Oct. 5, 1971 J. A. BRIGHT 3,609,988

SIDE-BY-SIDE REFRIGERATOR FREEZER WITH HIGH HUMIDITY COMPARTMENT

Filed May 25, 1970 3 Sheets-Sheet 1

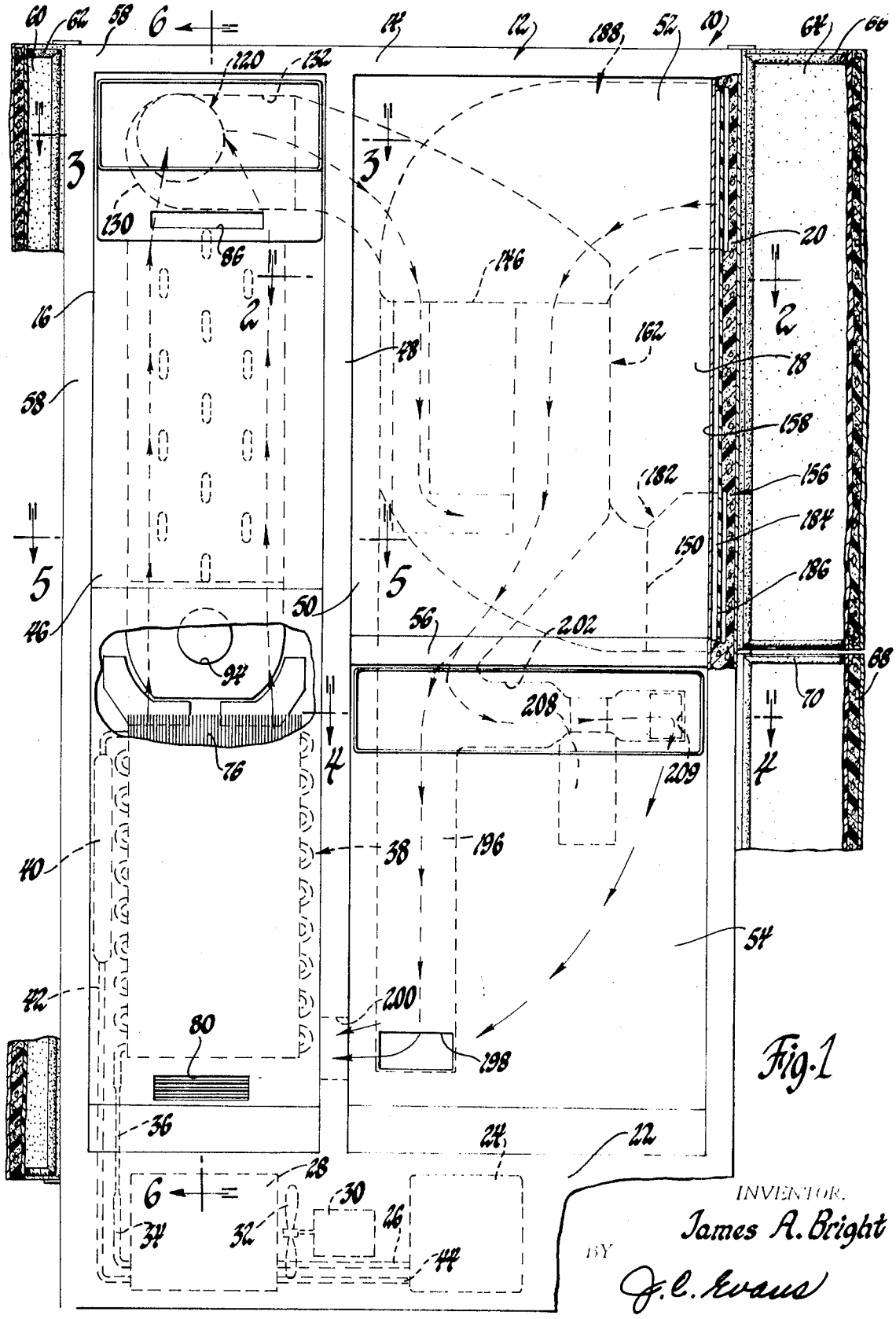


Fig. 1

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Filed May 25, 1970 3 Sheets-Sheet 2

