Jan. 9, 1962

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3,015,939

HEATING AND FREEZING SYSTEM

Filed June 22, 1959

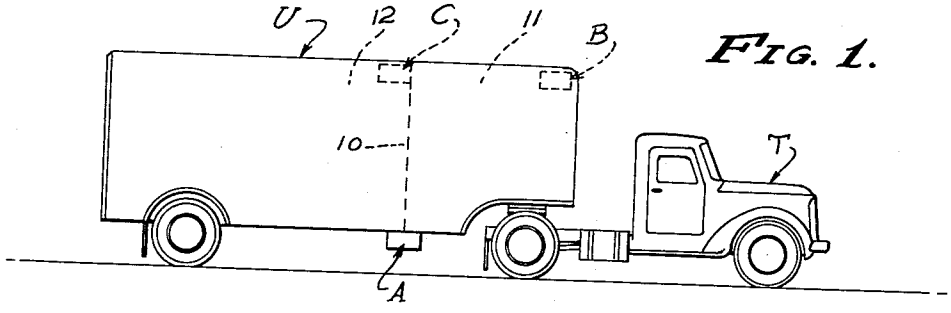
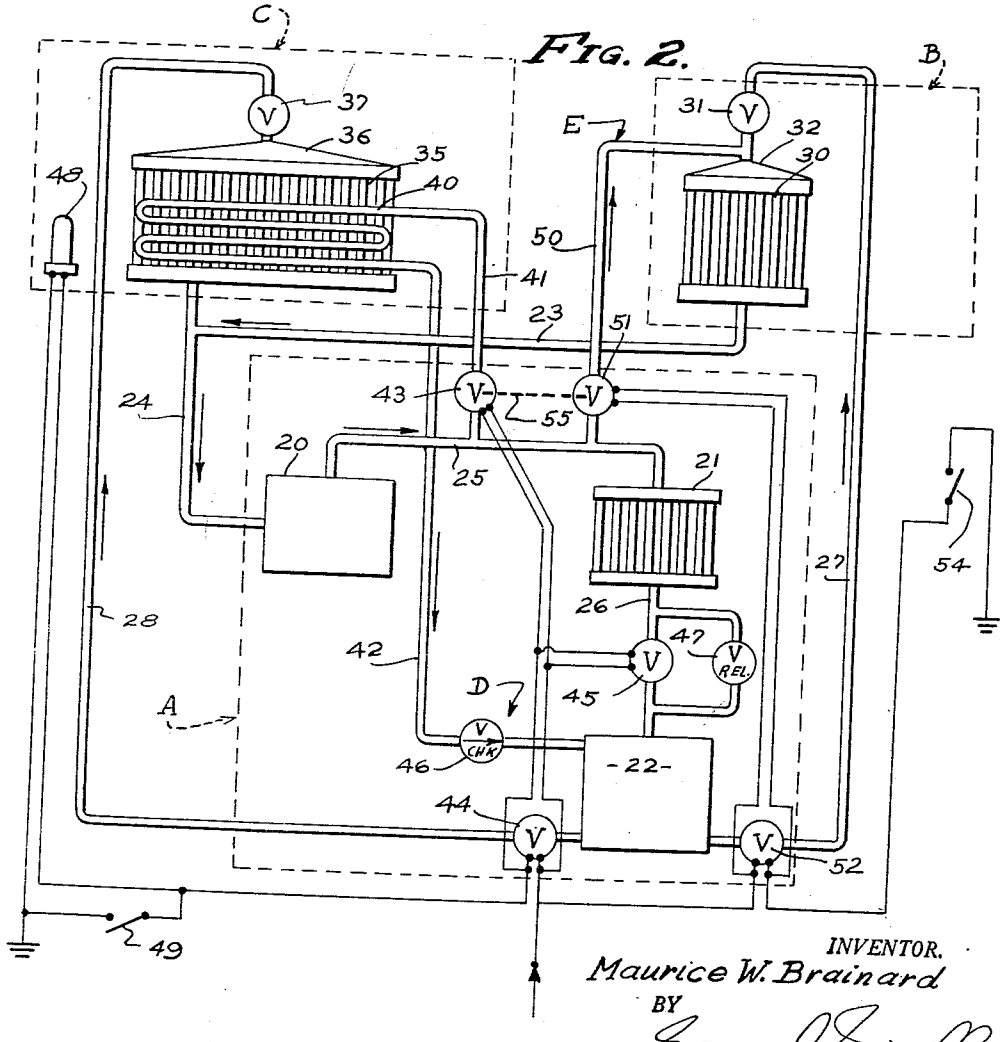


FIG. 1.

FIG. 2.



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United States Patent Office 3,015,939 Patented Jan. 9, 1962

3,015,939

HEATING AND FREEZING SYSTEM

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Filed June 22, 1959, Ser. No. 822,157
15 Claims. (Cl. 62—156)

This invention relates to a refrigerating system adapted for use in connection with installations wherein a plurality of compartments are provided, and which are adapted to be maintained at different temperatures.

