March 15, 1966 C. H. WURTZ 3,240,029

REFRIGERATOR CABINETS AND INSULATION THEREOF

Original Filed March 9, 1964 2 Sheets-Sheet 1

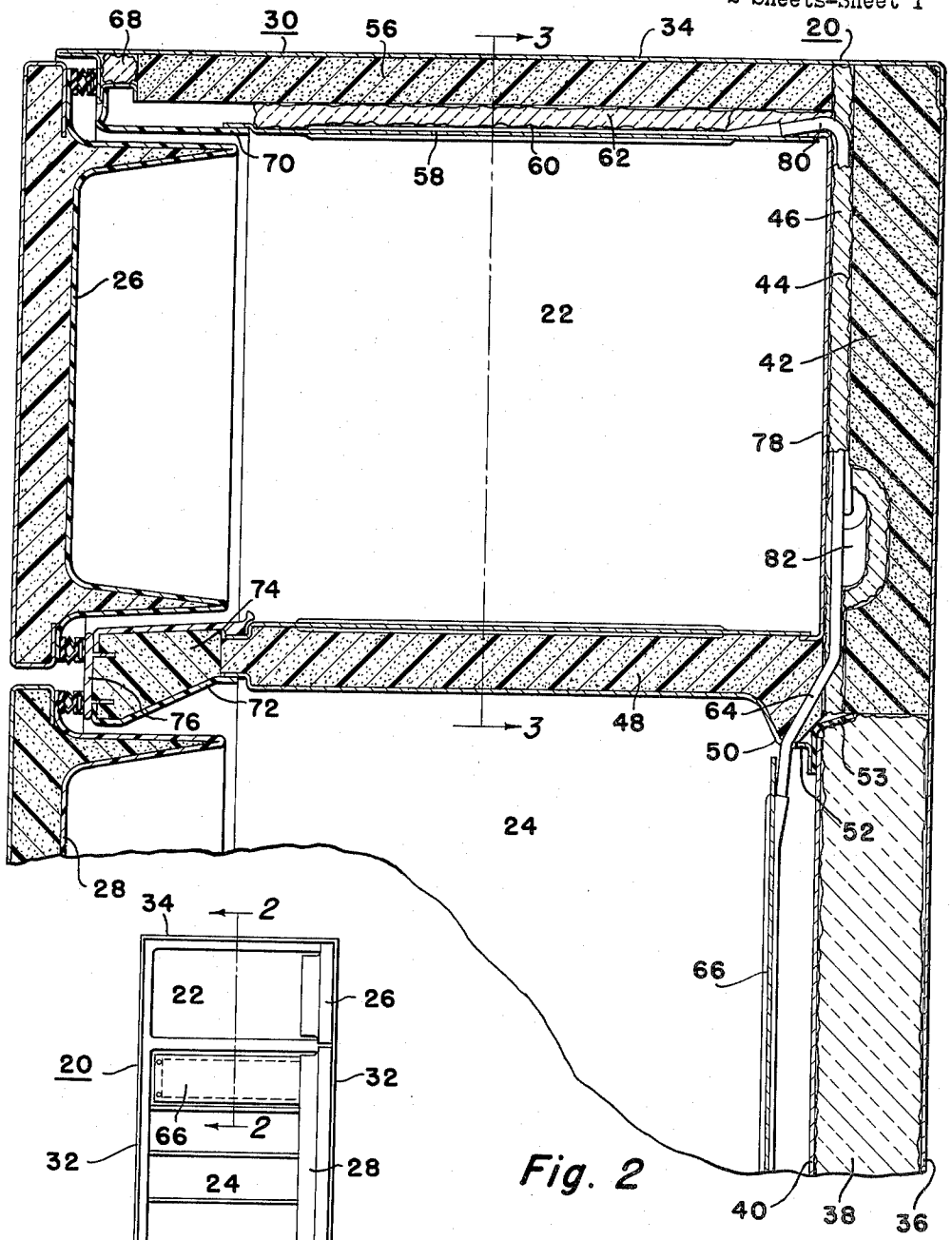

Fig. 2

Fig. 1

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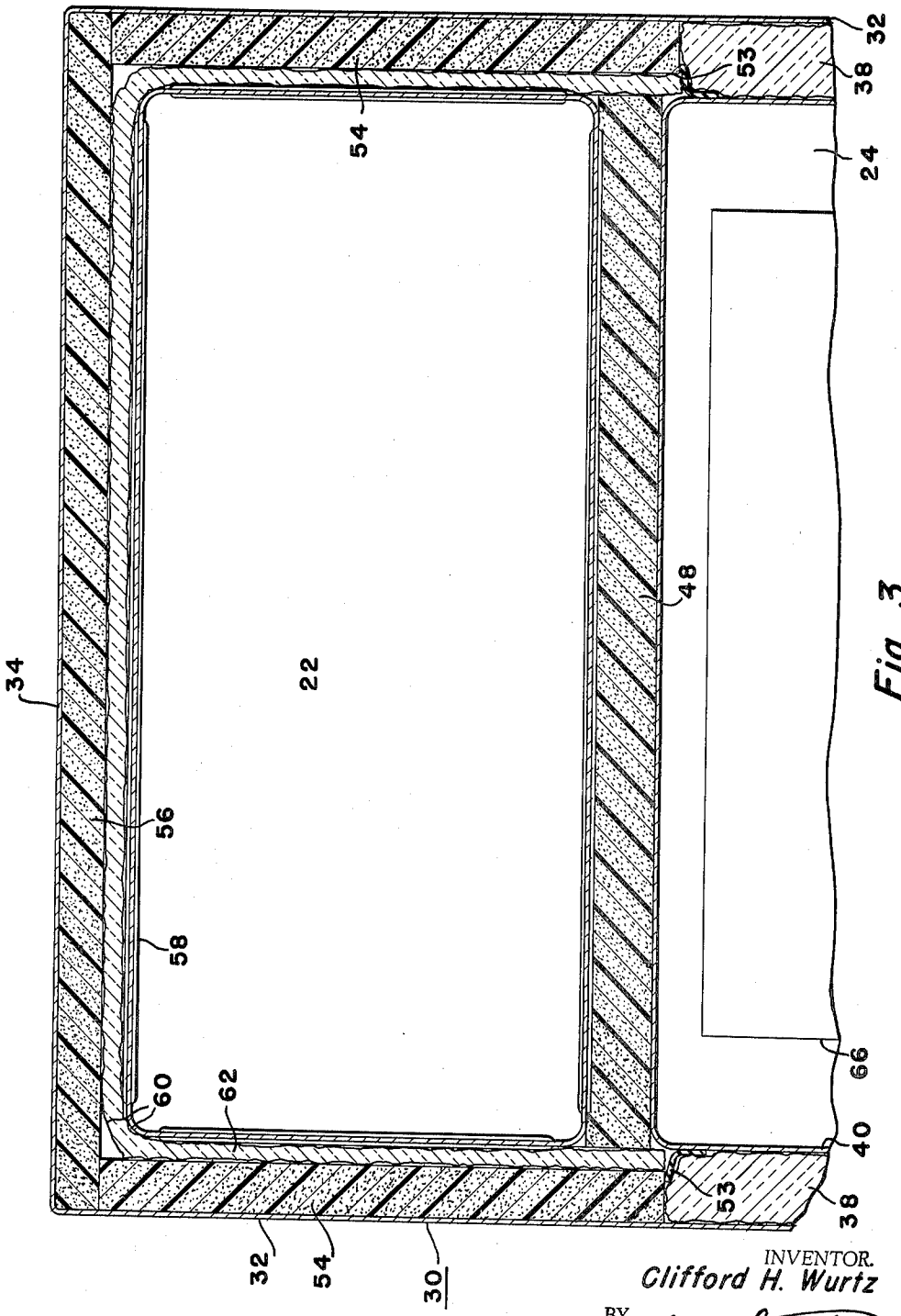

Fig. 3

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REFRIGERATOR CABINETS AND INSULATION THEREOF

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Continuation of application Ser. No. 350,468, Mar. 9, 1964. This application May 4, 1964, Ser. No. 364,744

3 Claims. (Cl. 62—273)

This application is a continuation of my co-pending application Serial No. 350,468 filed March 9, 1964, now abandoned.

