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2,104,548

REFRIGERATING APPARATUS

Original Filed July 3, 1931

2 Sheets-Sheet 2

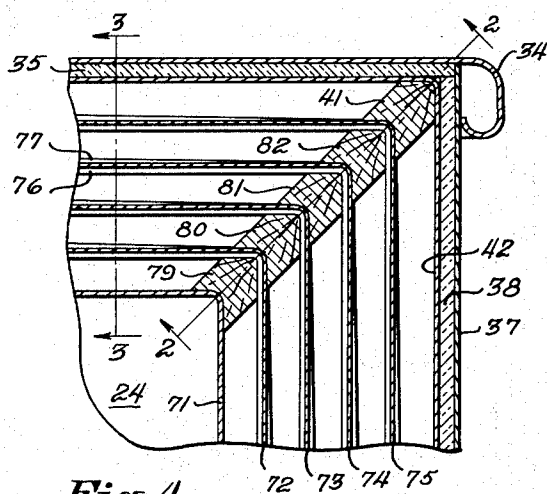


Fig. 4

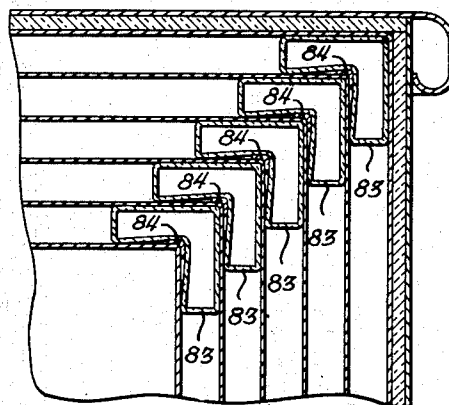


Fig. 5

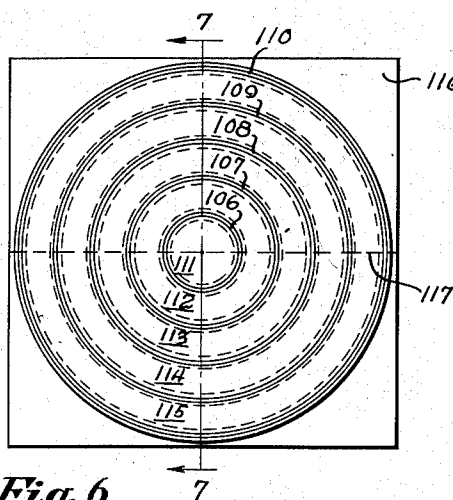


Fig. 6

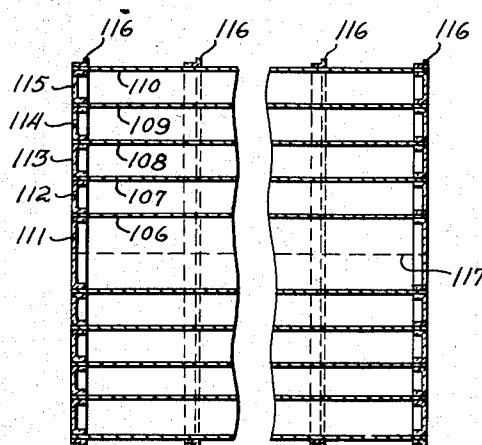


Fig. 7

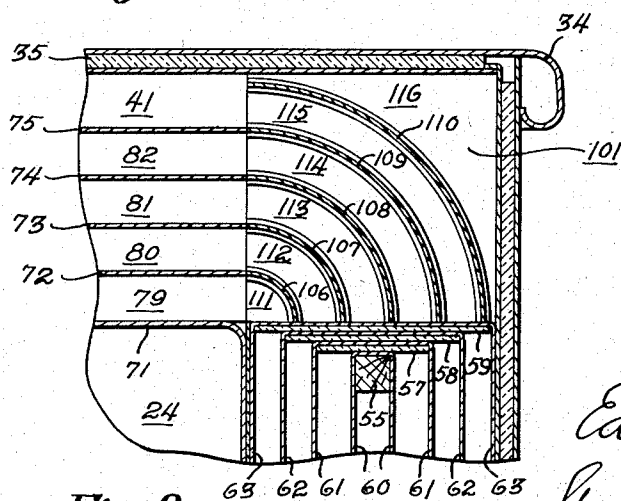


Fig. 8

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REFRIGERATING APPARATUS

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Original application July 3, 1931, Serial No.
548,583. Patent No. 2,057,746, dated October
20, 1936. Divided and this application June 27,
1936, Serial No. 87,760

12 Claims. (Cl. 20—4)

This application is a division of my co-pending application Serial No. 548,583, filed July 3, 1931.

This invention relates to refrigerating apparatus and more particularly to the construction of cabinets, the walls of which are heat insulated to prevent the passage of heat therethrough.

