May 5, 1953

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2,637,530

HEAT EXCHANGE STRUCTURE

Filed April 4, 1950

Fig. 1.

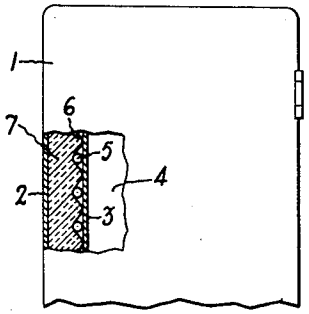
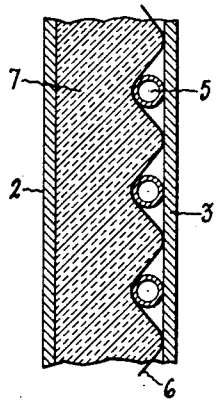



Fig. 2.

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Patented May 5, 1953

2,637,530

# UNITED STATES PATENT OFFICE

2,637,530

## HEAT EXCHANGE STRUCTURE

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Application April 4, 1950, Serial No. 153,973

8 Claims. (Cl. 257—17)

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My invention relates to a heat exchange structure and more particularly to arrangements for maintaining tubing in heat exchange relationship with a surface to or from which heat is to be transferred.

In refrigerators, a food storage compartment is frequently cooled by evaporator tubing which is secured to the exterior of the liner of the compartment. Similarly, condensers are some times constructed by employing tubing which is secured to the interior of the outer shell of the refrigerator cabinet. In either case it may be necesary at some time to remove the tubing, for example where replacement becomes necessary, and accordingly it is desirable that the tubing be easily removable and yet for efficiency, maintained in good heat exchange relationship with the wall adjacent to which it is disposed.

Accordingly it is an object of my invention to provide an improved heat exchange structure including a simplified arrangement for maintaining tubing removably in heat exchange relationship with a surface.

It is another object of my invention to provide an improved heat exchange structure employing a simplified arrangement for maintaining tubing removably in heat exchange relationship with a surface and including an element for minimizing radiation.

Further objects and advantages of my invention will become apparent as the following description 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.

In carrying out the objects of my invention, tubing through which a heat supplying or extracting medium is circulated is removably held against one wall of a spaced wall structure by an arrangement including a compressed insulating material and a second material having a surface of high reflectivity and high thermal conductivity.

For a better understanding of my invention, reference may be had to the accompanying drawing in which Fig. 1 is a view, partly in section, of a portion of a refrigerator illustrating an embodiment of my invention and Fig. 2 is an enlarged sectional view of a portion of the structure shown in Fig. 1.

Referring to the drawing, there is illustrated a refrigerator cabinet 1 which includes an outer wall or shell 2 and an inner wall or liner 3 spaced from the outer wall. The liner 3 defines a food storage compartment 4. In order to refrigerate the compartment 4, tubing 5 is arranged in

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serpentine fashion adjacent the exterior of the liner 3. Liquid refrigerant is supplied to the tubing 5 from a suitable condensing unit (not shown) and the tubing 5 provides an evaporator in which the liquid refrigerant vaporizes to refrigerate the liner 3 and to remove heat from the compartment 4.

