

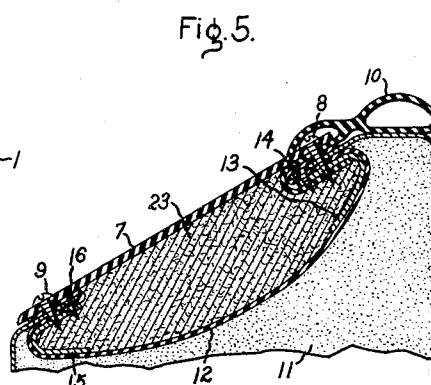
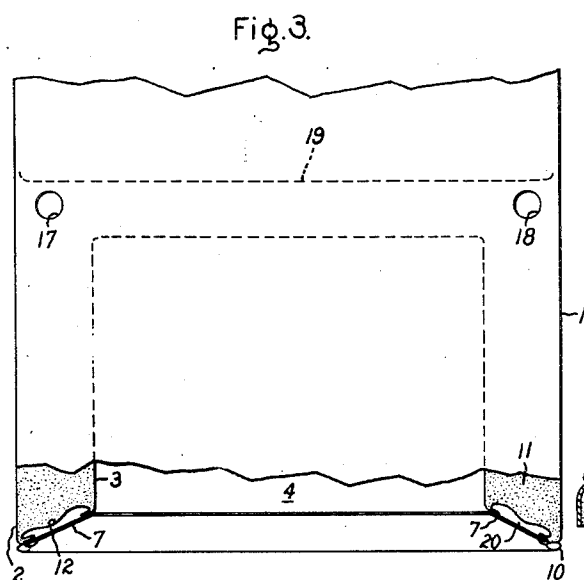
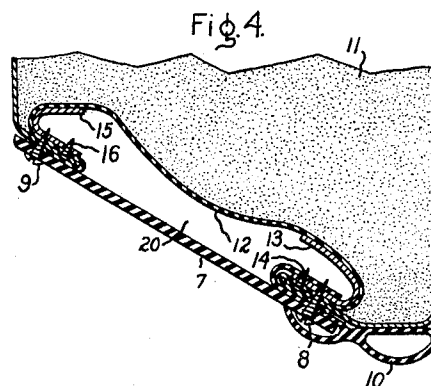
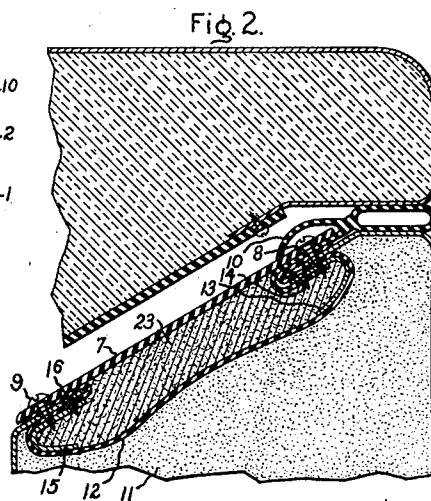
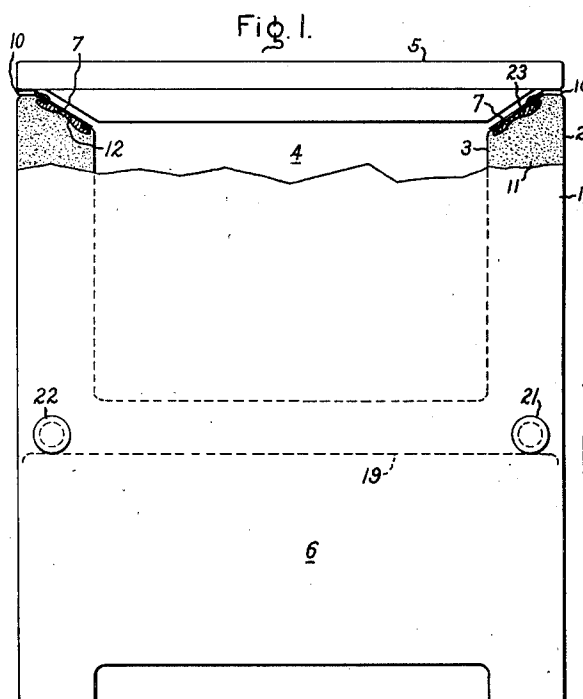
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REFRIGERATOR CABINET CONSTRUCTION

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REFRIGERATOR CABINET CONSTRUCTION

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My invention relates to refrigerated cabinets and more particularly to arrangements for insulating such cabinets.

