Dec. 21, 1937. R. E. GOULD 2,102,698

REFRIGERATING APPARATUS

Filed May 27. 1932 3 Sheets-Sheet 1

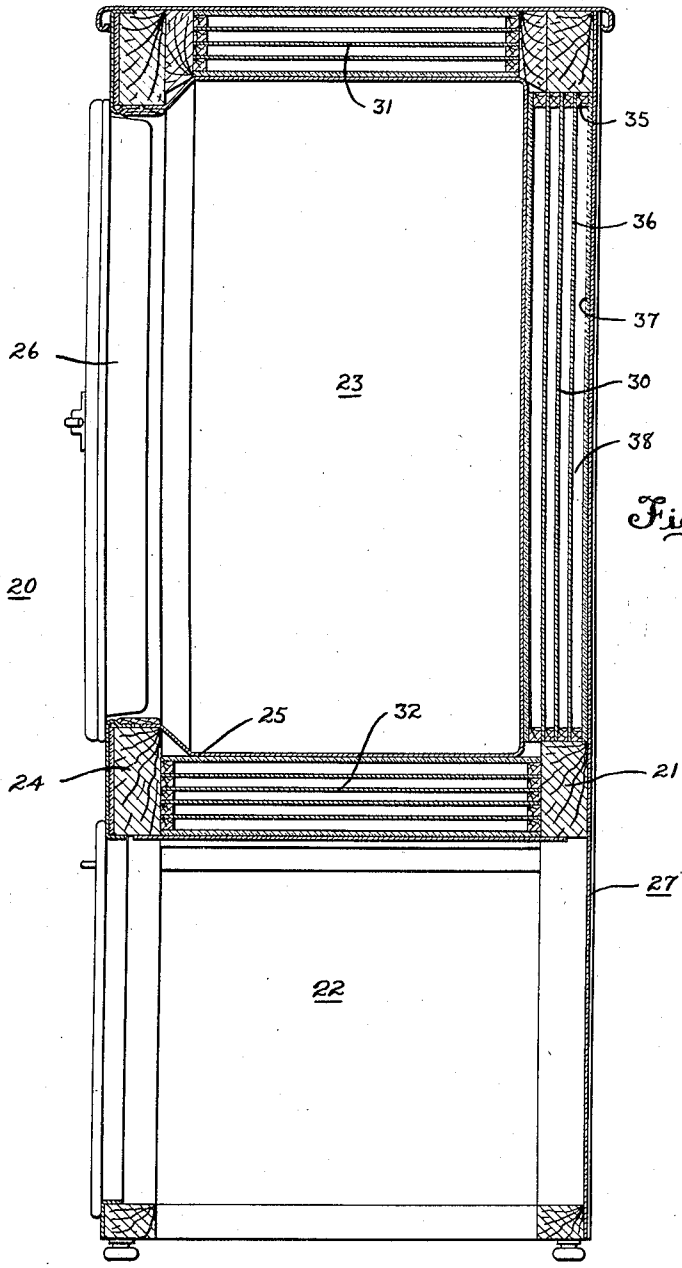

Fig. 1

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Filed May 27, 1932 3 Sheets-Sheet 2

