June 16, 1936. H. M. WILLIAMS 2,044,600

REFRIGERATING APPARATUS

Filed July 3, 1931

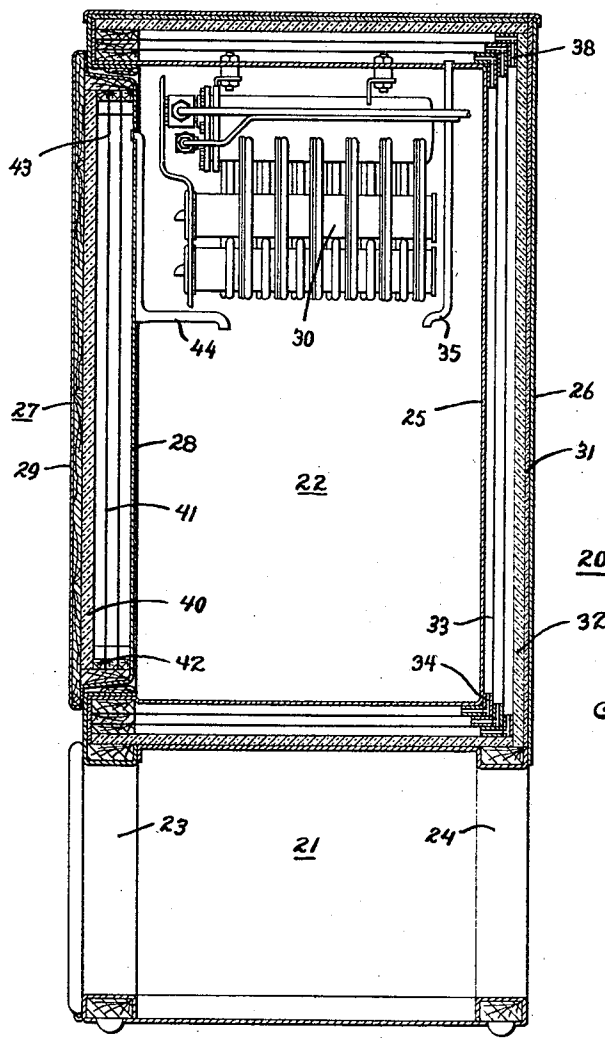


Fig. 1

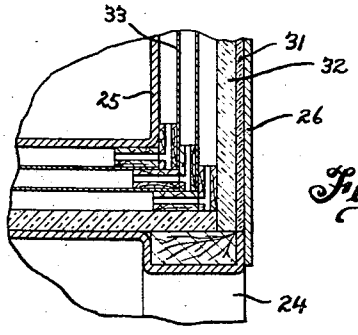


Fig. 2

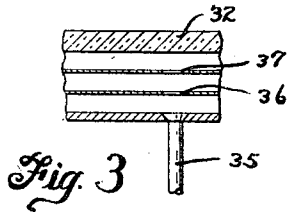


Fig. 3

INVENTOR
Harry M. Williams
BY
Spencer Hardman and Fehr
ATTORNEYS

Patented June 16, 1936 2,044,600

UNITED STATES PATENT OFFICE

2,044,600

REFRIGERATING APPARATUS

Harry M. Williams, Dayton, Ohio, assignor, by mesne assignments, to General Motors Corporation, a corporation of Delaware

Application July 3, 1931, Serial No. 548,612

6 Claims. (Cl. 62—89)

This invention relates to refrigerating apparatus and more particularly to refrigerator cabinets having insulating walls formed of a plurality of spaced sheets of bright metallic foil.

In insulation of spaced sheets of bright metallic foil, the enclosed air spaces are provided for preventing the transmission of heat by conduction, and the sheets of bright metallic foil are provided for preventing the transmission of heat by radiation. The bright metallic foil accomplishes this by its reflecting qualities. Hence in order to preserve the reflecting qualities of this bright metallic foil, it is essential that this foil should not tarnish. This tarnishing is ordinarily caused by the condensation of moisture upon the foil which usually enters the insulation carried by external air which finds its way therein.

