

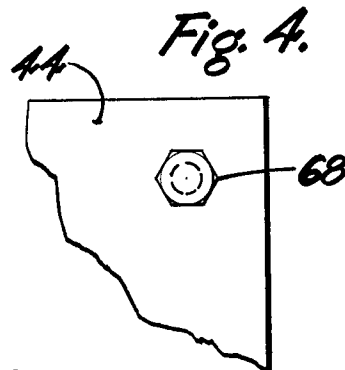
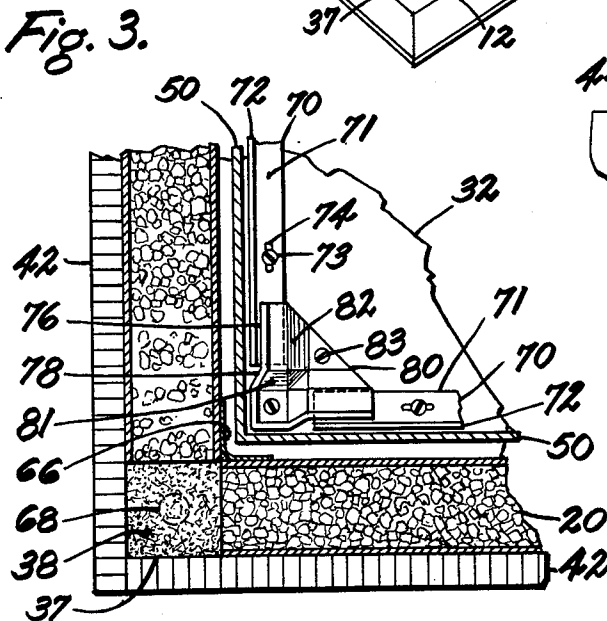
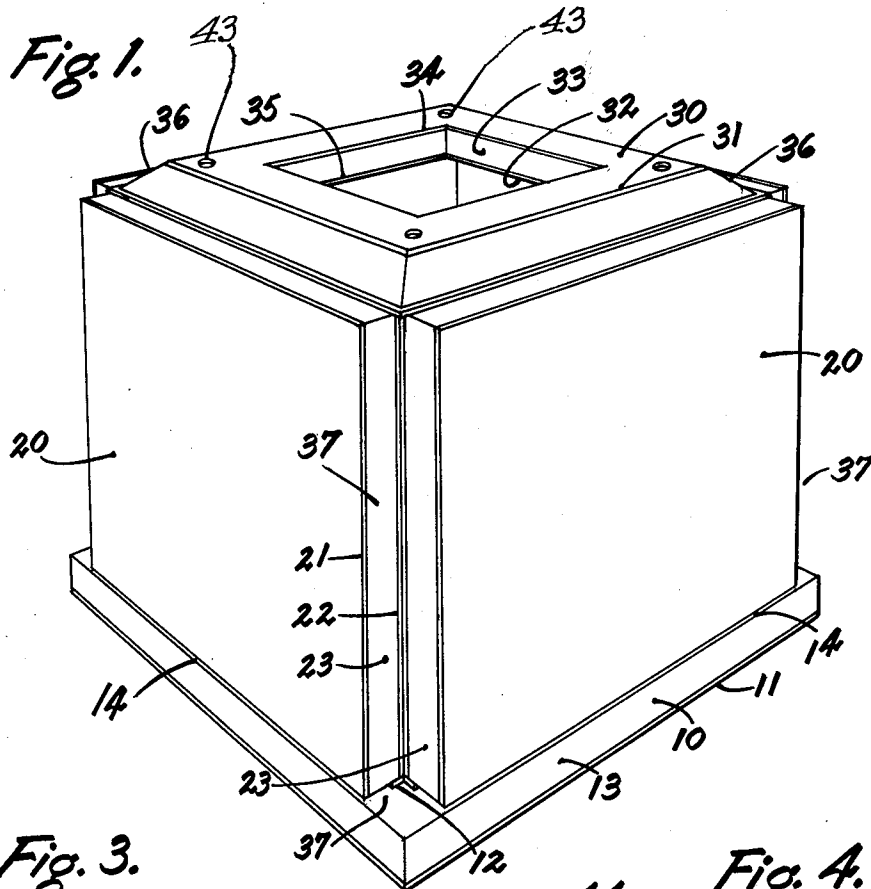
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W. L. MORRISON
SHIPPER CONTAINER

