

Oct. 15, 1957

M. E. ERICKSON ET AL
SELF-CONTAINED AIR CONDITIONING APPARATUS FOR USE
IN THE ROOF HATCH OF A RAILWAY REFRIGERATOR
CAR OR THE LIKE

2,809,812

Filed March 9, 1955

6 Sheets-Sheet 1

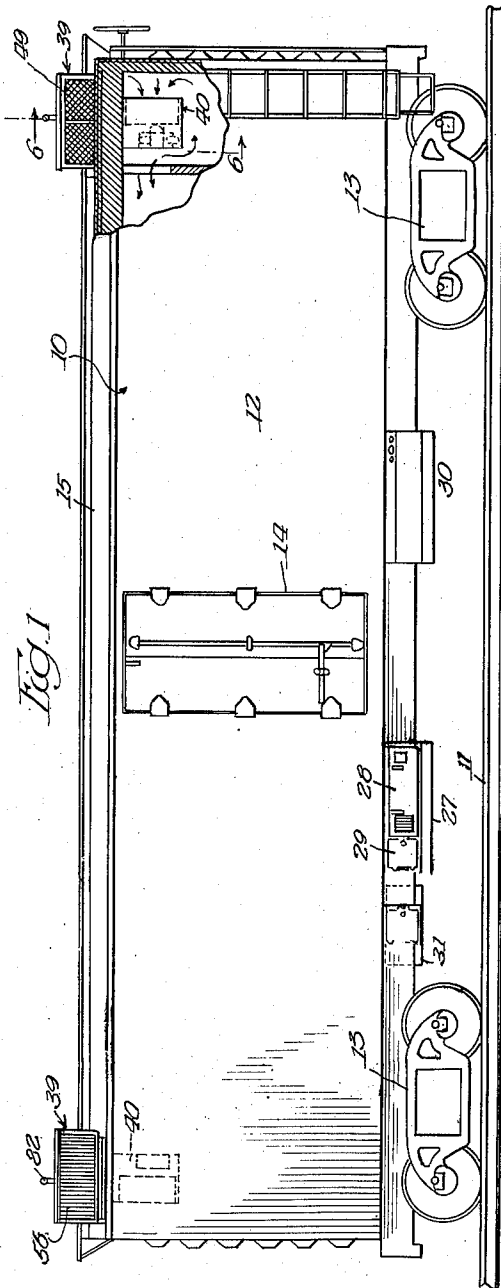


Fig. 1

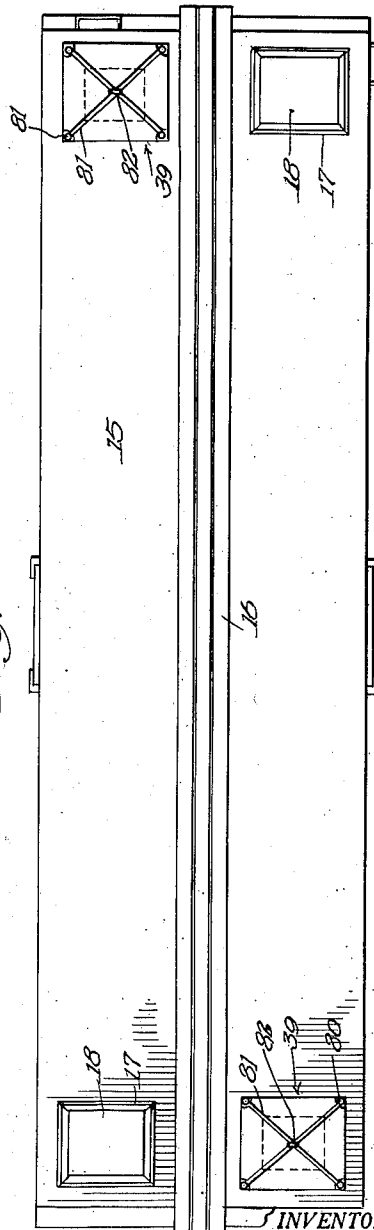


Fig. 2

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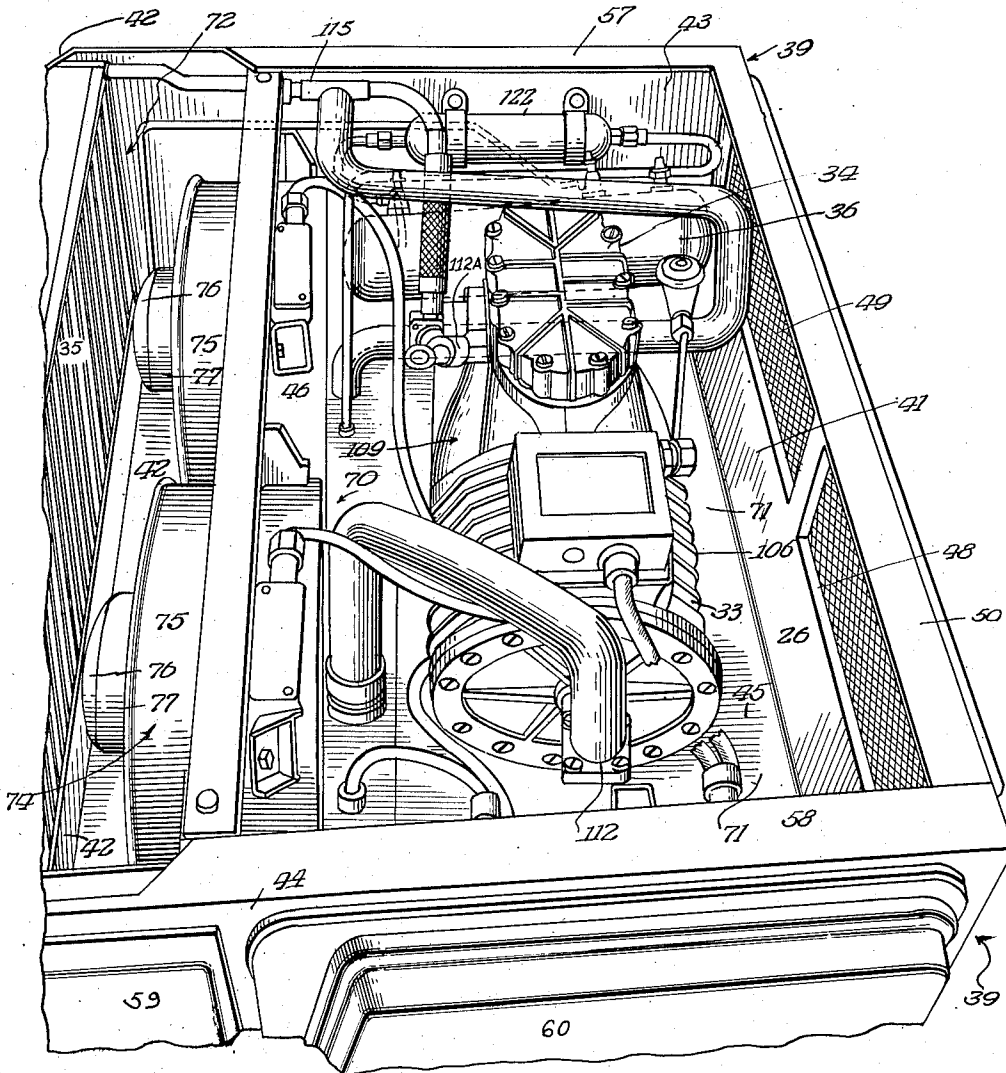
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Fig. 5