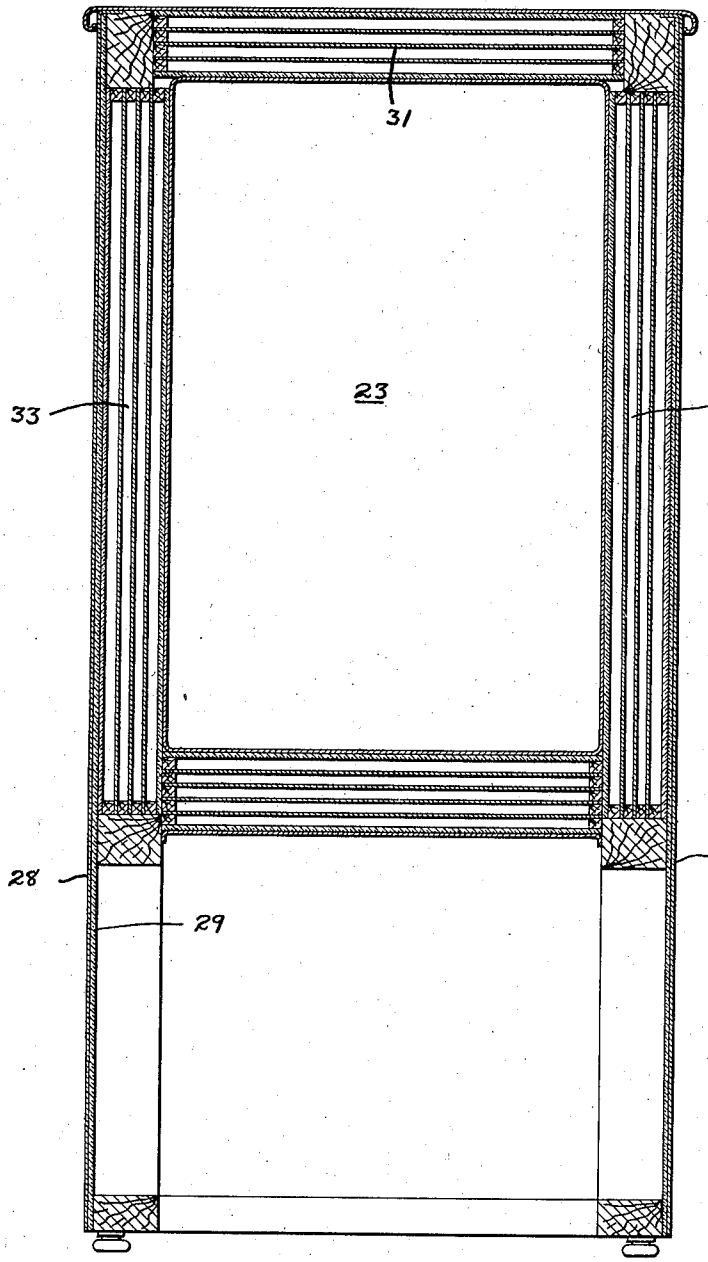

Fig. 2

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Filed May 27, 1932 3 Sheets-Sheet 3

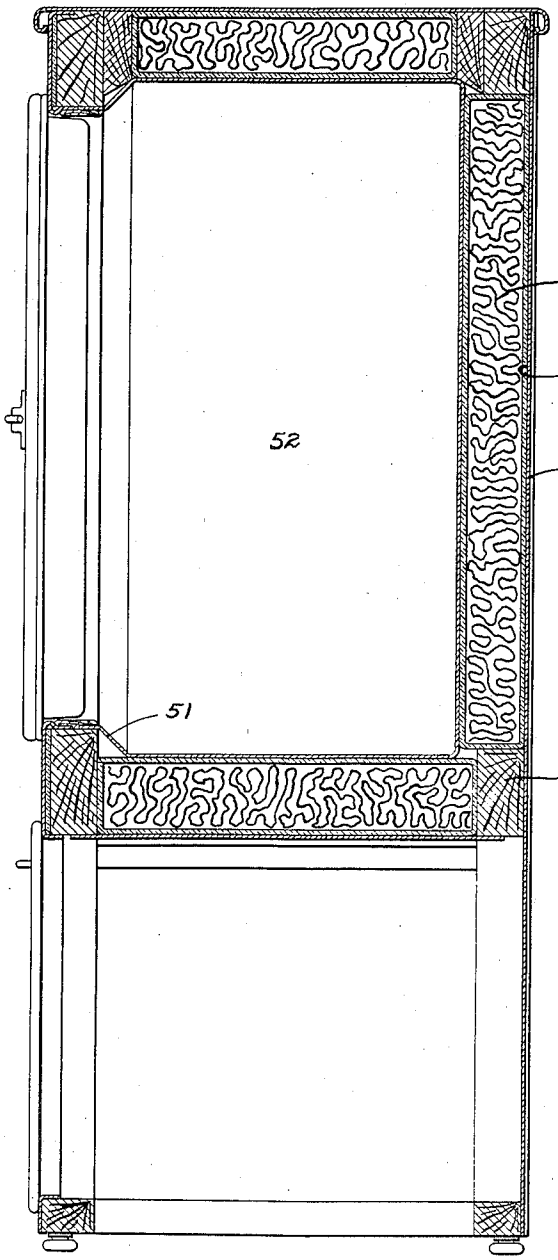

Fig. 3

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UNITED STATES PATENT OFFICE

2,102,698

REFRIGERATING APPARATUS

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Application May 27, 1932, Serial No. 613,941

8 Claims. (Cl. 220—9)

This invention relates to refrigerating apparatus and more particularly to insulated refrigerator cabinets.

