

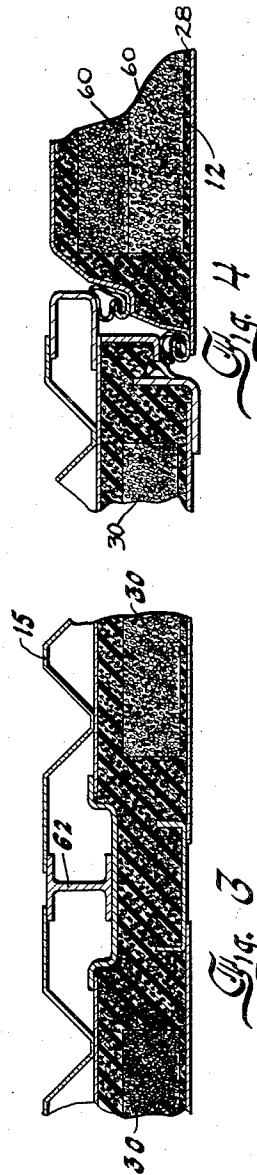
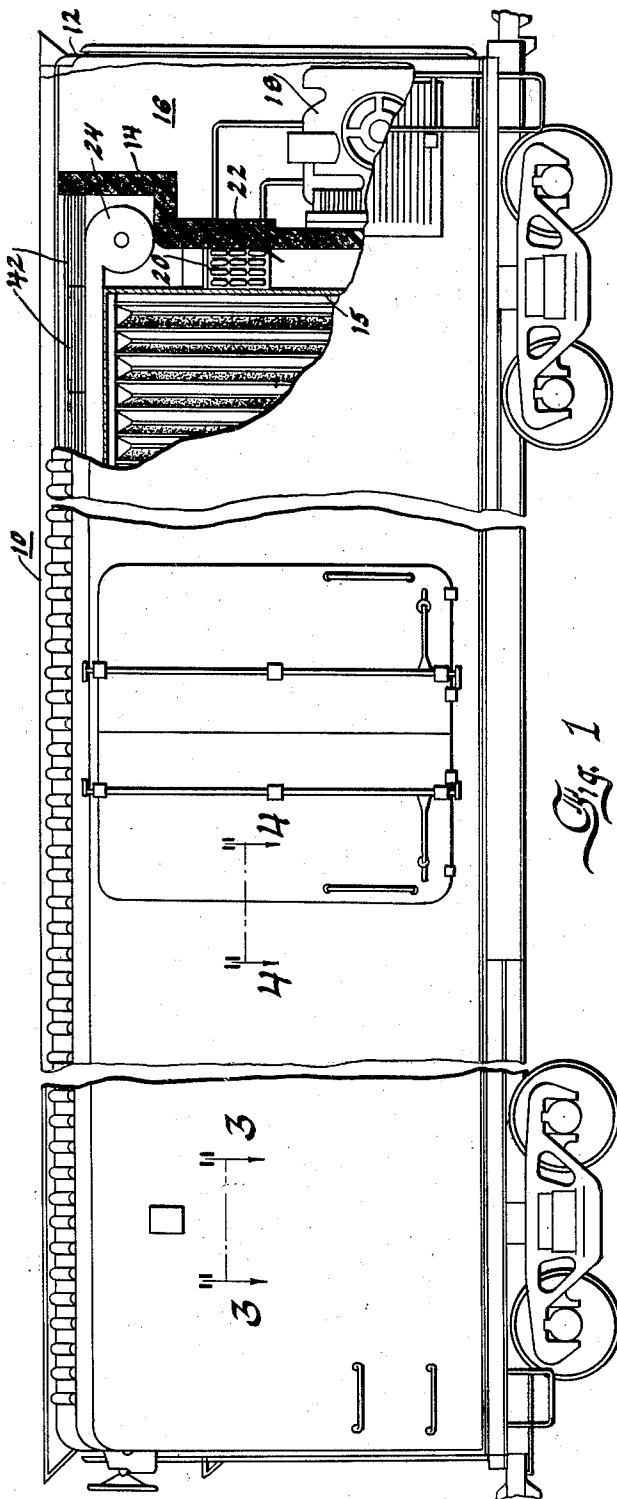
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J. M. SMIDL ET AL
REFRIGERATING APPARATUS