It is necessary in order to secure a satisfactory efficiency in the operation of the system to maintain the tubing 5 in intimate heat exchange relationship with the liner 3. On the other hand, since it may at times be necessary to remove the refrigerating system including the evaporator formed by the tubing 5, it is desirable to be able to effect such removal with a minimum of difficulty. To accomplish these objectives the construction shown more clearly in Fig. 2 is employed. As shown, the tubing 5 is placed adjacent the exterior surface of the liner 3 and a flexible sheet 6 is placed against the tubing 5. This sheet is made of a material having a surface of high reflectivity and high thermal conductivity. For example, aluminum foil can be readily employed as a material for this sheet 6. Materials such as aluminum foil not only have high reflectivity but also provide a good path for heat conduction through the material itself. In order to hold the sheet 6 in heat exchange relationship with both the tubing 5 and the liner 3, a compressible hat-insulating material 7 is placed in the space between the liner 3 and the outer shell 2 of the refrigerator. The heat-insulating material 7 may, for example, be some material such as spun glass, which has a low thermal conductivity and can be compressed as indicated in Fig. 2. Materials such as spun glass have inherent resiliency so that, under compression, the heat-insulating material exerts a force against the sheet 6 pressing the sheet 6 against the tubing 5 and the liner 3 and holding the tubing firmly against the liner 3. When it is desired to remove the tubing 5, the compressed heat-insulating material 7 is removed from a space between the walls 2 and 3 and the sheet 6 and the tubing are then readily removable. Similarly a new evaporating section can be readily assembled in the field by placing the new tubing adjacent the liner, fitting the sheet 6 against the tubing, placing compressible heat-insulating material between the wall 2 and the sheet 6 and then compressing the heat-insulating material.

By the construction described above, a heat conducting path is provided from the liner 3 directly to each of the sections of the tubing 5 illustrated by direct engagement of the tubing and

the liner. A second heat-conducting path is provided from the liner to the tubing through the sheet 6, which is pressed into the heat exchange engagement with both the liner and the tubing by the compressed heat-insulating material. Heat leakage from the exterior of the refrigerator into the compartment 4 is minimized by employing a material for the sheet 6 which has a high reflectivity. Also it should be noted that the sheet 6 in being forced about the tubing 5 assumes a somewhat parabolic shape so that heat from the compartment 4 is not only transferred to the tubing through the sheet by conduction but is also radiated to the tubing, the angles of reflection of heat striking the reflecting surface of sheet 6 being such that a substantial portion of the heat so radiated from the compartment 4 is directed toward the tubing 5.

For purposes of illustration an arrangement has been shown and described in which evaporator tubing is arranged adjacent the liner of a refrigerator for cooling a food storage compartment. In cases where it is desired to employ the outer wall as a surface for facilitating dissipation of heat from the condensing portion of a refrigerator system, the same construction is employed with the exception that the tubing which forms the condenser is disposed adjacent the outer wall in the same manner as the tubing which forms the evaporator in the above-described system is disposed adjacent the inner wall or liner.

While I have shown and described a specific embodiment of my invention, I do not desire my invention to be limited to the particular structure shown and described and I intend by the appended claims to cover all modifications within the true 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 refrigerator cabinet comprising an outer wall, an inner wall spaced from said outer wall and defining a food storage compartment, refrigerant-conducting tubing disposed adjacent one of said walls in the space between said walls, and means for maintaining said tubing in heat exchange relationship with said one of said walls, said means including a continuous sheet of flexible heat-conducting material adjacent said tubing on the side of said tubing opposite said one of said walls and compressed resilient heat-insulating material in the space between said sheet and the other of said walls, said compressed resilient heat-insulating material urging said flexible heat-conducting material against said tubing and against said one of said walls to maintain said tubing in heat exchange engagement with said one of said walls and to maintain said heat-conducting material in heat exchange engagement with said tubing and with said one of said walls.

2. A refrigerator cabinet comprising an outer wall, an inner wall spaced from said outer wall and defining a food storage compartment, refrigerant-conducting tubing disposed adjacent one of said walls in the space between said walls, and means for maintaining said tubing in heat exchange relationship with said one of said walls, said means including a continuous sheet of flexible metallic material adjacent said tubing on the side of said tubing opposite said one of said walls and compressed resilient heat-insulating material in the space between said sheet and the other of said walls, said compressed resilient heat-insulating material urging said flexible metallic material against said tubing and against said one of said walls to maintain said tubing in heat exchange engagement with said one of said walls and to maintain said flexible metallic material in said exchange engagement with said tube and with said one of said walls.

