Nov. 22, 1938. F. M. YOUNG 2,137,555

REFRIGERATOR CAR

Filed Aug. 26, 1936 2 Sheets-Sheet 1

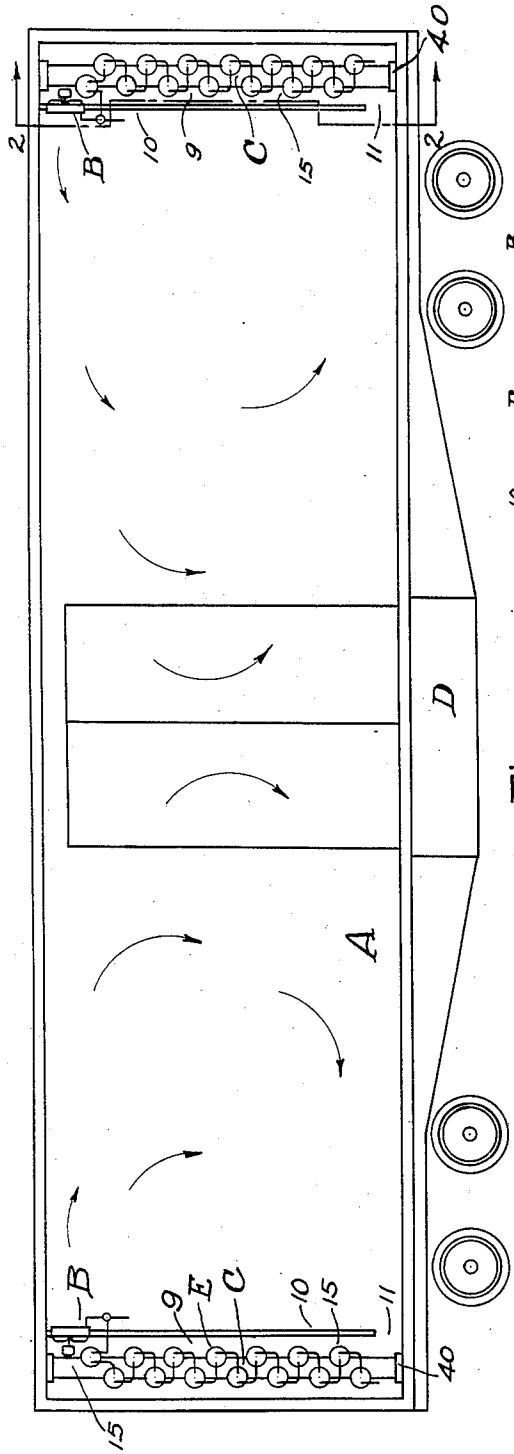


Fig. 1

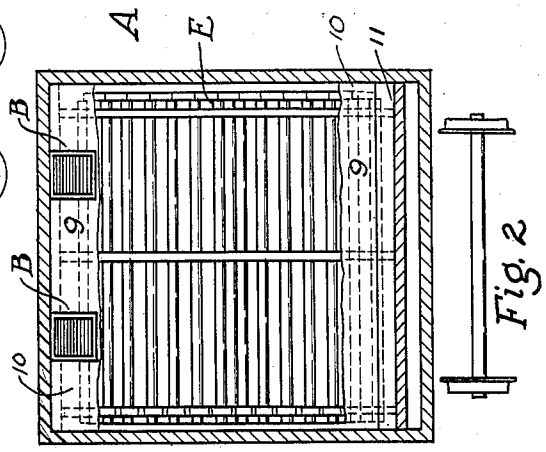


Fig. 2

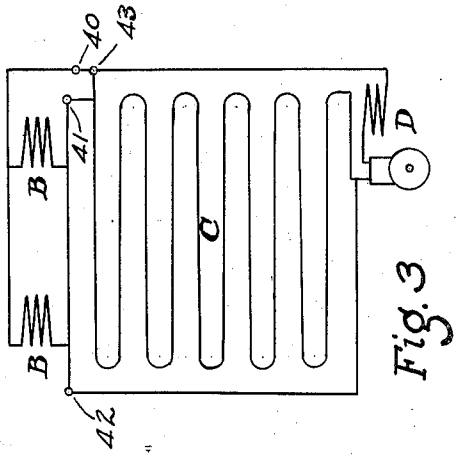


Fig. 3

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REFRIGERATOR CAR

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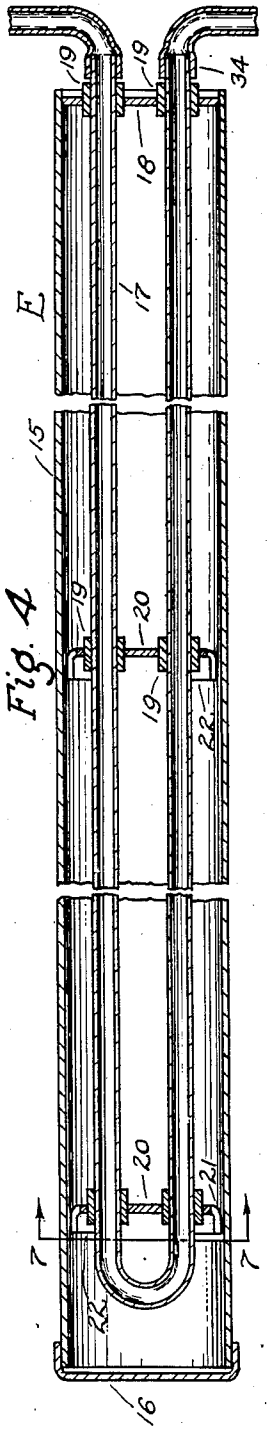


