Oct. 31, 1950 G. L. POWNALL 2,527,571

METHOD OF CONDITIONING AIR IN MECHANICAL REFRIGERATORS

Filed Aug. 18, 1948 2 Sheets-Sheet 1

Fig. 1.

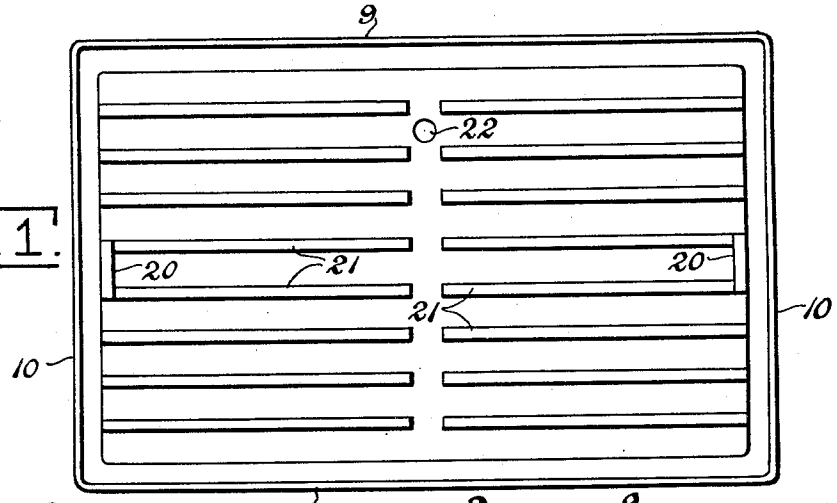


Fig. 2.

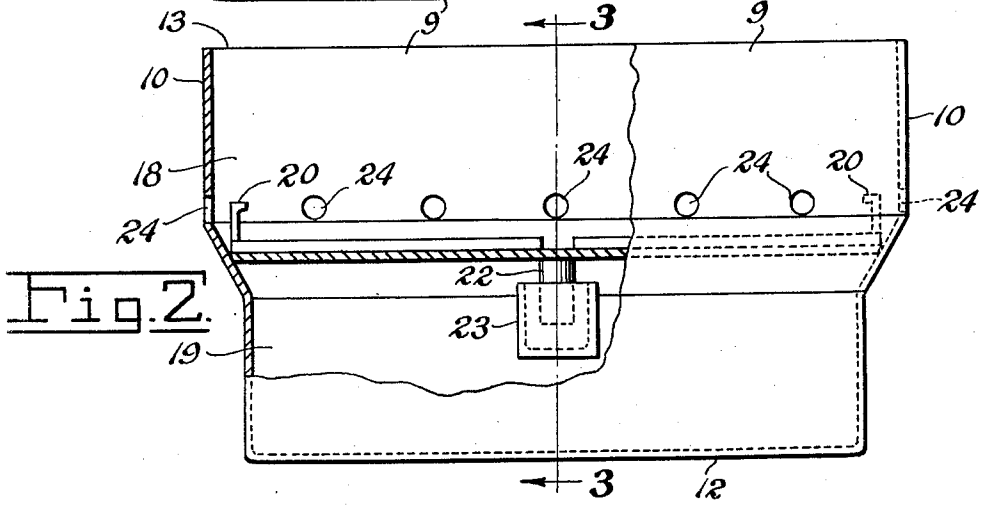
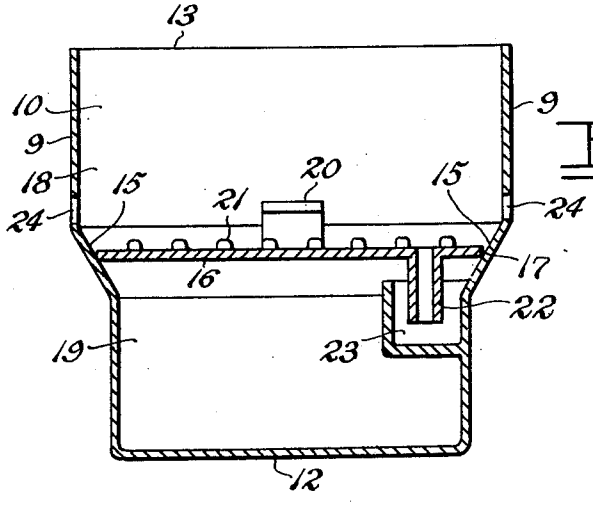


Fig. 3.