In the construction of refrigerated cabinets, and particularly of household freezers wherein a low temperature must be maintained, it is desirable to employ a material with good thermal-insulating properties so as to be able to minimize the thickness of insulation required. Reduction in the thickness of insulation is, of course, reflected in increased space available within the freezer for the storage of frozen foods without any increase in the space required by the cabinet. Some materials having desirable heat-insulating characteristics have an undesirable characteristic of limited settling due to jarring or vibration during factory handling and shipment and during operation of the cabinet, with the resultant appearance of voids within the insulation. The above characteristics are exhibited for example, by heat-insulating materials of the aerogel type, including inorganic aerogels, such as, silica aerogel, alumina aerogel, etc., organic aerogels, such as, organosilicon aerogel, described and claimed in the application of John R. Elliott and Robert H. Krieble, Serial No. 577,343, filed February 10, 1945, now Patent No. 2,441,423, and assigned to the same assignee as the present invention, and organic-inorganic aerogels, such as, organo-silicon-silica aerogels, described and claimed in the application of Robert H. Krieble and John R. Elliott, Serial No. 577,342, filed February 10, 1945, now Patent No. 2,441,422, and assigned to the same assignee as the present invention. The presence of such voids adversely affects the insulating properties. Also, the insulating properties of the inorganic aerogels may be adversely affected by condensation of moisture thereon in the insulation space, because of resultant shrinkage of the material involved.

It is an object of my invention to provide an improved arrangement for insulating a refrigerated cabinet.

It is another object of my invention to provide a refrigerated cabinet construction including an improved arrangement for minimizing voids in the insulation.

It is a further object of my invention to provide a refrigerated cabinet construction including an improved arrangement for minimizing transmission of moisture into the insulation space.

Other objects and advantages of my invention will become apparent as the following descrip-

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tion proceeds and the features of novelty which characterize my invention will be pointed out with particularity in the claims annexed to and forming part of this specification.

For a better understanding of my invention reference may be had to the accompanying drawing in which Fig. 1 is a rear elevation view of a refrigerator cabinet incorporating my invention; Fig. 2 is an enlarged view of a portion of the cabinet shown in Fig. 1; Fig. 3 is a rear elevation view of the cabinet in an inverted position; Fig. 4 is an enlarged view of a portion of the cabinet illustrated in Fig. 3; and Fig. 5 is an enlarged view of a portion of the cabinet showing the elements in a slightly different position.

Referring now to the drawing, there is shown a refrigerated cabinet 1 of the chest type suitable for the storage of frozen foods. The cabinet includes an outer wall 2 and an inner wall 3, the inner wall forming a compartment 4 for food storage. The compartment 4 is provided with an access opening at the top and this opening is closed by a lid 5. At the bottom of the cabinet a machinery compartment 6 is provided for housing the refrigerant condensing apparatus (not shown).

A breaker strip 7 of suitable heat-insulating material is provided for closing the space between the inner and outer walls adjacent the access opening of the cabinet. The breaker strip is secured to the walls 2 and 3 respectively by screws 8, 9 or other suitable fastening devices. A gasket 10 is provided between the lid 5 and the outer wall 2 for sealing the storage space. The gasket is clamped between the breaker strip and the outer wall by the screw 8.

The space between the walls 2 and 3 is adapted to be filled with a heat-insulating material 11 of the aerogel type, for example, silica aerogel. This material may be subject to settling due to jarring or vibration during handling or operation of the cabinet. Hence, voids may form, particularly in the upper portion of the insulating space between the walls 2 and 3, and thereby reduce the insulating effect. In order to minimize such voids a construction including a flexible diaphragm 12 is employed within the space between the walls 2 and 3 in the general area of the breaker strip 7. This diaphragm is formed of a flexible, moisture-impervious material, such as rubber. One edge of the diaphragm is held between a retaining strip 13 and the outer wall 2 by a screw 14 or other suitable fastening device. The other edge of the diaphragm is similarly held between a retaining strip 15 and the inner wall

3 by a screw 16 or other suitable fastening device. The diaphragm is preferably cemented to these walls to insure sealing engagement therewith.