Fig. 4

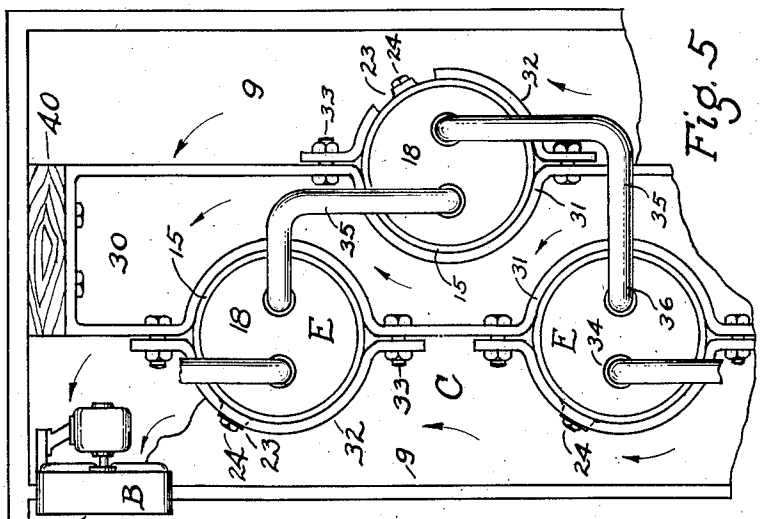


Fig. 5

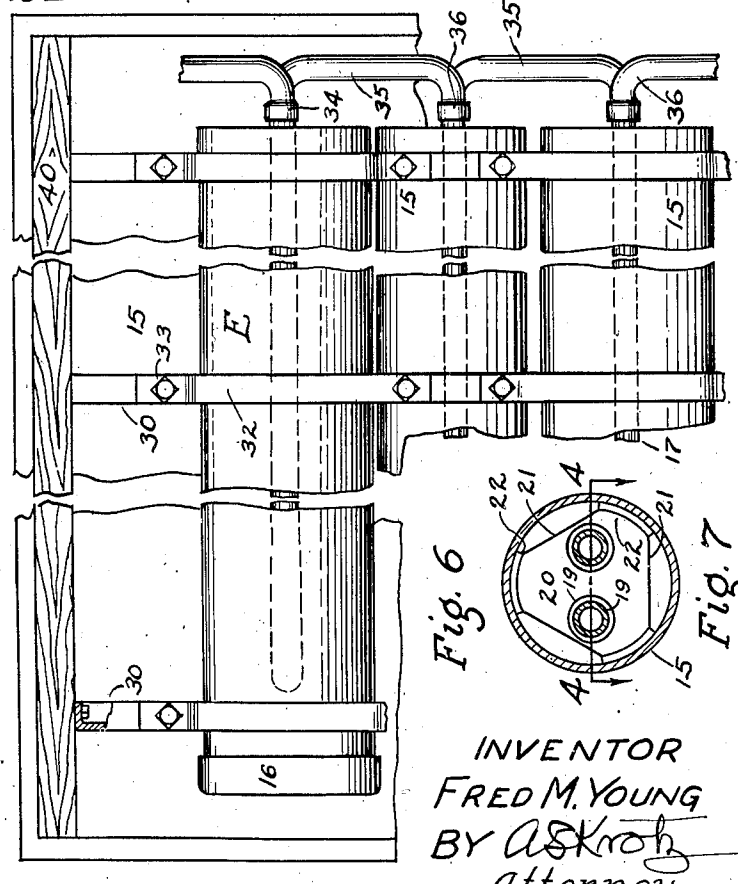


Fig. 6

Fig. 7

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UNITED STATES PATENT OFFICE

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REFRIGERATOR CAR

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7 Claims. (Cl. 62—117)

In refrigerator cars used for transporting vegetables, fruit, meat and the like, it is desirable to economize in space and to operate in the most economical way. It is further desired that the system be light, strong and durable so as to effectively withstand the various shocks and vibrations to which a device of the class is subjected.

It is an object of the present invention to provide evaporators, and hold-over devices and inclosures for the same, which are easily accessible for the purpose of cleaning and sterilizing and in which the several component parts may be easily removed and replaced.

A further object is to provide a system which comprises units which are conveniently manufactured and shipped and may be easily installed in the car as such.

Another object of the present invention is to make the hold-over unit from a number of separate containers which are removably secured to suitable frame members whereby individual containers or the entire unit may be conveniently removed and replaced.

A still further object of the present invention is to cause the cooled recirculated air to move uniformly throughout the entire car inclosure so there are no warm or stagnant pockets therein.

To these and other useful ends my invention consists of parts and combinations thereof or their equivalents and mode of operation as herein described and claimed and shown in the accompanying drawings in which:

Fig. 1 is a side elevation of a car equipped with my invention, the near side of the car being removed.

Fig. 2 is an end section of the car shown in Figure 1 and taken on line 2—2 of this figure.

Fig. 3 is a diagrammatic drawing illustrating one form of positions and connections of the units and pipes.