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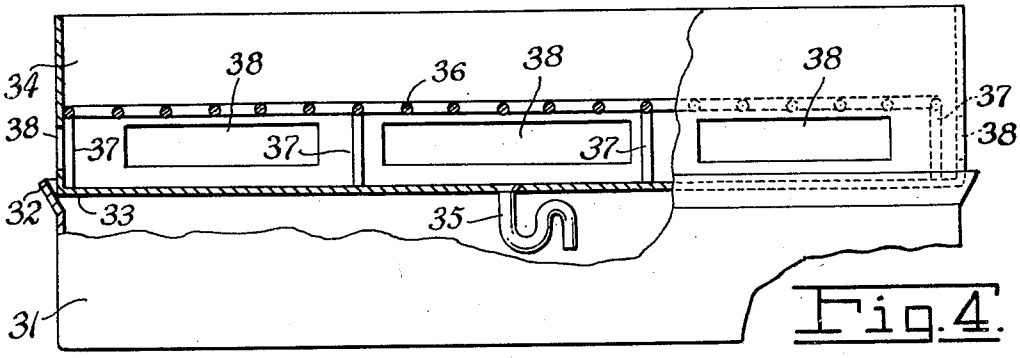

Fig. 4.

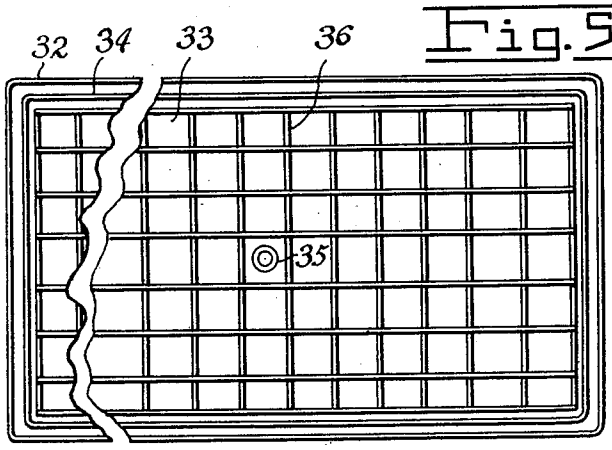

Fig. 5.

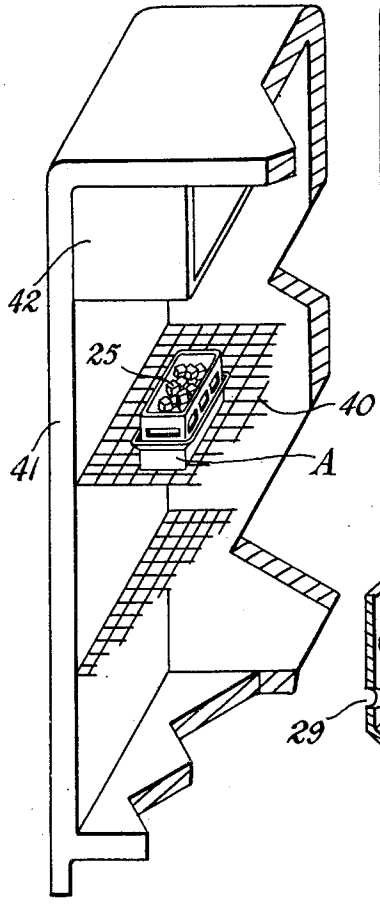

Fig. 6.

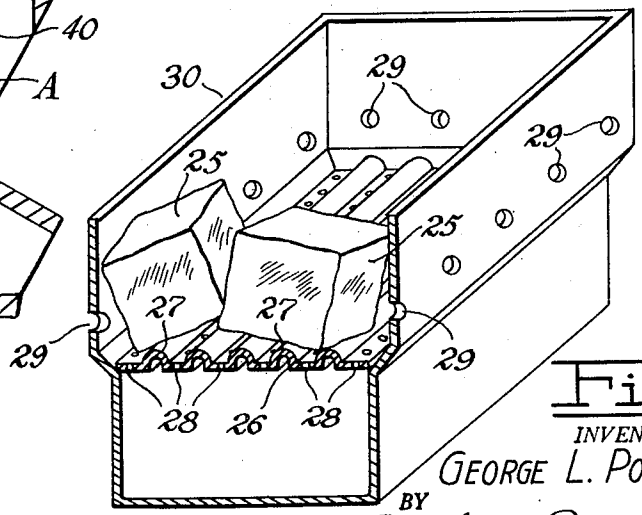

Fig. 7.