3,074,586

Filed Oct. 30, 1958

3 Sheets-Sheet 1



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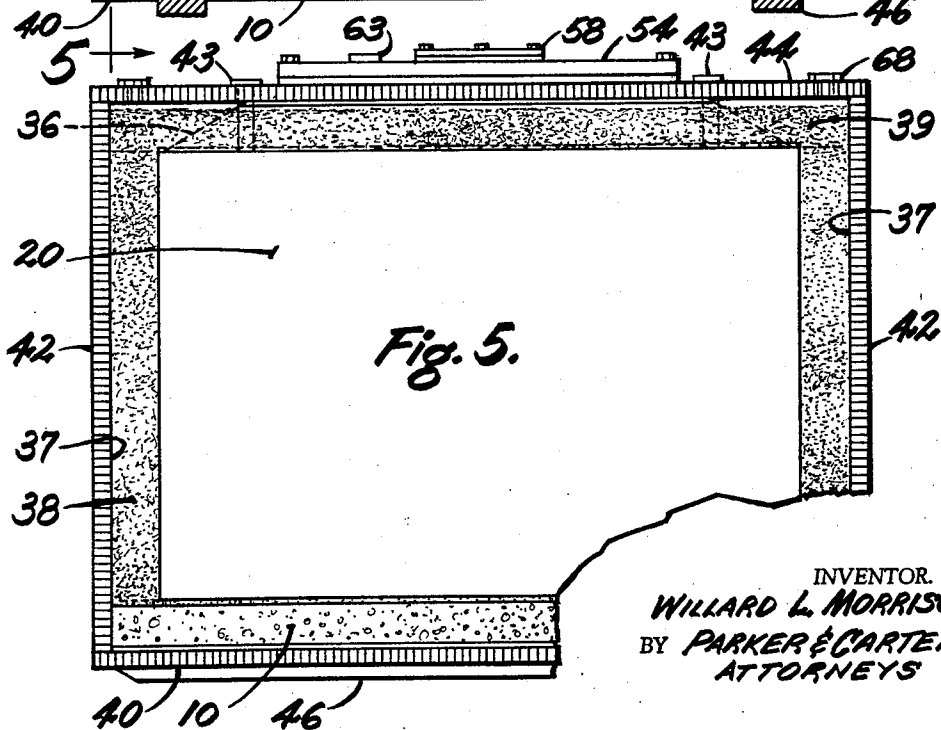
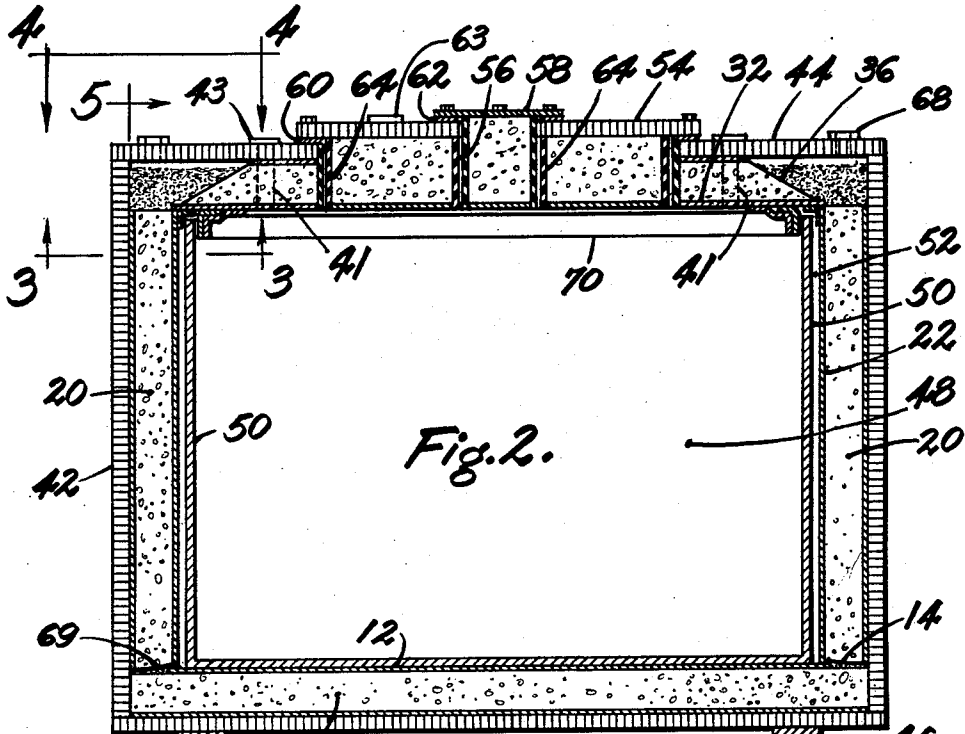
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SHIPPER CONTAINER

