

May 14, 1968

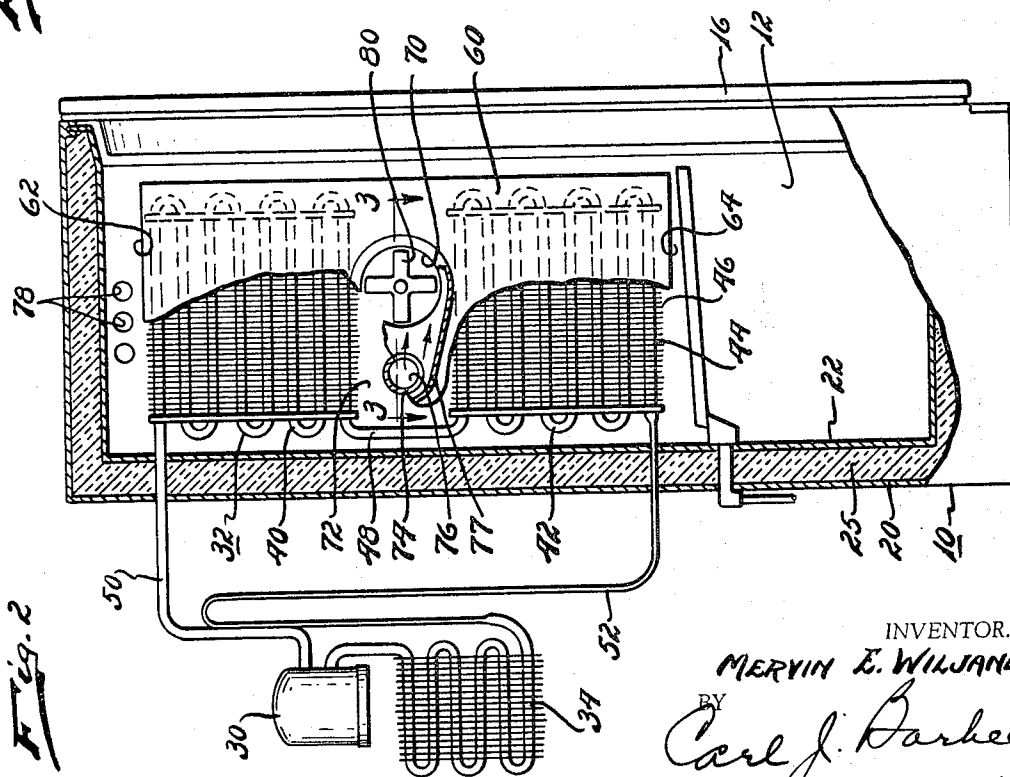
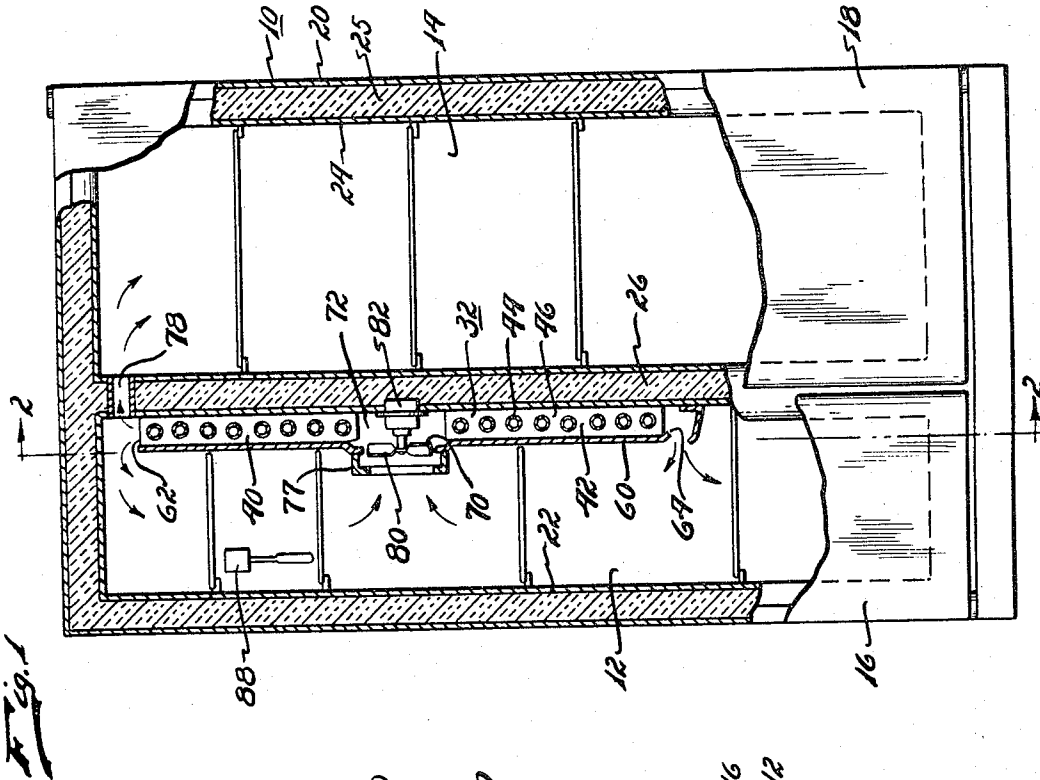
M. E. WILJANEN