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METHOD OF CONDITIONING AIR IN MECHANICAL REFRIGERATORS

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5 Claims. (Cl. 62—170)

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This invention relates to improving the food preserving qualities of air in mechanical refrigerators or coolers.

It is a well known fact that mechanically refrigerated cabinets, such as the ordinary household mechanical refrigerators, fail to preserve the wholesomeness of foods to the extent possible with the use of ice refrigerators. This is due in part, to the practice of sealing the mechanical refrigerator cabinet against entry and exit of atmospheric air, with the result that the air entrapped in the cabinet becomes stale and foul.

The bacterial count of the air is thereby greatly increased and oxygen is lost, resulting in early deterioration of foods stored within the cabinet. Other disadvantages and objections to the ordinary household mechanical refrigerator will be referred to at proper places in the specification which follows.

An object of the invention is to improve the preserving qualities of air in mechanical refrigerators, and thereby enhance the utility of such devices for the preservation of foods and perishables of various kinds.

Another object is to curtail contamination and cross-odorizing of foods and foodstuffs in mechanical refrigerators.

Another object is to prolong the keeping period of foods in a mechanical refrigerator, by restoring humidity and oxygen within the confines of the refrigerator cabinet.

A further object is the attainment of the foregoing objectives in a simple and expeditious manner, with the use of simple and inexpensive apparatus that may be used in any existing mechanical refrigerator, irrespective of its operating principle of power requirements.

The foregoing and other objects are attained by the means described herein and illustrated upon the accompanying drawings, in which:

Fig. 1 is a top plan view of a device for conditioning the air in a mechanical refrigerator, constructed in accordance with the present invention.

Fig. 2 is a side elevational view of the same, partly shown in cross-section.

Fig. 3 is a cross-sectional view taken on line 3—3 of Fig. 2.

Fig. 4 is a side elevational view of a modified form of the device, shown partly in cross-section.

Fig. 5 is a fragmentary top plan view of the Fig. 4 device, on a reduced scale.

Fig. 6 is a fragmentary view of a typical household mechanical refrigerator cabinet, showing application of the invention thereto.

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Fig. 7 is a perspective view of a second modification, part being broken away.

In the introduction of mechanical refrigerators for household and other uses, much emphasis has been placed upon the factors of convenience and economy in maintaining a relatively cool compartment for the preservation of foodstuffs, ignoring other factors which should properly be considered if the food is to be wholesome and healthful for consumption after being stored. It has been proven beyond any doubt, that with the storage of food in a mechanical refrigerator, foul and stagnant polluted air will be found to exist in the closed cabinet after a relatively brief period. Under scientific testing of the air conditions existing in the ordinary mechanically refrigerated cabinet, the bacterial count of the air was found to be dangerously high for the wholesome preservation of foodstuffs. Use of the present apparatus in such a cabinet, however, did materially reduce the bacteria therein by the meltage of ice in the apparatus. Comparative reasons for the more satisfactory performance of the ordinary ice refrigerator in some respects, are believed to involve the gradual replacement of foul air with fresh air in the cabinet, the meltage of the ice which restores oxygen and moisture to the cabinet interior, and the ability of the ice meltage to carry from the interior of the cabinet the various impurities that result from natural degeneration of the foodstuff in storage.

By means of the present invention, the benefits of melting ice common to the ice refrigerator are realized in a mechanical refrigerator, while at the same time the lower temperature and other advantages inherent in the mechanical refrigerator are used to advantage, with the result that an improved overall system is achieved.

With reference to the accompanying drawings, Figs. 1 to 3 inclusive, there is illustrated a complete unit for placement in a mechanical refrigerator, substantially as suggested by Fig. 6. The unit of Figs. 1 to 3 comprises a receptacle having side walls 9, end walls 10, a bottom wall 12, and an upper peripheral rim 13 defining the open top of the receptacle. Intermediate the rim and the bottom of the receptacle, there is provided an inner circumferential shelf 15, the purpose of which is to support in substantial parallelism with the bottom wall 12, a separator such as is indicated at 16. The separator may be in the form of a plate or sheet having all of its edges 17 resting upon the shelf 15 to effect a substantial seal separating the upper chamber 18

from the lower chamber 19. The member 16 may be lifted bodily from the receptacle for cleaning purposes, by means of suitable handles or finger grips 20, or their equivalent.