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3 Sheets-Sheet 2



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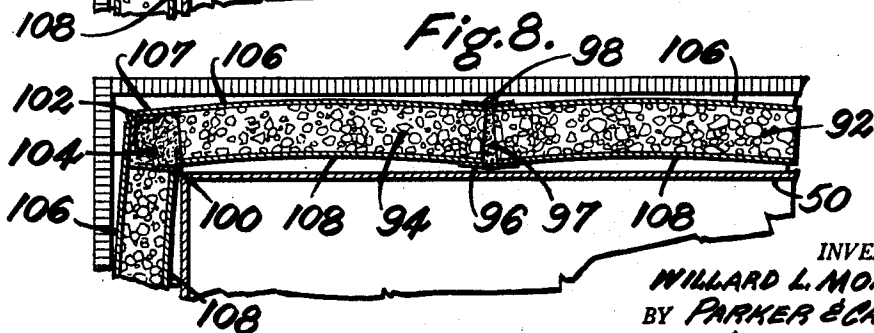
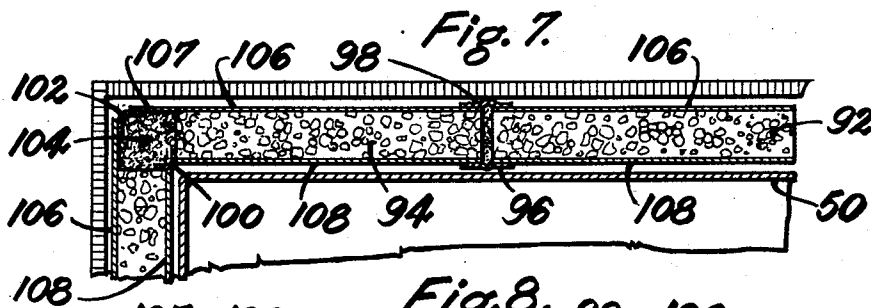
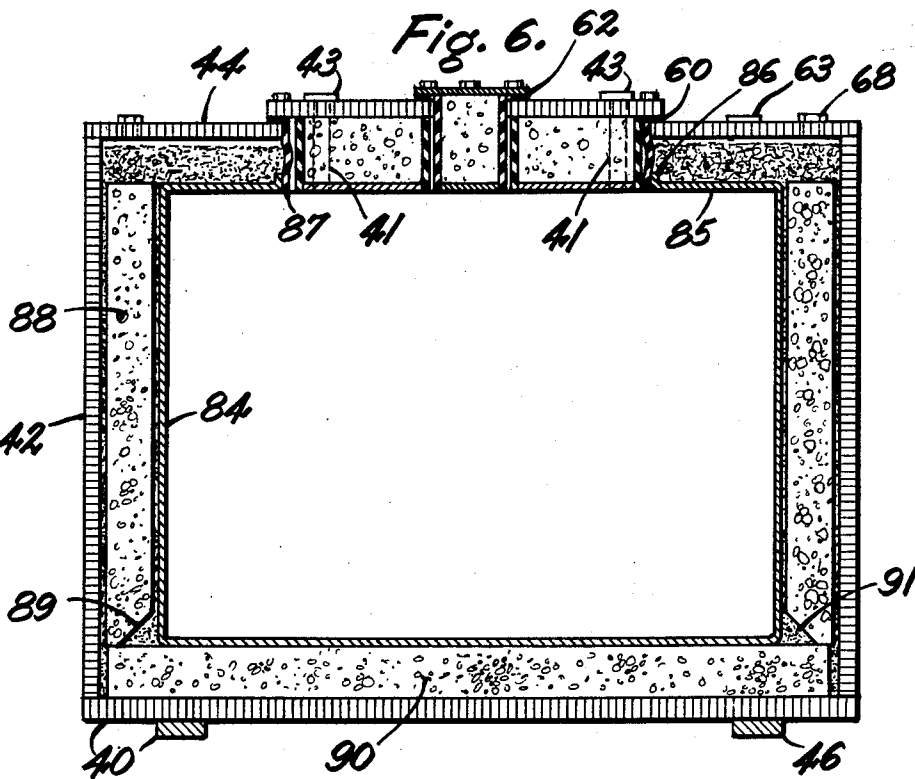
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SHIPPER CONTAINER

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3 Sheets-Sheet 3



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3,074,586

SHIPPER CONTAINER

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3 Claims. (Cl. 220-9)

This invention resides in the container field and relates specifically to containers for shipping perishable goods.

