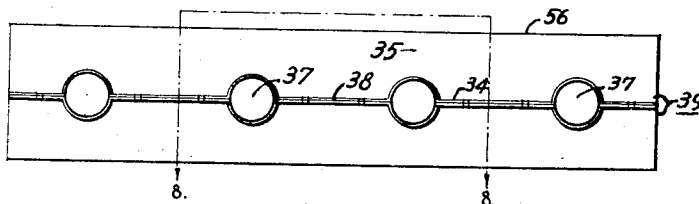


Fig. 6

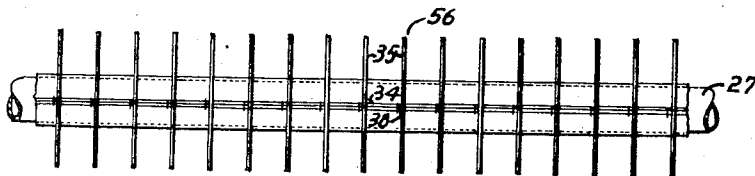


Fig. 7

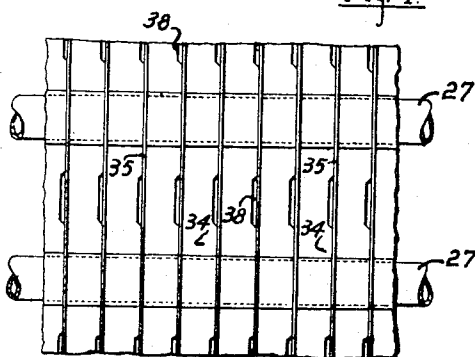


Fig. 8

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4 Sheets-Sheet 3

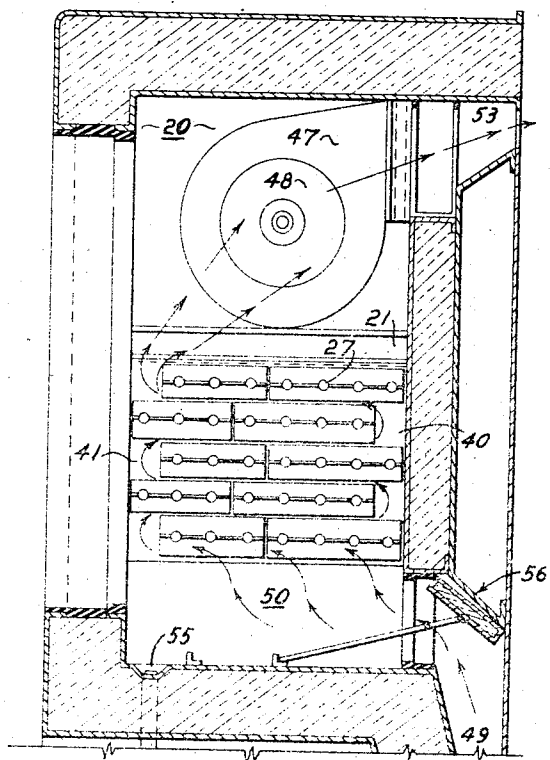


Fig. 15.

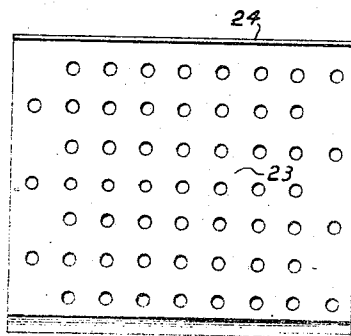


Fig. 12.

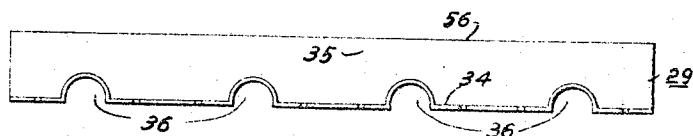


Fig. 9.