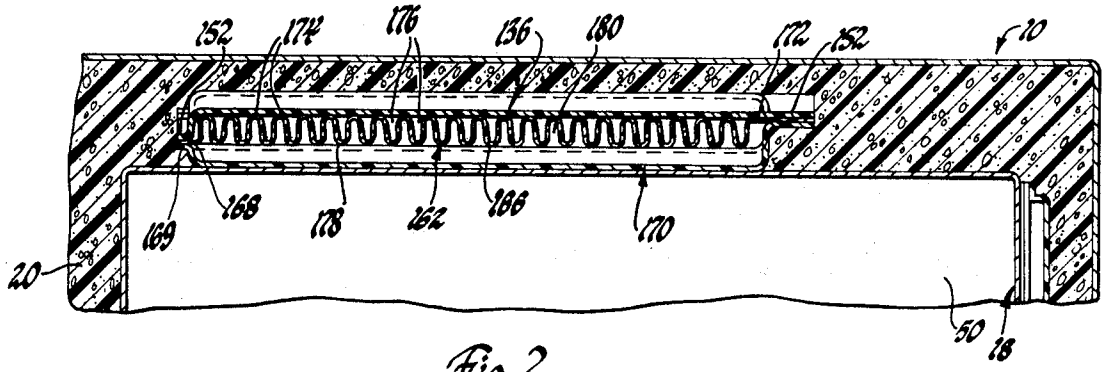


Fig. 2

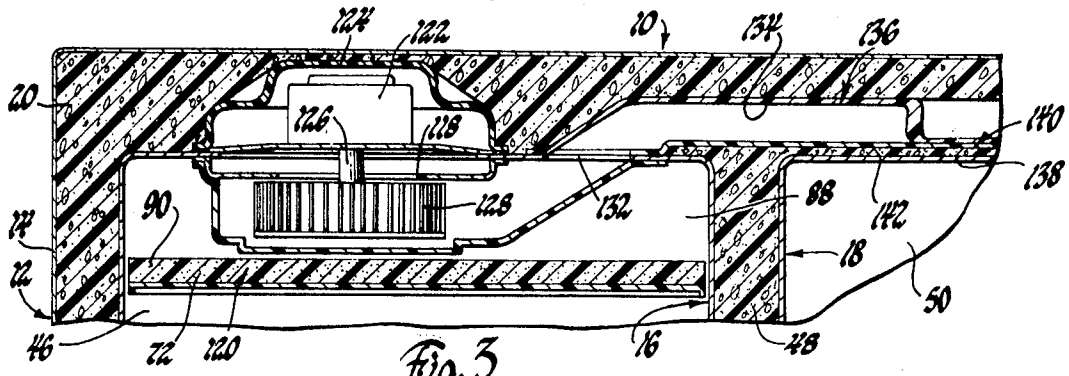


Fig. 3

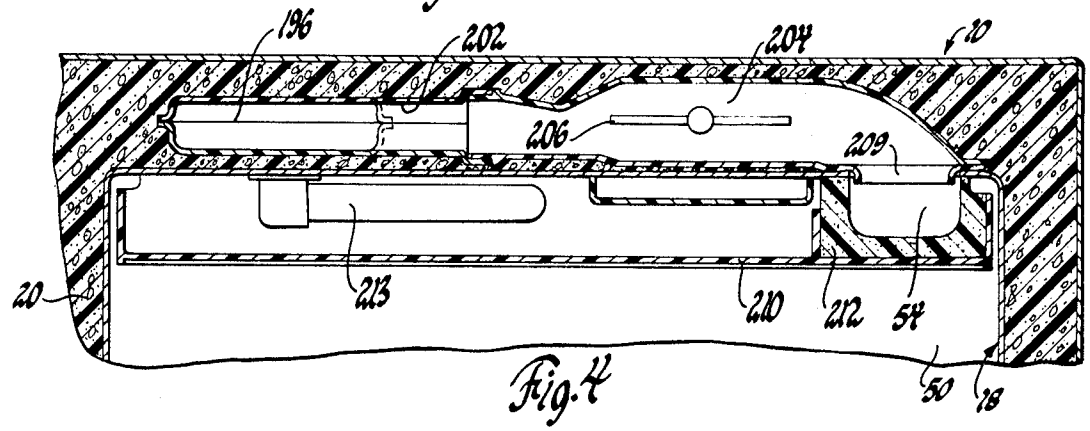


Fig. 4

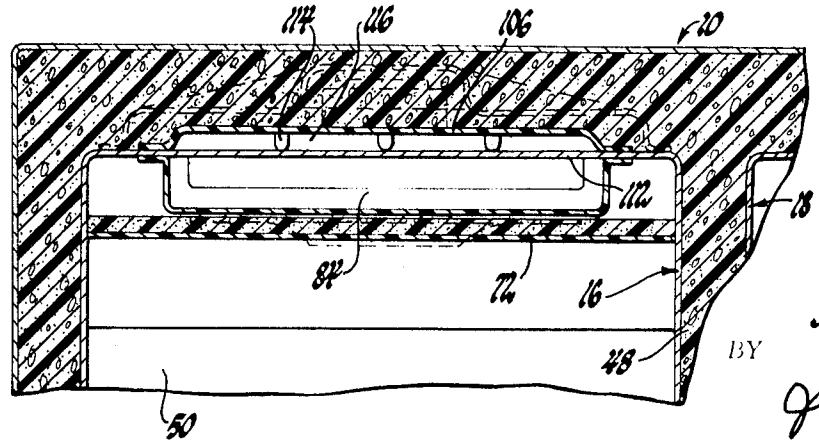


Fig. 5

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Filed May 25, 1970 3 Sheets-Sheet 3