3,382,683

REFRIGERATING APPARATUS-SINGLE EVAPORATOR

Filed Nov. 14, 1966

2 Sheets-Sheet 1



INVENTOR.
MERVIN E. WILJANEN
BY
Carl J. Barbee
ATTORNEY

May 14, 1968

M. E. WILJANEN

3,382,683

REFRIGERATING APPARATUS-SINGLE EVAPORATOR

Filed Nov. 14, 1966

2 Sheets-Sheet 2

Fig. 3

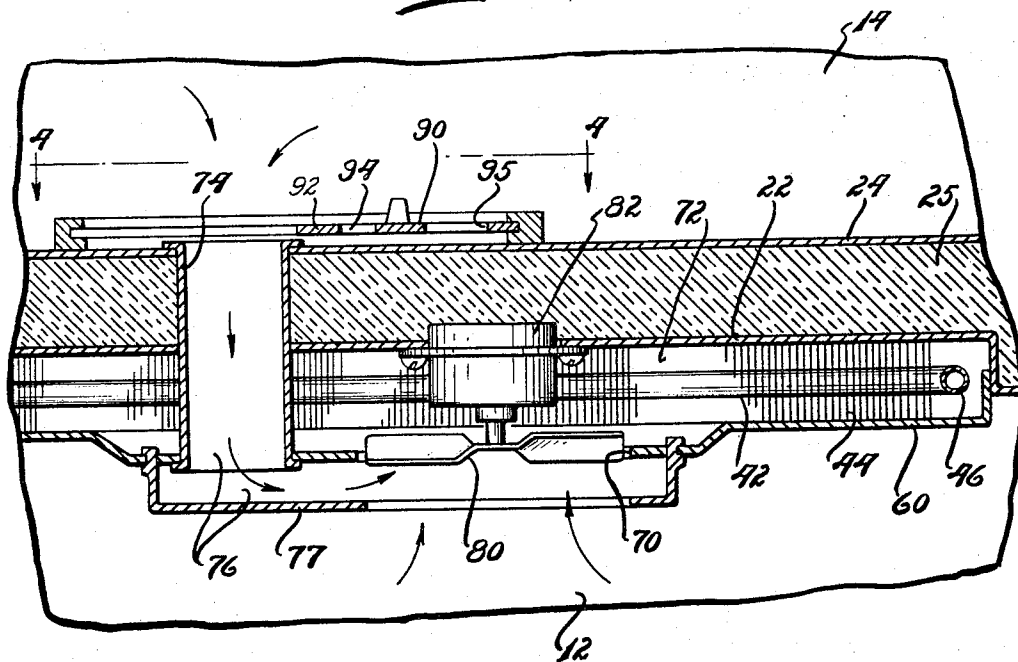


Fig. 4

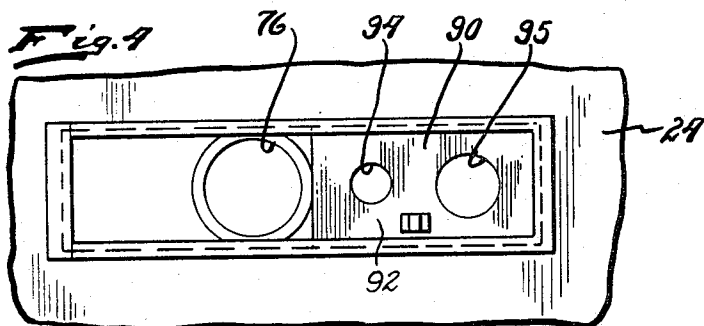
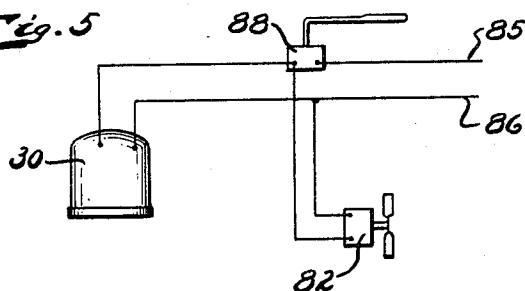


Fig. 5



INVENTOR.
MERVIN E. WILJANEN
BY
Carl J. Barbee
ATTORNEY

1

3,382,683

REFRIGERATING APPARATUS—SINGLE EVAPORATOR

Mervin E. Wiljanen, Livonia, Mich., assignor to American Motors Corporation, Detroit, Mich., a corporation of Maryland

Filed Nov. 14, 1966, Ser. No. 593,929

8 Claims. (Cl. 62—186)

ABSTRACT OF THE DISCLOSURE

A refrigerator cabinet having a low and a high temperature compartment cooled by a single evaporator. The evaporator is arranged with a circular to comingle the air from both compartments and pass it across different portions of the evaporator for return to the low temperature compartment. A counterflow between the compartments is through an open interconnecting passageway.