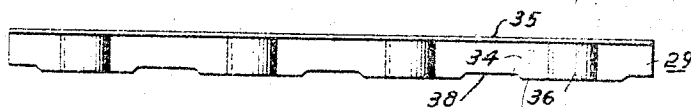


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2,437,452

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4 Sheets-Sheet 4

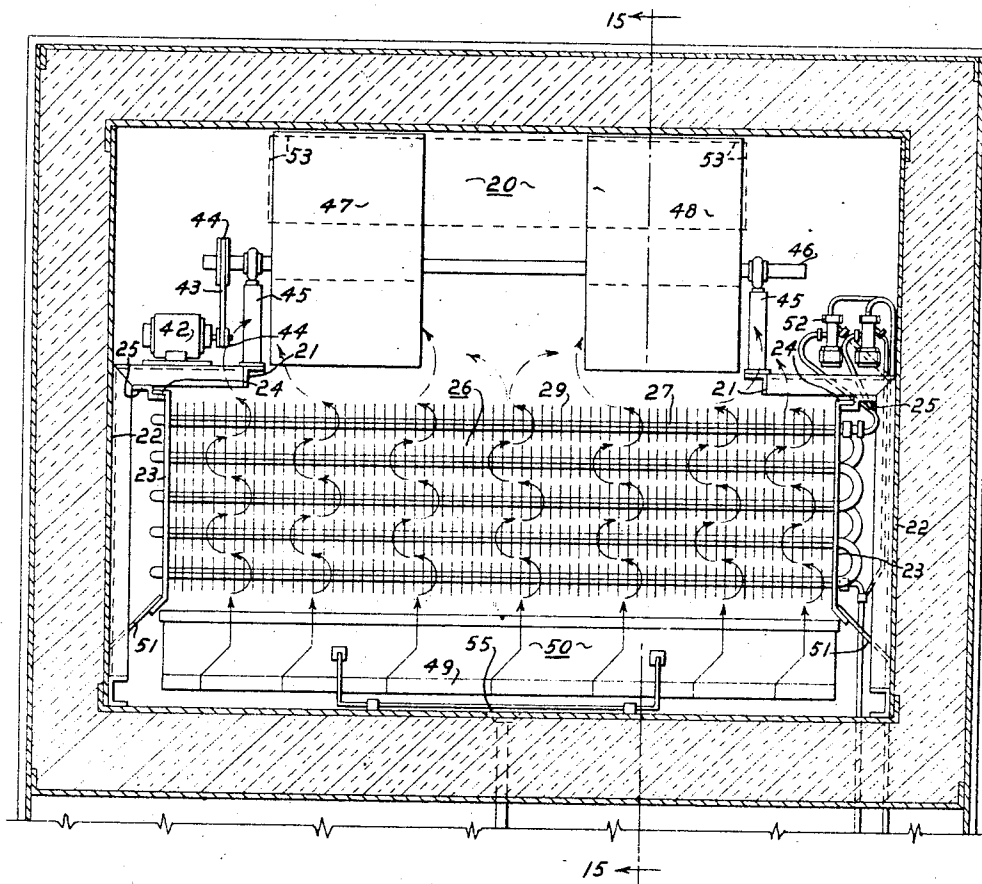


Fig. 14.

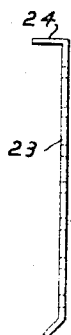


Fig. 11.

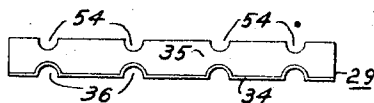


Fig. 16.

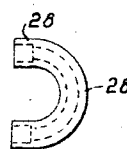


Fig. 13.

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UNITED STATES PATENT OFFICE

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FORCED AIR CIRCUIT REFRIGERATING APPARATUS

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Application June 12, 1944, Serial No. 539,961

3 Claims. (Cl. 62—102)

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This invention relates to a construction adapted to conduct and transmit cold and to refrigerate air in contact therewith.

It has long been a much needed development and a desired objective of the food preservation and the material handling industries to have a refrigerated locker system, cabinet or enclosure to freeze, preserve, store and test foods, biologicals, materials, at freezing temperatures, ranging from plus 10 degrees to minus 100 degrees Fahrenheit, economically, practically and safely.

In the industrial and commercial fields there are certain biologicals and materials that require a testing and ageing period at very low sub-freezing temperatures.

The present operated types of locker systems, or depots and the deep well type container or deep freeze cabinets utilize ice, dry ice or a series of pipe coils as the refrigeration media. The pipe coils are suspended from the ceiling or attached on the surrounding side walls which chill the air. The chilled air gradually descends to the lower levels of the locker plant, cabinets and enclosures through the circulation of air by connection.

Furthermore, a coating of ice or other objectionable matter accumulates on the food, biologicals or materials to be frozen, preserved, stored and tested, thereby counteracting the benefits of the subfreezing temperatures for industrial, commercial or domestic usage, as well as making it impossible to quickly defrost and cleanse the coils while in operation without changing the temperature of the locker plant, cabinet and enclosure.

Among the objects of my invention is to solve the foregoing problems and to provide an improved refrigeration media, that comprises a plurality of portable and expandable sections; that utilizes forced circulated cold air as a secondary refrigerant; that is more efficient, economical and compact thereby utilizing to the highest state the primary refrigerant, space, equipment and power.

My invention also contemplates such other objects, advantages and capabilities as will more fully appear later, and which are inherently possessed by my invention.