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2 Sheets-Sheet 1



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2 Sheets-Sheet 2

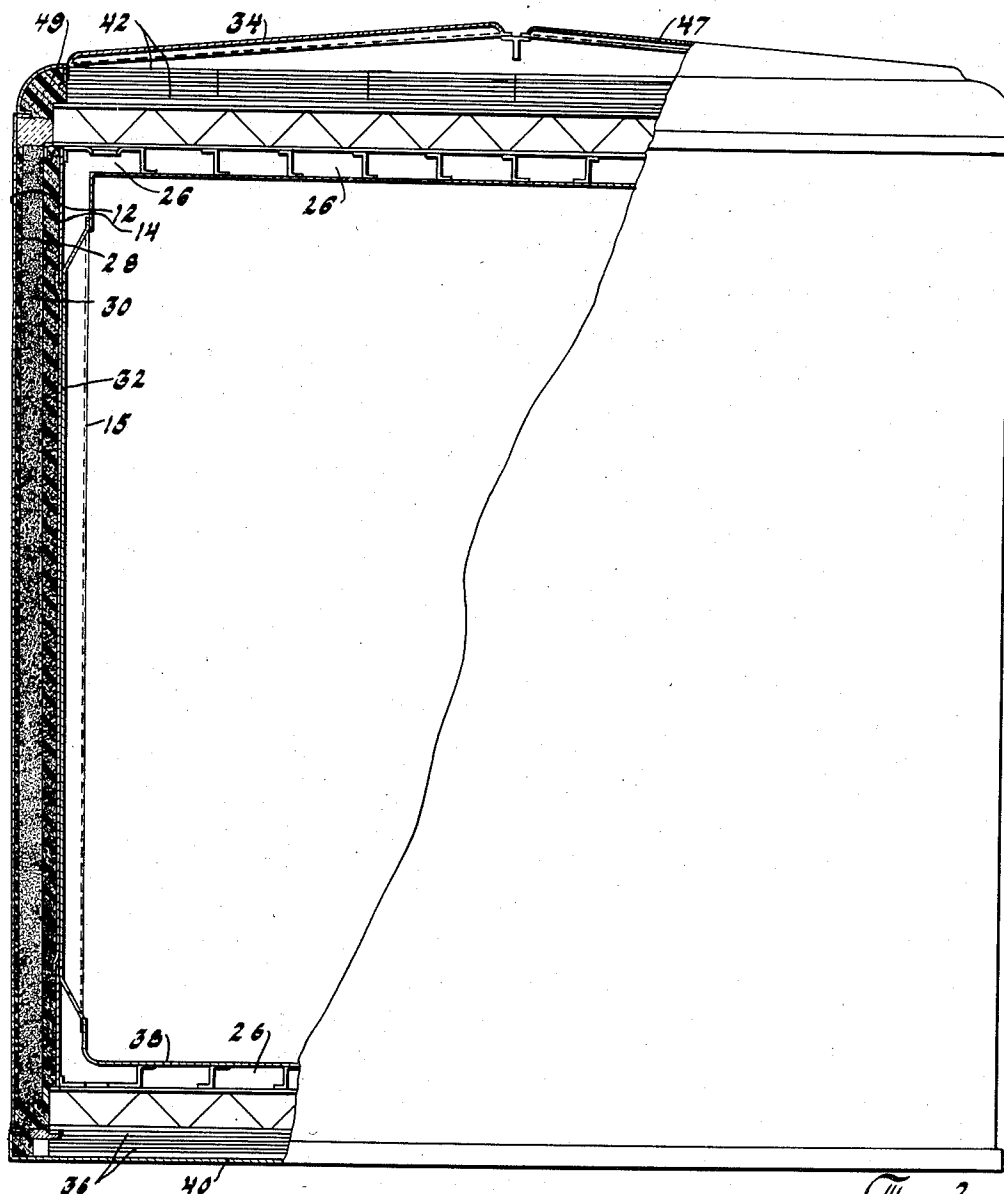


Fig. 2

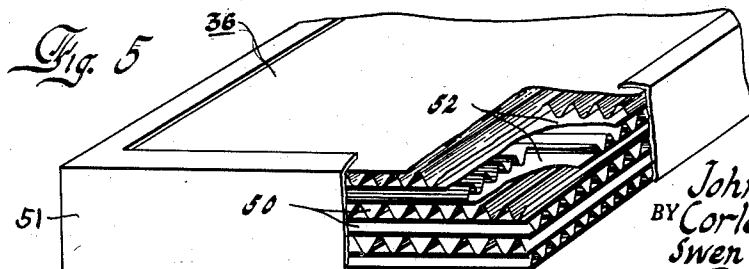


Fig. 5

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REFRIGERATING APPARATUS

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3 Claims. (Cl. 62—405)

This invention relates to refrigerating apparatus and, more particularly, to refrigerated railway cars and the like.