A typical installation of the character referred to is a refrigerated cargo carrying truck or van with two compartments, one a freezer compartment adapted to carry frozen products at below freezing temperatures and the other a cooler compartment adapted to receive and carry products which must be maintained at approximately plus 40° F.

With such an installation, it will be apparent that when the out of doors ambient temperature is below plus 40° F., the cooler compartment will demand heat rather than cold.

In the ordinary installation of the character referred to, a separate refrigerating unit or system is provided for each compartment and a separate heater is provided for the cooler compartment. The refrigerating system for the freezer compartment operates independently of the refrigerating system and the heater for the cooler compartment. The refrigerating and heating systems for the cooler compartment are under control of a suitable temperature responsive control means and each is put into or out of operation as heat or cold is demanded.

It will be apparent that such a manner of solving the above-mentioned problem is extremely costly and complicated since it requires two separate refrigeration systems and a heater system. Further, and in addition to the initial cost of such a set up, the maintenance and the chance of failure is multiplied three-fold as against a single or unitary structure or system which will achieve the desired end result.

An object of the present invention is to provide a unitary refrigerating and heating system adapted to maintain predetermined temperatures in related cooler and freezer compartments.

Another object of the present invention is to provide a refrigerating and heating system of character referred to wherein the refrigerant employed provides heat as well as cold, as circumstances require.

Still another object of my invention is to provide a system of the character referred to wherein a heating coil in the cooler compartment receives hot gas from the compressor of the system, to provide heat in the cooler compartment when desired.

An object of my invention is to relate the heating coil with the evaporator in the cooler compartment whereby the heating coil can serve to defrost the evaporator.

Another object is to provide a heating coil such as is referred to which functions as an auxiliary condenser for the refrigerating system.

Still another object of my invention is to provide a novel system of the character referred to having defrosting means for the evaporator in the freezer compartment.

An object of this invention is to provide a simple, inexpensive, highly effective and dependable system of the character referred to and a system which is easy and economical to service and maintain.

The various objects and features of my invention will be fully understood from the following detailed description of a typical preferred form and application of my invention, throughout which description reference is made to the accompanying drawings, in which:

FIG. 1 is a side elevational view of a refrigerated tractor and trailer construction with the refrigerating and heating system that I provide related thereto.

FIG. 2 is a diagrammatic view of my new refrigerating and heating system.

The refrigerating and heating system that I provide is adapted to be related to a structure having dual temperature compartments such as a cooler storage compartment and a freezer storage compartment and is operable to maintain the cooler compartment at a desired temperature, as above freezing, and the freezer compartment at a lower temperature, as a sub-zero temperature.

For the purpose of illustration, I have, in FIG. 1, shown the system applied to a typical tractor and trailer construction, said construction involving a tractor truck T and a van-type trailer U. The van is shown as having a partition 10 (dotted lines), intermediate its ends and dividing the interior thereof to define a front freezer compartment 11 and a rear cooler compartment 12.

The refrigerating and heating system that I provide involves, generally, a condensing unit A to occur at the exterior of the van, for instance, at the bottom side thereof, an evaporator unit B with the freezer compartment 11 of the van, and a combination heating and cooling unit C within the cooler compartment 12 of the van.

The condensing unit A of my new system includes generally, a compressor 20, a condenser 21 and a receiver 22.

The compressor 20 is a power driven unit and can be of any suitable design and construction. The compressor is adapted to receive low pressure gas flowing from the units B and C, through suitable suction lines 23 and 24 and to discharge said gas at higher pressure and resulting higher temperature into a discharge line 25 extending to and communicating with the condenser 21.

The condenser 21 is connected with the discharge line 25 to receive the hot gaseous refrigerant flowing therethrough and is adapted to cool and condense the refrigerant.

The condenser 21 can be of any suitable design and construction.

The receiver 22 is a single tank-like structure adapted to receive liquid refrigerant flowing from the condenser. The receiver is connected with the condenser by a suitable transfer pipe 26.

Connected with the receiver 22 is a liquid line 27 to conduct liquid refrigerant to the evaporator unit B and a liquid line 28 to conduct liquid refrigerant to the evaporator unit C.

The evaporator unit B that I provide is a simple, conventional evaporator unit arranged in the freezer compartment 11 and includes an evaporator 30 having inlet and outlet sides and an expansion valve 31 related to the inlet side of the evaporator. The evaporator can be in the form of a coil or any other suitable construction.

The expansion valve 31 is connected with the liquid line 27 and is adapted to receive liquid refrigerant from the receiver 22 of the condensing unit A and to control the flow of the refrigerant into the inlet side of the evaporator 30.

In the case illustrated, the inlet side of the evaporator 30 is provided with a suitable distributor 32 with which the valve 31 is connected.

The suction line 23, related to the compressor 20 of the unit A, connects with the outlet side of the evaporator 30 and serves to conduct the low pressure, gaseous refrigerant from the evaporator 30 to the compressor, as previously mentioned.

The evaporator and heater unit C that I provide and which is arranged in the cooler compartment 12 includes an evaporator 35 having inlet and outlet sides, a distributor 36 related to the inlet side of the evaporator and an expansion valve 37 connected with the distributor and with the liquid line 28 extending from the receiver 22 of the

condensing unit A. The suction line 24 mentioned in the foregoing and communicating with the compressor of the unit A connects with the outlet side of the evaporator 35.

