Jan. 23, 1951 F. E. HAZARD 2,538,780

REFRIGERATING DEVICE FOR PACKAGE GOODS

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Fig. 1.

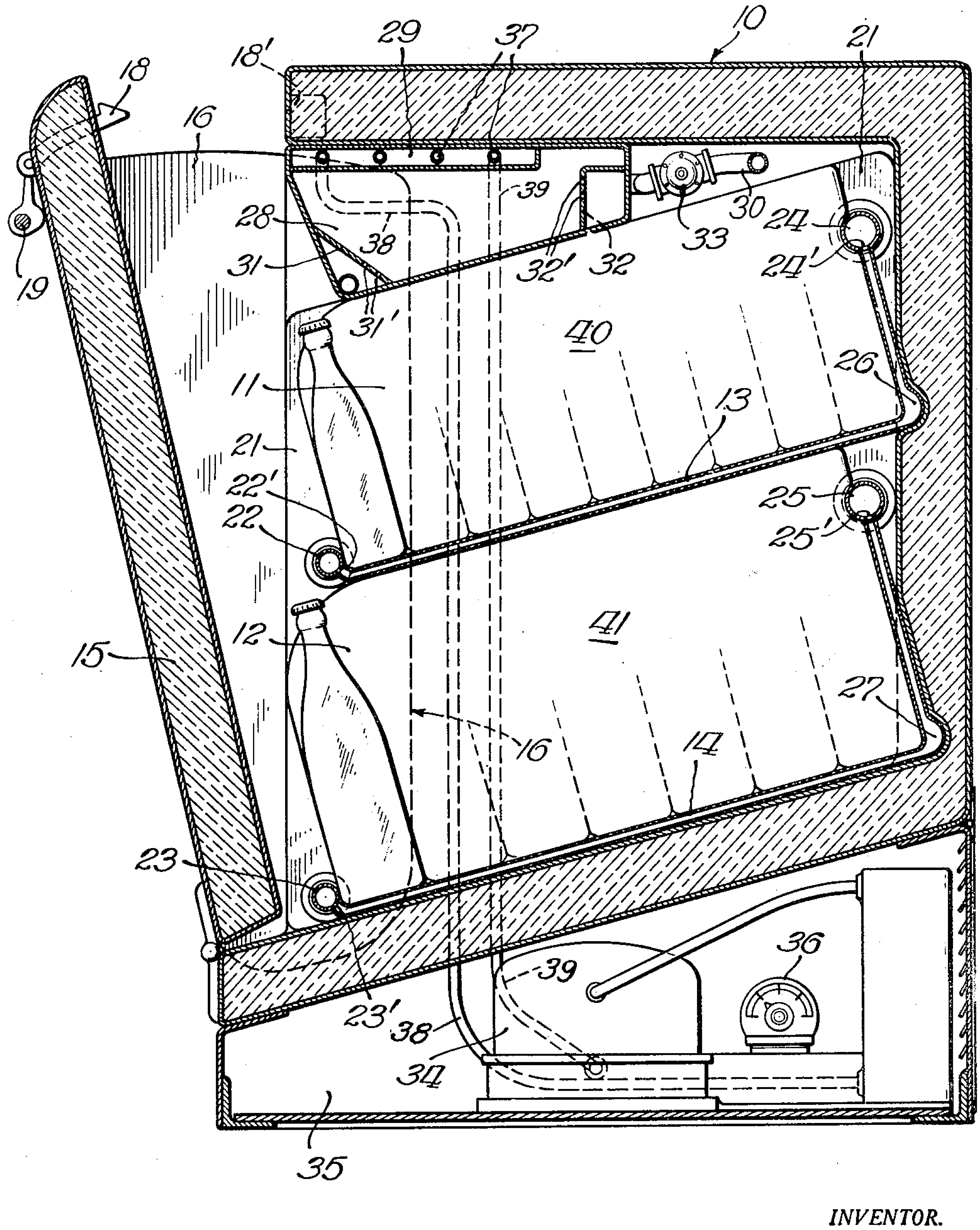