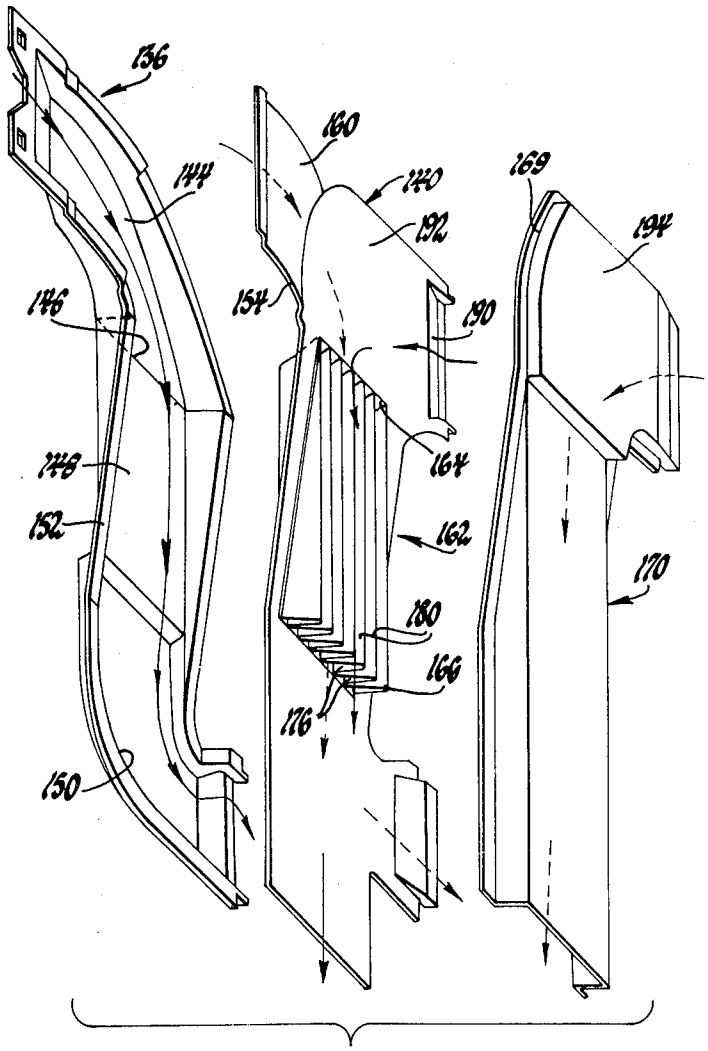


Fig. 7

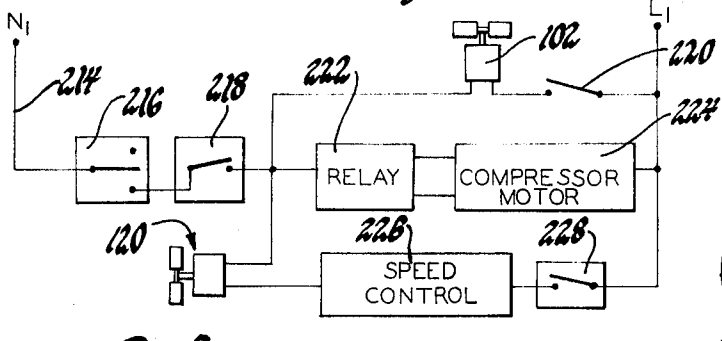


Fig. 8

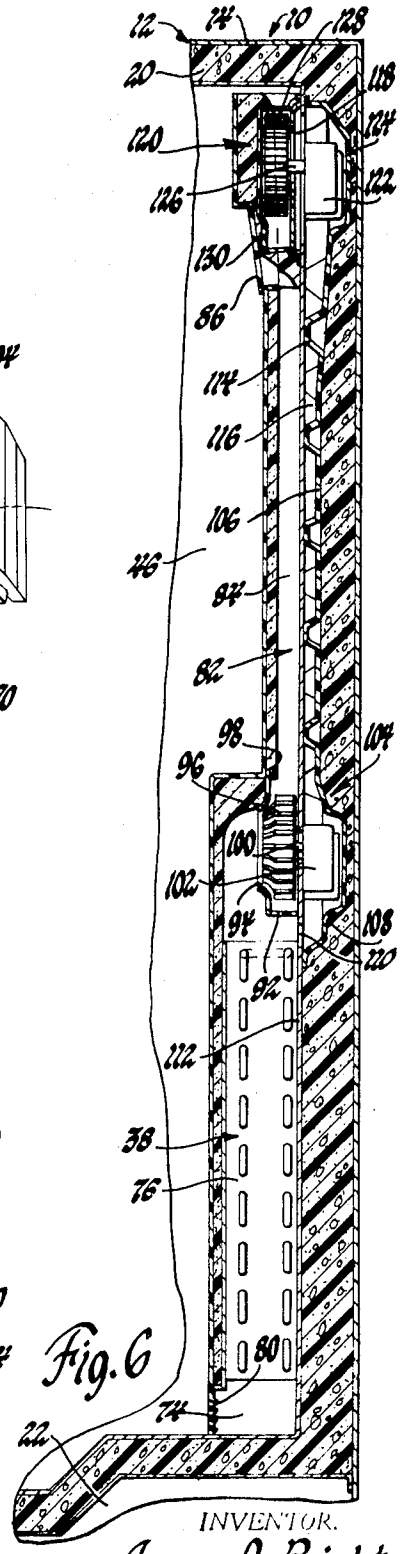


Fig. 6

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3,609,988

SIDE-BY-SIDE REFRIGERATOR FREEZER WITH HIGH HUMIDITY COMPARTMENT

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Filed May 25, 1970, Ser. No. 40,214
Int. Cl. F25d 17/04
U.S. Cl. 62—187 5 Claims

ABSTRACT OF THE DISCLOSURE

In preferred form, a side-by-side refrigerator freezer having a vertical partition separating a freezer compartment from an above freezing compartment which is divided into a high humidity space and a low humidity space. All of the compartments are cooled by air flow across a single evaporator located within a plenum in a freezer compartment. A parallel flow heat exchanger directs cold dry air into an envelope for cooling the high humidity space and thereafter receives the return air from the envelope to recool it prior to passage into the low humidity compartment for return flow to the evaporator plenum. A by-pass duct from the parallel flow exchanger returns part of the recooled air to a low point in the low humidity space to direct excess air from the parallel exchanger back into the cooling plenum.