In the manufacture of insulated cabinets, it has been proposed to use air spaces in the walls thereof to prevent the transfer of heat there-through. Heretofore such practice has been unsatisfactory for the reason that radiant heat will pass freely through air, and, in addition, the convection currents set up therein will transfer large amounts of heat therethrough. To overcome the transfer of radiant heat it has been proposed to provide a dead air space bounded by a thin bright metal foil or leaf, such for instance as bright aluminum foil, for insulating purposes. By the term "metal foil" is meant thin leaves of metal either with or without paper backing of such thickness that they can be readily formed to any desired shape. It has been found that these bright metallic surfaces of foil radiate but very little heat, and consequently it is possible to utilize air spaces lined with such bright surfaces in heat insulating cabinets. By reducing the size of the air space the other objectional feature of air space insulation, namely loss of heat by convection currents, is removed in that convection currents ordinarily set up are decreased to a minimum.

Attempts to adapt such thin bright metallic foil to cabinet construction so as to utilize air spaces in the walls thereof for insulating purposes have met with great difficulty. In the first place, this foil is extremely thin and consequently cabinets must be so constructed as to prevent rupturing of the foil when such cabinets are subjected to the slam test, a test involving the opening and closing of the cabinet door over prolonged periods of time. In addition, the foil must be so supported within the cabinet wall as to maintain it substantially taut at all times, while at the same time preventing the transfer of heat through these supporting means. Thirdly, the foil being metallic, has a tendency to rattle or cause what is known as a metallic cry and great care must be taken to prevent or render inaudible such cries or other noises.

It is to such structure that my invention par-

ticularly relates, having for one of its objects to provide a cabinet construction having foil insulation, that is, a cabinet capable of utilizing a thin bright metallic foil to advantage, while at the same time eliminating most of its disadvantages.

More particularly it is an object of the invention to provide the cabinet construction wherein all metallic cries are adequately deadened, rupturing of the foil is prevented, and a proper spacing of the foil is provided.

A further object of the invention is to provide an improved foil construction whereby the layers of foil may be formed by winding a continuous strip of foil continuously around four sides of the cabinet and to provide various constructions of insulated cabinets adaptable for easy and economical assembling.

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 invention is clearly shown.

In the drawings:

Fig. 1 is a vertical transverse section through a refrigerator cabinet embodying one form of wound foil insulation;

Fig. 2 is a fragmentary sectional view taken on the line 2—2 of Fig. 4;

Fig. 3 is a fragmentary sectional view taken on the line 3—3 of Fig. 4;

Fig. 4 is an enlarged view of an upper corner of Fig. 1;

Fig. 5 is a sectional view similar to Fig. 4 illustrating a modified construction of wound foil insulation;

Fig. 6 is a view illustrating a method of making the corner piece shown in Fig. 8;

Fig. 7 is a sectional view taken along the line 7—7 of Fig. 6; and

Fig. 8 is a sectional view taken along the line 8—8 of Fig. 1.

In order to illustrate one aspect of my invention, I have disclosed a refrigerator cabinet generally designated as 20. This cabinet includes a lower machinery compartment 21 formed within the framework which includes upright corner members 22 and horizontal cross members 23. The food storage compartment 24 is supported above the machine compartment. This food com-

partment is enclosed by a one-piece box-shaped metal porcelain lining secured at its front edges to the door opening of the cabinet.

According to my invention there is provided about the inner liner 71 a continuous strip of foil which is wound a plurality of times about the inner liner to provide a plurality of layers of foil numbered 72 to 75 inclusive in spaced relation. As better shown in Figs. 2, 3 and 4, the foil is provided with threads 76 and 77 arranged on either side of the continuous strip of bright metal foil.

This form of insulation is preferably constructed by fastening one end of the continuous strip of foil together with the threads upon the opposite sides of the foil to a portion of the inner liner as shown at 78 in Fig. 1. Spacing members numbered 79 to 82 inclusive, having matched V-shaped grooves and corresponding projections on opposite sides, are used to space the layers of the strip of foil winding so as to provide air spaces between the layers. These spacing members are adapted to fit along four of the edges of the inner liner and also upon each other.