The evaporator 35 is preferably in the nature of a coil.

The structure of the unit C thus far set forth functions in a conventional manner and the same as the unit B.

The unit C further includes a heater 40. The heater 40 is preferably in the nature of a coil having inlet and outlet sides and is intimately related to or associated with the evaporator 35.

A suitable control means D is provided for the heater 40 and evaporator 35 and includes a hot gas line 41 extending between the discharge line 25 of the unit A and the inlet side of the heater, a return line 42 extending between the outlet side of the heater and the receiver 22 of the unit A, a normally closed flow control valve 43 in the line 41, a normally open valve 44 in the liquid line 28, a normally open fluid valve 45 in the transfer pipe 26 extending between the condenser 21 and receiver 22 and a check valve 46 in the return line 42 and allowing for bow from the heater to the receiver only.

It will be apparent that when the several valves set forth above, are in their normal position, there is no flow of refrigerant through the heater and the flow of refrigerant through the evaporator 35 is maintained in a normal fashion to provide cold or cooling by the unit C.

When it is desired that the unit C provide heat, as when the temperature in the cooler compartment drops too low, the several valves referred to are actuated. Valve 43 is opened to allow for the free flow of hot gaseous refrigerant into and through the heater. Valve 44 is closed to put the evaporator out of service and valve 45 is closed to put the condenser 21 out of service and force all gas to flow through the heater.

With the several valves actuated as set forth, the normal flow of refrigerant through the condenser 21 is shut off and the said flow is bypassed through the heater 40, which heater, in effect, becomes the system condenser and, at the same time, effectively serves as a heater.

With such a construction, it will be apparent that heat is provided by existing heat energy available in the system and does not require a separate heat source. That is, the system utilizes heat energy which normally is dissipated into the atmosphere through the condenser, to heat the cooler compartment when such is demanded.

In practice, when the heater is in operation and flow from the condenser 21 to the receiver through the line 26 is stopped by the valve 45, the condenser 21 will normally flood and become ineffective. Should the pressures in the condenser become excessive, as by failure of the heater 40 to adequately handle the volume of refrigerant flow therethrough, I provide a bridge line in the transfer pipe to extend about the valve 45 and a pressure relief valve 47 in the bridge line and adapted to open when the pressure in the condenser 21 reaches a predetermined amount. When the valve 47 opens, the head pressure is released and a portion of the refrigerant is allowed to drain from the condenser into the receiver.

In the preferred carrying out of the invention and as illustrated in the drawings, the several valves 43, 44 and 45 are solenoid operated valves and are connected in a single circuit under control of a thermostatically operated switch unit 48 in the cooler compartment 12. With such a set up, it will be apparent that as the temperature in the compartment varies or fluctuates above and below a predetermined norm, and either heat or cold is demanded, the heater and evaporator will be put into and taken out of operation accordingly.

It is important to note that each time the heater is put into operation, it defrosts the evaporator 35.

In the event that the evaporator is caused to operate independently over a prolonged period of time and so that it will become frosted and lose its efficiency a suitable switch 49 can be provided in the circuit to put the heater into operation for a suitable defrost cycle on the evaporator 35.

In addition to the foregoing, the system that I provide further includes defrosting means E for the evaporator 30 of the unit B. The defrosting means E is shown as involving a hot gas line 50 extending from the discharge line 25 and connected with the distributor 32 on the evaporator 30, a normally closed solenoid operated valve 51 in the hot gas line 50 and a solenoid operated valve 52 in the liquid line 27.

The means E further involves an electric circuit related to the valves 51 and 52 and under control of a manually operated switch 54.

In practice, if the heater 40 of the unit C and the defrosting means E for the unit B were put into operation at the same time, the heater 40 and evaporator 30 would be starved, that is, they would not be provided with sufficient hot gas to function as intended and the head pressure of the system would drop materially with resulting drop in temperature. To avoid the foregoing, the valves 43 and 51 are connected with a suitable couple means, either mechanical or electric, and indicated by the dotted line 55, which means is such that it will permit only one valve to be open at any one time.

It is to be understood that the system described above and diagramatically illustrated in the drawings, can vary widely with respect to structural details and the electric circuit can be varied widely, without departing from the spirit of the invention.

From the foregoing, it will be apparent that I have invented a novel, highly effective, dependable economical system for maintaining a uniform temperature in a cooler compartment and a lower temperature in a freezer compartment and a system which is particularly adaptable for use in connection with cargo-carrying vehicles having separate compartments for handling refrigerated and frozen products.

It will be apparent that when the system that I provide is related to a vehicle of the character referred to and the vehicle is operated in a territory where the out of doors temperature drops to a temperature where heat is required or demanded continuously or to a temperature where heat and cold is alternately demanded to maintain the cooler compartment at a desired temperature, the system provided by the present invention will function to provide heat or cold, as required.

Having described only a typical preferred form and application of my invention, I do not wish to be limited or restricted to the specific details herein set forth, but wish to reserve to myself any modifications or variations that may appear to those skilled in the art and fall within the scope of the following claims.

