Dec. 18, 1934. L. A. BANTA 1,985,138

REFRIGERATING APPARATUS

Filed July 30, 1929 2 Sheets-Sheet 1

Fig. 1.

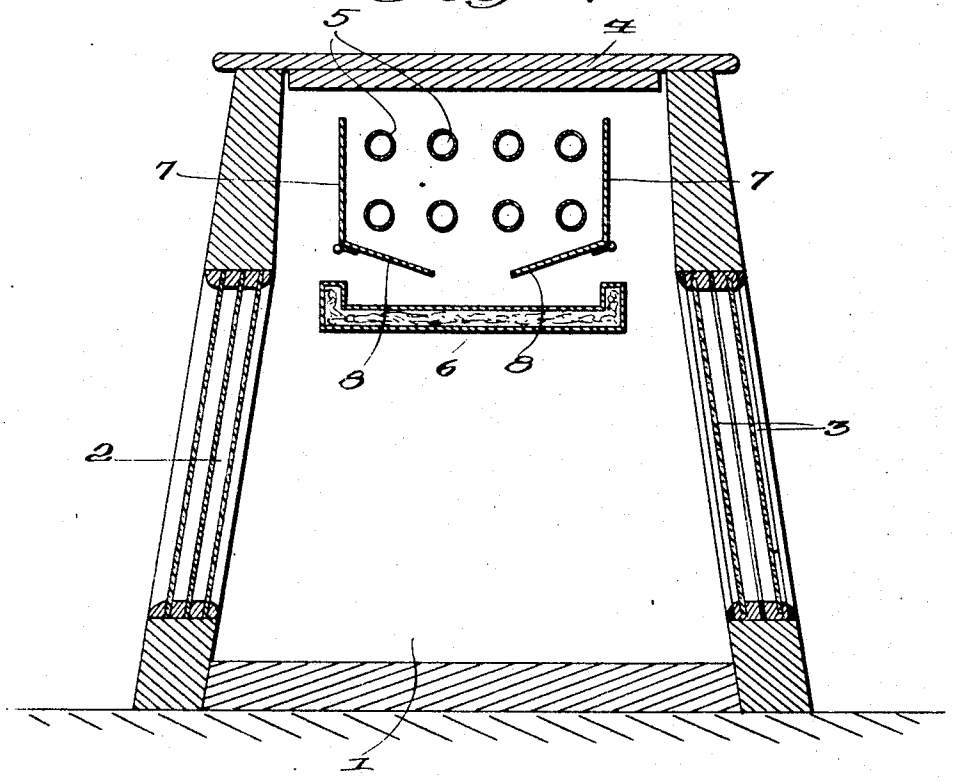


Fig. 2.

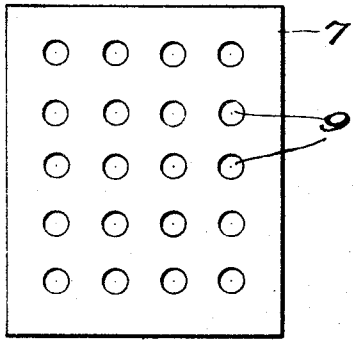
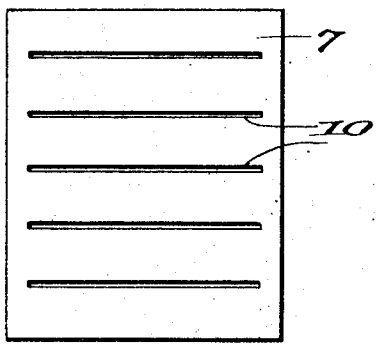


Fig. 3.



Inventor

Leo A. Banta

By Vernon C. Hodges

his Attorney

Dec. 18, 1934. L. A. BANTA 1,985,138

REFRIGERATING APPARATUS

Filed July 30, 1929 2 Sheets-Sheet 2

Fig. 4.