This ivention relates to plural compartment domestic refrigerators and more particularly to such refrigerators having side-by-side freezer and above freezing food storage compartments separated by a vertical partition and more particularly to such arrangements having a sealed, high humidity food storage space.

In domestic refrigerators it is desirable to include a side-by-side, separate freezer compartment and a food storage compartment maintained at a temperature above freezing within a single thermally insulated outer cabinet.

Such arrangements can utilize a common refrigerant system having a single evaporator located in a plenum through which air is circulated for cooling the separated compartments. Additionally, the function of two separate appliances can be combined within a single cabinet which occupies a reduced amount of space as compared to two separate appliances having separate outer cabinets.

Such arrangements often are cooled by a forced draft flow of below freezing dry air. This can result in undesirable dehydration of foods stored within the various compartments.

Accordingly, an object of the present invention is to improve side-by-side refrigerator freezers by the provision therein of a large volume sealed high humidity food storage compartment maintained at a temperature above freezing and cooled by circulation of air across the outer surface of the compartment liner to prevent forced draft dehydration of foods stored therein.

Yet another object of the present invention is to improve side-by-side refrigerators of the type having a vertical partition separating a freezer compartment from an above freezing compartment by the provision therein of a first air flow system for cooling the freezer compartment and a separate and distinct second air flow system including a closed path envelope on the outer surface of a high humidity compartment which cools the high humidity compartment without the circulation of a forced draft air flow therethrough, and wherein a parallel flow heat exchanger is located in the second flow system between a cold source and the envelope to direct air into the envelope; return air from the envelope passing through the parallel flow heat exchanger to be cooled by the air flow from the cold source thereby to reduce the outlet air flow therethrough, and wherein a parallel flow heat can be reused to cool a low humidity forced draft cooled compartment also maintained above freezing.

These and other objects of the present invention are attained in one working embodiment that includes a thermally insulated outer cabinet with a vertical partition that separates the cabinet into a freezer compartment and an above freezing compartment. A cold source is defined by an evaporator located within a plenum at the rear of the freezer compartment. A first duct includes a fan therein for circulating air through the freezer compartment and across the evaporator in a first flow system. A second duct system includes a second fan for drawing air from the evaporator plenum for discharge into the inlet of a parallel flow heat exchanger which defines a series path into the inlet of an envelope on the outer surface of a liner defining a high humidity sealed compartment within the refrigerator. The outlet of the envelope is in communication with a warm air inlet of the exchanger. The warm side of the exchanger defines a path leading to the inlet of a forced air cooled, low humidity, above freezing compartment of the refrigerator. Heat exchange in the parallel flow exchanger between the cold air from the plenum and the return air from the envelope reduces the temperature of the return air so that it can maintain the temperature of the low humidity, above freezing compartment slightly above freezing under the control of a thermal bulb controlled damper valve assembly. Excess return air flow from the envelope is directly returned into the plenum through a cross over passageway in the vertical partition located between the plenum and the bottom rear portion of the above freezing, low humidity compartment.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein a preferred embodiment of the present invention is clearly shown.

In the drawings:

FIG. 1 is a view in front elevation partially sectioned of a side-by-side refrigerator freezer of the present invention;

FIG. 2 is an enlarged, fragmentary horizontal sectional view taken along the line **2**—**2** of FIG. 1;

FIG. 3 is an enlarged, fragmentary horizontal sectional view taken along the line **3**—**3** of FIG. 1;

FIG. 4 is an enlarged, fragmentary horizontal sectional view taken along the line **4**—**4** of FIG. 1;

FIG. 5 is an enlarged, fragmentary horizontal sectional view taken along the line **5**—**5** of FIG. 1;

FIG. 6 is a fragmentary view in vertical section taken along the line **6**—**6** of FIG. 1;

FIG. 7 is an exploded view in perspective of the component parts of a parallel flow heat exchanger used in practicing the present invention; and

FIG. 8 is a wiring diagram of the control for regulating the operation of the refrigerator freezer in FIG. 1.

Referring now to the drawings, in FIG. 1 a side-by-side refrigerator freezer **10** is illustrated including an outer cabinet **12** defined by an outer shell **14** which cooperates with a first inner liner **16** on one side of the cabinet **12** and a second inner liner **18** on the opposite side thereof.

Space between the outer shell **14** and the inner liners **16**, **18** is filled by suitable thermal insulation **20** such as a foamed-in-place polyurethane material.

In the illustrated embodiment the refrigerator **10** includes a bottom machinery compartment **22** in which is located an electric motor driven refrigerant compressor **24** having a discharge line **26** connected to the inlet of a condenser **28**.

A motor **30** drives a fan **32** for directing forced air

across the condenser 28 for cooling refrigerant therein.

Liquid refrigerant passes through a conduit 34 and a capillary tube 36 where it expands into the inlet of an evaporator 38. The outlet of the evaporator is connected through an accummulator 40 by a conduit 42 to the suction line 44 back to the compressor 24.

The above refrigerant system is a representative system that defines a suitable cold source over which air can be circulated for cooling plural compartments in the side-by-side refrigerator freezer 10.