In the preferred form, the separator 16 has a series of ribs or other upstanding protuberances 21 formed upon its upper surface, so arranged as to maintain ice cubes or particles elevated above the plane of the separator. Meltage from the ice cubes or particles may thereby flow along the upper surface of the separator sheet or plate, to enter a drop tube 22 which is rigidly associated with the separator sheet or plate. This tube 22, in cooperation with a well 23 located inside the receptacle beneath the level of shelf 15, forms a trap capable of sealing the lower chamber 19 when the trap is filled with water from the melting ice. The well 23 has an open top so that ice meltage may overflow into the lower chamber 19 and be therein confined along with the slime and other impurities removed from the refrigerator cabinet by the melting ice during use of the unit in the manner illustrated by Fig. 6.

As will be understood, the separator 16 may be in the form of a flat plate with a separate grille or the like superposed thereon in place of the integral ribs 21. The separator may be constructed of any suitable material such as metal, molded glass or plastic composition, or any other substance capable of the required performance. The receptacle in which the separator 16 is placed may be similarly fabricated from the same or different materials, as desired. In the preferred form, the well 23 is formed integrally with one wall of the receptacle, as suggested by Fig. 3, although it is quite evident that the well might alternatively be a separate part simply placed within the receptacle beneath the drop tube. Other alternative constructions will suggest themselves in the light of the present disclosure, and it is intended that such alternatives which are obvious shall be considered as falling within the scope of the present invention.

To use the device above described, it is necessary only to assemble the unit by placing the separator properly within the receptacle as shown, and after filling the upper chamber with ice cubes or chunks, place the whole unit upon one of the shelves within the cabinet of the ordinary mechanical refrigerator. For the best results, the unit is placed on a shelf which is near the top of the fresh food compartment, so that it may set up a thermal air circulation whereby the warmer unclean air will flow over the ice particles which wash, cool, and humidify the air as it passes downwardly through the ice particles and emerges from the upper chamber through the side openings 24. While the presence of side openings such as 24 may not be essential to satisfactory operation of the device, it is nevertheless preferable.

The cleansed and humidified air then passes downward to and around the various food items in the refrigerator, to absorb decomposition gases given off by the food, and will thereupon be heated sufficiently to rise upwardly and again circulate through the ice particles 25 to impart to the ice meltage such contaminating substances as the circulating air contains. This cycle of air cleansing, cooling, and humidifying continues as long as ice remains in the upper chamber of the unit.

The meltage from the ice particles, which by now has become polluted and contaminated by bacteria and other foreign matter, passes through the trap 22—23 and into the lower chamber 19, where it remains isolated until the unit is cleaned and repacked with ice. Cleaning and repacking may be required every day or two, depending upon conditions within the refrigerator cabinet. So-called covered dishes may be eliminated when the present unit is operating, and fresh foods are found to retain their garden freshness for a long period of time due to the tendency of the unit to restore humidity and oxygen to the air within the cabinet, while at the same time cleansing and purifying the air.

The unit 30 as illustrated by Fig. 7, is substantially the same as that of Figs. 1, 2 and 3, with the exception that it includes no mechanical trap for the ice meltage. Instead, the separator plate 26 is provided with alternate rows of ribs 27 and small drainage holes 28, the holes being of such a size as to retain droplets of meltage water as long as ice chunks 25 are present and melting upon the separator plate. The droplets, of course, will gravitate to the lower chamber of the unit as the ice melts, but between drops there will be a tendency of the small holes 28 to retain some of the meltage for sealing purposes. Isolation of the contaminated meltage in the lower chamber is thereby achieved to a degree such as will render the unit satisfactorily operative. Side openings 29 may be formed in the receptacle as previously was explained, although these are not absolutely essential to operation of the unit.