Fig. 4 is a horizontal section of the hold-over containers taken on line 4—4 of Figure 7.

Fig. 5 is an enlarged fractional end elevation of the device shown in Figure 1.

Fig. 6 is an enlarged fractional side elevation of the device as shown in Figure 2.

Fig. 7 is a transverse section of the container taken on line 7—7 of Figure 4.

As thus illustrated I have designated the box car in its entirety by reference character A, the evaporator units by reference character B, the hold-over units by reference character C and the refrigerator plant by reference character D.

Unit D may consist of any form of compressor and condenser, and means for driving the compressor which may be an electric motor, the car having an electric generator which is driven by means of a belt from the car axle or otherwise, it also being understood that this unit may be otherwise positioned and driven.

In Figure 1 I illustrate units C as occupying narrow compartments 9, formed by partitions 10 which extend preferably for the entire width and height of the car interior except for an air passageway 11 at the floor. In some installations I may elect to use one only of these units.

In the upper end of the partition 10 I locate one or more evaporator units B. When two are used, they are preferably spaced as illustrated in Figure 2. These units B may be conventional unit evaporators comprising finned tubes and a fan motor; thus when the system is in operation, the air will be circulated through the car inclosure as indicated by arrows, passing into inlets 11 and up through chambers 9 and out through units B. I may however, elect to reverse the direction of air flow through one or both of the units; or chambers 9 may be positioned at the side of the car inclosure, preferably midway between the center and car end.

In some installations I may elect to dispense with the hold-over units C and in this eventuality, partition wall 10 will be positioned closer to the wall of the car.