Accordingly, a primary object of the invention is to provide a strong, durable shipper container which may be assembled from a minimum of component parts.

Another object is to provide a shipper container having an insulating shell formed of separate panels of insulation with a built-in reservoir of flowable insulating material which will fill in and later may be extruded from spaces created by the contraction of the panels to prevent formation of any heat transference paths.

Another object is to provide a shipper container having an outer shell that encloses a floating interliner and a deflector for directing a cooling fluid into the floating interliner and around the perishable goods therein.

Another object is to provide a deflector structure for directing a cooling fluid into a storage container, the deflector being self-adjusting so as to expand and contract in response to temperature differentials within the container.

Another object is to provide a shipper container having a cover fitting within a loading aperture, the complementary surfaces of the cover and container being lined with a resilient material to minimize the damage caused by rough handling and to permit contraction and expansion of the surfaces to which the material is anchored in response to temperature differentials.

Other objects and advantages of the invention will become apparent from the following description taken in connection with the accompanying drawings wherein by way of illustration and example certain embodiments of the invention are set forth.

FIGURE 1 is a perspective view of one form of shipper container with the exterior protective walls removed;

FIGURE 2 is a sectional view of the shipper container showing the exterior protective walls and the floating interliner in place;

FIGURE 3 is a partial sectional view on an enlarged scale taken along the line 3-3 of FIGURE 2;

FIGURE 4 is a partial plan view on an enlarged scale taken along the line 4-4 of FIGURE 2;

FIGURE 5 is a partial sectional view taken along the line 5-5 of FIGURE 2;

FIGURE 6 is a sectional view of a modification of the invention;

FIGURE 7 is a partial sectional view showing a modification of the wall construction before the contents of the container are chilled; and

FIGURE 8 is a view of the modification of FIGURE 7 showing insulating slabs warped by the cold container contents.

Referring now to the drawings, and more particularly to FIGURE 1, a perspective view of the shipper container without the outer protective wall is shown as including a bottom wall 10, side walls 20 and top wall 30. The bottom walls include a pair of substantially parallel plates 11 and 12 with insulating material 13 therebetween. Top plate 12 has been cut back at the corners to avoid a high heat bridge, and terminates short of the edges of the insulating slab 13 as best seen in FIGURES 1 and 2. A void space or clearance 14 is thereby formed about the periphery of the junction of the bottom of the side walls and the top of the bottom wall. Side walls 20 include a pair of substantially par-

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allel flat side plates 21 and 22, and a layer or slab of insulating material 23 therebetween, and top wall 30 similarly is composed of a pair of upper and lower plates 31 and 32 and insulating material 33. This combination of a pair of plates with an insulating material between forms a sandwich type construction.

The composite walls may be formed of any suitable materials. In one embodiment an insulating material such as dylite, which is a polymerized vinyl benzene with a foaming agent, may be bonded to presswood boards.

Each of the top wall plates 31 and 32 has a central aperture, indicated at 34 and 35 respectively, of substantially equal dimensions so that when assembled the apertures are in alignment. The external dimensions of upper plate 31 are less than the external dimensions of the lower plate 32 so that the edges of the insulating slab 33 are inclined as indicated at 36. A plurality of apertures are indicated at 43 to permit insertion of a liquid refrigerant such as nitrogen at atmospheric pressure. Any suitable number of holes located in suitable areas may be utilized, and the number and position shown is illustrative only.

The side walls 20 and bottom wall 10 may be of substantially equal dimensions in order to take advantage of stock material and may be assembled in overlapping relationship. Alternately, as shown in FIGURE 1, the side walls may be assembled edge to edge to thereby leave a space 37 at each corner. The corner space 37 is in communication with the peripheral void space 14 so that loose granular insulating material in the corner spaces may flow along the top of the bottom wall. It will be understood that the exact details of construction of the bottom, top and side walls may be varied widely without departing from the essential scope or spirit of the invention and the two plate construction shown is illustrative only.