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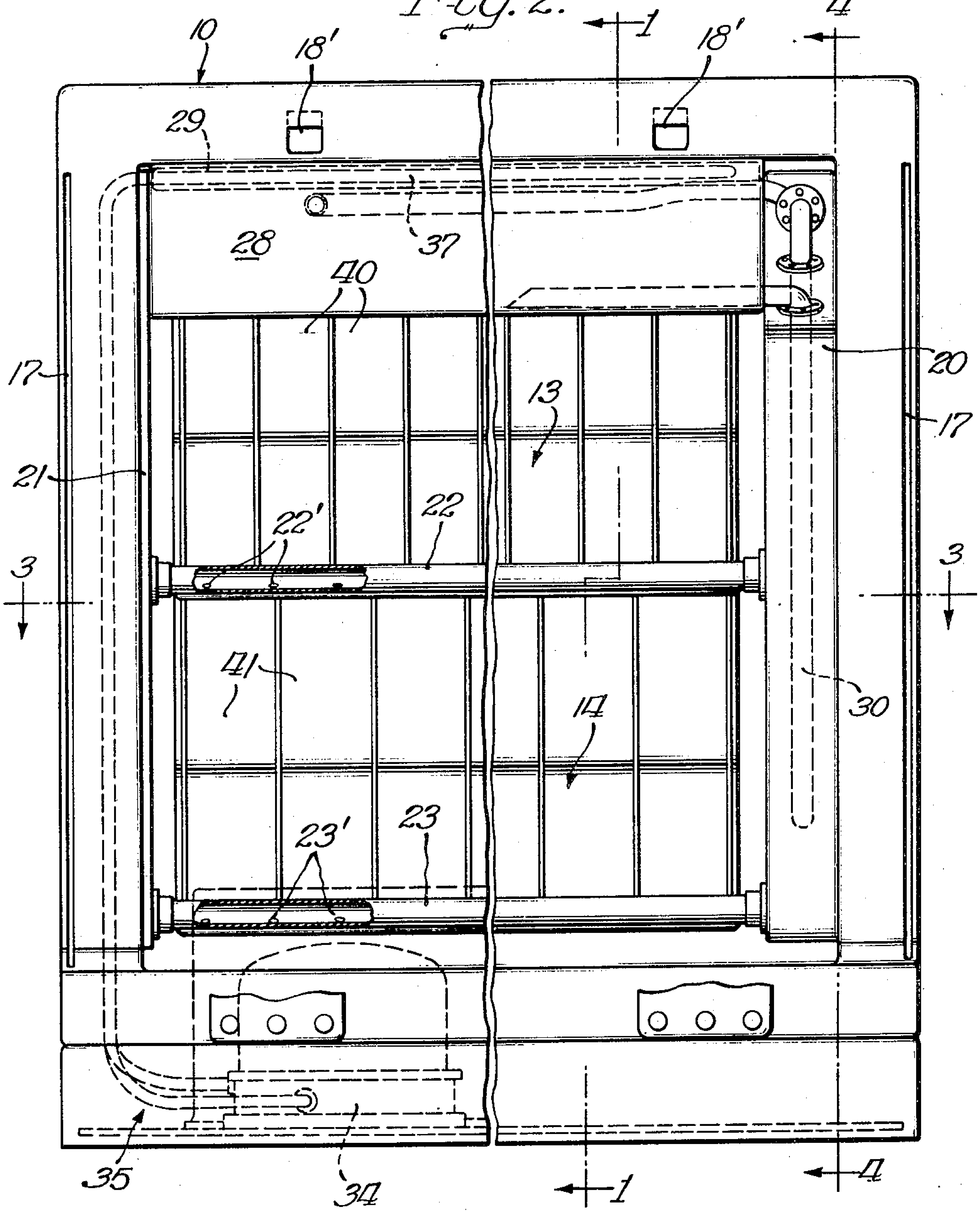
Fig. 2.



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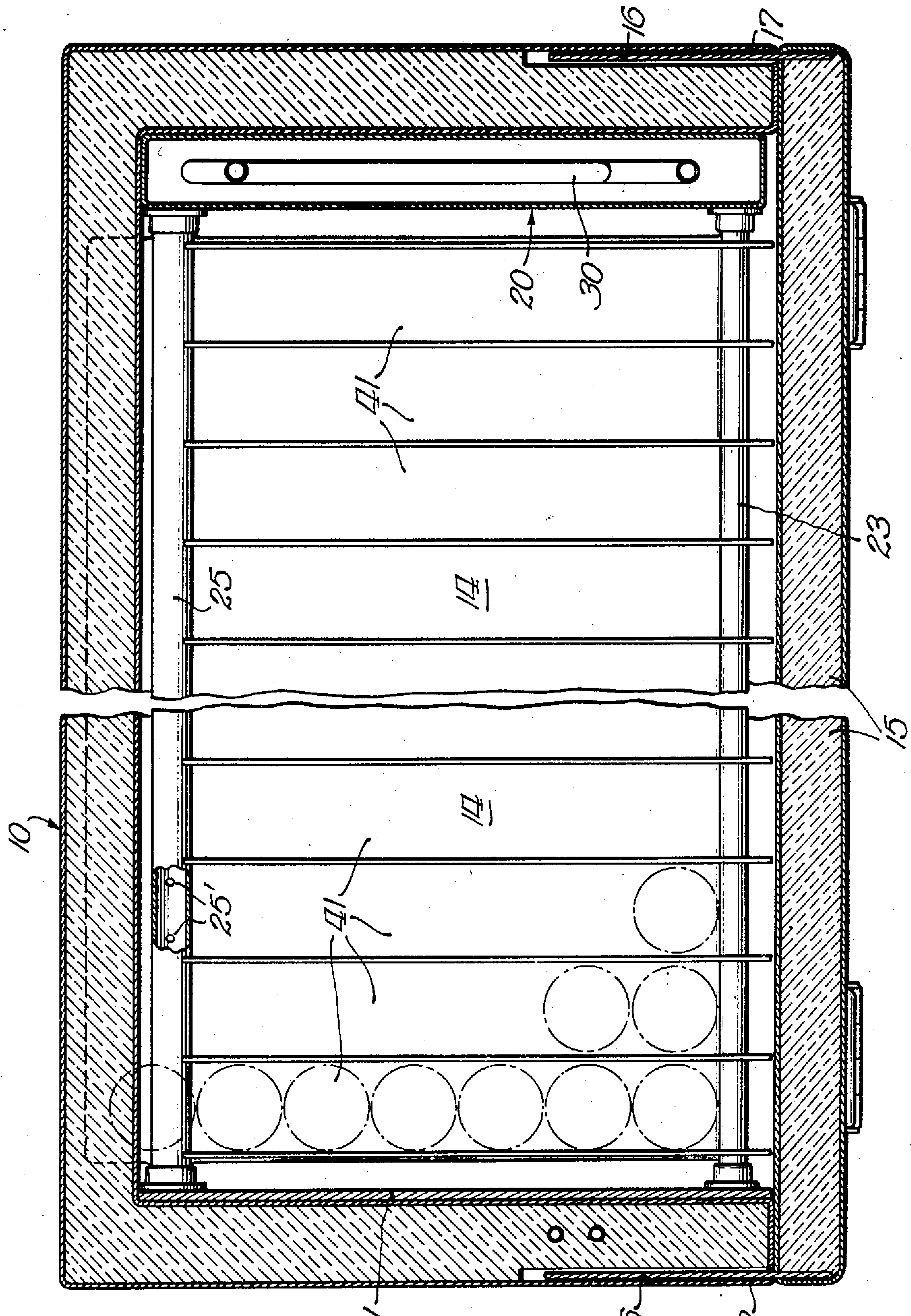

Fig. 3.