Having described my invention, I claim:

1. In combination, a plurality of storage compartments, a unitary heating and cooling system related to said compartments including a refrigerating system having a condensing unit with a compressor and a condenser coil remote from said compartments, an evaporator unit in each compartment having an evaporator coil receiving liquid refrigerant from the condensing unit and discharging gaseous refrigerant which is compressed and condensed by the condensing unit for recirculation and expansion through the evaporator units, a heat coil in one of the evaporator units and related to the evaporator coils thereof and valve means operable to shut off the flow of refrigerant through the condenser coil and bypass said refrigerant through the heater coil.

2. In combination, a freezer compartment, a cooler compartment and a unitary refrigeration system to supply cold to the freezer compartment and heat or cold to the cooler compartment, said system including a condensing unit with a compressor and condenser, an evaporator unit in the freezer compartment, a heater and evaporator unit in the cooler compartment comprising an evaporator coil

and a heater coil, means conducting liquid refrigerant from the condenser unit to the evaporator unit and the evaporator and heater unit and to conduct gaseous refrigerant from said evaporator and evaporator and heater units to the condensing unit, a hot gas line from the condenser unit to the heater coil and a return line from the heater coil to the condensing unit downstream of the condenser, and valve means normally preventing the flow of refrigerant through the hot gas line and operable to shut off the flow of refrigerant through the condenser coil and to the evaporator coil in the cooler compartment and bypass said refrigerant through said heating coil, whereby said heating coil of the heater and evaporator unit in the cooler compartment serves as the condenser for the system and provides heat in the cooler compartment.

3. In combination, a freezer compartment, a cooler compartment, and a unitary heating and cooling system including, a condenser unit at the exterior of said compartments including, a compressor, a condenser coil, a discharge line conducting hot high pressure gaseous refrigerant from the compressor to the condenser coil, a receiver and a transfer line conducting refrigerant from the condenser to the receiver, an evaporator unit in the freezer compartment, a delivery line extending from the receiver to the evaporator unit, and a suction line extending from the evaporator unit to the compressor, a heater and evaporator unit in the cooler compartment including an expansion valve, a liquid line extending from the receiver to the expansion valve, an evaporator coil, a distributor between the expansion valve and evaporator coil and a suction line extending from the evaporator coil to the compressor, a heater coil related to the evaporator coil, a hot gas line extending between the heater coil and the discharge line, a return line between the heater coil and the receiver, a normally closed valve in the hot gas line, normally open valves in the liquid line and the transfer pipe and a check valve in the return line allowing for flow of refrigerant from the heater coil and into the receiver only, said evaporator coil and condenser being in operation and the heater coil out of operation when the valves are in their normal position, said evaporator coil and condenser being out of operation and the heater coil in operation when the valves in the hot gas, liquid and transfer lines are operated.

4. In combination, a freezer compartment, a cooler compartment, and a unitary heating and cooling system related to the compartments and including, a condenser unit at the exterior of the compartments and including a compressor, a condenser, a discharge line conducting hot high pressure gaseous refrigerant from the compressor to the condenser, a receiver and a transfer line extending between the condenser and the receiver, an evaporator unit in the freezer compartment, a liquid line extending between the evaporator unit and the receiver and a suction line extending between the evaporator unit and the compressor, a heater and evaporator unit including an expansion valve, a liquid line extending from the receiver and connected with the expansion valve, an evaporator coil, a distributor between the expansion valve and evaporator coil and a suction line extending from the evaporator coil to the compressor, a heater coil related to the evaporator coil, a hot gas line extending between the heater and the discharge line of the compressor unit, a return line between the heater coil and the receiver, a normally closed valve in the hot gas line, normally open valves in the liquid line and the transfer pipe and a check valve in the return line allowing for flow of refrigerant from the heater coil and into the receiver only, the evaporator unit and the evaporator coil of the evaporator and heater unit and condenser being in operation and the heater coil of the evaporator and heater unit out of operation when the valves are in their normal position, said evaporator coil of the evaporator and heat unit and condenser being out of operation and the heater coil in operation when the valves in the hot gas, liquid and transfer lines are actuated, said heater coil thereby serving as the condenser for the system, said valves in the hot gas delivery and transfer lines being solenoid operated valves and each under control of a thermostatically controlled circuit responsive to the temperature about the heating and evaporator unit, whereby the heater and evaporator coils are alternately put into operation as heat and cold is demanded in the cooler compartment.