3. A refrigerator cabinet comprising an outer wall, an inner wall spaced from said outer wall and defining a food storage compartment, refrigerant-conducting tubing disposed adjacent one of said walls in the space between said walls, and means for maintaining said tubing in heat exchange relationship with said one of said walls, said means including a continuous sheet of flexible heat-conducting material adjacent said tubing on the side of said tubing opposite said one of said walls and having a surface of high reflectivity and compressed resilient heat-insulating material in the space between said sheet and the other of said walls, said compressed resilient heat-insulating material urging said flexible heat-conducting material against said tubing and against said one of said walls to maintain said tubing in heat exchange engagement with said one of said walls and to maintain said metallic material of high reflectivity in heat exchange engagement with said tubing and with said one of said walls.

4. A refrigerator cabinet comprising an outer wall, an inner wall spaced from said outer wall and defining a food storage compartment, refrigerant-conducting tubing disposed adjacent one of said walls in the space between said walls, and means for maintaining said tubing in heat exchange relationship with said one of said walls, said means including a continuous sheet of flexible aluminum foil adjacent said tubing on the side of said tubing opposite said one of said walls and compressed resilient heat-insulating material in the space between said sheet and the other of said walls, said compressed resilient heat-insulating material urging said aluminum foil against said tubing and against said one of said walls to maintain said tubing in heat exchange engagement with said one of said walls and to maintain said aluminum foil in heat exchange engagement with said tubing and with said one of said walls.

5. A refrigerator cabinet comprising an outer wall, an inner wall spaced from said outer wall and defining a food storage compartment, means for cooling said compartment including tubing disposed adjacent the exterior of said inner wall, and means for maintaining said tubing in heat exchange relationship with said inner wall, said means comprising a continuous sheet of flexible heat-conducting material adjacent said tubing on the side of said tubing opposite said inner wall and compressed resilient heat-insulating material in the space between said sheet and said outer wall, said compressed resilient heat-insulating material urging said flexible heat-conducting material against said tubing and against said inner wall to maintain said tubing in heat exchange engagement with said inner wall and to maintain said flexible heat-conducting material in heat exchange engagement with said tubing and with said inner wall.

6. A refrigerator cabinet comprising an outer wall, an inner wall spaced from said outer wall and defining a food storage compartment, means for cooling said compartment including tubing disposed adjacent the exterior of said inner wall, and means for maintaining said tubing in heat exchange relationship with said inner wall, said means comprising a continuous sheet of flexible

metallic material adjacent said tubing on the side of said tubing opposite said inner wall and compressed resilient heat-insulating material in the space between said sheet and said outer wall, said compressed resilient heat-insulating material urging said flexible metallic material against said tubing and against said inner wall to maintain said tubing in heat exchange engagement with said inner wall and to maintain said flexible metallic material in heat exchange engagement with said tubing and with said inner wall.

7. A refrigerator cabinet comprising an outer wall, an inner wall spaced from said outer wall and defining a food storage compartment, means for cooling said compartment including tubing disposed adjacent the exterior of said inner wall, and means for maintaining said tubing in heat exchange relationship with said inner wall, said means comprising a continuous sheet of flexible heat-conducting material adjacent said tubing on the side of said tubing opposite said inner wall and having a surface of high reflectivity and compressed resilient heat-insulating material in the space between said sheet and said outer wall, said compressed resilient heat-insulating material urging said flexible material against said tubing and against said inner wall to maintain said tubing in heat exchange engagement with said inner wall and to maintain said flexible material in heat exchange engagement with said tubing and with said inner wall.

8. A refrigerator cabinet comprising an outer wall, an inner wall spaced from said outer wall and defining a food storage compartment, means



for cooling said compartment including tubing disposed adjacent the exterior of said inner wall, and means for maintaining said tubing in heat exchange relationship with said inner wall, said means comprising a continuous sheet of flexible aluminum foil adjacent said tubing on the side of said tubing opposite said inner wall and compressed resilient heat-insulating material in the space between said sheet and said outer wall, said compressed resilient heat-insulating material urging said flexible aluminum foil against said tubing and against said inner wall to maintain said tubing in heat exchange engagement with said inner wall and to maintain said flexible aluminum foil in heat exchange engagement with said tubing and with said inner wall.

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