During the process of introducing heat-insulating material into the space between the walls 2 and 3, the cabinet is first placed in the inverted position shown in Fig. 3. The rear wall of the cabinet includes two filling openings 17 and 18 adjacent a bottom portion 19 of the outer wall 2. The heat-insulating material 11 is introduced into the space between the inner and outer walls through the filling opening 17. This is accomplished by blowing, pouring or vibrating the insulation into this opening, the air being vented through the opening 18. A suitable filter bag may be placed across the opening 18 to allow the exhausting of the air therethrough without permitting the passage of the heat-insulating material therethrough. The space between the inner and outer walls is filled with the heat-insulating material during this operation. The cabinet may be tipped forward toward the end of the filling operation so as to insure that the filling hole 17 is at the highest point in the space to be filled. As shown most clearly in Fig. 4, the flexible diaphragm 12 is forced toward the breaker strip during this operation minimizing the space 20 between the breaker strip and the flexible diaphragm.

When the filling with the heat-insulating material 11 has been completed the holes 17 and 18 are closed by suitable caps 21 and 22. These caps may be welded or otherwise secured to the outer wall 2 to seal these openings. The cabinet is then placed in the upright position illustrated in Fig. 1. The breaker strip 7 is removed and resilient compressible heat-insulating material 23, such as spun glass, wood fiber, felt, etc. is placed within the space 20. An excess of heat-insulating material 23 is employed, that is, an amount which is of greater volume before compression than the space 20 between the diaphragm 12 and the normal position of the breaker strip 7. The breaker strip 7 is then replaced, compressing the heat-insulating material 23 and forcing the diaphragm 12 into the general shape illustrated in Fig. 2.

It will be observed that the space 20 between the diaphragm and the breaker strip in Fig. 2 is less than the maximum space available between the diaphragm and the breaker strip, as illustrated in Fig. 5. Thus the heat-insulating material 23 in Fig. 2 is compressed between the breaker strip 7 and the mass of heat-insulating material 11. During handling of the cabinet and during operation of the refrigerating apparatus the heat-insulating material 11 may settle to some extent. As it does so, the compressed resilient heat-insulating material 23 expands to maintain the diaphragm 12 against the mass of heat-insulating material 11, and thereby fill any voids which might otherwise be left by the receding heat-insulating material 11.

It should be noted particularly that the resilient compressible heat-insulating material 23 is arranged in the region adjacent the breaker strip 7. The area in the region of the access opening of the cabinet and of the breaker strip 7 is particularly susceptible to the condensation of water vapor or "sweating," and this condition is aggravated by any voids which might appear in the area adjacent the breaker strip. The arrangement disclosed above, by providing the compressible heat-insulating material in this par-

ticular region, specifically insures the presence of heat-insulating material in this area.

Where the heat-insulating material 11 employed is an aerogel of the inorganic type, it may be adversely affected by moisture, and hence it is desirable to minimize the transmission of moisture into the insulation space between the walls 2 and 3. While the walls of the cabinet may be securely welded to prevent such leakage of moisture, moisture may leak into the insulation space in the region around the breaker strip 7. The flexible diaphragm minimizes such leakage of moisture in this region, since the diaphragm is made of a moisture-impervious material, such as rubber, and is arranged along those portions of the cabinet where leakage might otherwise occur.

In describing the process of insulating the cabinet the heat-insulating material 11 has been described as being introduced into the cabinet before any heat-insulating material is placed in the space 20 between the diaphragm and the breaker strip. If desired, the resilient compressible heat-insulating material 23 may be first placed in the space 20, forcing the diaphragm 12 to the general shape shown in Fig. 5. The cabinet may then be inverted as shown in Fig. 3 and the heat-insulating material 11 introduced as before. The mass of the heat-insulating material 11 compresses the heat-insulating material 23 to the general shape shown in Fig. 2. Any subsequent settling of the heat-insulating material 11 results in an expansion of the heat-insulating material 23 toward the shape shown in Fig. 5, as previously described.

In the insulating arrangement previously described the breaker strip 7 was set forth as secured in position before the cabinet was inverted and the heat-insulating material 11 introduced. When the cabinet was shifted to the position shown in Fig. 1 it was necessary to remove the breaker strip, introduce the heat-insulating material 23, and then replace the breaker strip. The original assembly of the breaker strip is required because in the particular cabinet construction illustrated, the breaker strip constitutes the support holding the inner and outer walls in spaced relationship. It will be apparent, therefore, that should a form of cabinet construction be employed in which other elements are utilized for holding the walls in spaced relationship, the breaker strip need not be installed until after the heat-insulating material 11 has been introduced and the resilient compressible heat-insulating material 23 has been placed in the space 20.