5. In combination, a freezer compartment, a cooler compartment, and a unitary heating and cooling system related to the compartments and including, a condenser unit at the exterior of the compartment and including a compressor, a condenser, a discharge line conducting hot high pressure gaseous refrigerant from the compressor to the condenser, a receiver and a transfer line extending between the condenser and the receiver, an evaporator unit in the freezer compartment, a delivery line from the receiver to the evaporator unit, and a suction line from the evaporator unit to the compressor, a heater and evaporator unit in the cooler compartment including an expansion valve, a liquid line extending from the receiver of the condensing unit and connected with the expansion valve, an evaporator coil, a distributor between the expansion valve and evaporator coil and a suction line extending from the evaporator coil to the compressor, a heater coil related to the evaporator coil, a hot gas line extending between the heater coil and the discharge line of the condensing unit, a return line between the heater coil and the receiver, a normally closed valve in the hot gas line, normally opening valves in the liquid line and the transfer line and a check valve in the return line and allowing for flow of refrigerant from the heater coil and into the receiver only, a bypass line connected with the transfer line at opposite sides of the valve therein and having a pressure release valve therein, said evaporator coil and condenser being in operation and the heater coil out of operation when the valves are in their normal position, said evaporator coil and condenser being out of operation and the heater coil in operation when the valves in the hot gas, liquid and transfer lines are actuated, said heater thereby serving as the condenser to the system, said pressure release valve opening when the head pressure increases to a predetermined amount and to put the condenser into limited operation thereafter when the heater coil is in operation.

6. In combination, a cooler storage compartment, a freezer storage compartment and a unitary refrigeration system related to and adapted to maintain said compartments at predetermined temperatures, said system including, a condensing unit at the exterior of the compartments, an evaporator unit in the freezer compartment and connected with the condensing unit, and a heater and evaporator unit in the cooler compartment and connected with the condensing unit, the condensing unit including, a compressor, a condenser, a discharge line from the compressor to the condenser, a receiver and a transfer line from the condenser to the receiver, said evaporator unit in the freezer compartment including, an expansion valve, a liquid line conducting refrigerant from the receiver to the expansion valve, an evaporator, a distributor between the expansion valve and the evaporator and a suction line extending between the evaporator and the compressor, said heater and evaporator unit in the cooler compartment including, an expansion valve, a liquid line extending from the receiver and connected with the expansion valve, an evaporator, a distributor between the expansion valve and the evaporator, a suction line extending from the evaporator to the compressor, a heater coil adjacent the evaporator, a hot gas line extending between the discharge line and heater coil, a return pipe extending between the heater coil and the receiver, a normally closed valve in the hot gas line, normally open valves in the liquid line related to the heater and evaporator unit and in the transfer line, and a check valve in the return pipe allowing for flow of refrigerant from the heater coil

into the receiver only, said evaporator of the heater and evaporator unit and condenser of the condensing unit being in operation when the valves are in their normal position, said evaporator and condenser being out of operation and the heater coil in operation when the said valves are actuated, said heater coil thereby serving to conduct heat into the cooler compartment and serving as the condenser for the system.

7. In combination, a cooler storage compartment, a freezer storage compartment and a unitary refrigeration system related to and adapted to maintain said compartments at predetermined temperatures, said system including, a condensing unit at the exterior of the compartment, an evaporator unit in the freezer compartment and connected with the condensing unit, and a heater and evaporator unit in the cooler compartment and connected with the condensing unit, the condensing unit including, a compressor, a condenser, a discharge line from the compressor to the condenser, a receiver and a transfer line from the condenser to the receiver, said evaporator unit in the freezer compartment including, an expansion valve, a liquid line between the receiver and the expansion valve, an evaporator, a distributor between the expansion valve and the evaporator and a suction line between the evaporator and the compressor, said heater and evaporator unit in the cooler compartment including, an expansion valve, a liquid line between the receiver and the expansion valve, an evaporator, a distributor between the expansion valve and the evaporator, a suction line between the evaporator and the compressor, a heater coil adjacent the evaporator, a hot gas line between the discharge line and heater coil, a return pipe between the heater coil and the receiver, a normally closed valve in the hot gas line, normally open valves in the liquid line related to the heater and evaporator unit and in the transfer line, and a check valve in the return pipe allowing for flow of refrigerant from the heater coil into the receiver only, said evaporator of the heater and evaporator unit and condenser of the condensing unit being in operation when the valves are in their normal position, said evaporator and condenser being out of operation and the heater coil in operation when the said valves are actuated, said heater coil thereby serving to provide heat in the cooler compartment and serving as the condenser for the system, said valves in the hot gas, delivery and transfer lines being under control of a thermostatically actuated means responsive to the temperature in the cooler compartment, whereby the heater and evaporator of the unit in the cooler compartment are alternately put into and out of operation as heat and cold is demanded.

8. In combination, a cooler storage compartment, a freezer storage compartment and a unitary refrigeration system related to and adapted to maintain said compartments at predetermined temperatures, said system including, a condensing unit at the exterior of the compartment, an evaporator unit in the freezer compartment and connected with the condensing unit, and a heater and evaporator unit in the cooler compartment and connected with the condensing unit, the condensing unit including, a compressor, a condenser, a discharge line from the compressor to the condenser, a receiver and a transfer line from the condenser to the receiver, said evaporator unit in the freezer compartment including, an expansion valve, a delivery line between the receiver and the expansion valve, an evaporator, a distributor between the expansion valve and the evaporator and a suction line extending between the evaporator and the compressor, said heater and evaporator unit in the cooler compartment including, an expansion valve, a liquid line between the receiver and the expansion valve, an evaporator, a distributor between the expansion valve and the evaporator, a suction line between the evaporator and the compressor, a heater coil adjacent the evaporator, a hot gas line between the discharge line and heater coil, a return pipe extending between the heater coil and the receiver, a normally closed valve in the hot gas line, normally open valves in the liquid line related to the heater and evaporator unit and in the transfer line, a bypass line connected with the transfer line at opposite sides of the valve therein and having a pressure release valve therein, and a check valve in the return pipe allowing for flow of refrigerant from the heater coil into the receiver only, said evaporator of the heater and evaporator unit and condenser of the condensing unit being in operation when the valves are in their normal position, said evaporator and condenser being out of operation and the heater coil in operation when the said valves are actuated, said heater coil thereby serving to conduct heat into the cooler compartment and serving as the condenser for the system.