More particularly, these compartments include a below freezing or freezer compartment 46 defined by the liner 16, and by a thermally insulated vertical partition 48 which extends between the bottom of liners 18 and 16 to the top thereof. The vertical partition 48 insulates the freezer compartment 46 from an above freezing food storage compartment 50 which is separated into a high humidity space 52 and a low humidity space 54 by a horizontal divider wall 56.

The outer shell 14 and inner liners 16 and 18 are joined by a breaker strip 58 which extends completely around the outer perimeter of the liner 16, 18 in a plane that includes the front surface of the vertical partition 48.

The access opening into the vertical freezer compartment 46 is closed by a vertically hinged side door 60 which has a peripheral seal 62 formed therearound which engages the breaker strip 58 when the door is closed to seal the freezer 46.

On the opposite side of the cabinet 10 at the top thereof is located a vertically hinged upper side door 64 which includes a peripheral seal 66 thereon which engages the partition 48 and breaker strip 58 around the perimeter of the opening into the high humidity space 52. When the door 64 is in its closed position, the space 52 is completely sealed against forced draft air flow therethrough by the liner 18, the vertical partition 48 and the door 64.

A lower side door 68 is vertically hinged at a point on cabinet 12 below the door 64 to close the access opening into the low humidity space 54 by means of a peripheral seal 70 on the door 68 which is located in sealed engagement with the breaker strip 58, the partition 48 and the wall 56 when the door is closed.

Within the freezer 46 is located a partition 72, best seen in FIG. 6, which is located forwardly of the rear wall of the liner 16 to define a cooling plenum 74 in which is located the evaporator 38 which is representatively illustrated as including a plurality of spaced vertically oriented fins 76 joined to a plurality of tube passes and return bends 78.

An air grill 80 in the bottom of partition 72 defines an inlet to the plenum 74 as well as the inlet of a first air flow system 82 which includes the plenum 74 and a vertical duct 84 located behind the partition 72 throughout substantially the full height of the freezer 46. The duct 84 includes an outlet 86 discharging downwardly into the freezer space 46.

Also, as illustrated in FIG. 3, the duct 84 communicates with a space 88 formed behind a top portion 90 of the partition 72 and the rear wall of the liner 16 so as to discharge cold dry air against the top of the liner 16 for producing an improved distribution of flowing cold within the freezer compartment 46.

At the top of the plenum 74 is located a fan scroll 92 having an inlet 94 to an impeller 96 which discharges through a top outlet 98 into the duct 84.

The impeller 96 is connected by a shaft 100 through the rear wall of the duct 84 to an electric drive motor 102.

When energized the fan 96 draws air from the top of the plenum 74 for discharge through the vertical reach of duct 84 thence through the outlet 86 downwardly into the compartment 46 and also upwardly across the top of the liner 16 through the space 88 between baffle 90 at the top of the duct 98.

The air then flows downwardly through the freezer compartment 46 and returns into the plenum through the grill opening 80 at the bottom of the freezer compartment 46.

The plenum 74 also communicates with a rearwardly located vertical duct 104 which includes a member 106 with an outwardly flared base portion 108 located in surrounding spaced relationship with the motor 102 to cover an opening 110 through the rear wall 12 of the liner 16 immediately above the top of the fins 76.

The duct member 106 further includes a plurality of inwardly directed truncated segments 114 thereon which contact the rear surface of the wall 112 to space the duct member 106 therefrom so as to define a vertically open passageway 116 for air flow from the plenum 74 to the inlet 118 of a motor fan assembly 120.

The motor fan assembly 120 more particularly includes a motor 122 which is enclosed by an upper portion 124 of the duct member 106 in spaced relationship therewith as best seen in FIG. 6.

A shaft 126 from the motor 122 is connected to an impeller 128 that is surrounded by a scroll 130 having a side outlet 132, best shown in FIG. 3, which communicates with a cross over passageway 134 located in the rear wall of the cabinet 14 so as to by-pass the insulated vertical partition 48 between the freezer compartment 46 and the above freezing compartment 50.

The cross-over 134 is defined by a duct member 136 which runs at a downward inclination across the rear wall 138 of the liner 18. The duct 136 includes a cover member 140 that is insulated from the rear wall 138 by a suitable layer of thermal insulating material 142.

The duct member 136 is illustrated in FIG. 7 as including a downwardly inclined inlet portion 144 which merges at a break line 146 to a recessed central portion 148 in fluid communication with an outlet segment 150 that extends to the opposite side of the rear wall 138 as is best seen in FIG. 1.

The member 136 includes a peripheral flange 152 thereon which is in sealing engagement with the periphery 154 of member 140 which covers the inclined inlet 144, the central portion 148 and the side outlet passageway 150 to define a closed, continuous flow path from the outlet 132 of the motor fan assembly 120 to a cooling envelope 156 which surrounds the outer surface of the side wall 158 of the liner 18 and a portion of the outer surface of the rear wall 138.

The cover 140 more particularly includes a segment 160 which cooperates with the baffle 136 to form the cross over passageway 134 seen in FIG. 3.

It also includes a parallel flow heat exchanger assembly 162 that fits within a recessed central portion 164 thereof as is best seen in FIG. 7.

The parallel flow heat exchanger more particularly includes a continuously convoluted plate 166 which is best illustrated in FIG. 2. The plate 166 includes a first edge portion 168 that is maintained in sealing engagement between the periphery 152 of the member 136 and the periphery 169 of a duct member 170 at the portion 148 through member 136.