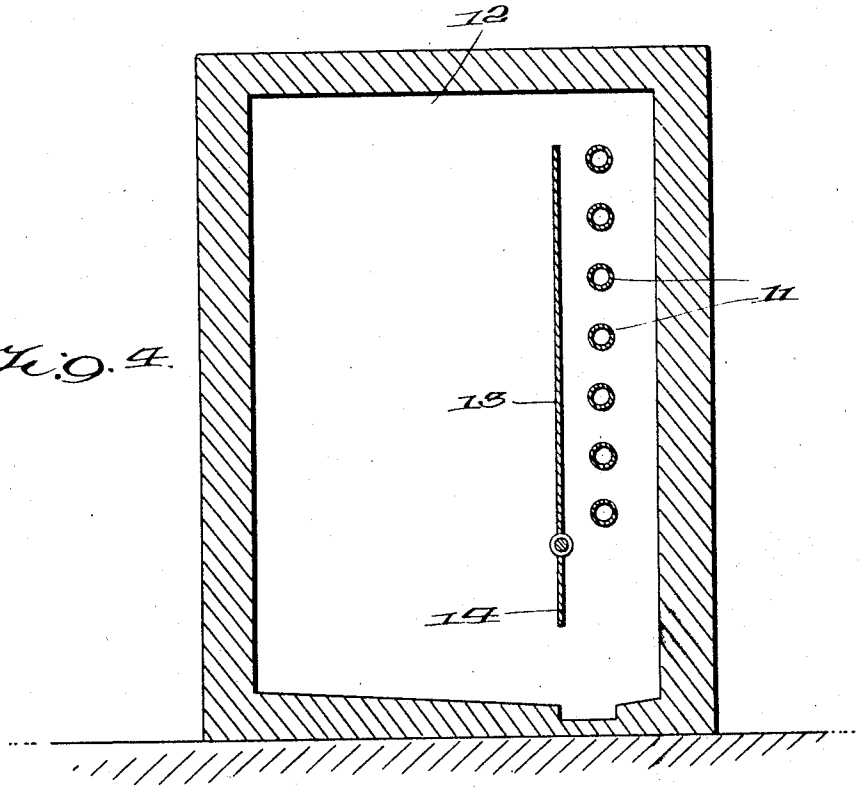
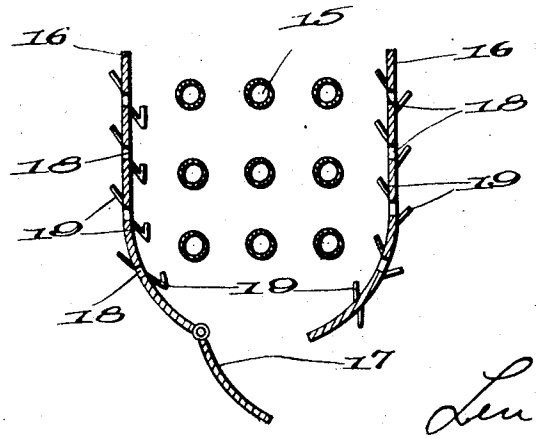


Fig. 5



Inventor
Lee A. Banta
By Vernon F. Hodges
His Attorney

Patented Dec. 18, 1934 1,985,138

UNITED STATES PATENT OFFICE

1,985,138

REFRIGERATING APPARATUS

Len A. Banta, Clearfield, Pa.

Application July 30, 1929, Serial No. 382,092

8 Claims. (Cl. 62—99)

This invention relates to an improvement in refrigerating apparatus, and is a continuation in part of my co-pending application Serial No. 268,966, filed April 10, 1928.

One of the principal objections to electrical or mechanical refrigeration by means of cooling coils has been the dehydration by which the circulation of the air inside the refrigerator chamber causes a deposit of the moisture from the circulating air onto the coils where it is frozen fast. This takes the moisture out of the air and keeps it from being returned to the air, which action dries out meats, fruits, vegetables, cheese, etc. to such an extent that it seriously affects their use for commercial purposes.

The object of this invention is, therefore, to cause a condensing of the moisture in the air before the air strikes the cooling-coils and without freezing the moisture as it is condensed, so as to allow it to be returned to the air in the course of its recirculation through the drying-chamber. This is effectively accomplished by the placing of an uninsulated metal sheet or sheets of suitable form and construction adjacent the cooling-coils or partly or entirely surrounding them, so as to be cooler than the surrounding air or the air in the refrigerating chamber, and as the air strikes the sheet or sheets in the course of its recirculation the moisture will become condensed or deposited on the surfaces of the sheets which do not freeze that moisture, and after losing its moisture and becoming cooled by contact with the coils the air has an affinity for re-absorbing the moisture which it does in the course of its passage from the coils along the sheets, so that as it passes back into the refrigerator chamber it carries that moisture back into that chamber and prevents an unreasonable and undue drying out of the products disposed in the refrigerator chamber.