9. In combination, a cooler storage compartment, a freezer storage compartment and a unitary refrigeration system related to and adapted to maintain said compartment at predetermined temperatures, said system including a condensing unit at the exterior of the compartments, an evaporator unit in the freezer compartment and connected with the condensing unit, and a heater and evaporator unit in the cooler compartment and connected with the condensing unit, the condensing unit including, a compressor, a condenser, a discharge line from the compressor to the condenser, a receiver and a transfer line from the condenser to the receiver, said evaporator unit in the freezer compartment including, an expansion valve, a liquid line conducting refrigerant from the receiver to the expansion valve, an evaporator, a distributor between the expansion valve and the evaporator and a suction line extending between the evaporator and the compressor, said heater and evaporator unit in the cooler compartment including, an expansion valve, a liquid line extending from the receiver and connected with the expansion valve, an evaporator, a distributor between the expansion valve and the evaporator, a suction line extending from the evaporator to the compressor, a heater coil adjacent the evaporator, a hot gas line extending between the discharge line and heater coil, a return pipe extending between the heater coil and the receiver, a normally closed valve in the hot gas line, normally open valves in the liquid line related to the heater and evaporator unit and in the transfer line, a bypass line connected with the transfer line at opposite sides of the valve therein and having a pressure release valve therein, and a check valve in the discharge pipe allowing for flow of refrigerant from the heater coil into the receiver only, said evaporator of the heater and evaporator unit and condenser of the condensing unit being in operation when the valves are in their normal position, said evaporator and condenser being out of operation and the heater coil in operation when the said valves are actuated, said heater coil thereby serving to conduct heat into the cooler compartment and serving as the condenser for the system, said valves in the hot gas, delivery and transfer lines being solenoid operated valves and each under control of a thermostatically controlled circuit responsive to the temperature in the cooler compartment, whereby the heater and evaporator are alternately put into operation as heat and cold is demanded.

10. In combination, a cooler storage compartment, a freezer storage compartment, and a unitary refrigeration system related to and adapted to maintain said compartments at predetermined temperatures, said system including, a condensing unit at the exterior of the compartment, an evaporator unit in the freezer compartment and connected with the condensing unit, and a heater and evaporator unit in the cooler compartment and connected with the condensing unit, the condensing unit including, a compressor, a condenser a discharge line from the compressor to the condenser, a receiver and a transfer line from the condenser to the receiver, said evaporator unit in the freezer compartment including, an expansion valve, a liquid line conducting liquid refrigerant from the receiver to the expansion valve, an evaporator, a distributor between the expansion valve and the evaporator and the

compressor, said heater and evaporator unit in the cooler compartment including, an expansion valve, a liquid line extending from the receiver and connected with the expansion valve, an evaporator, a distributor between the expansion valve and the evaporator, a suction line extending from the evaporator to the compressor, a heater coil adjacent the evaporator, a hot gas line extending between the discharge line and heater coil, a return pipe extending between the heater coil and the receiver, a normally closed valve in the hot gas line, normally open valves in the liquid line related to the heater and evaporator unit and in the transfer line, and a check valve in the return pipe allowing for flow of refrigerant from the heater coil into the receiver only, said evaporator of the heater and evaporator unit and condenser of the condensing unit being in operation when the valves are in their normal position, said evaporator and condenser being out of operation and the heater coil in operation when the said valves are actuated, said heater coil thereby serving to conduct heat into the cooler compartment and serving as the condenser for the system, and defrosting means for the evaporator unit in the freezer compartment including, a hot gas pipe extending between the discharge line and the distributor, a normally closed valve in the hot gas pipe and a normally open valve in the liquid line related thereto, said valve adapted to be actuated to stop flow of liquid refrigerant from the receiver to the unit and to direct hot gaseous refrigerant into and through the evaporator to defrost it.