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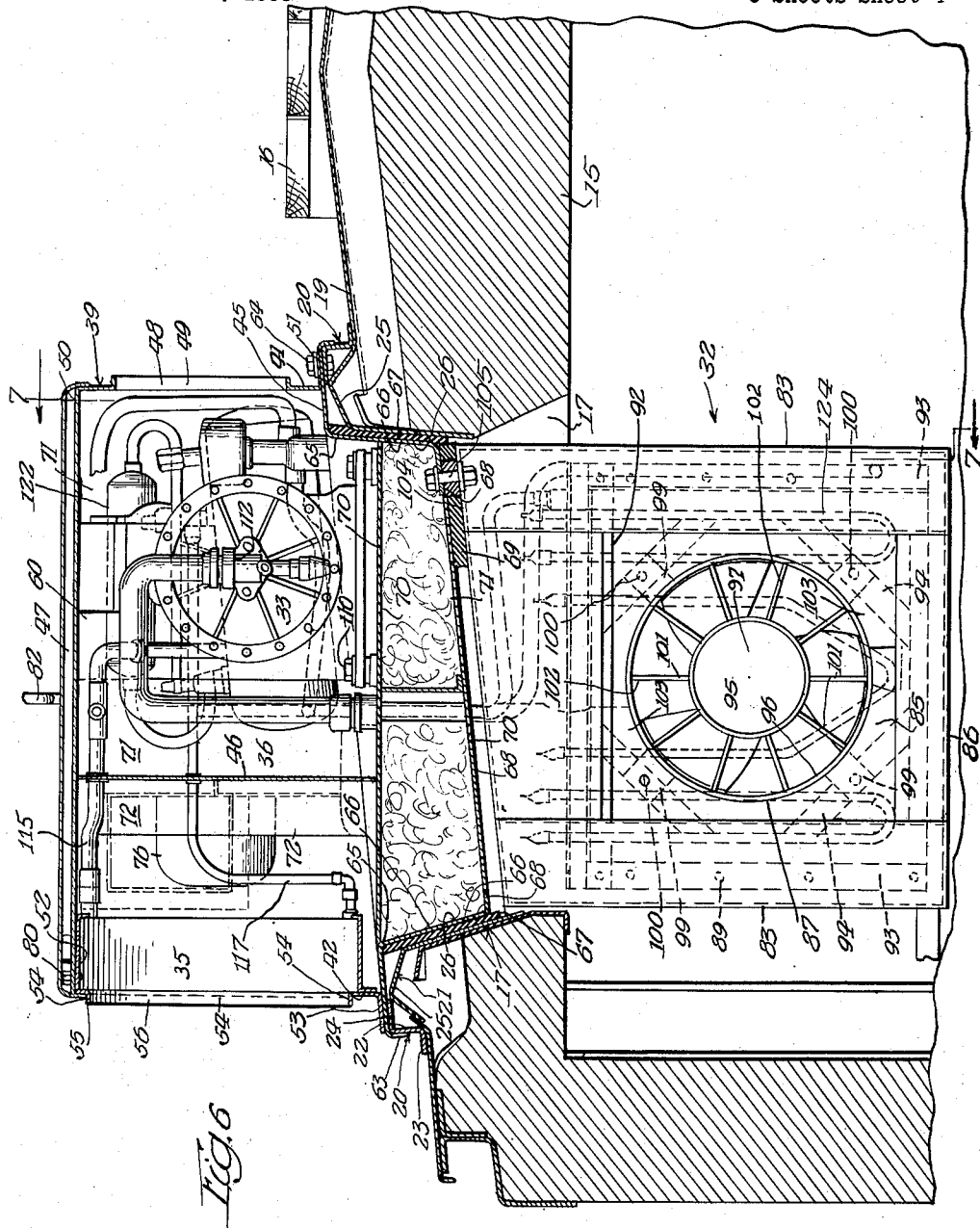