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Fig. 4.

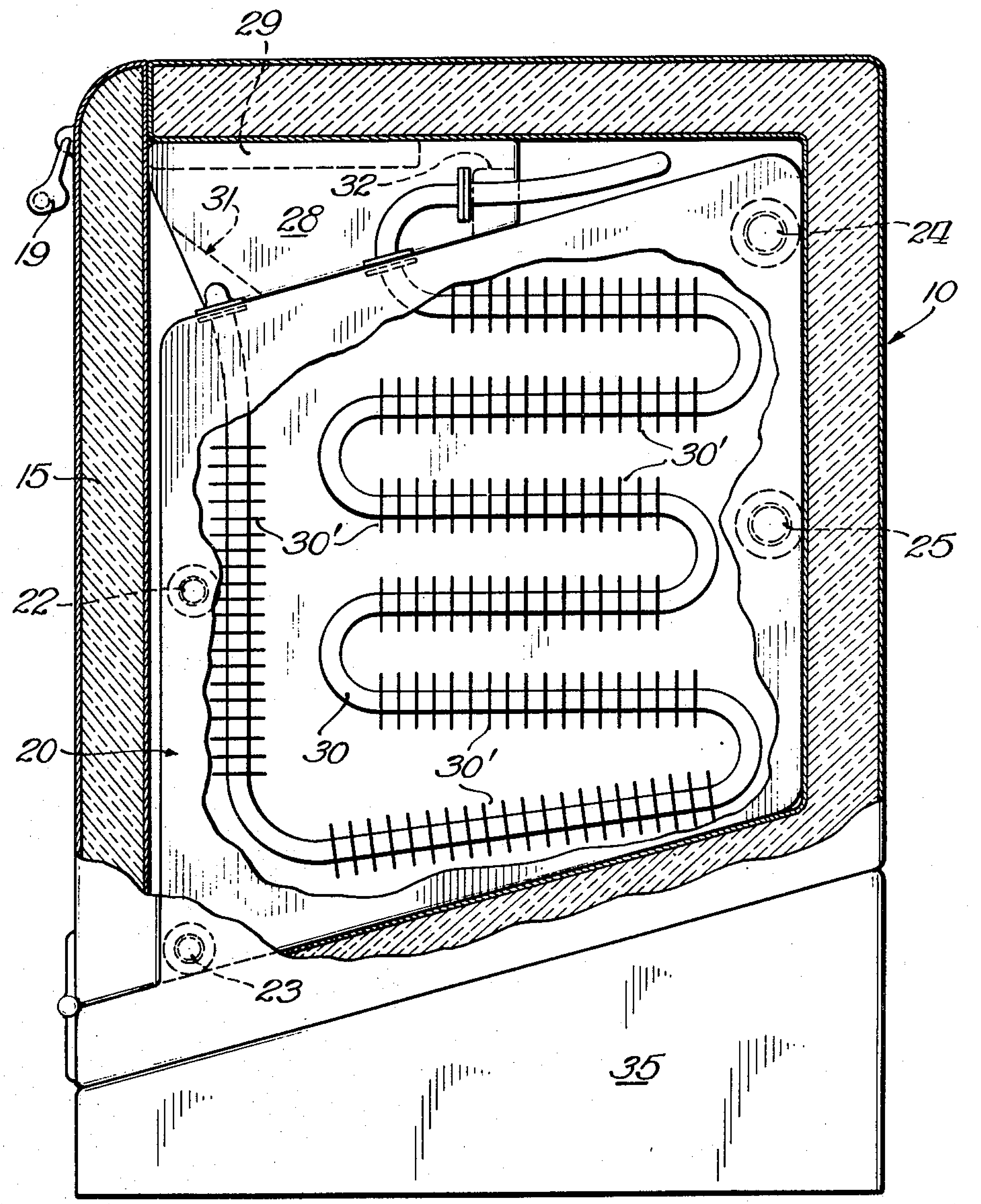

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Fig. 5.