While I have shown in the accompanying drawings a preferred form of my invention, yet I wish it understood that the same is susceptible of modification and change without departing from the spirit of my invention.

Referring to the drawings, Fig. 1 is a front elevational view of my evaporator comprising a plurality of sections or series; Fig. 2 is a top plan view of the evaporator taken on line 2—2 of Fig.

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1; Fig. 3 is an end view of the evaporator taken on line 3—3 of Fig. 1; Fig. 4 is an opposite end view of Fig. 1 of the evaporator taken on line 4—4 of Fig. 1; Fig. 5 is a cross sectional view of the evaporator taken on line 5—5 of Fig. 1; Fig. 6 is an enlarged cross sectional view of one of the fin sections of the plurality of sections shown in Fig. 5; Fig. 7 is an enlarged front elevational view of one section of the vertical faces of the fins, taken on line 7—7 of Fig. 1; Fig. 8 is an enlarged plan view of the fins between two tube conduits, taken on line 8—8 of Fig. 6; Fig. 9 is an enlarged front view of one embodiment of my fin; Fig. 10 is an enlarged plan view of said fin; Fig. 11 is a detailed view of one of the end plates that supports the tube conduits; Fig. 12 is an elevational view of the end plates; Fig. 13 is an enlarged plan view of a connecting elbow that is surmounted onto the extended ends of the tube conduits after insertion through the end plates; Fig. 14 is a sectional view of an enclosed insulated primary refrigerating area showing the front of the evaporator when installed; Fig. 15 is a sectional side view of the enclosed insulated primary refrigerating area taken on line 15—15 of Fig. 14, and Fig. 16 is a reduced front view of another embodiment of my fin construction.

Referring now to the preferred embodiment selected to illustrate my invention, I provide an insulated chamber 20 with an angle iron framework shelf 21 attached to the inner wall 22. A pair of end plates 23 having right angle portions 24 are slidable between spaced brackets 25 that are attached to the under portion of shelf 21.

Within chamber 20 is positioned by refrigerant evaporator 26 comprising a plurality of horizontally extending conduits 27 joined at their ends by a plurality of connecting elbows or connections 28, providing different heights for the conduits, and a plurality of cold conducting fins 29, to be hereinafter more fully described.

I prefer that my refrigerant evaporator 26 consist of two independently operated sections or series 30 and 31, each series having an intake 32 and an outlet 33 as shown in Figs. 2 and 4.

It is also within the contemplation of my invention that my refrigerant evaporator may have more than two series or only one series with a single intake 32 and a single outlet 33, with the intake 32 preferably at a high level and outlet 33 at a low level.

My fins 29, in their preferred form, each have a horizontal face 34. Each of my fins 29 is bent substantially at right angles to form a vertical face 35. A raised portion 36 in horizontal face

34 communicates with a hole 37 in vertical face 35 to permit the passage therethrough of one of the conduits 27. In each horizontal face 34 is a cut out portion 38 for drainage, as will later more fully appear.

By welding together horizontal faces 34 of two fins 29, I form fin sections 39 with holes 37 therein. My fin sections 39 are spot welded to tube conduits 27 which pass through holes 37 as shown in Figs. 6, 7 and 8.

The fin sections 39 are used in rows and the top edge 56 of the vertical face 35 of one section 39 abuts the corresponding bottom edge of the vertical face of the fin section 39 therebelow. It is also within the contemplation of my invention that the fin sections 39 be staggered horizontally so that the alternate lower vertical fins 35 may be inserted into the space formed by the upper vertical fins 35 of the next lower fin section 39. The order of relationship of the vertical fins may be reversed.

My fin sections 39 extend longitudinally within insulated chamber 20, in vertically staggered rows as shown in Fig. 5. Alternate rows extend from the rear wall of chamber 20 to a point short of the front wall leaving a space 40. Alternate rows extend from the front wall of chamber 20 to a point short of the rear wall leaving a space 41 thereby allowing an alternating vertical passage for the conduction of air.

On shelf 21 within chamber 20 is positioned a blower motor 42 operating a pulley belt 43 extending between pulleys 44. A pair of spaced brackets 45 also mounted on shelf 21 support a rotating shaft 46 which operates a pair of discharge blower fans 47 and 48 in a counter-clockwise manner.

The spaced series 30 and 31 of my refrigerant evaporator 26 are mounted on the same end plates 23.

In the ordinary undivided fin coil construction heretofore used, air from intake duct 49 would tend to enter that portion of the coil nearest duct 49. This resulted in the by-passing of the outer portion of the coil so that approximately only one-half of the coil was being efficiently used.