Fig. 6

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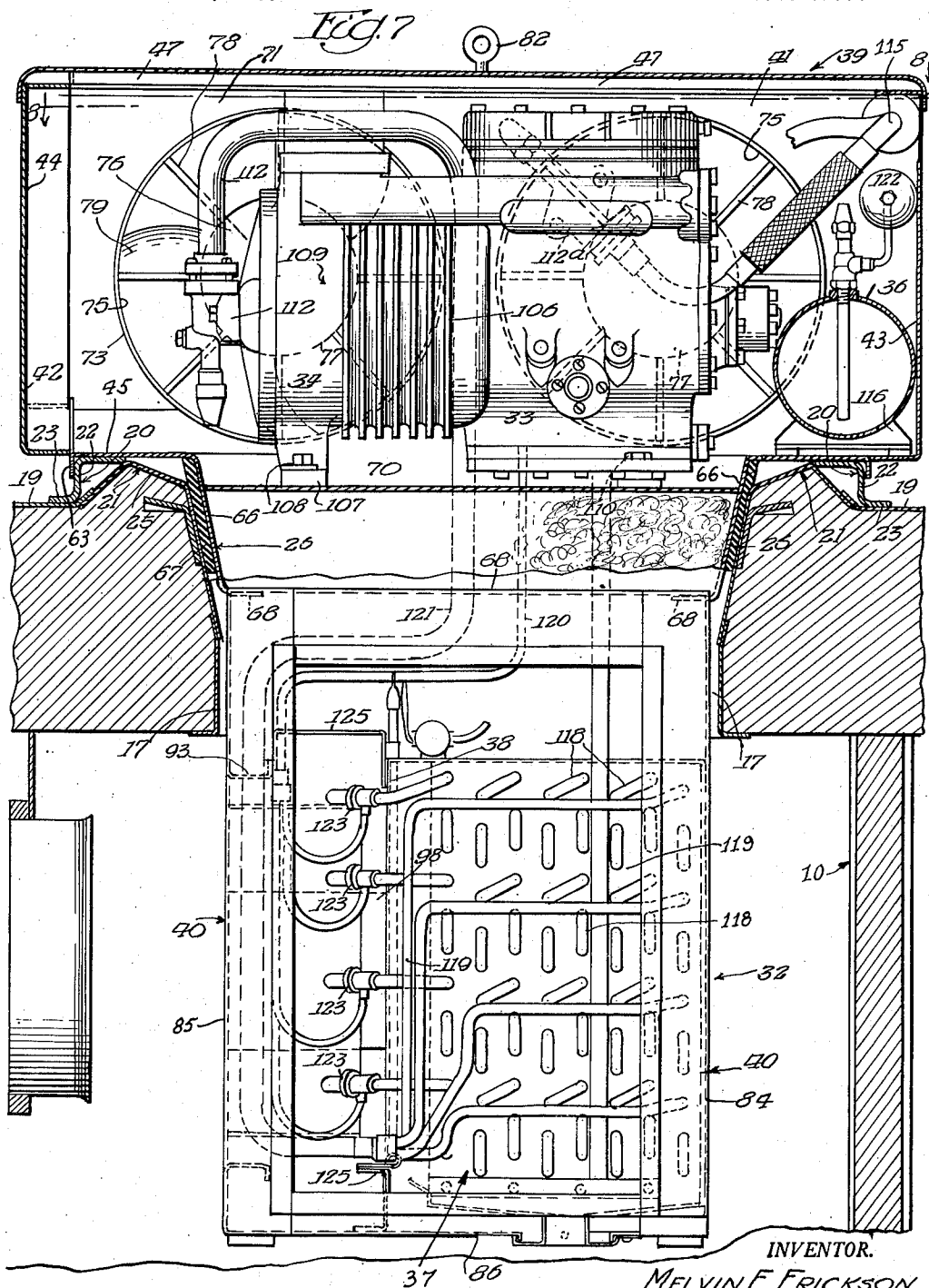
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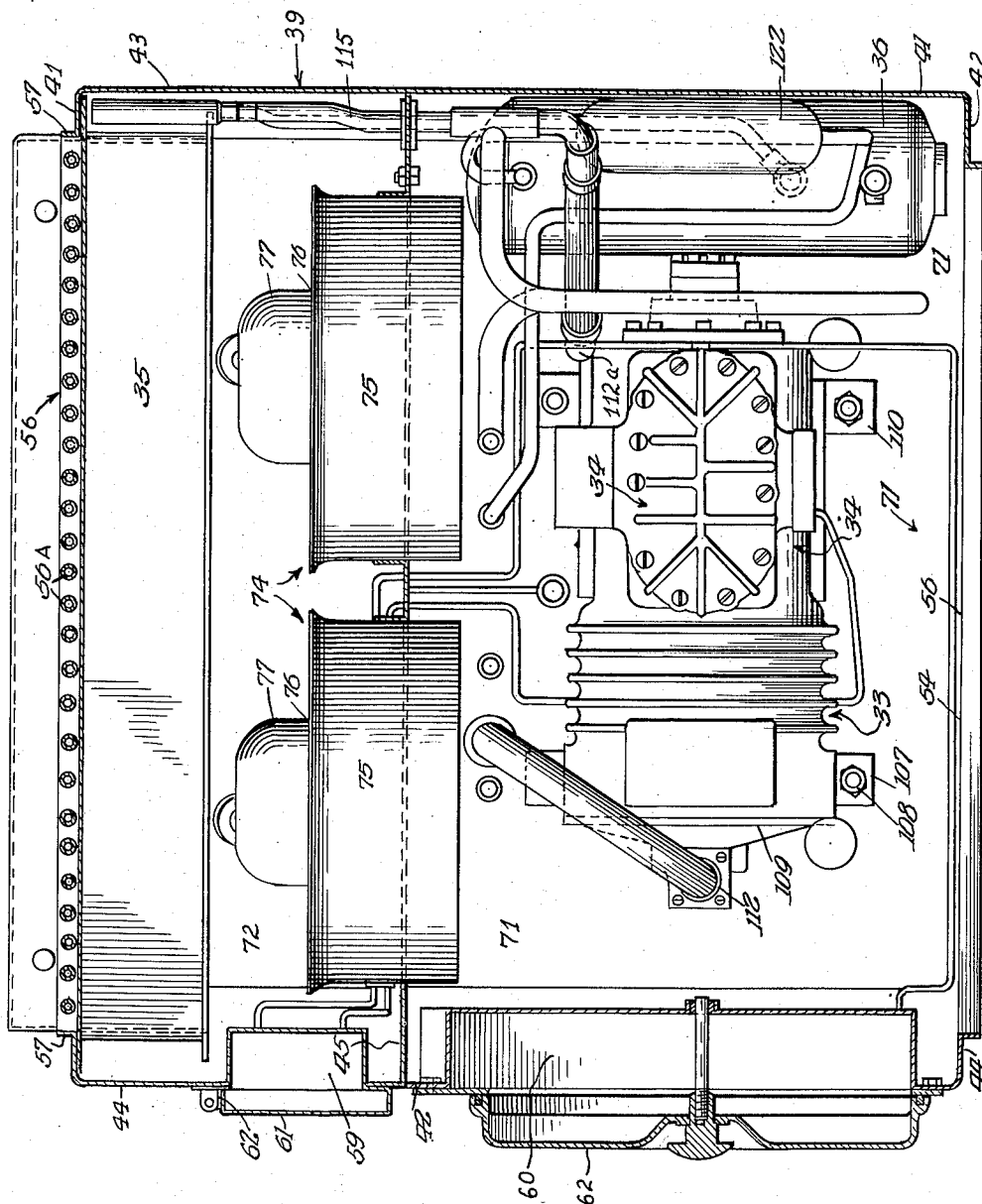


Fig. 8

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2,809,812

SELF-CONTAINED AIR CONDITIONING APPARATUS FOR USE IN THE ROOF HATCH OF A RAILWAY REFRIGERATOR CAR OR THE LIKE

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Application March 9, 1955, Serial No. 493,172

5 Claims. (Cl. 257—7)

The present invention relates generally to apparatus for conditioning the air in an enclosed space. More particularly, the invention relates to that type of air conditioning apparatus which is designed primarily for use in connection with a railway refrigerator car with hatches in the corner portions of its roof, comprises a motor driven compressor, a condenser, a receiver, and an evaporator, and serves when in operation to reduce the temperature of the air in the car.

One object of the invention is to provide an air conditioning apparatus which is an improvement upon, and has certain inherent advantages over, previously designed apparatus of the same general type and is characterized by high efficiency, a novel and compact arrangement of parts and the fact that it is in the form of a self-contained unit which is designed and constructed removably to fit within any one of the four hatches in the car roof to the end that it may be readily mounted in place and also removed for repair or replacement purposes.

Another object of the invention is to provide a self-contained air conditioning apparatus of the type and character under consideration in which the various operating parts are disposed within a sectional housing structure in the form of a comparatively large box-like upper housing and a smaller box-like lower housing.

Another object of the invention is to provide an air conditioning apparatus of the last mentioned character in which the comparatively large box-like upper housing of the sectional housing structure is adapted to be disposed exteriorly of the railway refrigerator car with which the apparatus is associated, has the motor driven compressor, the condenser and the receiver mounted therein, and embodies on the bottom wall thereof a depending downwardly tapered continuous extension which is shaped conformably to, and fits removably in, the selected hatch in the roof of the car and is surrounded by a gasket in order to effect hermetic sealing of the hatch when the apparatus is in its normal or operative position.