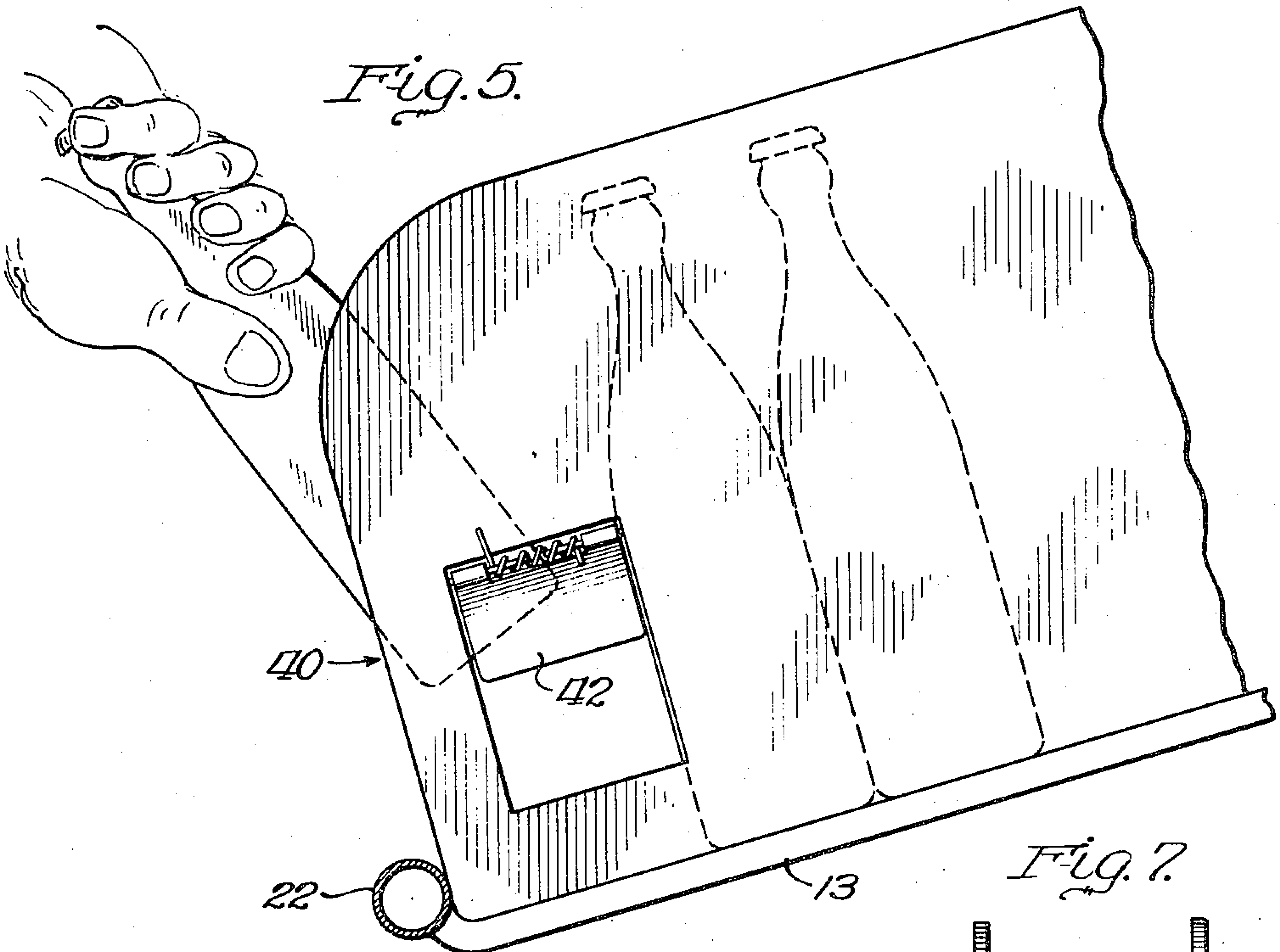


Fig. 7.