It also includes an opposite edge portion 172 maintained in sealing relationship with the opposite side of the periphery 152 and the opposite segment of the periphery 169 of member 170.

The plate 162 includes a plurality of spaced apart ridges 174 thereon which are held in sealing engagement with the duct member 136 to define a plurality of spaced apart inlet, cold side flow passageways 176 for directing below freezing, dry air flow from the portion 144 into the outlet 150 therefrom.

Additionally, the heat exchanger plate 162 includes a plurality of ridges 178 formed at spaced apart points along the convolutions therein which engage the inner surface of the innermost duct member 170 as is best seen in FIG. 2 to form a plurality of spaced apart outlet, warm side passageways 180 that are in heat transfer relationship with air flow through the passageways 176.

For purposes of this specification, the term parallel flow heat exchanger means an exchanger having a cold side inlet and outlet and a warm side inlet and outlet. Flow through the cold and warm side is parallel and flows in the same direction.

The outlet **150** communicates with an inlet duct **182** into the envelope **156**.

More particularly, the inlet duct **182** is formed as a right angle elbow on the outer surface of the lower, rear corner of the liner **18** to communicate or direct air flow from the outlet **150** around that corner and into the bottom of an air flow passageway **184** that is formed between the outer surface of the side wall **158** and the envelope **156** by a side duct member **186** which is located outwardly of the liner wall **158** as is best illustrated in FIG. 1.

The upper end of the passageway **184** communicates with a return duct **188** which is wrapped around the upper rear corner of the liner **18** to direct air flow from the upper part of passageway **184** around the outer surface of the liner **18** and then redirected through a return passageway **190**, FIG. 7, that is defined by an upper segment **192** of the duct **140** which is in sealing engagement with the top **194** of the duct member **170** so as to define a flow path into the inlet end of the warm side passageways **180** of the parallel flow heat exchanger **162**.

The outlet end of the passageways **180** discharge into a downwardly directed duct **196** which extends along the outer surface of the rear wall of liner **18** to a point adjacent the bottom of low humidity space **54** where it communicates with an opening **198** through the rear wall **138** into the compartment or space **54**.

In accordance with certain principles of the present invention the opening **198** is located in close proximity to a lower cross over passageway **200** in the vertical partition **48** which communicates the space **54** with the bottom of the evaporator plenum **74**.

The duct **196** additionally includes a branch duct **202** to a passageway **204** in which is located a damper valve **206** angularly positioned in passageway **204** to regulate cold air flow therethrough. The valve **206** is under the control of a thermally responsive valve operator **208** which includes a thermal bulb sensing the interior temperature of the low humidity space **54**.

The passageway **204** communicates with an opening **209** in the rear wall **138** of the liner below the partition **56** and rearwardly of a baffle **210** located at the rear of the space **54** adjacent the top thereof.

The opening **209** is covered by a downwardly facing air diverter **212** whereby cold dry air from the opening **209** will flow top to bottom through space **54**. The baffle **210** is made up of suitable translucent plastic material and serves as a cover for a compartment light **213**.

The duct system shown in FIG. 7 along with the envelope **156** defines a plural path cooling system for the above freezing compartment **50** which serves to maintain both the high humidity space **52** and the low humidity space **54** thereof at a predetermined desired operating temperature somewhat above freezing.

The plural path system includes a first circuit through which cold dry air from the cooling plenum **74** is directed across the outer surface of the liner **18** around the space **52** for cooling the interior thereof without directly passing flowing cold air therethrough. Since the space **52** is sealed articles therein are not dehydrated by air flow and the space **52** will thereby have a high humidity therein as compared to the other compartment.

This first circuit more particularly includes the vertical duct **104**, through the inlet and outlet of the motor fan assembly **120** thence through the cross over duct **134** into the duct **136** shown in FIG. 7. This flow is shown in dotted line in FIG. 1 up from evaporator **38**, across partition **48** and down the left side of the outlined duct system in FIG. 1.

The air flow through the cold side passageways **176** is warmed by heat transfer across the plate **178** from return air passing through the separate return passageways **180** of the parallel flow heat exchanger **162**. This flow is shown in dotted line on the right side of the outlined duct system in FIG. 1.

From the duct member **136** cold dry air in the first circuit passes into the cooling envelope **156** on the outer surface of the liner **18** through the inlet duct **182** thereof thence through the passageway **184** and then through the return duct **188**. The return air to the exchanger **162** is warmed through heat transfer across the liner wall **18** to a degree that will cool space **52** to maintain a desired temperature above freezing temperature therein without flow of cold, dry dehydrating air therethrough.

This return air is recooled by virtue of the heat transfer across the parallel flow heat exchange plate **178** and then passes through the valve controlled passageway **204** and the opening **209** into the low humidity, above freezing compartment **54**. The first circuit is then completed through the compartment **54** by air flow therethrough which passes through the cross over passageway **200** in partition **48** into the bottom of the cooling plenum **74**.

The portion of the first circuit that cools the space **52** without directing forced draft air therethrough has cold dry air therein which is then used to cool the lower humidity compartment **54** by direct convective air flow across contents therein. There is a certain amount of moisture picked up from articles therein which is removed when the return air through the passageway **200** is directed over the fin **76** of the evaporator.