The winding is performed in the following manner: After the continuous strip of foil is attached to the inner liner as at 78, the innermost spacing members 79 are fastened, preferably by glue or cement, to the four diagonal opposite edges about which the winding is to take place and the first turn of foil 72 passes around and rests upon the four spacing members 79 which have been fastened to the inner liner; after the first turn is made about the inner liner, the spacing members 80 have their inner grooves glued or cemented in place on top of the first turn of foil directly outside of the spacing members 79; after the spacing members 80 are put in place, a second turn of foil 73 is wound about the spacing members 80 so as to provide a second layer of foil; and then similar spacing members 81 are placed at the four corners on top of the second layer of wound foil 73 directly outside the spacing members 80 and then a third turn of the wound foil is taken about the spacing members 81; after this, similar spacing members 82 are placed on the third turn 74 of the wound foil directly outside of the spacing members 81 and a fourth turn of foil is taken around the spacing members 82 and the loose end of foil is fastened either to the outer layer of foil 79 or to one of the spacing members. It will be understood that the winding can be performed without the use of the threads 76 and 77, if desired, but the threads are preferably employed to prevent the rattling and the metallic cry of the foil and also to prevent its rupture during the winding operation.

After the last turn of foil is completed and fastened to the spacing members, additional spacing members 41 are provided upon the outside at the four corners of the wound construction directly on top of the outer layer of foil and the other spacing members. These spacing members 41 are preferably fastened to the outer layer of the foil similarly to the other spacing members by a suitable adhesive. This completed construction is then preferably slipped into the outer liner 42 which is an open one-piece box-shaped metal member. This outer liner preferably rests upon the horizontal members 23 and is fastened thereto.

A porcelain sheet metal covering 34 is provided on top of the cabinet spaced from the outer liner 41 by chip board 35 and the sides of the cabinet are similarly provided with sheet metal covering 36 and 37 also similarly provided with chip board

38 which is inserted between the coated sheet metal covering and the outer liner.

In order to insulate the rear wall of the cabinet, a frame 55 is provided which is wound in such a manner so as to provide air spaces formed by the spaced sheets of bright metallic foil. The frame 55 preferably comprises a rectangular wooden structure or low conducting material. The foil is placed upon the rectangular frame 55 in a peculiar manner. The continuous strip of foil is fastened to one edge of the rectangular frame 55. In Fig. 8, the foil has one end attached to the lower portion of the frame 55. The foil is then first wound around the rectangular frame 55 for one complete turn 60, and then spaced cardboard members 57 are attached to the upper and lower ends of the rectangular frame 55 over the first turn or layer of foil 60 and a complete turn 61 of foil is wound about these spacers 57. After this, a wider pair of spacing members 58 are fastened to the upper and lower ends of the rectangular frame over the second turn of winding 61, as well as over the spacers 57, and a third turn 62 of foil is wound about the pair of spacing members 58. After the third turn 62 of winding, a third pair of wider spacing members 59 are fastened to the upper and lower edges of the rectangular frame 55 over the third turn of winding 62 as well as over the spacer members 58, and a fourth turn of winding 63 is passed around the third pair of spacing members 59. In this manner, a slab of spaced foil insulation is produced by a winding method.

By inspection of Fig. 8 it will be seen that if the windings of foil, either the windings numbered 72 to 75 inclusive, or the windings of the back panel 60 to 63 inclusive, were extended laterally to the other portion of the outer wall at the rear corners of the cabinet, the air within the innermost space between the inner liner 71 and the first sheet of foil, either 72 or 62, would have access directly to the outer liner. Thus heat might be transferred directly from the outer liner through such a space to the inner liner without passing through all of the spaced sheets of foil and air spaces inbetween. This would reduce the efficiency of the insulation and would tend to cause sweating at that particular point in the outer wall.

In order to avoid this heat leakage, I have provided an insert 101 generally in the form of a long rectangular member square-shaped in cross section, having a length sufficient to extend across the rear wall from one side to the other. Similar members are provided at the side corners of the rear wall and the corner of the rear wall. It will be seen that in Fig. 8 the wound foil designated by the reference characters 72 to 75 inclusive terminates at the rear face of the inner liner 71, while the slab of wound foil at the rear of the cabinet terminates flush with the upper wall of the cabinet. By thus shortening the slab of wound foil and decreasing its width, there is provided a space at the corner of the rear wall which extends across the top of the cabinet into which fits the insert 101 and similar spaces are provided for receiving inserts at the sides and bottom of the rear wall.

This insert 101 is a quarter of a cylinder formed as shown in Figs. 6 and 7. The inserts are preferably formed in the following manner: The cylinders 106 to 110 inclusive, composed of cardboard having bright metallic foil on one or both sides, are placed in concentric relation and spacing discs 111 are glued onto both ends of the

smaller cylinder or tube 106, then a concentric spacing ring 112 is placed within the ends of the tube 107 and without the tube 106; the concentric spacing rings 113 are similarly positioned between the ends of the tubes 107 and 108; still larger concentric spacing rings of card board 114 are placed between the ends of tubes 108 and 109; a pair of larger concentric rings 115 are placed between the ends of the tubes 109 and 110 and the squared rings 116 are placed on the outside of the tube 110 at suitable points. All of these parts are suitably glued or cemented together. The cylinders or tubes may be made entirely of a suitable type of bright metallic foil, if desired.