The objects of my invention include the provision of means for preventing the bright metallic foil from tarnishing, the provision of means for preventing the access of external air to the foil insulation and for preventing the condensation of moisture upon the foil.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawing, wherein a preferred form of the present invention is clearly shown.

In the drawing:

Fig. 1 is a vertical sectional view of a refrigerator embodying the invention;

Fig. 2 is an enlarged sectional view of a portion of Fig. 1, and

Fig. 3 is an enlarged sectional view of another portion of Fig. 1.

In Fig. 1 there is shown a refrigerator cabinet 20 having a machinery compartment 21 in the lower portion and a food storage compartment 22 in the upper portion of the cabinet. Pillars 23 and 24 in the corners of the machinery compartment support the walls of the food storage compartment. The food storage compartment has an inner wall or shell 25 of sheet metal, preferably covered with a suitable substance such as porcelain, and an outer metal wall or shell 26 preferably covered with porcelain, paint, lacquer or other suitable substance. A door 27 is provided in one wall of the food storage compartment and has on its inner side a sheet metal member 28, coated with porcelain, and on its outer side a sheet metal member 29 which may be coated with porcelain, paint, or lacquer, similar to the outer metal shell 26. The inner shell 25 and the outer shell 26 of the food storage compartment are supported by the pillars 23 and 24 positioned at the four corners of the machinery compartment 21. A cooling unit 30 of any suitable type containing a volatile refrigerant is supported by the top wall of the inner wall or shell 25 within the food storage compartment. Evaporation of refrigerant within the cooling unit maintains the cooling unit 30 at a low temperature and cools the cabinet by the convection of air within the food storage compartment.

In order to prevent the porcelain coating upon the exterior of the refrigerator cabinet from chipping, a chip board 31 is placed against the inner side of the outer sheet metal walls 26. By preventing excessive flexing of the outer sheet metal walls, the chip board prevents the porcelain from chipping. Inside of the outer sheet metal wall 26 and the chip board 31, a relatively thin layer of insulating material 32 of the fibrous type such as cork is provided. This insulating material 32 reduces the amount of heat transmitted by conduction. Between the insulating material 32 and the inner sheet metal shell 25 are provided a plurality of spaced sheets of bright metallic foil. These sheets of foil 33 are spaced by wooden frame members 34 to provide air spaces between the sheets of foil. The air spaces between the sheets of foil further reduce the transmission of heat by conduction and the sheets of bright metallic foil reduce the amount of heat transmitted by radiation to a minimum. By such a construction the amount of heat leakage into the cabinet is exceedingly small. If desired, an additional sheet of foil separated by air spaces from the other sheets of foil and the chip board 31, may be used instead of the fiber insulation 32.

In order to preserve the reflecting qualities of the bright metallic foil so as to prevent heat leakage by radiation, it is necessary to prevent the tarnishing of the bright metallic foil. This tarnishing has its source in the leakage of warm air from the outside of the cabinet to the insulation between the inner and outer shell 25 and 26. The cause of this warm air getting into the insulation is due to the fact that it is practically impossible to perfectly seal the insulation, and that because of the varying temperature of the walls of the cooling unit and the varying barometric pressure, due to changing weather conditions, the air from the exterior of the cabinet is alternately drawn in and forced out of spaces between the outer and inner shells 25 and 26. Inasmuch as the inner shell 25 is made in one piece, leakage of air from the interior of the cabinet to the insulation does not often occur, consequently the air drawn by these causes is ordinarily drawn from

the exterior of the cabinet. The warm air surrounding the cabinet has a relatively high saturation point and normally contains a large amount of moisture as compared to the cold air within the cabinet. When this warm air reaches the insulation, it is cooled because of the coldness within the cabinet and by this cooling the saturation point, that is, the capacity of the air for holding the moisture, is reduced so that dew or moisture is condensed or deposited in and on the insulation. This dew lowers the insulating value of the fibrous type of insulation and causes the bright metallic foil of the foil type of insulation to tarnish and become dull so that its reflecting properties are diminished.