Referring now to FIGURE 2, an assembled shipper container is shown in section including a floating interliner and outer walls which form a protective shell. The insulated bottom, side and top are enclosed by the comparatively rigid protecting and supporting walls 40, 42 and 44. Feet 46 raises the entire box for shipping and handling purposes.

A storage compartment or chamber 48 is formed by the insulating walls and a floating liner 50 is loosely received therein. The upper edges of the liner terminate a short distance below the lower plate 32 and a clearance 52 is provided between the sides of the liner and inner plates 22. The spacing between the outer walls and the liner is such that no close tolerances are needed in the erecting of the parts and under all circumstances the liner and the insulation are free to warp and to expand and contract responsive to changes of relative temperatures of the elements. This substantial clearance is emphasized at 52 in FIGURE 2. The liner is liquid tight, whereas the insulating walls may not be liquid tight.

A removable cover 54 closes the aperture in the top wall. The cover may be essentially a composite structure similar to the walls. A center aperture 56 in the cover and a center plug 58 having upper and lower plates and insulating material therebetween are loosely received within the center aperture. Gaskets 60 and 62 make a tight connection between the cover and top wall. The vertical edges of the apertures in the top wall plates and insulating material, cover, and plug, are formed of resilient material 64 such as wool pile carpet or other yieldable material which may be bonded, cemented or otherwise suitably joined to the upper and lower plates. A pressure relief device such as a weighted flapper safety valve 63 is located on the cover. The valve could be in the cover or in the top wall 44, but since the particular

location and structure are not essential to an understanding of the invention, it is not further described.

In FIGURES 2 and 3, a corner construction including the insulating material reservoirs is shown in detail. Side walls 20, 20 are joined by an L channel Teflon seal 66 which holds the walls in rigid relationship and prevents leakage of the loose, flowable granular insulating material 38 at the wall junction. Any suitable insulating material in granular form, for example santocel, a silica aerogel having a high silicon dioxide content, and which under gravity will flow down stream and under pressure will flow up stream, may be used. A plurality of filler plugs are indicated at 63 for supplying or replenishing the supply of granular insulating material particles if or when needed.

FIGURE 5 shows the flowable granular insulating material which fills in around the edges of the sandwich type walls. The material 38 forms a vertical column in the corner spaces 37 and also fills the reservoir area 39 formed by the top of the side walls, inclined surfaces 36 of the top wall, and the exterior supporting shell walls 42 and 44. In FIGURE 5, the flowable material has settled slightly and a void space has opened beneath the upper supporting shell wall 44. If it is decided to fill in this space, filler plugs 68 may be removed, additional granular material may flow in either by gravity or under pressure, and the plugs replaced. The flowable material is of such a nature that it will flow longitudinally or horizontally as void spaces open up or contract in response to temperature differentials.

When fluid refrigerant is introduced into the container through any suitable apparatus, the interliner 50 contracts initially and then the inner surface of the walls 20. The outer surface of the walls may be substantially unaffected, and the result is a curling of the wall. The discrete particles of granular insulating material stored in the corner spaces 37 flow horizontally along the top of insulation 13 as the clearance 14 opens to prevent formation of heat transfer paths. The space between the top of the composite side walls 20, sloping surface 36 of the composite top wall, and the exterior structural frame work 42, 44 forms a reservoir for the granular insulating material. As it settles and flows along the upper surface of insulation 13, filler plugs 68 may if necessary be removed and additional material poured in.

A deflector structure extends around the upper periphery of the chamber and is inwardly spaced therefrom so as to form a substantially continuous skirt within the floating interliner. In the embodiment shown in FIGURES 2 and 3, the skirt consists of a plurality of angle members 70 which extend continuously along the walls. One flange 71 of the angles lies flush against the lower plate 32 of the top wall, and depending flange 72 extends inside the floating interliner. The angles are suspended by a series of bolts 73 extending through slots 74 in flange 71. The bolts should be snug but not tight so that the angles may freely expand and contract in response to temperature differentials within the chamber.

A generally triangular shaped corner bracket maintains the substantially continuous surface of the skirt at the corners. Although the details of this corner bracket may vary widely it is shown in FIGURES 2 and 3 as including a pair of depending legs 76 which are offset as at 78 to receive the depending flanges 72 of the angles. A web portion 80 which is also offset as at 81 and 82 to receive the upper flanges 71 of the angles is secured to the lower plate 32 of the upper wall by bolts 83. The offset portions of the corner bracket are so dimensioned that there will be a close sliding fit between the depending flanges and the legs and web of the bracket.