While I have shown and described a specific embodiment of my invention, I do not desire my invention to be limited to the particular construction shown and I intend by the appended claims to cover all modifications within the spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A refrigerated cabinet comprising an outer wall, an inner wall spaced from said outer wall, a breaker strip closing the space between said walls, a moisture-impervious, flexible diaphragm engaging said walls adjacent said breaker strip and extending into the space between said walls, a heat-insulating material filling the space between said walls, and a resilient compressed heat-insulating material filling the space between said breaker strip and said diaphragm and exerting pressure on said diaphragm.

2. A refrigerated cabinet comprising an outer

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wall, an inner wall spaced from said outer wall, a breaker strip closing the space between said walls, a moisture-impervious, flexible diaphragm, a retaining strip maintaining one edge of said diaphragm in engagement with said outer wall, a second retaining strip maintaining another edge of said diaphragm in engagement with said inner wall, said diaphragm being spaced from said breaker strip and extending into the space between said walls, a heat-insulating material filling the space between said walls, and a resilient compressed heat-insulating material filling the space between said breaker strip and said diaphragm and exerting pressure on said diaphragm.

3. A refrigerated cabinet comprising an outer wall, an inner wall spaced from said outer wall, a breaker strip closing the space between said walls, a moisture-impervious, flexible diaphragm engaging said walls adjacent said breaker strip and extending into the space between said walls, a heat-insulating material of the aerogel type filling the space between said walls, and a resilient compressed heat-insulating material filling the space between said breaker strip and said diaphragm.

4. A refrigerated cabinet comprising an outer wall, an inner wall spaced from said outer wall, a breaker strip closing the space between said walls, a moisture-impervious, flexible diaphragm engaging said walls adjacent said breaker strip and extending into the space between said walls, a heat-insulating material filling the space between said walls, said material being of a type subject to settling due to vibration during handling and operation of the cabinet, and a resilient compressed heat-insulating material filling the space between said breaker strip and said diaphragm, said last-named heat-insulating material expanding to fill any voids resulting from settling of said first-named heat-insulating material.

5. A refrigerated cabinet comprising an outer wall, an inner wall spaced from said outer wall, said walls being formed to provide an access opening at the top of said cabinet, a breaker strip closing the space between said wall adjacent said access opening, a moisture-impervious, flexible diaphragm secured to said walls adjacent said breaker strip, said diaphragm being spaced from said strip and extending into the space between said walls, a heat-insulating material of the aerogel type filling the space between said walls, and a resilient compressible heat-insulating material filling the space between said diaphragm and said breaker strip, said last-named heat-insulating material being placed in said last-named space under compression and having the characteristic of expanding to fill any voids resulting from the settling of said first-mentioned heat-insulating material.

6. A refrigerated cabinet comprising an outer wall, an inner wall spaced from said outer wall, a breaker strip closing the space between said walls, a moisture-impervious, flexible diaphragm, a retaining strip maintaining one edge of said diaphragm in engagement with said outer wall, a second retaining strip maintaining another edge of said diaphragm in engagement with said inner wall, said diaphragm being spaced from said breaker strip and extending into the space between said walls, a heat-insulating material of the aerogel type filling the space between said walls, and a resilient compressed heat-insulating material filling the space between said breaker strip and said diaphragm, said last-mentioned heat-insulating material tending to expand and

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thereby increase the extension of said diaphragm into said space between said walls.

7. In the assembly of a refrigerated cabinet including spaced inner and outer walls, a breaker strip for closing the space between said walls, and a moisture-impervious, flexible diaphragm secured to the walls adjacent the breaker strip and spaced from the breaker strip in the assembled position of the breaker strip, the method of insulating the cabinet which comprises filling the space between the walls with heat-insulating material, placing an excess of a resilient compressible heat-insulating material adjacent said diaphragm on the breaker strip side thereof, placing said breaker strip against said resilient heat-insulating material, pressing said breaker strip into engagement with the walls of said cabinet to compress said resilient heat-insulating material and cause said resilient heat-insulating material to exert pressure on said diaphragm, and securing said breaker strip in position in engagement with said walls.