A second circuit off of the first circuit constitutes return duct **196** that diverts recooled air from the parallel heat flow exchanger **162** in excess of that needed to maintain a predetermined temperature in the low humidity compartment **54** under the control of the thermostatically controlled valve **208**.

The second circuit is a direct by-pass circuit which is formed by the duct **196**, the opening **198** and its close, short circuit proximity to the cross over passageway **200** at the rear, bottom of space **54**.

This portion of the air is still dry and will return across the evaporator within the plenum **74** without depositing frost build-up thereon.

Referring now to FIG. 8 an electrical circuit is illustrated for controlling operation of the motor fan assembly of the refrigerator for maintaining a predetermined below freezing temperature within the compartment **46** a predetermined level of humidity and above freezing temperature within space **52** and an above freezing temperature within the space **54**.

More particularly, this circuit includes a conductor **214** connecting a wire N_1 to one side of a defrost timer switch **216** that is series connected with a unit thermostat **218** to control operation of the freezer fan motor **102**. The freezer fan motor **102** is also controlled by a door switch **220** that is operated when the side door **60** is opened to turn off the fan motor **102**.

The circuit further includes a compressor motor start relay **222** that is in series connection with the timer switch **216** and the thermostat **218** for controlling energization of a motor **224** operating the compressor. Additionally, in series with the defrost switch **216** and the thermostat **218** is a circuit for controlling energization of the motor fan assembly **120**.

It includes a variable speed controller **226** which is in series connection with a second door switch **228** that shuts off the above freezing compartment air flow when the side **68** is open. The controller **226** is a phase control device of the type set forth in United States Patent No. 3,399,333 issued August 27, 1968. The device includes a sensor that regulates motor speed in accordance with the temperature of the liner at the bottom of rear wall **138** just above divider **56**.

In operation, when all of the doors of the refrigerator are closed and the compartments require cooling, the compressor motor is energized to cause refrigerant to pass through the evaporator for cooling air flow through the

plenum **74**. The freezer compartment **46** is cooled by air flow which in one working embodiment under equilibrium conditions produced an outlet temperature at the opening **86** in the freezer compartment of 4° F.

One feature of the present invention is that the inlet flow into the duct **104** passes across the fan motor **102** of the freezer motor fan assembly and as a result the inlet air temperature into the system for cooling the above freezing compartment **50** in one working embodiment was maintained at 8° F.

Another feature of the invention is that the upward flow through the passageway **98** of the freezer cooling circuit is in heat exchange relationship with the warmer air flow through the vertical passageway **116** which leads to the inlet of the motor blower assembly **120**. Thus, in the working embodiment the temperature of the air flowing through the motor fan assembly was observed to be 7° F. at the cross over passageway or duct **134** prior to flow into the parallel flow heat exchanger **170**.

Outlet flow from the cold air passageways **176** of the parallel flow heat exchanger **170** in the same working embodiment was noted to be 10° F. Temperatures at the inlet and outlet ducts of the cooling envelope **156** were 13° F. and 19° F.

Inlet return air flow to the warm side passageways **180** of the parallel flow heat exchanger **170** were 21° F.

The cooling effect of the parallel flow heat exchanger **170** on this return air was capable of reducing the temperature of air flow through the warm side **180** to 16° F.

This cold dry air maintains the predetermined temperature established by the thermostatically controlled valve **208** within the flowing cold or low humidity above freezing compartment **54**.

In the working embodiment it was observed that the outlet temperature from the by-pass duct **198** was in the order of 17.5° F. representing the heat exchange between the space **54** and the by-pass duct **196**.

The combined return temperature through the cross over passage **200** was observed to be in the order of 29.5° F.

In the aforesaid working embodiment the total refrigerated volume of the system was in the order of 22 cubic feet. The system was operated to maintain a temperature range of 34 through 38° F. in the high humidity compartment and a temperature in the order of 34° F. in the low humidity flowing cold compartment.

The air temperature in the freezer compartment was maintained in the order of 10–15° F.

While the embodiments of the present invention, as herein disclosed, constitute a preferred form, it is to be understood that other forms might be adopted.

What is claimed is:

1. A side-by-side refrigerator freezer comprising, a thermally insulated cabinet having a vertical partition separating said cabinet into an above freezing compartment and a below freezing compartment, means separating said above freezing compartment into a high humidity space and a low humidity space, means for directing a first flow of air through said below freezing compartment including a fan and an evaporator located within a plenum within said below freezing compartment, means for circulating a second flow of air through said cabinet including a second fan having its inlet connected to said evaporator plenum and an outlet, a parallel flow air heat exchanger including a heat exchange surface separating first and second passageways therethrough, a cooling envelope around said high humidity space having an inlet and an outlet, said second fan discharging air in series flow relationship through said first plurality of heat exchanger passageways, thence through said envelope, thence through said second plurality of heat exchanger passageways for cooling said high humidity space without flow of air therethrough and to recool air return from said envelope, and means for directing said return air flow from said second plurality of passageways interiorly of said low humidity space in said above freezing compartment for cooling the contents thereof.