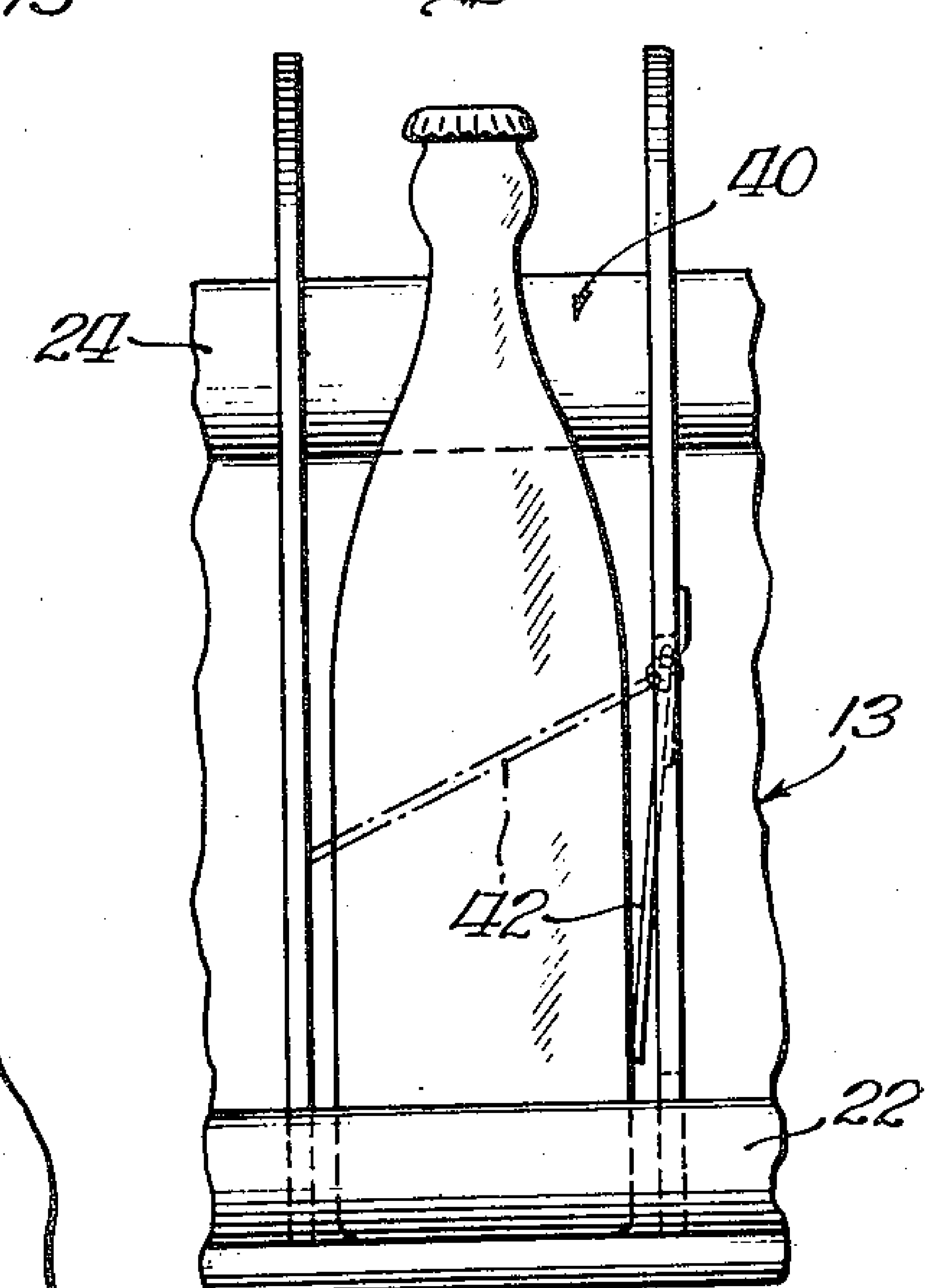
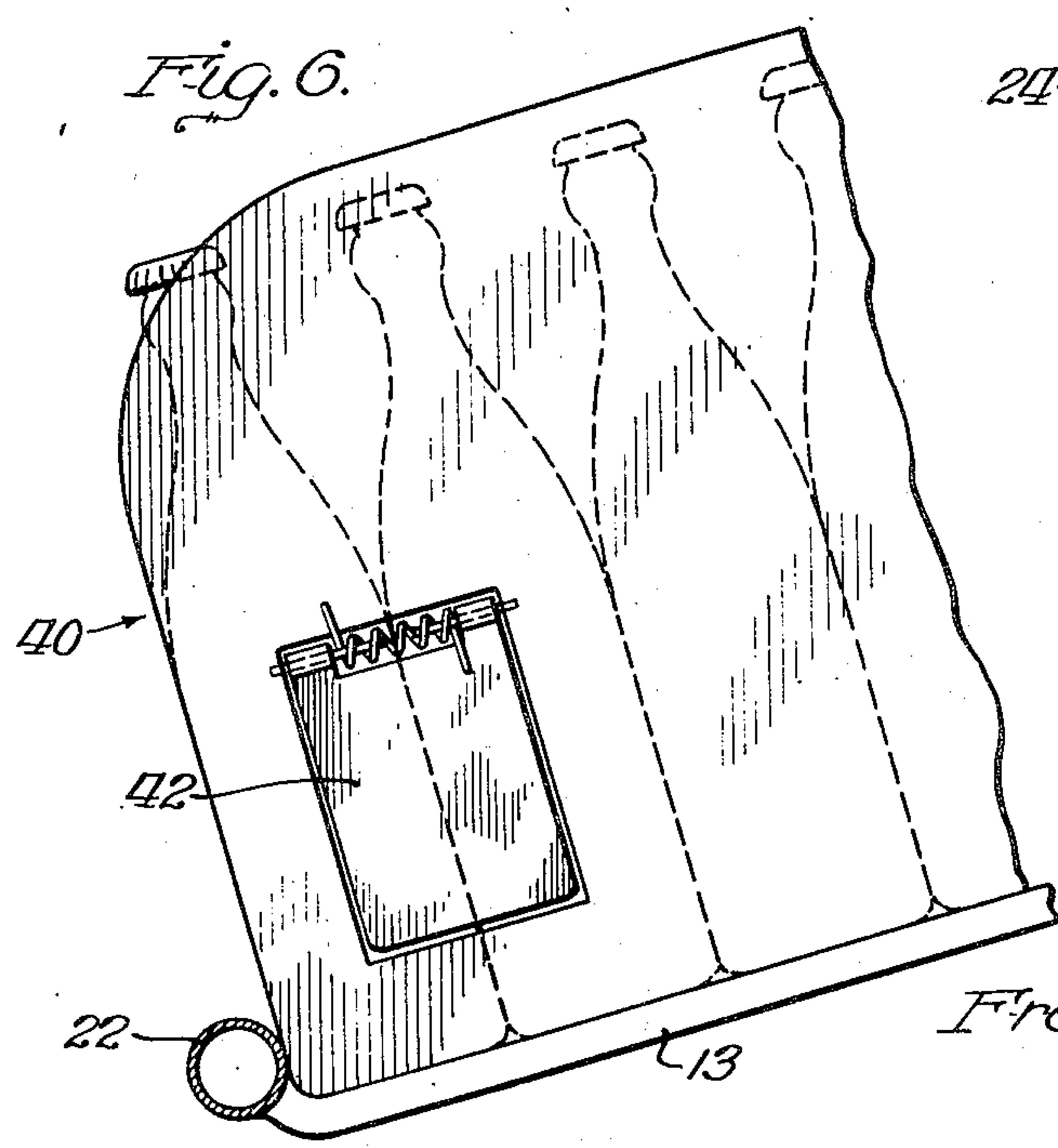


Fig. 6.



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UNITED STATES PATENT OFFICE

2,538,780

REFRIGERATING DEVICE FOR PACKAGE GOODS

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Application February 22, 1945, Serial No. 579,186

17 Claims. (Cl. 62—95)

This invention relates to refrigerating device for packaged goods and particularly for such devices as may be used for displaying and dispensing such goods in stores, restaurants and the like.

The particular object of the present invention is to provide a compact effective refrigerating device of large capacity wherein goods are segregated in front delivery channels for rapid charging and removal while exposed to proper refrigerating conditions maintained within the device.

Another object is to provide a packaged goods refrigerating device wherein a secondary non-volatile refrigerating fluid is used in secondary header tanks and hollow walls of the refrigerating compartment to convey heat from the compartment, the volume of secondary non-volatile liquid refrigerating fluid in the secondary system providing effective thermal-flywheel means for maintaining proper refrigerating temperatures and reducing the power consumption and wear of the power unit.

A further object is to provide a packaged goods refrigerating device wherein multiple high side power units may be used to serve the same secondary refrigerating systems.

A still further object is to provide a packaged goods refrigerator wherein any type of heat removing refrigerating apparatus may be utilized to maintain proper refrigerating temperatures with maximum effectiveness.

Other objects and benefits will be disclosed in the following descriptions and drawings in which:

Fig. 1 is a vertical cross-sectional view of a representative construction of my refrigerator for packaged goods substantially as taken along the line 1—1 in Fig. 2;

Fig. 2 is a front elevational view of the refrigerator shown in Fig. 1 with the door removed therefrom;

Fig. 3 is a plan sectional view thereof as the refrigertor would appear as viewed substantially along the line 3—3 of Fig. 2;

Fig. 4 is another vertical cross-sectional view of the refrigerator as seen along the line 4—4 in Fig. 2, with portions broken away and some in elevation to emphasize certain details of construction;

Fig. 5 is an enlarged fragmentary view of a part of the upper shelf to show a spring urged stop with the latter in position to effectively hold inserted bottles back while others are successively being inserted as illustrated;

Fig. 6 is another view like Fig. 5 with the shelf filled with bottles front to back; and

Fig. 7 is a front edge view of the shelf fragmentarily illustrating one bottle channel or compartment thereof, this view showing the position of the spring stop in full lines as per the Fig. 6 position thereof and in dot and dash lines as per the Fig. 5 position of the same.