Another object of the invention is to provide a self-contained air conditioning apparatus of the aforementioned character in which the upper housing of the sectional housing structure has grille-equipped openings in its side walls and embodies between and in parallel relation with the side walls thereof a partition which divides the interior of the upper housing into an inner compartment for the motor driven compressor and the receiver and an outer compartment for the condenser.

Another object of the invention is to provide an air conditioning apparatus of the last mentioned character in which the partition of the comparatively large box-like upper housing of the sectional housing is provided with two side-by-side but spaced apart openings in which are mounted a pair of motor driven fans which in connection with operation thereof serve to draw outside or ambient air into the outer compartment via the grille-equipped opening in the outer side wall of the upper housing and

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then past or through the condenser and also to force the air so that it flows through the inner compartment and past the motor driven compressor and the receiver and then is exhausted to atmosphere via the grille-equipped opening in the inner side wall of the upper housing.

Another object of the invention is to provide an air conditioning apparatus of the character under consideration in which the top wall of the exteriorly disposed upper housing of the housing structure is removably secured in place so that it may be removed to provide access to the inner and outer compartments in the upper housing, and embodies an upstanding attaching device which may be connected to the hook of an overhead hoist in connection with mounting and removal of the apparatus and is so positioned with respect to the center of gravity of the apparatus that when the apparatus is suspended by the hoist it will automatically assume a truly upright or vertical position.

Another object of the invention is to provide a self-contained air conditioning apparatus of the type and character under consideration in which the smaller box-like lower housing of the sectional housing structure is adapted to be disposed wholly within the interior of the railway refrigerator car with which the apparatus is associated, has the evaporator mounted in it, and embodies removable connections between its upper end and the lower end of the depending gasket-surrounded extension on the bottom wall of the upper housing.

Another object of the invention is to provide an air conditioning apparatus of the type under consideration in which the interiorly positioned lower housing of the sectional housing structure embodies a grille-equipped opening in its back wall, i. e., the wall that faces the adjacent end wall of the car and embodies in its front wall an opening in which is mounted a motor driven fan which in connection with operation thereof serves to circulate the air within the car so that it flows first into the lower housing via the grille-equipped opening in the back wall, then past the evaporator and then through the opening in the front wall back into the car interior.

A further object of the invention is to provide a self-contained air conditioning apparatus of the aforementioned type and character in which the lower housing of the sectional housing structure is provided with rod variety electric heating elements which are positioned between the evaporator and the motor driven fan in the opening in the front wall of the lower housing and operate when energized while the motor driven compressor is inoperative to heat or increase the temperature of the air in the railway refrigerator car with which the apparatus is associated.

A still further object of the invention is to provide a self-contained air conditioning apparatus which effectively and efficiently fulfills its intended purpose and is so designed and constructed that it may be readily applied to, and removed from, a standard or conventional railway refrigerator car and occupies but a comparatively small space.

Other objects of the invention and the various advantages and characteristics of the present self-contained air conditioning apparatus will be apparent from a consideration of the following detailed description.

The invention consists in the several novel features which are hereinafter set forth and are more particularly defined by claims at the conclusion hereof.

In the drawings which accompany and form a part of this specification or disclosure and in which like numerals of reference denote corresponding parts throughout the several views:

Figure 1 is a side view of a railway refrigerator car having applied to one of the roof hatches thereof a self-

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contained air conditioning apparatus embodying the invention;

Figure 2 is a plan view of the car;

Figure 3 is a rear perspective of the self-contained air conditioning apparatus;

Figure 4 is a front perspective of the apparatus, showing in their open position the doors of certain door-closed boxes which are mounted on the front wall of the upper housing of the sectional housing structure and serve, respectively, to house gauges and electrical control and operating devices;

Figure 5 is a fragmentary top perspective, showing the upper housing with the top wall thereof removed and illustrating the arrangement and positioning of the motor driven compressor and the receiver in the inner compartment in the upper housing;

Figure 6 is an enlarged transverse section taken on the line 6—6 of Figure 1, certain parts of the self-contained air conditioning apparatus being shown in section and other parts being shown in elevation;

Figure 7 is an enlarged vertical longitudinal section taken on the line 7—7 of Figure 6 and illustrating in detail the manner in which the apparatus is removably mounted in the selected hatch in the roof of the railway refrigerator car with which the apparatus is associated; and

Figure 8 is a horizontal section taken on the line 8—8 of Figure 7 and showing the arrangement and location of the motor driven compressor and the receiver in the inner compartment in the upper housing, and the design and construction of the motor driven fans for drawing outside air into the outer compartment via the grille-equipped opening in the outer side wall of the upper housing and then past the condenser and also to force the air through the inner compartment and around the motor driven compressor and the receiver and then back to atmosphere via the grille-equipped opening in the inner side wall of the upper housing.

The air conditioning apparatus that is illustrated in the drawings constitutes the preferred form or embodiment of the invention. It is essentially a self-contained unit or unitary structure and is designed primarily for use in connection with a standard or conventional railway refrigerator car 10. The purpose of the apparatus is to maintain the air in the interior of the car at a predetermined temperature by cooling or heating depending upon the temperature or condition of the outside air. The car 10 is of the type that is currently in use in connection with the transportation of perishable comestibles, such, for example, as fruit, vegetables and frozen food products. It is adapted to travel on a railway track 11 and comprises a horizontally elongated body 12 and a pair of wheel-equipped trucks 13 under the end portions of the bottom of the car body. The trucks are mounted to swivel or turn with respect to the body and the wheels of the truck are adapted to travel on the rails of the track 11. The central portions of the sides of the body have door-closed openings 14 through which the interior of the body of the car may be loaded or unloaded. The roof of the car body is designated in the drawing by the reference numeral 15 and has the side portions of its top surface downwardly and outwardly inclined as shown in Figure 6 of the drawing. Over the central portion of the roof is a longitudinally extending walk 16 to permit an attendant or trainman to travel back and forth over the car. In the corner portions of the roof of the car body are four rectangular hatches 17. The latter are normally closed by covers 18 and are normally for the purpose of permitting ice to be introduced into bunkers in the end portions of the interior of the car body 12. The top surface of the car roof 15 is covered by metallic sheets 19 as well understood in the art, and the hatches 17 are formed by outer rectangular frames 20 and inner rectangular frames 21. The outer hatch frames 20 are formed of stamped metal

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and consist of short rectangular upstanding walls 22, continuous outwardly extending flanges 23 on the lower margins of the walls 22 and continuous inwardly extending flanges 24 on the upper margins of the walls 22. The outwardly extending flanges 23 of the outer hatch frames 20 rest on, and are suitably secured to, the metallic sheets 19. The inner hatch frames 21 are in the form of metallic stampings and comprise outwardly extending rectangular walls 25 and depending rectangular walls 26. The outer marginal portions of the outwardly extending rectangular walls 25 underlie the inwardly extending flanges 24 of the outer frames 20 and are suitably secured to the sheets 19 as shown in Figure 6. The depending rectangular walls 26 of the inner hatch frames 21 have the upper marginal portions thereof connected to the inner marginal portions of the outwardly extending walls 25 and are downwardly tapered. The outer hatch frames 20 are downwardly and outwardly inclined in conformity with the slope or inclination of the side portions of the top surface of the roof 15.