After these cylinders are so assembled, they are cut into four parts along the lines 117 and the section line 1—7. These assembled quarter cylinders are then used as inserts and one of these inserts 101 is placed as shown in Fig. 8.

In Fig. 5, there is shown a modified form of spacing members 83 which are similar to the spacing members 79 to 82 inclusive shown in the other figures. These spacing members 83 also extend across the entire width of one of the edges of the inner liner 71. These spacing members 83 consist of cardboard formed into a hollow angle iron shape. These hollow angular spacing members 83 are preferably provided with gummed paper 84 at their inner corner for attaching to the preceding winding of foil so that the winding operation may be facilitated. By employing spacers of cardboard having a hollow angular shape, the conductivity through the spacing members is further reduced. In Fig. 5 no supporting threads 76 and 77 are shown, but these may be used in this modification also if desired.

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. An insulating structure including a space to be insulated, insulating means in the form of sheet means extending spirally around said space a plurality of times, and strip means extending between the layers across the sheet means for holding adjacent layers of the sheet means in spaced relation from each other.

2. An insulating structure including a space to be insulated, insulating means in the form of sheet means extending spirally around said space a plurality of times, and strip means extending between the layers across the sheet means for supporting said sheet means and for holding adjacent layers of the sheet means in spaced relation from each other.

3. An insulating structure including a space to be insulated, insulating means in the form of sheet means extending spirally around said space a plurality of times, and strip means extending between the layers across the sheet means for holding adjacent layers of the sheet means in spaced relation from each other, the strip means between the different layers being located in alignment at a plurality of points about the space to be insulated.

4. An insulating structure including intersecting inner walls enclosing a space to be insulated, insulating means in the form of sheet means extending spirally around said intersecting inner walls a plurality of times, and strip means extending between the layers across said sheet means for holding adjacent layers of said sheet means in spaced relation, said strip means be-

ing located adjacent and being parallel to intersections of said inner walls.

5. An insulating structure including intersecting inner walls enclosing a space to be insulated, insulating means in the form of sheet means extending spirally around said intersecting inner walls a plurality of times, and strip means extending between the layers across said sheet means for holding adjacent layers of said sheet means in spaced relation, said strip means being located in groups extending substantially radially outwardly from adjacent intersections of said walls.

6. An insulating structure including intersecting inner walls enclosing a space to be insulated, insulating means in the form of sheet means extending spirally around said intersecting inner walls a plurality of times, and strip means extending between the layers across said sheet means for holding adjacent layers of said sheet means in spaced relation, said strip means being mounted one upon the other at intersections of said walls.

7. An insulating structure having inner and outer walls, and insulating means between said walls including a plurality of superimposed spacing members extending along and supported upon the edges of said inner walls, said spacing members having grooves for receiving the edges of said inner walls, and sheets of bright metallic foil stretched between spacing members at opposite edges, said sheets being held between adjacent spacing members.

8. An insulating structure having inner and outer walls, and insulating means between said walls including a plurality of superimposed spacing members extending along and supported upon the edges of said inner walls, and sheets of bright metallic foil stretched between spacing members at opposite edges, a plurality of threads stretched upon opposite sides of the foil for preventing ruptures of the foil, said sheets being held between adjacent spacing members, the innermost spacing members being bonded to the inner walls, and the foil being bonded to the spacing members contacting therewith.

9. An insulating structure having inner and outer walls, and insulating means between said walls including a plurality of superimposed spacing members extending along and supported upon the edges of said inner walls, and sheets of bright metallic foil wound about said inner walls first over the inner set of spacers and then passing around the inner walls and progressively over successive sets of spacers a plurality of times to provide the desired number of layers of foil.

10. An insulating structure having inner and outer walls, and insulating means between said walls including a plurality of superimposed spacing members extending along and supported upon the edges of said inner walls, and sheets of bright metallic foil wound about said inner walls first over the inner set of spacers and then passing around the inner walls and progressively over successive sets of spacers a plurality of times to provide the desired number of layers of foil, said spacers being composed of stiff paper.

11. An insulating structure having inner and outer walls and means for insulating said walls including a plurality of spaced sheets of bright metallic foil adjacent said walls, some of said sheets terminating at the edges of said inner walls, and an insert having a plurality of quarter-

cylinders of sheets of bright metallic foil filling the space between the terminations of some of said sheets.

12. An insulating structure including inner walls enclosing a space to be insulated, insulating means in the form of sheet means extending spirally around said inner walls a plurality of times, and strip means extending between the

layers across said sheet means for holding adjacent layers of said sheet means in spaced relation, said strip means being parallel to each other and being located in groups the members of which extend radially outwardly from the inner walls. 5

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