The modified form of unit illustrated by Figs. 4 and 5 is distinguishable from the others in that it comprises three main parts rather than two; that is, the lower chamber is furnished by a pan or receptacle 31 having an outwardly flared peripheral upper edge 32 upon which may rest the bottom 33 of an upper pan or sealing closure member 34. The solid bottom of the upper pan is equipped with a goose-neck pipe or trap 35 that empties into the lower pan. A grid or grille 36 standing upon legs 37 is supported by the bottom of the upper pan, and in that position is adapted to retain ice chunks elevated above the pan bottom. Circulating air entering the open top of pan 34 passes around the ice chunks, and leaves through the side openings 38 after depositing its bacteria and contamination content with the melting ice. The air is cleansed and purified in the manner previously explained. The unit may be cleaned by lifting the upper pan from its bearing upon the lower pan, and then washing the parts with soap or other cleaning agents.

In every case the unit of the invention is applicable to existing mechanical refrigeration cabinets in substantially the manner illustrated by Fig. 6, wherein the unit, indicated at A, simply is placed upon a shelf 40 of the cabinet 41. The cabinet may include the usual evaporator 42, located to one side or centrally of the food compartment or, as applied to the so-called "cold wall" type of refrigerator, the evaporator may be located outside the food compartment in heat transfer relationship to the inner shell of the cabinet. The compartment door is not shown, but will be understood to close the front of the cabinet in the usual manner.

In the performance of its function of conditioning the air within the refrigerator, the air conditioning unit of this invention does not carry the cooling load. The cooling function is performed by the mechanical refrigerating unit. It will therefore be understood that the device of the present invention performs to purify the confined air, and to restore the humidity neces-

sary to proper preservation of the contents of the refrigerator cabinet.

Should it be desirable to do so, the units may be built into refrigerator cabinets at the factory, in which case the units might be attached or stationary, instead of removable bodily from the cabinet. In that event, access to the lower compartment for emptying its contents or for cleaning purposes might be had by way of a suitable entrance door or port. Such modifications, as well as others within the skill of persons conversant with the art, may be resorted to, within the scope of the appended claims, without departing from the spirit of the invention.

What is claimed is:

1. The method of improving the preserving qualities of the confined chilled air within a food compartment of a mechanically cooled refrigerator cabinet, comprising passing the pre-cooled relatively dry confined air over a body of ice within the food compartment of the cabinet, whereby the meltage of said ice restores humidity and oxygen to the air while concomitantly absorbing bacteria and noxious gases, then immediately isolating the contaminated ice meltage from the air of the cabinet to preclude evaporation of the meltage into the air of the cabinet.

2. The method of improving the food preserving qualities of the confined chilled air within a food compartment of a mechanically cooled refrigerator cabinet, comprising passing the pre-cooled relatively dry confined air over a body of ice within the food compartment, and then immediately trapping and isolating the contaminated ice meltage without removing same from the confines of the cabinet to preclude evaporation of the meltage into the air of the cabinet.

3. The method of treating the confined chilled air within a normally closed mechanically cooled refrigerator having a food compartment and an evaporator therein, which method comprises passing air in the refrigerator over a body of ice in the food compartment spaced from the evaporator, whereby the meltage of ice restores humidity and oxygen to the air and at the same time absorbs bacteria and noxious gases from the air in the resulting ice meltage water, and isolating the contaminated meltage water immediately after the meltage is formed to ensure the presence of well-balanced humidified washed and cleansed air for recirculation within the food compartment and to preclude evaporation of the meltage into the air of the cabinet.

4. The method of treating the confined chilled air within a normally closed mechanically cooled refrigerator having a food compartment, which method comprises supporting within the compartment a receptacle containing ice chunks about which the confined air may circulate for melting the ice and imparting to the ice meltage such impurities as the air may carry from the food within the compartment, and catching and isolating the meltage immediately beneath the ice-containing receptacle to preclude contact of the treated air with said meltage after its absorption of said impurities and to preclude evaporation of the meltage into the air of the cabinet.

5. The method of treating confined air in a refrigerated compartment having a cooling element normally maintained at a temperature below the freezing point of water and a food compartment cooled by said element and normally maintained at a temperature above the freezing point of water which comprises passing the air in the food compartment over a body of ice disposed in the food compartment and spaced from the cooling element, whereby the ice maintains humidity in the food compartment and meltage of the ice absorbs bacteria and noxious gases from the air in the cabinet, and collecting the meltage in a closed container to isolate the meltage from the air in the cabinet immediately after the meltage is formed to preclude evaporation of the meltage into the air of the cabinet.

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