It is an object of this invention to provide an improved form of insulation for the wall of a refrigerated compartment which not only provides good insulation but also provides structural strength.

Another object of this invention is to provide insulation employing relatively rigid slabs of polystyrene insulation in conjunction with a polyisocyanate foam type of insulation which bonds the polystyrene slabs in place and fills all of the cracks and voids between the slabs and the supporting walls of a compartment to be insulated.

One of the problems in constructing a refrigerated railway car is that of completely insulating the inner liner from the outer shell so as to eliminate the need for any direct metallic connection between the inner shell to the outer shell. It has been found that a poured type of polyisocyanate foam insulation is ideal for filling the space between the inner and outer shell of a railway car as it has the necessary insulating properties and also provides the necessary structural strength for holding the inner shell in proper assembled relationship to the outer shell. It is an object of this invention to improve upon the use of the polyisocyanate foam type insulation by inserting relatively rigid preformed slabs of insulation between the inner and outer walls of the car so as to reduce the amount of polyisocyanate required and so as to reduce the tendency of the outer side walls to shrink inwardly after the polyisocyanate insulation has completed its chemical reaction within the space between the inner and outer walls of the car.

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 present invention is clearly shown.

In the drawings:

Figure 1 is a side elevational view with parts broken away showing the invention applied to a modern refrigerated railway car;

Figure 2 is an end elevational view with parts broken away showing the arrangement of the insulation within the side walls of the car;

Figure 3 is a fragmentary sectional view taken substantially on line 3—3 of Figure 1;

Figure 4 is a fragmentary sectional view taken substantially on line 4—4 of Figure 1; and

Figure 5 is a perspective view with parts broken away showing the reflective cell type insulation used in the floor and ceiling of the car.

Referring now to the drawing wherein a preferred embodiment of the invention has been shown, reference numeral 10 generally designates a refrigerated railway car having an outer sheet metal shell 12, intermediate sheet metal side and end walls 14 spaced from the outer shell 12 as best shown in Figure 2 of the drawing and an

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inner lining 15 spaced from the intermediate walls to form an air space through which refrigerated air is circulated. A machinery compartment 16 is provided adjacent one end of the car and has mounted therein conventional refrigerant liquefying apparatus 18 which supplies liquid refrigerant to an evaporator 20 disposed in an air duct 22 provided between the commodity compartment of the car and the machinery compartment 16. Blower means 24 are provided for circulating air through the hollow portions 26 of the walls of the car. The construction and arrangement of the refrigerating equipment and the arrangement for circulating the air through the hollow wall portions of the car is essentially the same as that more fully described in our earlier copending application S. N. 473,516, filed December 7, 1954, to which reference is hereby made for a more complete description of the refrigerating apparatus and the air distributing ducts.

The main difference between the car construction shown in the above-mentioned application and the present application is in the insulation which has been provided between the wall portion 14 and the outer shell 12 and in the method of applying the insulation.

In the car construction disclosed in our earlier copending application the entire space between the inner shell and the outer shell was filled with foamed type polyisocyanate insulation which was poured in situ. Such a construction is relatively expensive and makes it difficult to prevent unwanted inward shrinkage of the outer side wall of the car due to the chemical reaction in the polyisocyanate during the pouring and curing thereof. In the construction shown herein a thin layer of polyisocyanate foam 28 is applied onto the one side of the outer wall preferably while the outer wall is supported on a flat horizontal surface. A preformed slab 30 of rigid insulation is then placed onto the polyisocyanate layer 28 before the polyisocyanate is cured whereby the polyisocyanate forms a strong bond between the insulation slab 30 and the outer wall 12. The insulation 30 is preferably rigid polystyrene foam of the type now used extensively for insulating purposes and commercially available under the name Styrofoam although any other type of rigid insulation could be substituted for the polystyrene insofar as certain aspects of this invention are concerned. By virtue of the above described construction and procedure in forming the outer portion of the wall, a very rigid outer wall is formed which will not bulge or become distorted during subsequent stages of manufacture or use of the car. The outer walls are then assembled around the intermediate wall 14 with a small space being provided between the rigid slab 30 and the wall 14 for receiving additional polyisocyanate foam type insulation 32. The intermediate wall 14 forms the inner wall of the insulated portion of the car wall. The insulation 32 is poured in place before the top assembly 34 is put in place. The polyisocyanate foam 32 then serves to fill all of the cracks and crevices left between the outer shell 12 and the wall 14 and also serves to form a strong bond between the slab 30 and the wall 14 with the result that a very rigid side wall construction is provided which affords the necessary insulation to the passage of heat through the walls of the car. The composition and method of forming the polyisocyanate foam is the same as that disclosed in the aforementioned application and is now well known commercially.