A valve or valves may also be used in and to regulate the down chute for the cold air for increasing or retarding the downward circulation of the cold air. In the various climates of the United States, a very flexible or adjustable and manually controlled means should be provided for increasing or decreasing the amount of circulation and dehydration in order to keep such foods as meats, fruits, vegetables, cheese, etc. in the proper condition. By opening or closing the down chute for the cold air, the circulation can be retarded or increased, causing a much larger deposit of moisture on the metal plates surrounding the coils when the circulation is retarded. In other words, when the circulation is retarded, the air because of slow circulation, reabsorbs the moisture on the plates and there is not so much frozen solid ice on the coils, and consequently the humidity in the storage portion of the refrigerator is more nearly normal. In hot damp weather it may be advisable to increase the circulation so that more moisture may be deposited on the coils in order to prevent too much humidity in the storage portion of the refrigerator. In the usual method heretofore used, where the moisture is deposited on the coils and frozen solid, when the period of defrosting comes, which is at more or less regular intervals, the ice is quickly melted from the coils and is drained off from the refrigerator. This process takes a more or less large volume of moisture from the refrigerator which may be advisable during hot humid weather. But by decreasing the amount of circulation, the moisture is retained within the refrigerator, because there is a smaller amount of frozen ice on the coils, so that when the coils are defrosted, not so much of the moisture escapes into the drain.

In the accompanying drawings:

Fig. 1 is a transverse sectional view, showing the application of the invention to a display case;

Fig. 2 is a plan view of one of the metal sheets having holes therein;

Fig. 3 is a similar view showing slots;

Fig. 4 is a sectional view through a closed refrigerating chamber showing a modification; and

Fig. 5 is a sectional view through a slightly different form of refrigerating unit.

The invention is applicable to any of the various types of electrical or mechanical refrigerators which cool the refrigerating chamber by means of cooling coils, and since the arrangement of the coils varies in accordance with the type and character of the refrigerating-chamber, the illustration of the invention and the arrangement shown is merely to indicate the manner in which the invention is applied and used, and may be varied as found desirable and suitable.

In Fig. 1 is illustrated a refrigerator display case having a refrigerating chamber 1 therein, with the usual glass front 2, sliding-doors 3 at the back, and closed top 4. Disposed in the upper portion of the refrigerating-chamber 1 are the usual cooling coils 5 which may be of electrical or mechanical refrigeration, and since the assembling and operation of these are well-

known in the art they are not described in detail.

Disposed beneath the coils 5 is an insulating-pan 6 arranged to catch the drip. On opposite sides of the coils are thin sheets 7 of a suitable metal, such as galvanized iron, which sheets are disposed in relatively close proximity to the cooling-coils so as to be cooler than the air in the refrigerating chamber and yet not of a freezing temperature. The sheets 7 have manually-controlled flap-valves 8 hinged thereto and extending into the downward air and passageway for regulating the size of the downward cold-air chute. The sheets 7 may be plain and unperforated or may have holes 9 therein shown in Fig. 2, or, if desired, may be provided with slots 10 as shown in Fig. 3.

The disposition of the coils 5 in a portion of the refrigerating-chamber or communicating with such chamber serves to cool that particular portion to an extent greater than the remainder of the refrigerating-chamber, which attracts the warmer air in other parts of the chamber, and this forces out the cold air, which is then circulated downward and through the chamber until its temperature is raised, and is then attracted back to the refrigerating coils, forming a complete turn-over of air in the chamber and a complete recirculation therethrough.

As the air circulates, the warm air from the refrigerating-chamber comes into contact with the cold sheets 7, which causes a condensing of the moisture and a depositing of it on the sheets before the air reaches the refrigerating coils, which keeps the coils comparatively free from ice; but by reason of the fact that the sheets are slightly spaced from the coils, they are not sufficiently cold as to cause a freezing of this moisture as it is condensed on these sheets. As the air after losing its moisture and becoming cooled has an affinity for taking up the moisture again, and before it leaves the region of the cooling coils, it has reabsorbed the moisture on these metal plates or sheets, so that the air as it passes back into the remainder of the refrigerating-chamber is approximately normal in its moisture content. In other words, these sheets take up the greater portion of the mosture before the air reaches the coils, and as the sheets never get cold enough to freeze the moisture which is deposited in liquid form thereon, the air reabsorbs this moisture before passing into the refrigerating-chamber again in the course of its re-circulation, which keeps the air approximately in its normal condition or humidity.

Heretofore the air passed directly into contact with the cooling-coils, so that when the warm air came into contact with the coils the moisture was condensed directly on the coils, which dehydration was undesirable because of the accumulation of frost or ice on the coils greatly decreasing the efficiency of the refrigerating system. It has been attempted to overcome this by frequent defrosting of the coils, which is not satisfactory because of the lowering of the temperature in the refrigerating-chamber at frequent intervals, and also because this drains off a large part of the moisture which has been taken from the air. This is effectively overcome, however, by the placing of the metal sheets or plates in close proximity to the cooling-coils so as to condense the air and withdraw the moisture therefrom before the air comes into contact with the cooling coils, and to permit the air to re-absorb this moisture after it has become cooled.

The use of flap or other valves or regulators for the downward circulation of the cold air regulates or varies the amount of moisture that may be deposited on the coils and likewise varies the amount of moisture that is allowed to remain in the air, or may be withdrawn therefrom by dehydration. This may be accomplished by the use of flap or other types of valves or regulators to open or close the cold air chute, thereby increasing or decreasing the humidity within the refrigerator at the will of the operator to meet the various changing weather conditions.