As hereinafter described, the air conditioning apparatus is electrically energized or motivated. In order to furnish current to the apparatus, the railway refrigerator car 10 is provided with an engine-generator unit 27 (Figure 1). The latter as shown in Figure 1 is mounted under the bottom of the car body 12 and consists of an internal combustion engine 28 and a generator 29. The engine serves as the prime mover for the generator 29 and is supplied with fuel from a tank 30 under the bottom of the body 12 of the railway refrigerator car 10. A battery 31 is disposed in close proximity to the engine-generator unit 27. It is suitably mounted under the bottom of the car body 12 and serves as a source of electric current for the starting motor for the engine 28.

The air conditioning apparatus is associated with one of the hatches 17 in the roof 15 of the car body and may be used alone or with a similar apparatus depending upon the outside temperature conditions to which the car 10 is subjected. If the apparatus is used with a similar apparatus, it is contemplated that the two apparatuses will be associated with diagonally opposite hatches as shown in Figure 2. But one air conditioning apparatus will be described and in connection with the description it will be referred to as being associated with or mounted in the "selected" hatch. As its principal components or parts, the apparatus comprises a sectional housing structure 32 (Figures 3 and 4), an electric motor 33, a compressor 34, a condenser 35, a receiver 36, an evaporator 37 and an electric heater 38. As heretofore pointed out, the apparatus as a whole is essentially a self-contained unit, i. e., it is of unitary character.

The sectional housing structure 32 of the air conditioning apparatus is designed and constructed removably to fit within the selected hatch 17 in the roof 15 of the body of the railway refrigerator car 10 to the end that it may be readily mounted in place and also removed either for repair or replacement. It consists of a comparatively large box-like upper housing 39 and a smaller box-like lower housing 40. The upper housing 39 is disposed exteriorly of the roof of the car body and serves as an enclosure for the electric motor 33, the compressor 34, the condenser 35 and the receiver 36. The lower housing 40 is disposed wholly within the interior of the car body 12 and serves as an enclosure for the evaporator 37 and the electric heater 38.

The comparatively large box-like upper housing 39 of the housing structure 32 is of materially greater size than the selected hatch 17 and comprises an inner side wall 41, an outer side wall 42, a back wall 43, a front wall 44, a bottom wall 45, a partition 46 and a top wall 47. The partition and the aforementioned walls with the exception of the top wall 47 are in the form of metallic stampings. The inner side wall 41 of the upper housing 39 is rectangular and extends truly vertically. It has its end margins welded or otherwise suitably connected to the

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inner end margins of the back wall 43 and the front wall 44 and embodies a substantially full sized opening 48 in which is mounted a grille 49 of expanded metal. The top margin of the inner side wall 41 is provided with an integral inwardly extending flange 50 and the bottom margin of the inner side wall is provided with an integral outwardly extending flange 51. The outer side wall 42 is rectangular and extends truly vertically. It is spaced outwards an appreciable distance from the inner side wall 41 and has its end margins welded or otherwise fixedly secured to the outer end margins of the back wall 43 and the front wall 44. The top margin of the outer side wall 42 is provided with an integral inwardly extending flange 52 and the bottom margin of the outer side wall is provided with an integral outwardly extending flange 53. The outer side wall 42 is provided with a substantially full sized rectangular opening 54 which is defined by an integral outwardly extending rectangular flange 55. Within the opening 54 is a grille 56 which is formed by a series of vertically extending equi-distantly spaced hollow rods 56A the upper ends of which are fixedly connected to the upper portion of the flange 55 and the lower ends of which are fixedly connected to the lower portion of the flange. The back wall 43 extends vertically and together with the front wall 44 serves to hold the inner and outer side walls in laterally spaced relation. It extends truly vertically and embodies at its top margin an integral inwardly extending flange 57. The front wall 44 of the upper housing 39 is disposed in spaced apart and parallel relation with the back wall 43 and embodies at its top margin an integral inwardly extending flange 58. As shown in Figure 5, the inwardly extending flanges 50, 52, 57 and 58 are coplanar. The bottom edges of the back and front walls 43 and 44 are downwardly and outwardly inclined in conformity with the slope or inclination of the subjacent portion of the top surface of the car roof 15. The central portion of the front wall 44 is provided with a small sized box 59 and a large sized box 60. The box 59 serves as an enclosure for a cluster 59A of pressure and other gauges and is normally closed by a hinged latch-equipped door 61. The box 60 serves as an enclosure for electrical control and operating devices (not shown) and is normally closed by a hinged door 62 which is tightly held in its closed position by a handle-equipped nut and a stud (see Figure 8). The bottom wall 45 of the upper housing 39 is flat and extends downwards and outwards in conformity with the outer frame 20 of the selected hatch 17. The inner side margin of the bottom wall 45 underlies and is welded or otherwise fixedly secured to the outwardly extending flange 51 on the bottom margin of the inner side wall 41 and the outer side margin of the bottom wall underlies and is welded or otherwise secured to the outwardly extending flange 53 on the bottom margin of the outer side wall 42. The four marginal portions of the bottom wall 45 rest on the upper inwardly extending flange 24 of the outer frame 20 when the apparatus is in its operative position. As best shown in Figures 6 and 7, the bottom wall 45 is provided with an integral downwardly extending continuous rectangular flange 63 which is arranged in surrounding relation with the rectangular wall 22 of the outer frame 20. The upper housing 39 is releasably secured in its normal or operative position by way of bolts 64 which extend through registering holes in the outwardly extending flange 51 on the bottom margin of the inner side wall 41 and the inner side margin of the bottom wall 45. The central portion of the bottom wall is provided with a rectangular opening 65 and embodies a depending continuous rectangular extension 66. The latter is downwardly tapered in conformity with, and fits removably in, the downwardly tapered continuous rectangular depending wall 26 of the inner frame 21 of the selected hatch and is surrounded by a gasket 67 in order to effect hermetic sealing of the selected hatch 17 when the apparatus is in its normal or operative position as shown in the drawings.