Preformed batts 36 of a reflective type of insulation are used beneath the floor 38 of the commodity compartment and the outer bottom wall 40. Similar batts 42 of reflective type insulation are provided in the top assembly as shown. The top assembly including the roof portion 47, the batts 42 and the polyisocyanate foam 49 which fills the corners as shown in Figure 2 is con-

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structed and assembled as a unit and then placed on top of the rest of the structure after the foam insulation 32 has been poured.

As best shown in Figure 5 of the drawing, these batts consist of a series of aluminum sheets 52 which are held in spaced relationship by means of corrugated paper spacers 50. The corrugations of the alternate spacers 50 are arranged at a 90° angle to each other so as to provide a very rigid but light weight insulating batt. The aluminum sheets and corrugated paper spacers are held in assembled relationship by a sealing tape 51 that encompasses the edges of all the sheets and the spacer elements.

As best shown in Figure 4 of the drawing, each of the doors includes two polystyrene slabs 60 which are mounted in much the same manner and serves the same purpose as the single slabs 30 in the main side walls. The slabs 30 may be made to extend the full height and length of each side wall or if desired, several slabs may be used in each side wall. For purposes of illustration, we have shown a car in which the slabs 30 do not extend the entire length of the car. The slabs 30 stop adjacent each of the bolster posts 62 as shown in Figure 4 of the drawing as both the inner and outer panels of the insulated wall are sufficiently rigid at this point to withstand any tendency of the isocyanate foam to shrink or bulge.

By virtue of the above-described construction and arrangement, the insulation has the necessary structural strength to hold the inner shell assembly in place and has the necessary insulating qualities to provide an efficient refrigerator car construction. It is apparent that certain aspects of this invention are equally applicable to insulated wall constructions used in other types of installations.

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, as may come within the scope of the claims which follow.

What is claimed is as follows:

1. In a refrigerated car, means forming a lading storage space having a wall structure comprising an outer metallic sheet, an intermediate metallic sheet, insulation between said outer sheet and said intermediate sheet, an inner sheet adjacent said intermediate sheet and forming with said intermediate sheet an air passage for receiving refrigerated air for cooling said storage space, means including an evaporator for refrigerating air, and means including a fan for circulating said refrigerated air in thermal exchange relationship with said evaporator and thereafter through said air passage, said insulation comprising a rigid slab of foamed polystyrene laminated with polyisocyanate foam type insulation, said polyisocyanate foam type insulation being bonded to said outer metallic sheet, to said insulating slab and to said intermediate metallic sheet so as to form a composite barrier of insulation between said outer and intermediate sheets.

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2. In a refrigerated car, means forming a lading storage space having a wall structure comprising outer panel means, a first layer of foam type insulation having its outer surface bonded to said outer panel means, a rigid slab type insulation bonded to said first layer of foam type insulation, a second layer of foam type insulation bonded to said slab type insulation, an intermediate panel means bonded to the inner surface of said second layer of foam type insulation, an inner corrugated panel means adjacent said intermediate panel means and forming therebetween a plurality of air passages, said inner corrugated panel means being secured to said intermediate panel means so as to reinforce said intermediate panel means, means including an evaporator for refrigerating air, fan means for circulating said air in thermal exchange relationship with said evaporator and thereafter through said air passages so as to cool the interior of said lading storage space.

3. In a refrigerator car, an outer shell, an inner shell forming a commodity enclosure, insulating means between said inner shell and said outer shell, the top, bottom, and at least one side wall of said inner shell being spaced from said outer shell so as to provide clearance for said insulating means, the insulating means between said side wall and said inner shell comprising polystyrene bonded to said inner and outer shells by means of foamed polyisocyanate, the insulation between said bottom wall and said outer shell comprising a plurality of insulating batts each of which comprises a plurality of reflective metallic sheets spaced from one another by means of corrugated spacer elements in which the corrugations in adjacent spacer elements are arranged at right angles to one another, said foamed polyisocyanate extending downwardly into contact with the edges of said insulating batts so as to prevent voids in the space between said inner and outer shells.

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