In most installations however, it is desirable to provide two hold-over cooling means. In the present invention C designates such means whereby ice is formed in the containers by passing a certain volume of the refrigerant through tubes therein, either direct from the condenser or otherwise; or part or all of the refrigerant may be caused to flow through these tubes after leaving the evaporators. Thus when the supply of refrigerant is shut off, as for example, when the train stops at stations or when the car is waiting on a siding, the fan of unit B may be caused to continue the circulation of air which is then cooled by the previously accumulated ice in the containers.

Unit C comprises a number of containers which in their entirety are designated by reference character E and comprising a tube 15 having a rear end head 16. I provide preferably a looped pipe 17, the ends protruding through front heads 18 and having reinforcing sleeves 19 therebetween to which the tubes and heads are seal welded. I provide two or more supporting partitions 20 through which pipes 17 extend and having sleeves 19 to which the tubes and partitions are secured. Members 20 have preferably

three cut away openings as at 21, the remaining edges of these partitions having flanges 22. During the manufacturing process the partitions 20 and heads 18 are assembled and secured to the tube 17 as illustrated, the head 18 and sleeves 19 being seal welded to pipe 17; this assembly is then pushed into tube 15 and head 18 at its edge is seal welded to the end of the tube. Flanges 22 are adapted to yieldingly contact the inner wall of tube 15, thus loop 17 may expand and contract longitudinally independent of tube 15, the flanges being snug enough to prevent vertical movement of the loop.

I provide screw threaded flanged opening 23 having a plug 24. This opening is positioned about as shown in Figure 5 whereby containers E are filled up to the flanged opening 23 preferably with a mixture of "Prestone" and water; thus loops 17 will be covered by this solution and there will remain enough air space to provide for expansion and contraction during the freezing and thawing process.

Unit C comprises three or more channel frame bars 30 having spaced openings 31 formed in staggered relation on opposite edges. These openings are adapted to embrace about one half of the diameter of chambers E which are secured to members 30 by means of straps 32 and bolts 33. After containers E have been secured to members 30, they are preferably operatively connected in series as follows: tubes 17 are enlarged at their ends as at 34. I provide L shaped loops 35 which are bent at right angle at their ends as at 36, the ends being secured to tube ends 34 as illustrated; thus the refrigerant will pass through the loops in series and loops 35 are shaped to thereby provide for unequal expansion between members 35 and 30. Thus the structure is to some extent resilient whereby the vibrations set up in the car and transferred to unit C, will not be injurious.

Wood bars 40 are secured to the roof and floor of the car and the ends of members 30 are secured to these bars as illustrated.

It will be noted by referring to Figures 1 and 5 that the air in passing upward in compartment 9 will move back and forth, around and between containers E.

The operation of the device will be as follows: When the car is in motion, the compressor will be operated and the refrigerant will pass through evaporators B and the air passing therethrough will be cooled during this normal operation of the compressor. A portion of the refrigerant may be allowed to pass through loops 17, freezing the water in the containers, the ice forming around the loop tubes. When the car is stopped, the compressor will not operate, but means are provided for operating the fan on units B during an extended delay; thus the air will be cooled by the ice in the containers as it passes through compartment 9.

It may be stated that the refrigerant supply is normally greater than necessary to maintain the desired temperature in the enclosure, therefore the surplus may be diverted into tubes 17 of unit C in the following manner: I have provided four control valves (see Figure 3) which may be used to regulate the flow of the refrigerant. Valve 43 may be made to operate on the three-way principle, thus when valves 40 and 42 are opened and valve 41 closed, valve 43 may be set so all or any desired percentage of the refrigerant may be caused to flow through units B. The object of the present design is to cause some of the refrigerant to flow through coils C after the air in the car enclosure has been reduced to the desired temperature thus to freeze the water around pipes 17 and when it is necessary to stop the train for a considerable period of time, at which time the refrigeration plant is not in operation, the fans in unit B will be caused to continue to operate, thus the air will then be cooled as it passes through chamber C by ice in chambers E. When the car is started again coils B will again operate to cool the circulating air and by a proper manipulation of the valves the water in chambers E will again be frozen and prepared for another hold-over. Another position of the valves may be as follows: Valve 42 is closed and valve 41 is opened, valve 40 is opened and valve 43 set so as to direct all of the refrigerant through valve 40. Thus units B will be in multiple and C act as a return to the compressor. Clearly the valves may be set so units B will be inactive and all of the refrigerant directed through unit C. Thus it will be seen that applicant's device may be used to successfully cool the interior of a refrigerator car while being transported and during stop-overs, that the device will continue to operate to keep the enclosure cool during the stop-overs and will at all times be under the control of the operator.