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The top margin of the extension 66 is formed integrally with the portion of the bottom wall 45 that defines the rectangular opening 65. The bottom margin of the extension 66 is provided with an integral inwardly extending continuous flange 68. Associated with the bottom wall 45 of the upper housing 39 is a divider board 69. The latter is formed of insulating material and underlies and extends across the inwardly extending continuous flange 68 on the lower end of the extension 66. It serves to separate and insulate the interior of the upper housing from the interior of the lower housing 40 and has its marginal portions suitably fixedly secured to the flange 68. Also associated with the depending extension 66 is a platform 70. The latter is preferably formed of plate metal and extends truly horizontally. It is located in the upper end portion of the depending extension 66 and has its marginal portions welded to the adjacent portions of the upper end of the extension. The partition 46 of the upper housing 39 extends truly vertically and is disposed between and in parallel relation with the inner and outer side walls 41 and 42. It divides the interior of the upper housing into an inner compartment 71 and an outer compartment 72 and has its end margins welded or otherwise fixedly secured to the adjacent portions of the back and front walls 43 and 44. Formed in the end portions of the partition 45 are two large sized circular holes 73 in which are mounted a pair of electric fan assemblies 74. The fan assemblies 74 operate within cylindrical air conduits 75 secured within the openings 73. Each fan assembly 74 includes the usual motor casing 76 and rotor hub 77 from which there extend radially outwardly a series of fan blades 78 which are closely confined within the respective conduit 75. The assemblies 74 serve, when energized, to draw outside air into the outer compartment 72 via the grille-equipped opening 54 in the outer side wall 42 of the upper housing and force the air through the inner compartment 71 back to atmosphere via the grille-equipped opening 49 in the inner side wall 41 in order first to cool the condenser 35 and then to cool the motor 33, the compressor 34 and the receiver 36. The top wall 47 of the upper housing 39 is rectangular and normally rests on the inwardly extending flanges 50, 52, 57 and 58 on the top margins of the side, back and front walls of the upper housing. It is preferably in the form of an iron casting and is removably secured in place by way of bolts 80 which extend downwards through holes in the marginal portions of the top wall and fit within screw threaded holes in the aforementioned inwardly extending flanges. The upper surface of the top wall is provided with two crossed diagonally extending integral upstanding ribs 81 for top wall reinforcing purposes. On the central portion of the top wall of the upper housing 39 is an upstanding eye bolt 82 the screw threaded shank of which projects downwards and fits within a screw threaded hole in the top wall. The eye bolt constitutes an attaching device which may be connected to the hook of an overhead hoist in connection with mounting and removal of the apparatus as a whole. It is positioned in vertical alignment with the center of gravity or mass of the apparatus in order that when the apparatus is suspended by the hoist it will automatically assume a truly upright or vertical position. When the top wall 47 is removed after withdrawing the bolts 80, access may be had to the inner and outer compartments 71 and 72.

The smaller box-like lower housing 40 of the sectional housing structure 32 is located directly beneath the upper housing 39 and as hereinbefore pointed out is disposed wholly within the car body 12 when the apparatus is in its operative position. It is formed for the most part of plate metal stampings and comprises a pair of parallel spaced apart side walls 83, a back wall 84, a front wall 85 and a bottom wall 86. The side walls 83 extend vertically and are disposed in parallel relation with the inner and outer side walls 41 and 42 of the upper housing 39,

The central portions of the side walls 83 are provided with large sized rectangular openings 87 (Fig. 3) and these openings are normally closed by way of rectangular plates 88. The latter are removably secured in place by way of screws 89 which extend through the marginal portions of the plates 88 into screw threaded holes in the portions of the side walls 83 that define the openings 87. When the plates 88 are removed, the openings 87 provide access to the interior of the lower housing 40. The back wall 84 of the lower housing 40 extends between, and is welded or otherwise fixedly secured to, the rear side margins of the side walls 83. The central portion of the back wall 84 is provided with a large rectangular opening 90 in which is mounted a grille 91 of expanded metal. The front wall 85 of the lower housing extends between, and is welded or otherwise fixedly secured to, the front side margins of the sides 83. It is provided in its central portion with a rectangular opening 92 and embodies around the opening an integral continuous inwardly extending rectangular flange 93. Extending across the corner portions of the flange 93 are four diagonally extending channel bars 94 which are welded or otherwise fixedly secured to the inner edge of the flange 93. Within the opening 92 in the front wall 85 of the lower housing 40 is an electric fan assembly 95. The latter is similar in design and construction to the fan assemblies 74 and comprises a motor casing 97 supported by radial struts 101, and a rotor hub 98 carrying fan blades 102, the latter operating within an air conduit 96, the assembly operating to draw air from the interior of the car body 12 into the interior of the lower housing 40 via the grille-equipped opening 90 in the back wall 84 and then to discharge the air back into the car interior. Mounted on the outer end portion of the air conduit 96 is centrally apertured rectangular plate 103. The latter is shaped conformably to, and serves as a closure for, the rectangular opening 92 in the front wall 85 of the lower housing 40 and has the inner edge thereof welded to the front end portion of the frame 96. The bottom wall 86 of the lower housing 40 is rectangular and has its marginal portions connected to the bottom margins of the side, back and front walls of the lower housing. The inner side wall of the lower housing 40 is higher than the outer side wall as shown in Figure 6. The top margins of the back wall 84 and the front wall 85 are downwardly and outwardly inclined in order that they lie in a plane which is parallel to the plane of the integral inwardly extending continuous flange 68 on the bottom margin of the extension 66. On the upper corners of the lower housing are four gusset-type plates 104 which are welded in place and directly underlie the corners of the divider board 69. The lower housing 40 is removably connected to the upper housing 39 by way of bolts 105 which as shown in Figure 6 extend through aligned holes in the flange 68, the corner portions of the divider board 69 and the gusset-type plates 104. The lower housing may be removed from the upper housing by withdrawing the bolts 105 from the aforementioned holes. Preferably, the space between the divider board 69 and the platform 70 is filled with fibre glass for insulating purposes.

The electric motor 33 of the apparatus is located in the inner compartment 71 in the upper housing 39 and is suitably connected to receive current from the engine-driven generator 29 on the bottom of the railway refrigerator car 10. As shown in Figures 5 and 8, the motor 33 is located directly inwards of the large sized box 60 on the front wall 44 of the upper housing and comprises a fin-equipped casing 106. The latter is provided with downwardly and outwardly extending feet 107 and these rest on, and are connected by bolts 108 to, the front portion of the fixed platform 70 in the upper end of the depending extension 66 of the bottom wall 45. The motor 33 serves as a prime mover for the compressor 34.

The compressor 34 of the apparatus is located in the inner compartment 71 directly behind the electric motor

33. It is preferably of the piston type and comprises a casing 109. The latter is formed integrally with the motor casing 106 and rests on, and is connected by bolts 110 to, the rear portion of the platform 70. The crank or drive shaft of the compressor is connected to the armature shaft of the motor 33 in order that the compressor is driven during operation of the motor. The casing 109 of the compressor has a refrigerant inlet 112 associated with it and is provided with a refrigerant outlet 112a.

The condenser 35 of the apparatus is of the air cooled variety and is disposed in the outer compartment 72 in the upper housing 39 and extends throughout the entire length and height of the outer compartment. The condenser 35 is located directly inwards of the grille 56 in the outer side wall 42 of the upper housing 39. The inlet end of the condenser 35 is connected by a conduit 115 to the refrigerant outlet 112a of the casing 109 of the compressor 34.

The receiver 36 is located in the inner compartment 71 directly behind the compressor 34. It is provided on the bottom portion thereof with a base structure 116 which, as shown in Figure 7, rests on, and is connected to, the inner rear corner portion of the bottom wall 45. A conduit 117 extends between, and is connected to, the outlet end of the condenser 35 and one end of the receiver 36 and serves to deliver the condensed refrigerant from the air cooled condenser to the receiver.