My invention has for its objects to provide refrigerator cabinets wherein insulating means in the form of a plurality of air spaces bounded wholly or partially by zinc or zinc foil, is provided for preventing the transfer of heat from outside of to the inside of the cabinet.

I find by providing an insulating means of a plurality of dead air spaces bounded by sheets of zinc that an excellent insulating medium is thus provided since sheets of zinc have a low value of emissivity and thus prevent the transfer of radiant heat while the dead air spaces prevent the transfer by conduction. It should be remembered that zinc has a relatively low value of heat conductivity which is an especial advantage in its form of insulation.

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

In the drawings:

Fig. 1 is a vertical longitudinal sectional view through a refrigerator cabinet embodying one form of my invention,

Fig. 2 is a transverse vertical section through a refrigerator cabinet shown in Fig. 1, and

Fig. 3 is a vertical longitudinal sectional view through a refrigerator cabinet embodying another form of my invention.

Referring to the drawings and more particularly to Fig. 1 there is shown for the purpose of illustrating my invention, a refrigerator cabinet, generally designated by reference character 20, having a rectangular frame 21 of some suitable non-conducting material such as wood. This frame 21 provides for a machinery compartment 22 located in the lower portion of the cabinet 20 and a food storage compartment 23 located in the upper portion of the cabinet. The frame 21 provides a door jamb 24 for the cabinet to which is attached an inner liner 25 which is preferably coated with porcelain or some other suitable finish and which forms an inner wall surrounding the food storage compartment 23. The front wall of the food storage compartment 23 is provided by the door 26. On the outer portion of the frame 21 there is provided a plurality of metal panels, such as the rear panel, designated by reference character 27, and side panels designated by reference character 28. The front, side, and top outer panels are preferably coated with a suitable finish such as porcelain. Beneath the outer metal panels chipboard 29 is provided which backs up and supports the sheet metal panels to prevent the cracking of the porcelain or other finish. These outer sheet metal panels form the outer walls of the cabinet.

I provide my improved form of insulating means between the inner liner 25, or in other words the inner walls, and the outer sheet metal panels, which may be termed the outer walls. My improved insulating means takes the form of rectangular panels. For example, between the inner and outer walls, I provide a rear insulating panel 30, a top insulating panel 31, a bottom insulating panel 32 and side insulating panels 33 and 34. These insulating panels are similar in construction but different in size. Taking the panel 30 as an example of the construction of these panels, I provide a framework comprising a plurality of similar rectangular wooden or other non-conducting frames 35 which support a plurality of sheets of zinc foil 36 between them. These sheets of zinc foil are preferably applied by means of adhesive to the rectangular frames 35 and then the frames together with sheets of foil attached thereto are stacked and fastened together by nails, by an adhesive, or other suitable means to form the construction of the panel. On each side of the panels, there is provided a sheet of corrugated cardboard 37 which encloses the sheets of zinc foil and prevents the access of moisture and foreign matter to the zinc. By this construction in this specific example there are four narrow dead air spaces 38 provided between the sheets of zinc and the outer corrugated cardboard cover of the panel. These dead air spaces are an effective barrier against transfer of heat through the walls of the cabinet by conduction. The sheets of zinc, by reason of their very low value of emissivity, provide a barrier against the transfer of heat through the walls of the cabinet by radiation. In the drawings, for the purpose of illustration, it was necessary that the thickness of the sheets of zinc be exaggerated, but in reality, it is preferred that these sheets of zinc foil be very thin, preferably in the form of foil. By reason of the fact that zinc has a very low value of heat conductivity and that the zinc or zinc foil is very thin, the transfer of heat from one portion of the panel to another through the sheets of zinc is effectively prevented.