Now referring to the drawings and at the outset of Fig. 1, I designate the main body of the insulated cabinet by the numeral 10. The refrigerating cabinet is divided into two compartments 11 and 12 by inclined hollow walled L-shaped shelves 13 and 14 for supporting packaged goods, in this case bottled beverages, as shown. Although this is a preferred form of my invention for packaged goods, it will be understood that many other arrangements of the refrigerating compartment for other packaged goods may be constructed without departing from the spirit or teachings of the invention. Although I have shown inclined shelves whereby the goods are gravitated forwardly, I appreciated that similar results may be attained mechanically on horizontal shelves by spring or weight and pulley urged devices. The present form of the device is shown for the purpose of illustration only.

The cabinet 10 has a door 15 hinged on its bottom front that is normally stopped in the position shown by a conventional stop (not shown) which may be retracted to permit a 90° opening of the door when desired. The door 15 has two end baffles 16 which telescope into dual openings 17 provided in the end walls of the cabinet 10. The door is normally latched shut by conventional latch elements 18 and 18′ controlled by a cross bar 19 mounted on the front of the door 15.

Although I have shown and described a door hinged on the bottom of the cabinet, it will be appreciated that many other arrangements are possible with the door hinged at various points and the baffles arranged to properly coact to stop losses of refrigerated air.

It will be understood and appreciated that the telescoping end baffles 16—16 effectively hold the heavy cold refrigerated air within the refrigerating compartments by preventing this cold fluid air from spilling out in the natural manner commonly observed when a conventional refrigerator door is opened. This is an important feature of my device because such losses of refrigerated air would be a serious handicap in packaged goods refrigerators which are often opened for charging and dispensing.

The L-shaped shelves are mounted and supported on a secondary refrigerant tank 20 and a sheet metal support 21 mounted in the ends of the refrigerating compartment. The hollow shelves 13 and 14 are mainly supported by cross tubes 22—24 and 23—25 welded to the support elements 20—21 in a conventional manner.

The outlet tubes 24—25 are larger than the inlet tubes 22—23 in order to facilitate thermo-siphonic flow.

The tubes are hollow and communicate with the secondary tank 20 and hollow shelves by multiple inlet openings 22′—24′ and 23′—25′ which are arranged to provide complete diffusion of the refrigerant through the hollow shelves by thermo-siphonic flow of the refrigerant in a closed hermetically sealed secondary system as explained in my co-pending continuation-in-part application S. N. 32,318 filed June 11, 1948. It will be noted that flow of the refrigerant around the corners of the L-shelves is assisted by providing release elbows 26—27 in accordance with the teaching of my co-pending application above mentioned.

Mounted on the top of the support member 20—21 is a main secondary refrigerant tank 28 having an inset evaporator refrigerant tank 29.

The remaining secondary refrigerant tank 28 is connected to a heat transfer coil 30 having heat absorbing fins 30′ attached thereon. The connections are made in a conventional manner except that they communicate with internal cross channels 31—32 having openings 31′—32′ arranged to provide complete diffusion of the refrigerant throughout the tank 28. The return flow of the refrigerant liquid is through a thermo-siphonic valve 33 for controlling the temperature of the liquid refrigerant as fully explained in my aforementioned co-pending application.

A conventional compressor-condenser high side unit 34 is mounted in the base section 35 of the cabinet 10 and is controlled by a conventional thermostat or pressure valve 36 for the volatile refrigerants used therewith. The high side unit is connected to an evaporator coil 37 mounted in the inset tank 29 by pipe connectors 38—39 as shown.

I now desire to explain that my entire secondary liquid refrigerant system including the main secondary tank 28, the subsidiary secondary tank 20, the secondary coil 30, and the hollow shelves 13—14 is assembled as a unit and fully filled with non-volatile liquid refrigerant at about 70° F. and hermetically sealed. It will be appreciated that the secondary liquid refrigerant operates at considerably lower temperature than the 70° F. and therefore the secondary tanks operate under a slight vacuum head in expansion chambers provided in the tops of the secondary tanks, as explained in my aforementioned co-pending application. It will be carefully observed and appreciated that I have provided considerable excess header capacity in the subsidiary secondary tank 20 over the hollow shelves 13—14 and a similar excess header capacity in the main secondary tank 28 over the connected coil 30. By this arrangement and by using a freely flowing thermo-siphonic liquid refrigerant, I am enabled to provide an effective secondary refrigerating system of large heat absorbing capacity to reduce the cycling of the high side unit, thus saving both wear on the unit and consumption of electricity, as fully taught in my co-pending application mentioned hereinbefore.

The evaporator coil 37 is inserted in the inset tank 29 and covered with heat transfer liquid to provide effective heat transfer from the tank 28. It will be understood that both the coil 37 and the heat transfer liquid in which it is submerged, are not a part of my fully filled and sealed liquid refrigerating system, and that the complete high side unit with its evaporator coil 37 may be replaced or repaired without disturbing my secondary system which has sufficiently large capacity to override shutdowns which might endanger the contents.

I also desire to explain that for larger refrigerators for packaged goods as may be required, I arrange to have two high side units serving two evaporator coils mounted in the same tank 29 to serve a single main secondary tank 28. Thus the entire secondary refrigerating system for the large refrigerator is served by dual high side units that supplement each other and thus provide assurance of continuous effective performance of the large refrigerator. This feature is of extreme importance where delicate high cost packaged goods are stored.