This invention pertains to refrigerating apparatus and more particularly to refrigerator cabinets and the insulation thereof.

When a substantially rigid or semi-rigid foam type insulation is used for refrigerator cabinets, because of this rigidity there is difficulty in removing parts of the refrigerator and particularly parts of the refrigerating system which are located in or alongside the insulation from the cabinet for inspection or repair. Patent 3,078,003 does show an arrangement in which a polyethylene sheeting surrounds an inner liner for preventing adherence of the foam insulation to the inner liner, but unless a tapered arrangement is used there is a possibility of binding between the foam and the liner. Also, this arrangement does not allow removal where the part to be removed, such as an evaporator, has an irregular surface. Any irregularities of the part to be removed may be interlocked with the foam or the foam may have obstructions thereon which obstruct the removal of the part through interference with projections on the part.

It is therefore an object of this invention to provide an efficient insulating arrangement in which rigid or semi-rigid foam insulation can be efficiently used which provides for the easy removal of parts of the refrigerating system such as the evaporator from the cabinet without any possibility of binding.

It is another object of this invention to provide an insulating arrangement for a refrigerator cabinet which surrounds the evaporator with slab foamed insulation of high insulating value which provides for the convenient removal of the evaporator without damaging the foam insulation.

The penetration of moisture into the insulation spaces of refrigerated cabinets has always been a difficult problem because it is difficult and practically impossible to provide a perfect seal or a seal which will keep moisture vapor out of the insulation space. The solution most often used is to attempt to seal the outer walls as completely as possible and to allow the inner walls to leak. However, this arrangement still permits moisture from the interior of the refrigerator cabinet to penetrate the insulation spaces. Where a sufficiently cold surface is exposed in the insulation space, the moisture vapor will condense to a liquid and depending on temperature will freeze thereon and then become a problem when the refrigerator is defrosted or shut down.

Where a cold surface vulnerable to corrosion, such as aluminum, is contacted by insulation in the insulation space, which may contribute to its corrosion this penetration of moisture may cause corrosion of the aluminum surfaces according to the corrosive contribution or action of the insulation. This may occur when polyurethane foam of especially high insulating value, such as when blown by a halohydrocarbon gas, is in contact with the cold aluminum surface. The halohydrocarbon may adhere to the surface and in the presence of the moisture vapor and the aluminum may form a halogen acid with the aluminum apparently acting as a catalyst. The halogen acid such as hydrochloric, if formed, attacks and severely corrodes the aluminum. Where the aluminum forms a refrigerant evaporator container, and especially where the aluminum has been stretched in the roll bonding process, this corrosion may be sufficiently deep to cause leakage.

It is another object of this invention to provide an insulating arrangement for a refrigerator cabinet which provides a corrosion preventing barrier between the insulation and the freezing surface exposed in the insulation space.

It is another object of this invention to provide an insulating arrangement for a refrigerator cabinet which surrounds the evaporator with slab foam insulation of high insulating value and especially minimizes the freezing of moisture between the foam insulating slabs and the freezing surfaces of the evaporator exposed in the insulation space and provides for the removal and escape of the frozen moisture upon defrosting and melting.

These and other objects are attained in the form shown in the drawings in which the outer sheet metal shell is provided with insulation in the form of glass fibers around the lower portion of the sides, back, and bottom surrounding the sheet metal inner liner of the above freezing compartment. To provide superior insulation for the below freezing compartment, foam insulation slabs are provided for the upper portion of the back, side and top walls. The below freezing compartment is enclosed by a box-shaped sheet metal evaporator which is made readily insertable and removable inside of the foam insulation slabs by being surrounded by bags of flexible plastic resin sheet containing a layer of glass fiber insulation. The flexibility and resiliency of the bags of glass fiber insulation facilitates the ready insertion and removal of the sheet metal evaporator. The bags containing the glass fiber insulation also serve to prevent corrosion between the foam slabs and the outer surface of the sheet metal evaporator when moisture penetrates the insulation space. Any moisture freezing on the outer surface of the evaporator which melts during the defrost period will be permitted to drain by the bags of glass fiber insulation through a suitable drainage system.