A modification of the invention is shown in FIGURE 6. In this instance, the surface plates on the walls have been eliminated and slabs of insulating material 88 form the chamber within which the interliner 84 is received.

The liner in this instance includes an inwardly extending top portion 85 which terminates in an upturned flange 86 forming a cover aperture. The junction between the top portion 85 and the vertical portions of the liner are liquid tight so that no deflector is needed to direct the fluid refrigerant into the box. The internal vertical edges of the cover aperture are faced with a layer of resilient or yieldable material 87. The material permits the upturned flange 86 to contract downwardly and is shown with a wavy contour to indicate that the vertical position of the flange can vary. The material may have somewhat more expansion and contraction capacity than that used in the construction of FIGURE 2.

In this embodiment the composite top wall has been entirely eliminated and the entire space above the top surface 85 of the interliner forms a reservoir for discrete particles of flowable insulating material. The lower inner corners of the slabs of insulating material 88 have been cut away as at 89 to form a triangularly shaped space 91 which aids the flow of flowable insulating material along the top of bottom slab 90. In addition, the hard surfaces of the walls and the Teflon seals have been eliminated since the interliner and exterior supporting walls 40, 42 and 44 have sufficient structural strength to maintain the shape of the container and protect the insulating slabs from damage.

In FIGURES 7 and 8, a modification of the insulating wall construction is illustrated. In this instance the wall has not been formed of a solid continuous sandwich type panel as indicated at 10 and 20 in FIGURE 2, but is formed by a plurality of slabs 92 and 94 which are joined by seals 96 and 98 at their abutting edges. Similar seals 100 and 102 may be used at the corner junctions to form a vertical chamber for loose flowable insulation material 104. The exterior plates 106 have been extended as at 107 beyond the interior plates 108 to form, with the corner seals 100, 102, the vertical chamber.

In FIGURE 7, the wall is shown in an ambient temperature condition. The seals 96, 98, 100, 102 and plates 108, 106 are in a non-flexed condition. In FIGURE 8 the walls are shown in a super chilled condition such as would exist when fluid refrigerant is admitted into the liner 50 in chamber 48. The mid-portions of the individual wall slabs are warped outwardly which results in a tensioning or straightening of the inner mid-wall seals 96 and compression of the exterior mid-wall seals 98. Similarly, the inner end wall seal 100 will be slightly tensioned and the exterior end wall seal 102 will be compressed. Flowable material from any suitable source such as the reservoir indicated at 39 in FIGURE 5, will fill in the changing voids 97 and 104 between the abutting edges of the wall slabs.

It should be understood that the showing of FIGURE 8 is exaggerated for purposes of illustration and that the actual displacement of the walls will be substantially less.

The use and operation of the invention is as follows:

There has long been a need for an inexpensive, rugged, large capacity shipping container capable of holding perishable goods such as frozen foods during long hauls to market. With the increasing use of quick freezing the problem has become intensified because it is difficult to maintain perishable goods in a frozen condition. A recently developed process for freezing and shipping foods utilizes the cooling capacity of liquid gases, such as liquid nitrogen, to quickly freeze perishable foodstuffs.

The deflector structure because of the depending flanges 72 acts as a skirt to direct the fluid downwardly into the floating liner. With the inwardly extending flanges 71 in snug engagement with the lower plate 32, it will be practically impossible for the freezing fluid to find its way between these flanges and the plate.

It not infrequently happens that the temperature within the chamber of the shipping container varies considerably over the course of shipping. It takes four to ten days for frozen foods packed in California to reach New

York for example, and during that time the temperature inside the chamber will gradually rise. This temperature differential results in expansion and contraction of the parts within the chamber. The shipper container is so constructed that the floating liner is of a slightly smaller dimension in all directions than the interior plates of the side, top and bottom walls so that it may expand and contract at will. Similarly, the masking strips 70 are slightly inwardly spaced from the upper peripheral edges of the liner to permit contraction of the liner without interference with the masking strip, and the strips themselves are mounted with bolt and slot arrangements to permit their movement relative to the surface to which they are attached.

If the pressure build-up within the chamber becomes too great due to the expansion of the coolant the safety valve 63 will open to reduce the pressure to a predetermined value. The valve permits outward breathing only and forms in effect a uni-directional seal.