I may also arrange to operate the high side units during off-peak electrical consumption periods, in order to take advantage of lower electrical rates, and build up reserve refrigerating capacity in my large volume thermal-flywheel secondary system.

In a refrigerator for bottled beverages as illustrated, I divide the shelves into channels by multiple partitions 40—41, the lower shelf being arranged for quart bottles and upper shelf for pints. It will be noted that the partitions 41 extend between the shelves 13—14 while the partitions 40 extend between the shelves 13 and the underside of the main secondary tank 28. These partitions may be adjusted for various sizes of packaged goods of any description. By this arrangement, I not only effectively support the shelves and tanks but also provide effective heat transfer means by conduction-convection of the partitions which, like the shelves, are made of good conduction materials.

Examination of Figs. 5, 6 and 7 will clearly reveal that the spring actuated stop 42 holds the bottles upwardly on the inclined shelf 13 to permit ready manual insertion of additional bottles, as shown in Fig. 5. When the shelf is filled, as shown in Fig. 6, the downwardly sliding bottles will retain the stop in open position to permit the lowermost bottle to slip downwardly against the stops 22 and 23. It will be appreciated that this arrangement permits ready manual insertion of the bottles on the shelves for loading while the bottles are always present in lowermost shelf position for ready removal.

With the bottles or other packaged goods held in the lowermost position in the channels, they may be readily removed by the operator who quickly identifies the various kinds of beverages as they are exposed to clear view. As heretofore explained, the heavy refrigerated air is retained in the compartments by the baffles 16 and therefore the continual opening of the refrigerator does not waste any appreciable amount of refrigeration and the high side unit operates through far less cycles although for longer periods of time because of the large capacity of the secondary system. This is the most efficient arrangement because it is well known that starting the high side unit is wasteful of power because of the inertia of the machinery and the electrical surge losses incident thereto. Now it will be appreciated that heat is taken from the packaged goods, in this case bottled beverages, by conduction through the shelves on which they rest and by contact with the partitions. The shelves and partitions being made of copper or aluminum, this conduction of heat is rapid and effective for the contact areas. However, consideration of the cross-section of Fig. 1 will readily explain that much of the heat extracted is extracted by convection of the cold air currents as they drop downwardly from the surrounding cold walls. These cold air currents are effectively controlled into intimate wiping contact through the downwardly extending channels so that all packages or bottles are subjected to this effective wiping contact through the downwardly extending channels so that all packages or bottles are subjected to this effective wiping action as the cold air drops downwardly or is impelled throughout the compartment by the fan action of the door 15. In a bottles cooler as illustrated, I arrange, through the thermostat 36, for a temperature range of —5° to —15° in the evaporator tank 29 and a temperature range of 30° to 32° F. of the refrigerant in the coil 30. This gives a temperature range of 32° to 34° F. on the shelves 13—14 which is not sufficient to freeze beverages but does extract heat rapidly. The air currents in the compartments 11—12 will be held close to 32° F., for balanced conditions, because of the downflow of air from the colder main subsidiary tank 28 and this creates and maintains this downward flow of cold air.

It will further be appreciated that the various beverages or packages are segregated in channels where the conduction of heat from the bottles or beverages by contact is rapidly diffused to create an increased localized thermo-siphonic flow of refrigerant due to the heat differential thus created. The dissipation of heat by convection is similarly augmented by channel currents of cold air created by the warmer bottles or packages. Thus, I provide an automatic increase in the refrigeration rate for newly charged channels.

From the foregoing descriptions, it will be appreciated that I have provided a compact effective refrigerating device of large capacity wherein large thermo-flywheel means are used to store up reserve refrigerating capacity which may be expended rapidly, when conditions require such expenditures, and at a rate far beyond the normal heat removing capacities of the primary refrigerating apparatus, while utilizing such primary refrigerating apparatus at highest efficiency to refrigerate packages economically, efficiently and safely.

Having thus described my invention, I now claim as new:

1. In a refrigerating apparatus for packaged goods, a cabinet, a door hinged on the bottom front of the cabinet, a refrigerating compartment exposed for vision and access by the door, telescoping baffles coacting with the door to prevent heavy refrigerated air from spilling out of the compartment, a forwardly inclined plane shelf in the compartment for supporting goods in unstable sliding relationship on the shelf, and stop means integral with the shelf for supporting in view the foremost packages on the shelf for easy removal when the door is opened.

2. In a refrigerating apparatus for packaged goods, a cabinet, a door hinged on the bottom front of the cabinet, a refrigerating compartment exposed for vision and access by the door, a forwardly inclined plane shelf including package channels in the compartment for gravitating packages forwardly on the shelf, stop means integral with the shelf for supporting in view the foremost packages on the shelf for easy removal when the door is opened, and telescoping baffles coacting with the door to prevent heavy refrigerated air from spilling out of the compartment.

3. In a refrigerating apparatus for packaged goods, an insulated cabinet, a door hinged on the cabinet, a refrigerating compartment exposed for vision and access by the door, an inclined hollow plane shelf for supporting packaged goods, refrigerating means associated with the shelf for removing heat from the packages by their conduction contact with the shelf, said refrigerating means including a liquid refrigerant in a closed hermetically sealed secondary refrigerating system operating by thermo-siphonic action.

4. In a refrigerating apparatus for packaged goods, an insulated cabinet, a door hinged on the cabinet, a refrigerating compartment exposed for vision and access by the door, a shelf for supporting packaged goods in a forwardly sliding position, refrigerating means associated with the shelf for removing heat from the packages by their conduction contact with the shelf, said refrigerating means including liquid refrigerant in a closed hermetically sealed secondary refrigerating system operating by thermo-siphonic action.