As stated above, the air within the food storage compartment 22 contains a relatively small amount of water vapor therein since the air in its circulation past the cooling unit 30 has been reduced in temperature so that the excess moisture in the air has been condensed out of the air and as a result, the air contains only a small amount of water vapor therein. By the breathing action of the insulation, I supply this cold air containing a relatively small amount of water vapor through the breathing tube 35 to the insulation between the inner and outer shells 25 and 26. The tube 35 has its mouth preferably directly beneath the cooling unit so as to draw the coldest air inside of the food storage compartment. Apertures 36 and 37 are provided in the sheets of metal foil 33 to provide for the access of air between all the layers of insulation to the tube 35. The spacing members 34 are also provided with apertures 38 for providing access of air from the various side panels of the cabinet to the breathing tube 35. In order to further prevent a tarnishing of the foil, extremely thin coating of beeswax or stearic acid may be applied. Preferably, however, the foil is provided with a thin plating of chromium which resists tarnishing to a very high degree. Chromium plated foil resists tarnishing to such a degree that it may be used for insulation without the above described breathing apparatus. Instead of ordinary foil, sheets of paper coated with a suitable adhesive which in turn is coated with aluminum lining bronze by a dusting method may be used.

The door 27 is similarly insulated. The door 27 is provided with a thin layer 40 of insulating material of the fibrous type and a plurality of layers of bright metallic foil 41 suitably spaced by spacing members 42 of wood or other suitable material. The sheets of foil are provided with apertures 43 which provide access of the air between the layers of foil to a breathing tube 44 which extends beneath the cooling unit. Inasmuch as the zone immediately beneath the cooling unit contains air which has just been cooled by the cooling unit, it is preferable that the breathing tubes should have their mouths immediately beneath the cooling unit. The foil in the door may be treated similar to the foil in the other parts of the cabinet as described above to prevent tarnishing.

Thus I have disclosed means for preventing sheets of bright metallic foil from tarnishing.

While the form of embodiment of the invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. A refrigerator including a cabinet having inner and outer walls, a cooling unit supported within said cabinet, insulation between said inner and outer walls, said insulation comprising a plurality of spaced sheets of bright metallic foil, and means for preventing said foil from tarnishing including breathing means having connections with the spaces between said sheets for inhaling into said spaces only air dehydrated by said cooling unit.

2. A refrigerator including a cabinet having inner and outer walls, a cooling unit supported within said cabinet, insulation between said inner and outer walls, said insulation comprising a plurality of spaced sheets of bright metallic foil, and means for preventing said foil from tarnishing including breathing means having a tube structure connecting with the spaces between said sheets, said tube structure extending immediately beneath the cooling unit for inhaling into said spaces only air dehydrated by said cooling unit.

3. A refrigerator including a cabinet having inner and outer walls, and insulation between said inner and outer walls comprising a plurality of spacing members, a plurality of sheets of foil mounted in spaced relation upon the spacing members forming insulation spaces, said spacing members having passages therethrough and said sheets having passages therethrough providing a restricted communication between the insulation spaces, and breathing means having a single passage communicating with the interior of the cabinet and said communicating insulation spaces for inhaling into said spaces only cold dry air from the interior of the cabinet.

4. An insulating structure including inner and outer walls and insulation between the inner and outer walls including a plurality of sheets held in spaced relation by structural members providing substantially dead air spaces between the sheets at least some of the sheets having bright metal surfaces, and breathing means for breathing air into and from the air spaces.

5. An insulating structure including inner and outer walls and insulation between the inner and outer walls including a plurality of sheets of bright metal foil held in spaced relation by structural members providing substantially dead air spaces between the sheets of foil, and breathing means communicating with each of the air spaces between the sheets of bright metal foil for breathing air into and from the air spaces aforesaid.

6. An insulating structure including an enclosure formed of spaced inner and outer walls, insulating means between said spaced inner and outer walls including a plurality of sheets held in spaced relation by structural members providing substantially dead air spaces between the sheets, at least some of the sheets having heat reflecting surfaces, said inner walls being provided with breathing means for breathing air from the interior of the enclosure into the space between the inner and outer walls.

HARRY M. WILLIAMS.