As shown in FIGURE 3, the side masking strips or angles 70 have upper flanges 71 and the corner brackets have upper webs which lie substantially flush along the lower surface of the top wall plate to thereby prevent the freezing fluid from seeping around the ends of the masking strips.

By eliminating those portions of the top plates 12 of the bottom wall 10 which coincide with the open spaces 37 at the corner junctions, a path of low resistance to heat flow is eliminated since the presswood, plywood or metal plate 12 will conduct heat much faster than the foamed in place insulating material 13.

As the chamber formed by the top, side and bottom walls cools down, an uneven rate of contraction between the interior and exterior surfaces of the walls will occur. This results in a curling action which increases the voids indicated at 14 and 91. By filling the empty corner spaces 37 with discrete particles of flowable insulating material, the voids are automatically filled. The space above the slanting surface 36 or the top surface 85 acts as a compensating reservoir which fills in the voids 37 that are formed at the junction of the insulating walls. The corner seals 66 prevent leakage of insulating particles at the junctions of the walls.

The triple layer construction of side, top and bottom walls permits rough handling of the shipper container and its cargo. The parts are rugged and easily assembled because the only joints that must be liquid tight are those of the floating liner.

In addition, the removable wearing parts have been cushioned with a resilient or yieldable material to permit rough handling without deformation of the mating surfaces. In the modification shown in FIGURE 2 for example, all of the vertical edges of the cover and cover plug have been faced down to the bottom edges.

The upwardly extending lip 86 of FIGURE 6 provides a better seating surface for the resilient material and prevents seepage of the fluid refrigerant around the edges of the interliner.

The gasket seals 60 and 62 form a gas tight seal between the joined surfaces. This is necessary because the container is often subjected to strong wind currents which tend to create a vacuum on the down stream side of joints which could cause evacuation of the vaporized refrigerant in the container. Since many refrigerating fluids are relatively expensive, it is essential that the loss be kept at a minimum.

It will be understood that the foregoing description is intended to be illustrative only and not definitive. Ac-

cordingly, the invention should not be limited except by the scope of the following appended claims.

I claim:

1. An insulated shipper container including a housing having rigid, top, bottom and side walls, the top wall being centrally apertured, a liquid tight liner therefor of lesser dimensions both vertically and horizontally than the interior of, and conforming generally in shape to the housing, having bottom and side walls only, a plurality of stiff, self-supporting, insulating, sandwich type slabs loosely contained in the space between the liner and housing walls, the sandwich panel including a light, porous, insulating core bounded on opposite sides by relatively stiff, supporting walls, a similar sandwich type top insulating slab extending across the open top of the liner, loosely resting upon the side slabs, centrally apertured in register with the central aperture of the top, the top slab being downwardly and outwardly chamfered to define a storage chamber overlying the side slabs and the peripheral portion of the top slab.

2. An insulated shipper container including a housing having rigid, top, bottom and side walls, the top wall being centrally apertured, a liquid tight liner therefor of lesser dimensions both vertically and horizontally than the interior of, and conforming generally in shape to the housing, having bottom and side walls only, a plurality of stiff, self-supporting, insulating, sandwich type slabs loosely contained in the space between the liner and housing walls, the sandwich panel including a light, porous, insulating core bounded on opposite sides by relatively stiff, supporting walls, a similar sandwich type top insulating slab extending across the open top of the liner, loosely resting upon the side slabs, centrally apertured in register with the central aperture of the top, flanges projecting inwardly from the inner walls of the side slabs above the top of the liner, the top slab resting upon said flanges.

3. An insulated shipper container including a housing having rigid, top, bottom and side walls, the top wall being centrally apertured, a liquid tight liner therefor of lesser dimensions both vertically and horizontally than the interior of, and conforming generally in shape to the housing, having bottom and side walls only, a plurality of stiff, self-supporting, insulating, sandwich type slabs loosely contained in the space between the liner and housing walls, the sandwich panel including a light, porous, insulating core bounded on opposite sides by relatively stiff, supporting walls, a similar sandwich type top insulating slab extending across the open top of the liner, loosely resting upon the side slabs, centrally apertured in register with the central aperture of the top, flanges projecting inwardly from the inner walls of the side slabs above the top of the liner, the top slab resting upon said flanges, a flange depending downwardly from the top slab within but out of contact with the liner.

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