By practical experiments, it has been demonstrated that the method of condensing the air and allowing reabsorption of the moisture after the air has been cooled, causes a drying out of meats to an extent of only one-fourth as much as in the former practice, where the air passes directly into contact with the cooling-coils and is frozen thereon, which is a great improvement in the keeping qualities of the meats, fruits, vegetables, etc.

In the form of refrigerating-chamber shown in Fig. 4, the coils 11 are disposed along one side of the chamber 12, being hung on the wall in the usual way, and a single metal plate 13 is disposed in front of the coils and in proximity thereto, and in the path of the air passing through the coils so as to cause the moisture to be deposited on this plate or sheet and to be re-absorbed after being cooled. If desired, a flap-valve 14 may be disposed beneath the coils in the path of the circulation of the air, in order to regulate this circulation.

In Fig. 5 is illustrated still another form of the invention in which the cooling coils 15 have side plates 16 disposed on opposite sides thereof and curved at the bottom with a damper or valve 17 for regulating the space between these sheets and thereby regulating the circulation of the air into and through the cooling-chamber. Holes or openings 18 are formed through the sheets 16, and troughs 19 may be formed on the sides of the sheets to receive the moisture as the air is condensed and to allow the air to reabsorb this moisture in passing back into the refrigerating chamber.

By reason of this refrigerating system, a more normal humidity is maintained in the air in any kind of refrigerating chamber than has been attained heretofore, which may be controlled by the flap-valves which regulate the circulation and without affecting the temperature inside the refrigerator.

Any kind or shape of coils used in a refrigerator may be partly or entirely surrounded to any extent, in close proximity thereto, with the metal plate or plates, either plain or perforated, and they may be on one side or both sides, or on the top or bottom. Because of the close proximity of these sheets to the coils, they are made cold by direct radiation from the coils themselves, but are not sufficiently cold to freeze the moisture deposited thereon, and, consequently, the moisture is kept in a liquid condition in the form of drops or sweat and is reabsorbed by the circulating air.

I claim:

1. In a refrigerating chamber, the combination of refrigerating coils and an uninsulated metallic member disposed in close proximity to the refrigerating coils to be cooled thereby for causing a condensation of the moisture in the

air in its passage into contact with said member.

2. In a refrigerating-chamber, the combination of refrigerating coils for cooling the air in the chamber, an uninsulated metallic plate disposed in close proximity to the coils to be cooled thereby and in the path of the air passing to the coils for condensing the moisture in the air to extract the moisture therefrom before it contacts with the cooling coils.

3. In a refrigerating-chamber, the combination of cooling coils for cooling the air in the chamber and causing a recirculation thereof, and an uninsulated metallic plate or sheet disposed in relatively close proximity to the cooling-coils and in the path of the movement of the air to the coils to be cooled for condensing the moisture in the air and extracting the moisture therefrom before contact of the air with the coils and without freezing the moisture, to cause a re-absorption of the moisture by the air after being cooled.

4. In a refrigerating chamber, the combination with refrigerating coils for cooling the air in the chamber, of an uninsulated metallic plate or sheet disposed in close relation to the coils and in the path of the air passing to the cooling coils for condensing the moisture in the air and means for regulating the passage of the cold air from the region of the cooling coils.

5. In a refrigerating chamber, the combination with refrigerating coils for cooling the air in the chamber, of an uninsulated metallic plate or sheet disposed in the path of the air passing to the cooling coils, said sheet being disposed in relatively close proximity to the coils for condensing the air, and means for regulating and controlling the passage of cold air from the region of the cooling coils back into the chamber.

6. In a refrigerating chamber, the combination of refrigerating means for cooling the air in the chamber, and an uninsulated metallic plate or sheet constructed and arranged in close proximity to the cooling means for condensing moisture from the air passing into contact with said plate.

7. In a refrigerating chamber, the combination of refrigerationg means for cooling the air in the chamber, and an uninsulated metallic plate or sheet disposed in the path of the air passing to said cooling means and arranged in close proximity thereto with the surface thereof in contact with the air for condensing moisture therefrom, said plate or sheet defining a relatively restricted passageway for the air by the cooling means.

8. In a refrigerating chamber, the combination of refrigerating means for cooling air in the chamber, and an uninsulated sheet-metal baffle arranged so close to the refrigerating means as to cool said baffle sufficiently to condense moisture in the air, and spaced slightly from the refrigerating means to prevent frosting the baffle, said baffle being arranged in the path of the air passing to the refrigerating means.

LEN A. BANTA.