The evaporator 37 is located in the rear portion of the lower housing 40 and consists of a serpentine tube 118 and a series of vertically extending spaced apart sheet metal cooling fins 119. The cooling fins are arranged in parallel relation with the side walls 83 of the lower housing. The evaporator 37 is positioned directly in front of the grille 56 in the back wall 84 of the lower housing 40. The inlet end of the tube 118 of the evaporator is connected by a conduit 120 to the receiver 36 and the outlet end of said tube is connected by a conduit or suction line 121 to the refrigerant inlet 112. The conduit 120 extends through holes in the platform 70 and the divider board 68 and includes a filter-drier unit 122 and a plurality of expansion valves 123. The filter-drier unit 122 is located in the inner compartment 71 in the upper housing 39 and the expansion valves 123 are located in the lower housing 40, as shown in Figure 7.

The electric heater 38 of the apparatus is located in the lower housing 40 of the housing structure 33 and is positioned between the evaporator 37 and the electric fan 95. It serves as a medium or instrumentality for heating the air in the car body 12 when the motor driven compressor 34 is not in use or operation and consists of a series of U-shaped rods 124. The latter constitute electric resistance elements and are provided with mounting brackets 125 for securing them in place.

It is contemplated that the electric motor 33, the fans 34 and the fan 95 will be in a common circuit which is supplied with current from the generator 29 and includes a thermostatically controlled switch whereby it is automatically closed when the air in the car body 12 raises to a predetermined temperature and is automatically opened when the air in the car body drops to a certain temperature. When such circuit is closed the apparatus operates to cool the air in the car body. As previously pointed out, the fans 74 when in operation operate to draw outside air into the outer compartment 72 via the grille-equipped opening 54 and to force the air through the inner compartment and then to atmosphere via the grille-equipped opening 48. As the air flows inwards through the outer compartment, it serves to cool the air cooled condenser 35 and as the air flows through the inner compartment 71 it serves to cool the electric motor 33, the compressor 34 and the receiver 36. In connection with operation of the fan 95 while current is being supplied to the motor 33 for compressor driving purposes, the air in the car body 12 is circulated continuously past the evaporator 37 and

is cooled by the latter. It is also contemplated that the electric heater 38 and the fan 95 will be in another circuit which is supplied with current from the generator 29 and includes a thermostatically controlled switch whereby under certain conditions it is automatically closed when the air in the car body 12 drops below a predetermined temperature and is automatically opened when the air in the car body rises to a predetermined temperature. When the heater is in operation as the result of closing of such circuit, the fan 95 circulates the air in the car body past the heater for heating purposes.

The herein described air conditioning apparatus effectively and efficiently fulfills its intended purpose and is characterized by a novel and compact arrangement of parts. By reason of the fact that it is in the nature of a self-contained unit, it may be readily mounted in place within the selected hatch and also removed for repair or replacement purposes. Because the grille-equipped openings 48 and 54 are formed in the sides of the upper housing 39 of the housing structure 32 the circulation of air through the upper housing is crosswise of the direction of travel of the railway refrigerator car 10 and hence forward or backward movement of the car does not impair in any way the operation of the fans 74 or the cooling of the motor, generator, condenser and receiver. The apparatus as a whole is of comparatively small size but is capable of producing a substantial amount of cooling or heating.

The invention is not to be understood as restricted to the details set forth since these may be modified within the scope of the appended claims without departing from the spirit and scope of the invention.

Having thus described the invention what we claim as new and desire to secure by Letters Patent is:

1. In combination with a refrigerator type vehicle the body of which is elongated and normally closed and has a downwardly tapered hatch in the roof thereof; a self-contained air conditioning apparatus comprising: a vertically elongated housing structure extending downwards through, and mounted removably in, the hatch and consisting of a comparatively large box-like upper housing in parallel relation with the sides of the car body positioned normally on the roof and over the hatch, including spaced apart inner and outer side walls, a closed back wall, a front wall, a closed bottom wall and a top wall, having grille-equipped substantially full sized openings in its side walls, and provided on the central portion of its bottom wall with a depending tubular downwardly tapered gasket-surrounded extension shaped conformably to, and fitting snugly and removably within, the hatch, and a small sized box-like lower housing of no greater size than the hatch positioned normally within the vehicle body and beneath the hatch, including four rectangularly arranged vertical walls, having the upper end thereof connected to the lower end of the extension, and embodying openings in certain of its walls; a refrigerant compressor mounted in the upper housing adjacent to the inner side wall and provided with a refrigerant inlet and a refrigerant outlet; an electric motor mounted in the upper housing adjacent to the inner side wall and connected to drive the compressor; a vertically extending air cooled condenser mounted in the upper housing adjacent to the outer side wall and connected to the refrigerant outlet of the compressor; a receiver mounted in the upper housing adjacent to said inner side wall and connected to the condenser so as to receive condensed refrigerant therefrom; a vertically extending evaporator mounted in the lower housing; a pair of refrigerant conduits extending through the extension and arranged so that one extends between, and is connected to, the receiver and the evaporator and the other extends between, and is connected to, the evaporator and the refrigerant inlet of the compressor; an electric fan mounted in the central portion of the upper housing and operative when driven to circulate outside air through the upper housing so that it flows first past the condenser and then past the motor, compressor and receiver for

cooling purposes; and a motor driven fan mounted in the lower housing and operative when driven to circulate air in the vehicle body through the lower housing and past the evaporator for air cooling purposes.

2. In combination with a refrigerator type vehicle the body of which is elongated and normally closed and has a hatch in the roof thereof; a self-contained air conditioning apparatus comprising: a vertically elongated housing structure extending downwards through, and mounted removably in, the hatch and consisting of a comparatively large box-like upper housing of materially greater size than the hatch positioned normally on the roof and over the hatch, including spaced apart inner and outer side walls in parallel relation with the sides of the car body, a closed back wall, a closed front wall, a bottom wall and a top wall, having grille equipped substantially full sized openings in its side walls, embodying a partition between and in parallel relation with said side walls and with laterally spaced openings therein, and provided on the central portion of its bottom wall with a depending tubular gasket-surrounded extension shaped conformably to, and fitting snugly and removably within, the hatch, and a small sized box-like lower housing of no greater size than the hatch positioned normally within the vehicle body and beneath the hatch, including four rectangularly arranged vertical walls, having the upper end thereof connected to the lower end of the extension, and embodying openings in certain of its walls; a refrigerant compressor mounted in the upper housing between the partition and the inner side wall and provided with a refrigerant inlet and a refrigerant outlet; a motor mounted in the upper housing between the partition and the inner side wall and connected to drive the compressor; a vertically extending air cooled condenser mounted in the upper housing between the partition and the outer side wall and connected to the refrigerant outlet of the compressor; a receiver mounted in the upper housing between said partition and said inner side wall and connected to the condenser so as to receive condensed refrigerant therefrom; vertically extending evaporator mounted in the lower housing; a pair of refrigerant conduits extending through the extension and arranged so that one extends between, and is connected to, the receiver and the evaporator and the other extends between, and is connected to, the evaporator and the refrigerant inlet of the compressor; electric fans mounted fixedly in the openings in the partition and operative when driven to circulate outside air through the upper housing so that it flows first past the condenser and then past the motor, compressor and receiver for cooling purposes; and a motor driven fan mounted in the lower housing and operative when driven to circulate air in the vehicle body through the lower housing and past the evaporator for air cooling purposes.