5. In a refrigerating apparatus for packaged goods, an insulated cabinet, a door hinged on the cabinet, a refrigerating compartment exposed for vision and access by the door, a shelf for supporting packaged goods in a forwardly sliding position, refrigerating means associated with the shelf for removing heat from the packages by their conduction contact with the shelf, refrigerating means associated with the walls of the compartment for removing heat from the packages by convection of air currents created by the refrigerating means, said first-mentioned refrigerating means including a liquid refrigerant in a closed hermetically sealed secondary refrigerating system operating by thermo-siphonic action.

6. In a refrigerating apparatus for packaged goods, an insulated cabinet, a door hinged on the cabinet, package goods supporting means having a forwardly and downwardly inclined supporting surface for supporting articles for downward and forward sliding movement for display and for ready removal by the operator, and refrigerating means associated with the walls of the compartment for removing heat from the packages by both conduction and convection, said refrigerating means including a liquid refrigerant in a closed hermetically sealed secondary refrigerant system operating by thermo-siphonic action.

4. In a refrigerating apparatus for packaged goods, a cabinet providing a refrigerant chamber, a subsidiary secondary refrigerant tank at one end of said chamber, a metal support at the other end of said chamber, a pair of tubes supported between said tank and said metal support and having communication with the former, the front tube being at a lower elevation than the other tube, an L-shaped shelf having a hollow bottom supported upon and communicating with the lower tube, and a hollow rear wall supported upon and communicating with the higher tube, and means for supplying refrigerant to said tank.

8. In a refrigerator as described in claim 5; said secondary refrigerating means providing a large thermal fly-wheel for a high pressure portion of a refrigerating system thermally associated with the said secondary means whereby the high side portion may become inoperative with-

out disturbing the fly-wheel refrigerating function of the secondary refrigerating means.

9. Heat transfer and exchange apparatus on the order of a refrigerating device for package goods comprising a cabinet, at least one forwardly inclined planar shelf in the cabinet for the reception of package goods, vertically extending partitions associated with the shelf and dividing the space thereon into package-guiding channels, stop means associated with the fore-end of the shelf for supporting in viewable and readily removable position the foremost package in each channel, and other stop means adjacent the first-named stop means for holding packages from forward movement during filling of the channels from their fore-ends, said last named stop means being inoperative at all times other than during filling of the channels.

10. Heat transfer and exchange apparatus on the order of a refrigerating device for package goods comprising a cabinet, a plurality of forwardly inclined and superposed planar shelves in the cabinet for reception of package goods, a door providing a closure for the front of the cabinet, the lower front part of each superposed shelf terminating sufficiently rearwardly of the front portion of the shelf therebeneath that access to package goods on the fore-part of each shelf may freely be had for removal from the shelves from above and forwardly thereof during the open position of the door.

11. Heat transfer and exchange apparatus on the order of a refrigerating device for package goods comprising a cabinet, a plurality of forwardly inclined and superposed planar shelves in the cabinet for reception of package goods, a door providing a closure for the front of the cabinet, the lower front part of each superposed shelf terminating sufficiently rearwardly of the front portion of the shelf therebeneath that access to package goods on the forepart of each shelf may freely be had for removal from the shelves from above and forwardly thereof during the open position of the door, said door being horizontally hinged along its bottom and having side flanges telescopable into the cabinet to inhibit outward spillage of cold air from within the cabinet when the door is opened.

12. In a refrigerating apparatus for packaged goods, a cabinet, a door hinged on the cabinet, a refrigerating compartment exposed for vision and access by the door, an inclined hollow planar shelf for supporting packaged goods, refrigerating means associated with the shelf for removing heat from the packages by their contact with the shelf, said refrigerating means including a refrigerant in a secondary refrigerating system operating upon thermo-siphonic principles.

13. In a refrigerating apparatus for packaged goods, a cabinet, a door hinged on the cabinet, a refrigerating compartment exposed for vision and access by the door, a shelf for supporting packaged goods in a forwardly sliding position, refrigerating means associated with the shelf for removing heat from the packages by their conduction contact with the shelf, said refrigerating means including a refrigerant in a closed secondary refrigerating system operating upon thermo-siphonic principles.

14. In a refrigerating device for package goods, a cabinet, at least one package-supporting shelf within the cabinet, a subsidiary secondary reservoir having heat transfer and exchange fluid therein, said subsidiary secondary reservoir being in heat transfer and exchange relation with said shelf, a main secondary reservoir having heat transfer and exchange fluid therein, said main secondary reservoir being in heat transfer and exchange relation with said subsidiary secondary reservoir, and means for bringing the heat transfer and exchange fluid in said main secondary reservoir to and maintaining it within a predetermined temperature range.

15. A refrigerating device for package goods as set forth in the claim 14 including means for maintaining the temperatures of the heat transfer and exchange fluids in said main and said subsidiary reservoirs at substantially predetermined differentials to one another.

16. In a refrigerating device for package goods, a cabinet, a main secondary reservoir having a heat transfer and exchange fluid therein, means for producing and maintaining a desired temperature range in the heat transfer and exchange fluid in said main secondary reservoir, a subsidiary secondary reservoir having a heat transfer and exchange fluid therein, means connecting said main and said subsidiary secondary reservoirs in heat transfer and exchange relation, article-supporting shelves in said cabinet, said shelves having heat transfer and exchange fluid therein, and means connecting said shelves and said subsidiary secondary reservoir in heat transfer and exchange relation.

17. In a refrigerating device for package goods, a cabinet, a main secondary reservoir within the cabinet, said main secondary reservoir having a heat transfer and exchange fluid therein, means for producing a desired thermal condition in the heat transfer and exchange fluid in said main secondary reservoir, a subsidiary secondary reservoir in said cabinet, said last-named reservoir having heat transfer and exchange fluid therein and being in heat transfer and exchange relation with the fluid in said main secondary reservoir, article-supporting shelves in said cabinet, said shelves being in heat transfer and exchange relation to said subsidiary secondary reservoir.

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