11. In combination, a cooler storage compartment, a freezer storage compartment and a unitary refrigeration system related to and adapted to maintain said compartments at predetermined temperatures, said system including, a condensing unit at the exterior of the compartment, an evaporator unit in the freezer compartment and connected with the condensing unit, and a heater and evaporator unit in the cooler compartment and connected with the condensing unit, the condensing unit including, a compressor, a condenser, a discharge line from the compressor to the condenser, a receiver and a transfer line from the condenser to the receiver, said evaporator unit in the freezer compartment including, an expansion valve, a liquid line conducting liquid refrigerant from the receiver to the expansion valve, an evaporator, a distributor between the expansion valve and the evaporator and a suction line from the evaporator to the compressor, said heater and evaporator unit in the cooler compartment including, an expansion valve, a liquid line extending from the receiver and connected with the expansion valve, an evaporator, a distributor between the expansion valve and the evaporator, a suction line extending from the evaporator to the compressor, a heater coil adjacent the evaporator, a hot gas line extending between the discharge line and heater coil, a discharge pipe extending between the heater coil and the receiver, a normally closed valve in the hot gas line, normally open valves in the liquid line related to the heater and evaporator unit and in the transfer line, and a check valve in the discharge pipe allowing for flow of refrigerant from the heater coil into the receiver only, said evaporator of the heater and evaporator unit and condenser of the condensing unit being in operation when the valves are in their normal position, said evaporator and condenser being out of operation and the heater coil in operation when the said valves are actuated, said heater coil thereby serving to conduct heat into the cooler compartment and serving as the condenser for the system, and defrosting means for the evaporator unit in the freezer compartment including, a hot gas pipe extending between the discharge line and the distributor related thereto, a normally closed valve in the hot gas pipe and a normally open valve in the liquid line related thereto, said valve adapted to be actuated to stop flow of liquid refrigerant from the receiver to the unit and to direct hot gaseous refrigerant into and through the evaporator to defrost it, said valves of the defrosting means being solenoid operated valves and under control of a thermostatically controlled circuit responsive to temperatures in the freezer compartment.

12. In combination, a cooler storage compartment, a freezer storage compartment and a unitary refrigeration system related to and adapted to maintain said compartment at predetermined temperatures, said system including, a condensing unit, at the exterior of the compartment, an evaporator unit in the freezer compartment and connected with the condensing unit, and a heater and evaporator unit in the cooler compartment and connected with the condensing unit, the condensing unit including, a compressor, a condenser, a discharge line from the compressor to the condenser, a receiver and a transfer line from the condenser to the receiver, said evaporator unit in the freezer compartment including, an expansion valve, a liquid line conducting liquid refrigerant from the receiver to the expansion valve, an evaporator, a distributor between the expansion valve and the evaporator and a suction line extending between the evaporator and the compressor, said heater and evaporator unit in the cooler compartment including, an expansion valve, a liquid line extending from the receiver and connected with the expansion valve, an evaporator, a distributor between the expansion valve and the evaporator, a suction line extending from the evaporator to the compressor, a heater coil adjacent the evaporator, a hot gas line extending between the discharge line and heater coil, a return pipe extending between the heater coil and the receiver, a normally closed valve in the hot gas line, normally open valves in the liquid line related to the heater and evaporator unit and in the transfer line, and a check valve in the return pipe allowing for flow of refrigerant from the heater coil into the receiver only, said evaporator of the heater and evaporator unit and condenser of the condensing unit being in operation when the valves are in their normal position, said evaporator and condenser being out of operation and the heater coil in operation when the said valves are actuated, said heater coil thereby serving to conduct heat into the cooler compartment and serving as the condenser for the system, said valves in the hot gas, liquid and transfer lines being solenoid operated valves and each under control of a thermostatically controlled circuit responsive to the temperature in the cooler compartment, whereby the heater and evaporator are alternately put into operation as heat and cold is demanded, and defrosting means for the evaporator unit in the freezer compartment including, a hot gas pipe extending between the suction line and the distributor related thereto, a normally closed valve in the hot gas pipe and a normally open valve in the liquid line related thereto, said valve adapted to be actuated to stop flow of liquid refrigerant from the receiver to the unit and to direct hot gaseous refrigerant into and through the evaporator to defrost it.

13. In combination, a cooler storage compartment, a freezer storage compartment and a unitary refrigeration system related to and adapted to maintain said compartment at predetermined temperatures, said system including, a condensing unit at the exterior of the compartment, an evaporator unit in the freezer compartment and connected with the condensing unit, and a heater and evaporator unit in the cooler compartment and connected with the condensing unit, the condensing unit including, a compressor, a condenser, a discharge line from the compressor to the condenser, a receiver and a transfer line from the condenser to the receiver, said evaporator unit in the freezer compartment including, an expansion valve, a liquid line conducting liquid refrigerant from the receiver to the expansion valve, an evaporator, a distributor between the expansion valve and the evaporator and a suction line extending between the evaporator and the compressor, said heater and evaporator unit in the cooler compartment including, an expansion valve, a liquid line extending from the receiver and connected with the expansion valve, an evaporator, a distributor

between the expansion valve and the evaporator, a suction line extending from the evaporator to the compressor, a heater coil adjacent the evaporator, a hot gas line extending between the discharge line and heater coil, a return pipe extending between the heater coil and the receiver, a normally closed valve in the hot gas line, normally open valves in the liquid line related to the heater and evaporator unit and in the transfer line, a bypass line connected with the transfer line at opposite sides of the valve therein and having a pressure release valve therein, and a check valve in the return pipe allowing for flow of refrigerant from the heater coil into the receiver only, said evaporator of the heater and evaporator unit and condenser of the condensing unit being in operation when the valves are in their normal position, said evaporator and condenser being out of operation and the heater coil in operation when the said valves are actuated, said heater coil thereby serving to conduct heat into the cooler compartment and serving as the condenser for the system, and defrosting means for the evaporator unit in the freezer compartment including, a hot gas pipe extending between the discharge line and the distributor related thereto, a normally closed valve in the hot gas pipe and a normally open valve in the liquid line related thereto, said valve adapted to be actuated to stop flow of liquid refrigerant from the receiver to the unit and to direct hot gaseous refrigerant into and through the evaporator to defrost it.