3. In combination with a refrigerator type vehicle the body of which is elongated and normally closed and has a hatch in the roof thereof; a self-contained air conditioning apparatus comprising: a vertically elongated housing structure extending downwards through, and mounted removably in, the hatch and consisting of a comparatively large box-like upper housing of materially greater size than the hatch positioned normally on the roof and over the hatch, including four rectangularly arranged vertical walls, a top wall and a bottom wall, having openings in certain of its vertical walls, and provided on the central portion of its bottom wall with a depending tubular gasket-surrounded extension shaped conformably to, and fitting snugly and removably within, the hatch, and a small sized box-like lower housing of no greater size than the hatch positioned normally within the vehicle body and beneath the hatch, including spaced apart side walls, a back wall and a front wall, having the upper end thereof connected removably to the lower end of the extension, and embodying large sized openings in its back and front walls; a refrigerant compressor mounted in the upper housing and provided with a refrigerant inlet and a re-

frigerant outlet; a motor mounted in the upper housing and connected to drive the compressor; an air cooled condenser mounted in the upper housing and connected to the refrigerant outlet of the compressor; a receiver mounted in the upper housing and connected to the condenser so as to receive condensed refrigerant therefrom; a vertically extending evaporator mounted in the lower housing adjacent to the back wall thereof; a pair of refrigerant conduits extending through the extension and arranged so that one extends between, and is connected to, the receiver and the evaporator and the other extends between, and is connected to, the evaporator and the refrigerant inlet of the compressor; a motor driven fan mounted in the upper housing and operative when driven to circulate outside air through the upper housing and past the condenser, motor, compressor, and receiver for cooling purposes; and an electric fan mounted fixedly in the opening in the front wall of the lower housing and operative when driven to circulate air in the vehicle body so that it flows forward through the lower housing and past the evaporator for air cooling purposes; and an electric heater disposed in the lower housing and positioned between the evaporator and said electric fan.

4. In combination with a railway refrigerator car the body of which is elongated and normally closed and has a downwardly tapered hatch in one of the corner portions of the roof thereof; a self-contained air conditioning apparatus comprising: a vertically elongated housing structure extending downwards through, and mounted removably in, the hatch and consisting of a comparatively large box-like upper housing of materially greater size than the hatch, positioned normally on the roof of the car and over the hatch, including spaced apart inner and outer side walls in parallel relation with the sides of the car body, a back wall, a front wall and a bottom wall, having openings in its side walls, embodying a partition between, and in parallel relation with, said side walls and with an opening therein and provided on the central portion of its bottom wall with a depending tubular downwardly tapered gasket-surrounded extension shaped conformably to, and fitting snugly and removably within, the hatch, and a small sized box-like lower housing of no greater size than the hatch, positioned normally within the car body and beneath the hatch, including spaced apart side walls, a back wall, a front wall, a bottom wall and a top wall, having the upper end thereof connected removably to the lower end of the extension, and embodying large sized openings in the back and front walls; a refrigerant compressor mounted in the upper housing between the partition and the inner side wall and provided with a refrigerant inlet and a refrigerant outlet; a motor mounted in the upper housing between the partition and the inner side wall and connected to drive the compressor; a vertically extending air cooled condenser mounted in the upper housing between said partition and the other side wall and connected to the refrigerant outlet of the compressor; a receiver mounted in the upper housing between said partition and said inner side wall and connected to the condenser so as to receive condensed refrigerant therefrom; a vertically extending evaporator mounted in the lower housing adjacent to the back wall thereof; a pair of refrigerant conduits extending through the extension and arranged so that one extends between, and is connected to, the receiver and the evaporator and the other extends between, and is connected to, the evaporator and the refrigerant inlet of the compressor; an electric fan mounted fixedly in the aforesaid opening in the partition and operative when driven to circulate outside air through the upper housing so that it flows first past the condenser and then past the motor, compressor and receiver for cooling purposes; and fan mounted fixedly

edly in the opening in the front wall of the lower housing and operative when driven to circulate air in the car body and past the evaporator for air cooling purposes.

5. In combination with a railway refrigerator car the body of which is elongated and normally closed and has a rectangular downwardly tapered hatch in one of the corner portions of the roof thereof; a self-contained air conditioning apparatus comprising: a vertically elongated housing structure extending downwards through, and mounted removably in, the hatch and consisting of a comparatively large box-like upper housing of materially greater size than the hatch, positioned normally on the roof and over the hatch, including spaced apart inner and outer side walls in parallel relation with the sides of the car body, a closed back wall, a closed front wall, a bottom wall and a removable top wall, having grille-equipped substantially full sized openings in its side walls, embodying a partition between, and in parallel relation with, said side walls and with laterally spaced openings therein, and provided on the central portion of its bottom wall with a rectangular depending tubular downwardly tapered gasket-surrounded extension shaped conformably to, and fitting snugly and removably within, the hatch, and a smaller box-like lower housing of no greater size than the hatch, positioned normally within the car body and beneath said hatch, including spaced apart side walls, a back wall and a front wall, having the upper end thereof connected removably to the lower end of the extension, and embodying openings in its back and front walls; an upstanding attaching device mounted on the top wall of the upper housing, adapted to be connected to an overhead hoist in connection with mounting and removing of the apparatus, and positioned substantially in vertical alignment with the center of mass of the apparatus so that the latter hangs vertically when suspended from said hoist; a refrigerant compressor mounted in the upper housing between the partition and the inner side wall and provided with a refrigerant inlet and a refrigerant outlet; an electric motor mounted in the upper housing between the partition and the inner side wall and connected to drive the compressor; a vertically extending air cooled condenser mounted in the upper housing between said partition and the outer side wall and connected to the refrigerant outlet of the compressor; a receiver mounted in the upper housing between said partition and said inner side wall and connected to the condenser so as to receive condensed refrigerant therefrom; a vertically extending evaporator mounted in the lower housing adjacent to the back wall thereof; a pair of refrigerant conduits extending through the extension and arranged so that one extends between, and is connected to, the receiver and the evaporator and the other extends between, and is connected to, the evaporator and the refrigerant inlet of the compressor; electric fans mounted fixedly in the openings in the partition and operative when driven to circulate outside air through the upper housing so that it flows first past the condenser and then past the motor, compressor and receiver for cooling purposes; an electric fan mounted fixedly in the opening in the front wall of the lower housing and operative when driven to circulate air in the car body so that it flows forwards through the lower housing and past the evaporator for air cooling purposes; and an electric heater disposed in the lower housing and positioned between the evaporator and the last mentioned electric fan.

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