2. A side-by-side refrigerator freezer comprising, a thermally insulated cabinet having a vertical partition separating said cabinet into an above freezing compartment and a below freezing compartment, means separating said above freezing compartment into a high humidity space and a low humidity space, means for directing a first flow of air through said below freezing compartment including a fan and an evaporator located within a plenum within said below freezing compartment, means for circulating a second flow of air through said cabinet including a second fan having its inlet connected to said evaporator plenum and an outlet, a parallel flow air heat exchanger including a heat exchange surface separating first and second passageways therethrough, a cooling envelope around said high humidity space having an inlet and an outlet, said second fan discharging air in series flow relationship through said first plurality of heat exchanger passageways, thence through said envelope, thence through said second plurality of heat exchanger passageways for cooling said high humidity space without flow of air therethrough and to recool air return from said envelope, means including a thermostatic valve for directing a part of said return air flow from said second plurality of passageways interiorly of said low humidity above freezing compartment for cooling the contents thereof, means including a by-pass duct for returning the remainder of air flow from said second plurality of passageways into the bottom of said low humidity space and then through said partition into said plenum.

3. A side-by-side refrigerator freezer comprising, insulated cabinet means having a vertical partition defining a below freezing compartment and an above freezing compartment, means for dividing said above freezing compartment into first and second food storage spaces, a refrigerant system comprising a compressor, a condenser, and an evaporator, means for connecting said compressor, condenser and evaporator in series flow relationship, means forming a plenum within said freezer compartment, said evaporator being located within said plenum, a first duct communicating with said plenum, fan means in said first duct for drawing below freezing air from said plenum and discharging it into said freezing compartment at the top thereof, a second duct located between said first duct and said cabinet, a parallel flow heat exchanger having a heat exchange surface separating first plurality of flow passageways and a second plurality of flow passageways, a low temperature envelope surrounding exterior portions of part of said first food storage space of said above freezing compartment for cooling the interior thereof without directing high velocity air flow therethrough, second fan means in communication with said second duct for drawing air from said plenum for discharge through said first plurality of passageways of said parallel flow heat exchanger, thence through said envelope, means for returning air from said envelope for passage through said second plurality of heat exchange passageways for recooling by heat exchange between air flow from said plenum passing through said exchanger, and means for directing said recooled air interiorly of said second food storage space for convectively cooling the contents thereof.

4. A side-by-side refrigerator freezer comprising, insulated cabinet means having a vertical partition defining a below freezing compartment and an above freezing compartment, means for dividing said above freezing compartment into first and second food storage spaces, a refrigerant system comprising a compressor, a condenser, and an evaporator, means for connecting said compressor, condenser and evaporator in series flow relationship, means forming a plenum within said freezer compartment, said evaporator being located within said plenum, a first duct communicating with said plenum, fan means in said first duct for drawing below freezing air from

said plenum and discharging it into said freezing compartment at the top thereof, a second duct located between said first duct and said cabinet, a parallel flow heat exchanger having a first plurality of flow passageways and a second plurality of passageways, a low temperature envelope surrounding exterior portions of part of said first food storage space of said above freezing compartment for cooling the interior thereof without directing high velocity air flow therethrough, second fan means in communication with said second duct for drawing air from said plenum for discharge through said first plurality of passageways of said parallel flow heat exchanger, thence through said envelope, means for returning air from said envelope for passage through said second plurality of heat exchange passageways for recooling by heat exchange between air flow from plenum passing through said exchanger, means for directing said recooled air interiorly of said second food storage space for convectively cooling the contents thereof, a cross over passageway between said plenum and said second food storage space for returning air from said above freezing compartment into said plenum for cooling by said evaporator, and second means for directing the return air from said envelope to a point immediately adjacent said cross over passageway whereby part of the flow of air from said envelope is returned to said plenum without mixing with said air for convectively cooling said second food storage space.

5. A side-by-side refrigerator freezer having a high humidity compartment comprising, means forming an insulated cabinet having a vertical partition therein separating said cabinet into an above freezing compartment and a below freezing compartment, means separating said above freezing compartment into a high humidity space and a flowing cold space, a refrigerant system including a cold source, means forming a plenum in said below freezing compartment having said cold source located therein, a first vertically up-standing duct at the rear of said below freezing compartment having an inlet in communication with said plenum and an outlet in communication with said below freezing compartment at the top thereof, first fan means for circulating air from said plenum for discharge into the top of said below freezing compartment, means defining a return passageway from said freezing compartment into the base of said plenum, a second vertically up-standing duct located between said first duct and said cabinet, said second duct having an inlet in communication with said plenum and an outlet extending around said partition at the rear of said cabinet,

second fan means for drawing air from said plenum through said second duct for discharge around said partition, a parallel flow heat exchanger located rearwardly of said above freezing compartment including a first plurality of passageways and a second plurality of passageways, a heat exchange surface between said first and second plurality of passageways, means for communicating said outlet of said second duct with said first plurality of passageways, an envelope in surrounding relationship with the outer surface of said high humidity space including an inlet and an outlet, said first plurality of heat exchanger passageways communicating with said inlet of said envelope, said outlet of said envelope communicating with said second plurality of passageways in said parallel flow heat exchanger for causing air flow from said envelope to be cooled by air flow from said second duct in a parallel flow path, means for diverting a part of the recooled air from said envelope and directing it interiorly of said flowing cold space, valve means for controlling the diverted air flow in accordance with the temperature of the flowing cool compartment for maintaining a predetermined above freezing temperature therein, a return opening through the base of said partition for communicating said flowing cold compartment with said plenum, a branch duct from said heat exchanger for directing the remainder of the return air from said envelope into said flowing cold compartment at a point adjacent said return opening for short circuit return flow through said plenum whereby said flow cold compartment is maintained at a temperature under the control of said valve means.

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