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 embodiment of the present invention is clearly shown.

In the drawings:

FIGURE 1 is a front view of a two-compartment refrigerator embodying one form of my invention.

FIGURE 2 is a fragmentary vertical sectional view taken along the line 2—2 of FIGURE 1 and

FIGURE 3 is a fragmentary vertical sectional view taken along the line 3—3 of FIGURE 2.

Referring now more particularly to the drawings, there is shown in FIGURE 1 a two-compartment refrigerator cabinet 20 having an upper below freezing compartment 22 and a lower above freezing compartment 24 which are closed respectively by the upper and lower doors 26 and 28. The refrigerator includes an outer metal shell 30 provided with side walls 32, a top wall 34, and a back wall 36.

In the assembly of the refrigerator cabinet, insulation is first placed on the bottom and the lower portions of the side and back walls. This insulation may be in the form of bats 38 of glass fibers. After this, the box-shaped inner liner 40 may be inserted into the cabinet. A slab 42 of polyurethane foam is then placed against the rear wall 36 above the rear bat of glass fiber insulation 38 as shown in FIGURE 2. In front of this bat 42 is placed a sealed bag 44 containing a layer 46 of glass fiber insulation. This bag 44 may be made of any suitable

plastic resin such as polyethylene, polyvinylidenechloride or copolymers of vinylchloride and other suitable resins. This bag 44 containing the layer of fiber glass insulation 46 extends substantially from the top of the bat of glass fiber insulation 38 to the top wall 34 of the cabinet substantially coextensive with the front face of the slab 42.

On top of the inner liner 40 there is placed a slab 48 of a polystyrene foam insulation. This slab 48 does not have as high an insulating value as the slab 42 but it does not have any possibility of corrosion like the slab 42. The slab 48 is not required to have as high an insulating value since it merely serves as a barrier between the below freezing compartment 22 and the above freezing compartment 24. This slab 48 may have passages leading to a drain trough 50 formed around the upper edges of the inner liner 40. This drain trough 50 may have one or more drain holes 52 draining into the interior of the liner 40 in the compartment 24 for disposal. If desired, a bag similar to the bag 44 containing glass fiber insulation may be substituted for the slab 48. Also, if desired, a slab of polyurethane foam similar to the slab 42 may be placed beneath such a substituted bag.

At the sides above the glass fiber insulation 38 are provided slabs 54 of polyurethane foam. Resting upon top of these slabs 54 is a slab 56 of similar polyurethane foam coextensive with the top wall 34. The polyurethane foam used for the slabs 42, 54, and 56 is preferably blown by a halogen substituted hydrocarbon such as trichioromonofluoromethane or dichloridifluoromethane. The halogen substituted hydrocarbon is substantially permanently retained in the cells of the polyurethane foam providing superior insulating qualities. After this the sheet metal evaporator 58, covered by a sealed polyethylene bag 60 containing a layer 62 of glass fiber insulation extending across the top and down the sides, is introduced into the space between the slabs 48, 56, and the slabs 54. The evaporator 58 may be similar to the evaporator shown in Patents Nos. 2,712,726 issued July 12, 1955 or 2,863,303 issued Dec. 9, 1958. The glass fiber insulation 62 has sufficient resiliency to press against the slabs 54 and 56 to hold them against the outer shell 30 so as to minimize the occurrence of voids in the insulation. The sealed bag 60 may be taped to the evaporator 58 during the installation. However, this tape may be later removed. The evaporator 58 is preferably made of roll bonded aluminum expanded to provide refrigerant passages and is connected by refrigerant tubing 64 with a refrigerated plate 66 in the above freezing compartment 24. The plate 66 is connected in series with the avaporator 58 in a system such as is more fully described in Patent No. 2,672,027 issued Mar. 16, 1954.