8. In the assembly of a refrigerated cabinet including spaced inner and outer walls formed to provide an access opening for the cabinet, a breaker strip for closing the space between the walls adjacent the access opening, and a moisture-impervious, flexible diaphragm engaging the walls adjacent the breaker strip and spaced from the breaker strip in the assembled position of the breaker strip, the method of insulating the cabinet which comprises arranging the cabinet with the access opening downward, filling the space between said walls with heat-insulating material, arranging the cabinet with the access opening upward, placing an excess of a resilient compressible heat-insulating material adjacent said diaphragm on the breaker strip side thereof, placing said breaker strip against said resilient heat-insulating material, pressing said breaker strip into engagement with the walls of said cabinet to compress said resilient heat-insulating material and cause said resilient heat-insulating material to exert pressure on said diaphragm, and securing said breaker strip in position in engagement with said walls.

9. In the assembly of a refrigerated cabinet including spaced inner and outer walls, a breaker strip for closing the space between said walls, and a moisture-impervious, flexible diaphragm secured to the walls adjacent the breaker strip and spaced from the breaker strip in the assembled position of the breaker strip, the method of insulating the cabinet which comprises filling the space between the walls with a heat-insulating material of the aerogel type, placing an excess of a resilient compressible heat-insulating material adjacent said diaphragm on the breaker strip side thereof, placing said breaker strip against said resilient heat-insulating material, pressing said breaker strip into engagement with the walls of said cabinet to compress said resilient heat-insulating material and cause said resilient heat-insulating material to exert pressure on said diaphragm, and securing said breaker strip in position in engagement with said walls.

10. In the assembly of a refrigerated cabinet including spaced inner and outer walls, a breaker strip for closing the space between said walls, and a moisture-impervious, flexible diaphragm engaging the walls adjacent the breaker strip and spaced from the breaker strip in the assembled position of the breaker strip, the method of insulating the cabinet which comprises filling the space between the walls with a heat-insulating

material of the aerogel type, removing the breaker strip, placing an excess of a resilient compressible heat-insulating material adjacent said diaphragm on the breaker strip side thereof, and replacing the breaker strip to compress said resilient heat-insulating material and cause said resilient heat-insulating material to exert pressure on said diaphragm.

11. In the assembly of a refrigerated cabinet including spaced inner and outer walls, a breaker strip for closing the space between said walls, and a moisture-impervious, flexible diaphragm secured to the walls adjacent the breaker strip and spaced from the breaker strip in the assembled position of the breaker strip, the method of insulating the cabinet which comprises filling the space between the diaphragm and the plane occupied by the breaker strip in the assembled position of said breaker strip with a resilient compressible heat-insulating material, closing said space with said breaker strip, and filling the space between said walls with a heat-insulating material of the aerogel type sufficient in amount to compress said first-mentioned heat-insulating material.

12. In the assembly of a refrigerated cabinet including spaced inner and outer walls formed to provide an access opening for the cabinet, a breaker strip for closing the space between the walls adjacent the access opening, and a moisture-impervious, flexible diaphragm engaging the walls adjacent the breaker strip and spaced from the breaker strip in the assembled position of the breaker strip, the method of insulating the cabinet which comprises arranging the cabinet with the access opening downward, filling the space between the walls with a heat-insulating material of the aerogel type, arranging the cabinet with the access opening upward, placing an excess of a resilient compressible heat-insulating material adjacent said diaphragm on the breaker strip side thereof, placing said breaker strip against said resilient heat-insulating material, pressing said

breaker strip into engagement with the walls of said cabinet to compress said resilient heat-insulating material and cause said resilient heat-insulating material to exert pressure on said diaphragm, and securing said breaker strip in position in engagement with said walls.

13. In the assembly of a refrigerated cabinet including spaced inner and outer walls formed to provide an access opening for the cabinet, a breaker strip for closing the space between said walls adjacent the access opening, and a moisture-impervious, flexible diaphragm secured to the walls adjacent the breaker strip and spaced from the breaker strip in the assembled position of the breaker strip, the method of insulating the cabinet which comprises arranging the cabinet with the access opening downward, filling the space between the walls with a heat-insulating material of the aerogel type, arranging the cabinet with said access opening upward, removing said breaker strip, placing an excess of a resilient compressible heat-insulating material adjacent said diaphragm on the breaker strip side thereof, and replacing said breaker strip to compress said last-named heat-insulating material and cause said resilient heat-insulating material to exert pressure on said diaphragm.

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