In the form of my invention shown in Fig. 3, I show for the purposes of illustration, a cabinet of similar construction having a frame 50 which supports an inner liner 51 which forms the inner

walls of the food compartment **52**. The frame **50** also supports the outer panels **53** which provide the outer walls of the refrigerator cabinet. Between the inner and outer walls I provide a plurality of insulating panels which are similar but different in size and shape. Taking the rear panel as an example, there is provided a rectangular container **54** made of corrugated cardboard or similar material. This container **54** is filled or stuffed with crinkled or crushed zinc foil **55** which forms a plurality of dead air spaces surrounded by the zinc foil. As in the first described form, the dead air spaces prevent the transfer of heat by conduction while the sheets of zinc foil which surround in whole or in part the dead air spaces, prevent the transfer of heat by radiation. The sheets of zinc foil are very thin and by reason of this, together with the fact that zinc has a relatively low value of heat conductivity, the transfer of heat by conduction through the walls of the cabinet by the zinc foil itself is effectively prevented.

By reason of the thinness of the zinc foil, a very light weight insulation is provided which is superior in insulating efficiency to the ordinary commercial forms of insulation which have been in general use for refrigerator cabinets and for various other sundry purposes. I find that this form of insulation is also low in cost and it is evident that it contains little combustible material.

I find that zinc foil is particularly valuable for this type of insulation since it is a relatively poor metallic conductor of heat, has a low coefficient of emissivity, i. e., it radiates heat at only a fraction of the rate at which a perfect radiating surface radiates even when the surface is oxidized and badly corroded. The heat entering the cabinet from the outside of the cabinet first strikes the outermost dead air space which retards the transfer of heat by conduction and convection but permits the radiant heat to pass therethrough. This radiant heat and a small amount of the heat transmitted by conduction will travel to the outermost sheet of zinc foil which will reflect the greater part of the radiant heat but will absorb the remainder as well as the heat transmitted by conduction. This will slightly increase the temperature of this outer sheet of zinc foil but by reason of its low rate of emissivity very little of this heat will be emitted from this outer sheet of zinc foil into the next dead air space. The remaining sheets of foil reflect the greater part of the radiant heat transmitted to them while the dead air spaces each prevent the transfer of the greater part of the heat transferred to them by conduction and convection so that very little heat is permitted to enter the cabinet.

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 cabinet having inner and outer walls and insulation between said inner and outer walls, said insulation including a plurality of sheets of zinc separated by dead air spaces.

2. A refrigerator cabinet having inner and outer walls and insulation between said inner and outer walls, said insulation including a plurality of insulation panels each comprising a framework supporting a plurality of sheets of zinc in spaced relation with air spaces between the sheets of zinc.

3. A refrigerator cabinet having inner and outer walls and insulation between said inner and outer walls, said insulation including a plurality of insulation panels each comprising a framework supporting a plurality of sheets of zinc in spaced relation with air spaces between the sheets of zinc, said framework being provided with an outer covering for protecting the sheets of zinc.

4. An insulating structure comprising a space defined by spaced walls adapted to be exposed to relatively higher and lower temperatures, a sheet having a metallic surface extending between the walls and having gas spaces on either side, said metallic surface possessing relatively low reflective characteristics with respect to radiation of wave lengths within the visible portion of the electromagnetic spectrum and relatively high reflective characteristics with respect to radiation of longer wave lengths than the visible portion of the electromagnetic spectrum, said metallic surface of said sheet containing zinc.

5. An insulating structure comprising a relatively flat rigid corrugated cardboard container, said container containing zinc sheets extending from one side wall of the container and having gas spaces in between the sheets and between the sheets and the walls of the container, said zinc sheets having surfaces possessing relatively low reflective characteristics with respect to light waves and relatively high reflective characteristics with respect to heat rays even when corroded so as to prevent the passage of radiant energy through the container, said zinc sheets also serving to prevent convection currents of the gas within the container to prevent heat loss by convection.

6. An insulating structure including means forming a dead air space, and a sheet extending across the dead air space dividing said dead air into two dead air spaces in direct contact with the sheet, said sheet having a zinc surface possessing relatively low reflective characteristics with respect to light waves and relatively high reflective characteristics as to heat waves even when corroded so as to prevent the passage of radiant energy.

7. An insulating structure including a framework supporting a plurality of sheets of zinc in spaced relation with air spaces between the sheets of zinc and enclosed by the framework.

8. An insulating structure including a framework comprising a plurality of similar rectangular frames, said similar frames having a plurality of sheets between them extending substantially from one edge of the framework to the other, at least one of the sheets having a zinc surface.

RICHARD E. GOULD.