A strip 68 of glass fiber insulation is located in front of the slabs 54 and 56 as shown in FIGURE 2. This may be inserted prior to the insertion of the slabs 54 and 56. The assembly of the cabinet is completed by the installation of the breaker strips 70 at the front of the below freezing compartment 22 and the installation of the breaker strips 72 at the front of the above freezing compartment 24. Between the breaker strips 70 and 72 there is provided a piece 74 of molded polyurethane foam insulation, at the front of which there is provided a trim strip 76. In this cabinet the sealed bags 44 and 60 containing each a layer of glass fiber insulation effectively prevent contact between the slabs 42, 54, and 56 of polyurethane foam insulation with the evaporator 58 so that corrosion of the outer surface in the evaporator 58 is prevented. The sealed bag 44 extends outwardly between the slab 42 and the 54 and 56 to the outer shell 30 to prevent a void or open space in the insulation. The outer shell 30 is preferably sealed against the penetration of moisture from the outside so that only the more dry air within the cabinet is permitted to leak into the insulation spaces surrounding the evaporator 58 and the inner liner 40. The moisture vapor penetrating the insulation spaces will pass only very slowly through the foam insulation slabs and the sealed bags 44 and 60 to the outer surface of the evaporator 58. Because the bags 44 and 60 are pressed against the outer surface of the evaporator 58 and its back wall 78, very little moisture can freeze onto these surfaces.

Any moisture which does freeze onto these surfaces will melt during a shutdown of the refrigerator. The inner liner 40 adjacent its upper side and rear edges is provided with an upwardly and outwardly extending flange 53 beneath the bottoms of the sealed bags forming a drain lip. This melted ice or frost will run down the outer surface of these bags onto the flange 53 and thence to the trough 50 and be drained through the aperture 52 into the interior of the compartment 24 for disposal. Through this arrangement the below freezing compartment can be provided with a superior insulation without the danger of serious corrosion or water logging of the insulation. By preventing interference and interlocking between the foam slabs 54, 56 and the evaporator 58, the flexible sealed bags 44 and 60 also make it possible for the evaporator 58 to be readily removed without any binding. The sealed bag 44 has sufficient resiliency to cover any projecting refrigerant conduits such as the conduit 80 and the accumulator 82 and to prevent any interference with the removal of the evaporator 58. Normally the sealed bag 60 will be removed along with the evaporator 58 after the removal of the breaker strips 70.

While the embodiment of the present invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted.

What is claimed is as follows:

1. A refrigerator including a cabinet having outer walls, slabs of foam insulation lining said outer walls, a metal container located within said outer walls, means for cooling said metal container, means for preventing the corrosion of said container by said foam insulation and for holding said slabs of insulation against said outer walls comprising a thin flexible walled sealed bag of plastic resin containing throughout a layer of fibrous resilient insulating material extending between said container and said slabs having sufficient resiliency to hold said slabs against said outer walls.

2. A refrigerator including a cabinet having outer walls, a removable metal container within said outer walls, means for cooling said container below water freezing temperatures, slabs of foam insulation between said metal container and said outer walls, and means providing for easy removal of said container without binding comprising removable resilient means for separating said slabs and said container constituting thin flexible walled sealed bag means of plastic resin containing a layer of resilient fibrous insulating material extending over the top and sides of said container having sufficient resiliency to hold said slabs against said outer walls for minimizing the panetration of moisture onto said container.

3. A refrigerator including a cabinet having outer walls, a lower container located within said walls, a slab of polystyrene foam resting on top of said lower container, fibrous insulating material located between the sides of said lower container and the outer walls, a removable upper metal container located above said slab of polystyrene foam, means for cooling said upper container below water freezing temperatures, slabs of polyurethane foam insulation extending above said fibrous insulating material between the sides and top of said upper container and said outer walls comprising a top slab resting upon the tops of said side slabs, removable resilient means for separating said slabs of polyurethane foam insulation and said upper container for preventing binding therebetween comprising thin flexible walled sealed bag means of plastic resin containing a layer of resilient fibrous in-

sulating material extending over the top and sides of said upper container between said upper container and said slabs having sufficient resiliency to hold said slabs of polyurethane foam against said outer walls.

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