Having thus shown and described my invention, I claim:

1. A device of the class described, including a car inclosure and a refrigerator plant and comprising in combination therewith, a partition near the end of said inclosure forming a narrow vertical air passageway for the width and height of said inclosure and having an opening at the bottom thereof into said inclosure, the evaporator of said refrigerator plant being positioned in the top of said partition and having a fan being adapted to force air therethrough, whereby the air in said inclosure is recirculated and cooled and passes through said passageway in the opposite direction to the flow of air through said inclosure.

2. A device of the class described, including a can inclosure and a refrigerator plant and comprising in combination therewith, a partition wall near each interior end of said inclosure forming vertical air passageways having openings at their bottoms into said inclosure, one or more evaporators having operating connections to said refrigerator plant and being positioned in the top of each of said partitions said evaporators having fans adapted to force air therethrough, whereby the air in said inclosure is recirculated and cooled and passes through said passageways in the opposite direction to the flow of air in said inclosure.

3. A device as described in claim 1 and including, a holdover cooler positioned in said passageway and extending from near the floor to near the roof thereof, comprising a number of spaced containers having tubes therein, means whereby a suitable quantity of water may be placed in said containers, said tubes being operatively connected together and being operatively connected to said refrigerator.

4. A device of the class described, including a car inclosure and a refrigerator plant and comprising in combination therewith, a partition near the end of the interior of said inclosure, forming a vertical air passageway and having an opening at the bottom thereof into said inclosure, the evaporator of said refrigerator plant being positioned in the top of said partition and having a fan being adapted to force air therethrough,

whereby the air in said inclosure is recirculated and cooled and passes through said passageway, a holdover cooler positioned in said passageway, comprising a number of spaced containers having tubes therein, means whereby a suitable quantity of water may be placed in said containers, said tubes being operatively connected together and being operatively connected to said refrigerator.

5. A holdover cooler unit comprising two or more vertical frame members and a number of horizontally positioned spaced containers removably secured in zigzag relation to opposite sides of said frame members, tubes positioned in said containers with the ends protruding therefrom, partition walls in said containers secured in spaced relation on said tubes each having cutaway portions on their perimeters, flanges on the remaining perimeter and being adapted to yieldingly contact the inner walls of said containers, loops connecting certain tube ends whereby said tubes will be operatively connected in series.

6. A holdover cooler unit comprising two or more spaced vertically positioned frame members and a number of spaced horizontally positioned containers removably secured to the opposite edges of said frame members, tubes positioned in said containers, the ends protruding therefrom, partition walls in said containers being secured in spaced relation on said tubes, each having cut away portions on their perimeters, flanges on the remaining perimeter being adapted to yieldingly contact the inner walls of said containers, right angle elbows operatively secured to the protruding ends of said tubes and having a bent tube connection between certain elbows whereby said tubes are yieldingly connected in series, filler means in said container being positioned whereby a suitable quantity of freezable liquid may be placed therein, said frame members comprising U shaped channels having pockets formed in opposite edges in zigzag spaced relation for the positioning of said containers, straps adapted to removably secure said containers in said pockets, said frame members extending past the upper and lower containers and having means on their ends adapted to act as supporting and anchoring means for the assembly.

7. A holdover container of the class described, comprising an elongated chamber having end heads, a tube loop in said chamber, the ends protruding through one of said heads, spaced partitions secured to said loop having one or more cut away portions in the perimeter thereof, the uncut portion having flanges being adapted to yieldingly contact the walls of said chamber whereby said loop is supported but permitted to freely expand and contract independent of said chamber.

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