With my two independently operated sections or series 30 and 31, I can control and provide for a faster flow of the primary refrigerant direct to the outer series 31 through the regulation of the intake 32 and the outlet 33, and thereby provide a colder condition in 31 than in 30 and thereby accelerate the attraction of more of the air or secondary refrigerant from air chamber 50 through section 30. This results in the air in chamber 50 passing more evenly and uniformly through both series 30 and 31, utilizing the cold surfaces in both of the series to their maximum extent and providing greater efficiency in supplying the secondary refrigerant at a reduced operating cost.

Attached to the lower portions of each of the end plates 23 is a guide plate 51 for guiding the air in chamber 50 direct to evaporator 26 thereby preventing the air from moving around evaporator 26.

On each of the series 30 and 31 at intake 32 I provide a thermostatic expansion valve and pot type header 52.

In operation of my construction, air enters air chamber 50 through air intake duct 49. The air expands in chamber 50 and is drawn upwardly against the lowest row of the fins of series 30 and 31. The air passes longitudinally along vertical

face 25 and against the under surface of horizontal face 34 until reaching space 40, when the air is free to pass upwardly to the next row of fins thereabove. There the air passes longitudinally in a reverse direction in the path formed by faces 34 and 35 until space 41 is reached, when the air may pass upwardly to the path formed by the next row of fins. This continues through each row until the cooled air is released into chamber 20 and then passed to adjoining locker sections or a duct for dispatch to a desired location.

When it is desired to defrost the evaporator 26, water may be sprayed over the parts. The water will drain down through openings 38, as illustrated in Figs. 6, 7, 8, and 10, into chamber 50 where it passes out through outlet 55 as shown in Figs. 14 and 15.

In another embodiment of my fins 29 I do not weld together horizontal faces 34 of two fins 29 but provide single fins 29, each having the horizontal face 34, and the vertical face 35 at substantially right angles thereto. There is the usual raised portion 36 in the horizontal face communicating with hole 37 in vertical face 35 to receive one of the conduits 27. There is also the usual drainage cut out portion 38 in horizontal face 34. In this embodiment however, the vertical face is extended and has a curved cut out portion 54 in its top edge to fit against the conduit 27 thereabove.

It is, of course, within the contemplation of my invention that my fins may have one or more openings for tube conduits and of any desired size.

My fins, tube conduits, elbows and end plates may be formed of metal, plastic or any suitable cold conducting material. The fins may be welded or attached to the conduits by any suitable means.

Having thus described my invention, I claim:

1. In an insulated chamber, a plurality of primary refrigerant conduits, and a plurality of separate individual cold conducting fins, each of said fins having a horizontal face, and substantially at right angles thereto a vertical face, each horizontal face having a raised portion, and each vertical face having an opening at the inner end of said raised portion, each fin mounted on a conduit with the conduit surrounded by and extending along said raised portion and extending through said opening, each horizontal face also having an opening therein for drainage.

2. In an insulated chamber, a plurality of vertically spaced banks of longitudinally spaced horizontally extending conduits, a plurality of separate individual cold conducting fins, each of said fins having a horizontal face and substantially at right angles thereto a vertical face, said vertical face having a cut out portion at its inner end adjacent said horizontal face, said horizontal face having a raised portion extending to the cut out portion of said vertical face, said fins mounted on said conduits with said conduits surrounded by and extending through the raised portions of the horizontal faces of the fins and extending through the communicating cut out portions of the vertical faces of the fins, said fins extending longitudinally within the chamber in vertically staggered rows, with alternate rows extending from the rear wall of the chamber to a point short of the front wall leaving a space and alternate rows extending from the front wall of the chamber to a point short of the rear wall leaving a space, said spaces provided for direct-

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ing the upward flow of air progressively from row to row until reaching the top row.

3. In an insulated chamber, a plurality of vertically spaced banks of longitudinally spaced horizontally extending conduits, a plurality of fins, each having a pair of joined horizontal faces with raised portions providing an opening, and substantially at right angles thereto upper and lower vertical faces, said vertical faces having cut out portions at their inner ends adjacent said horizontal faces and communicating with the opening therein, said horizontal faces having raised portions extending to the cut out portions of said vertical faces, said fins mounted on said conduits, with said conduits surrounded by and extending through the raised portions of the horizontal faces of the fins and extending through the communicating cut out portions of the vertical faces of the fins, said fins extending longitudinally within the chamber in vertically staggered rows, with the top edge of the upper vertical face of a row abutting the lower edge of the lower

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vertical face of a higher row and with alternate rows of fins extending from the rear wall of the chamber to a point short of the front wall leaving a space, and alternate rows extending from the front wall of the chamber to a point short of the rear wall leaving a space, said spaces provided for directing the upward flow of air progressively from row to row until reaching the top row.

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