14. In combination, a cooler storage compartment, a freezer storage compartment and a unitary refrigeration system related to and adapted to maintain said compartment at predetermined temperatures, said system including, a condensing unit at the exterior of the compartment, an evapoartor unit in the freezer compartment and connected with the condensing unit, and a heater and evaporator unit in the cooler compartment and connected with the condensing unit, the condensing unit including, a compressor, a condenser, a discharge line from the compressor to the condenser, a receiver and a transfer line from the condenser to the receiver, said evaporator unit in the freezer compartment including, an expansion valve, a delivery line conducting liquid refrigerant from the receiver to the expansion valve, an evaporator, a distributor between the expansion valve and the evaporator and a suction line extending between the evaporator and the compressor, said heater and evaporator unit in the cooler compartment including, an expansion valve, a liquid line extending from the receiver and connected with the expansion valve, an evaporator, a distributor between the expansion valve and the evaporator, a suction line extending from the evaporator to the compressor, a heater coil adjacent the evaporator, a hot gas line extending between the discharge line and heater coil, a return pipe extending between the heater coil and the receiver, a normally closed valve in the hot gas line, normally open valves in the liquid line related to the heater and evaporator unit and in the transfer line, a bypass line connected with the transfer line at opposite sides of the valve therein and having a pressure release valve therein, and a check valve in the return pipe allowing for flow of refrigerant from the heater coil into the receiver only, said evaporator of the heater and evaporator unit and condenser of the condensing unit being in operation when the valves are in their normal position, said evaporator and condenser being out of operation and the heater coil in operation when the said valves are actuated, said heater coil thereby serving to conduct heat into the cooler compartment and serving as the condenser for the system, said valves in the hot gas, liquid and transfer lines being solenoid operated valves and each under control of a thermostatically controlled circuit responsive to the temperature in the cooler compartment, whereby the heater and evaporator are alternately put into operation as heat and cold is demanded, and defrosting means for the evaporator unit in the freezer compartment including, a hot gas pipe extending between the suction line and the distributor related thereto, a normally closed valve in the hot gas pipe and a normally open valve in the liquid line related thereto, said valve adapted to be actuated to stop flow of liquid refrigerant from the receiver to the unit and to direct hot gaseous refrigerant into and through the evaporator to defrost it.

15. In combination, a cooler storage compartment, a freezer storage compartment and a unitary refrigeration system related to and adapted to maintain said compartment at predetermined temperatures, said system including, a condensing unit at the exterior of the compartment, an evaporator unit in the freezer compartment and connected with the condensing unit, and a heater and evaporator unit in the cooler compartment and connected with the condensing unit, the condensing unit including, a compressor, a condenser, a discharge line from the compressor to the condenser, a receiver and a transfer line from the condenser to the receiver, said evaporator unit in the freezer compartment including, an expansion valve, a liquid line conducting liquid refrigerant from the receiver to the expansion valve, an evaporator, a distributor between the expansion valve and the evaporator and a suction line extending between the evaporator and the compressor, said heater and evaporator unit in the cooler compartment including, an expansion valve, a liquid line extending from the receiver and connected with the expansion valve, an evaporator, a distributor between expansion valve and the evaporator, a suction line extending from the evaporator to the compressor, a heater coil interengaged in the evaporator, a hot gas line extending between the discharge line and heater coil, a return pipe extending between the heater coil and the receiver, a normally closed valve in the hot gas line, normally open valves in the liquid line related to the heater and evaporator unit and in the transfer line, and a check valve in the return pipe allowing for flow of refrigerant from the heater coil into the receiver only, said evaporator of the heater and evaporator unit and condenser of the condensing unit being in operation when the valves are in their normal position, said evaporator and condenser being out of operation and the heater coil in operation when the said valves are actuated, said heater coil thereby serving to conduct heat into the cooler compartment and serving as the condenser for the system, said valves in the hot gas, liquid and transfer lines being solenoid operated valves and each under control of a thermostatically controlled circuit responsive to the temperature in the cooler compartment, whereby the heater and evaporator are alternately put into operation as heat and cold is demanded, and defrosting means for the evaporator unit in the freezer compartment including, a hot gas pipe extending from between the discharge line and the distributor related thereto, a normally closed valve in the hot gas pipe and a normally open valve in the liquid line related thereto, said valves adapted to be actuated to stop flow of liquid refrigerant from the receiver to the unit and to direct hot gaseous refrigerant into and through the evaporator to defrost it, said valves of the defrosting means being solenoid operated valves and under control of a thermostatically controlled circuit responsive to temperatures in the freezer compartment.

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