This invention relates to refrigerating apparatus and particularly to two temperature refrigerators having a single evaporator.

It is an object of the present invention to provide a single evaporator for use in a two compartment refrigerator and the compartments are required to be maintained at different temperatures.

Another object of the present invention is to arrange a single evaporator within one of two compartments and to make use of forced air circulation to maintain desired temperatures in each of the compartments.

Another object of this invention is to arrange a single evaporator within one compartment against a vertical partition wall that separates it from an adjacent compartment maintained at a different desired temperature and to interconnect the compartments in air flow communication by relatively short open passageways extending transversely through the partition wall.

Another object of this invention is to make use of forced air circulation to withdraw air from two different compartments of different temperatures and be comingled, thereafter passing the comingled air into heat transfer with an evaporator for return to one of the compartments, and interconnecting the two compartments in open air flow communication for balancing the withdrawal therebetween.

Another object of this invention is to regulate the desired temperature to be maintained in one of two different compartments by a manual control adjustable to regulate the air flow withdrawal therefrom.

These and other objects and advantages to be gained in the practice of this invention will be better understood and further appreciated from the following specification having reference to the accompanying drawings.

In the drawings:

FIG. 1 is a front elevation of a refrigerator cabinet with parts broken away and parts shown in section and embodying features of the present invention.

FIG. 2 is a sectional view taken substantially along line 2—2 of FIG. 1 and showing a schematic arrangement a refrigeration system used therewith.

FIG. 3 is a fragmentary sectional view taken substantially along line 3—3 of FIG. 2.

FIG. 4 is a fragmentary view taken along line 4—4 of FIG. 3 and

FIG. 5 is a wiring diagram of a control arrangement used with the present invention.

Shown in the drawings is a refrigerator cabinet 10 having a low temperature freezer compartment 12 and a higher temperature above freezing storage compartment 14. The compartments are horizontally arranged in spaced

2

apart side by side relation. Access to each compartment 12, 14 is through vertically hinged doors 16, 18 respectively.

The cabinet 10 comprises an outer shell wall 20 and liners 22, 24. The liner 22 forms the sides of compartment 12 and the liner 24 forms the sides of the compartment 14. The sides of the liners 22, 24 are spaced from adjacent opposed sides of the outer shell walls, and from each other, by suitable thermal insulation 25. The sides adjacent and in opposed relation of the liners 22, 24 together with the insulation 25 therebetween form an upright vertical partition wall 26 which insulates and separates the compartments 12 and 14.

A refrigerating apparatus is shown schematically to include a motor compressor unit 30, an evaporator 32 and a condenser 34.

The evaporator 32 is formed in two separated sections 40, 42. Each section is similarly formed in conventional manner which includes a serpentine coil 44 extending through spaced thin walls 46.

The evaporator 32 is disposed vertically against the partition wall 26 within the freezer compartment 16 with the section 40 spaced vertically above and from the lower section 42. A tubing or conduit 48 interconnects the outlet of the section 42 with the inlet of the upper section 40 so that volatile refrigerant will flow unrestricted from the lower section 42 to the upper section 40. From the section 40 the heat laden vaporized refrigerant is withdrawn through a conduit 50 to the motor-compressor unit 30 to be compressed thereby and passed into the condenser 34 to be cooled and liquefied. The outlet of the condenser is connected to the inlet of the section 42 by a capillary tube 52 which meters the flow to the section 42. The capillary tube 52 has a section of its length bonded in thermal exchange to the return conduit 50.

The evaporator sections 40, 42 are separated from the freezer compartment 16 by a vertically disposed wall 60 which cooperatively forms with the partition wall 25 a duct like enclosure that is in open communication with the freezer compartment through a top outlet opening 62 and a bottom outlet opening 64. The wall 60 extends, preferably, the vertical height of the evaporator 32 extending from the bottom edge of the evaporator section 42 upwardly to terminate with the top edge of the section 40. The top edge of the wall 60 being a spatial distance from the top wall of the compartment 12 and similarly the bottom edge is a spatial distance from the bottom wall of the compartment.

A circular opening 70 is formed in the wall 60. The opening 60 is located to provide air movement from the freezer compartment 12 into a space or area 72 formed between the evaporator sections 40, 42. The storage compartment 14 is also in open air flow communication with the space 72, and compartment 12, through an interconnecting duct 74 forming an air passage 76 which extends from the compartment 14 through the partition wall 25, across to and through the wall 60 where it connects with a laterally extending duct 77 to extend the passage 76 to the peripheral edge of the opening 70 in open communication therewith.

The compartments 12, 14 are connected in open communication by a passageway or passageways 78 which extend through the partition wall 25. It is desirable, and preferred, that this interconnection be made to join the upper regions of the compartments and in near proximity downstream from the opening 62. Though plural passageways 78 are shown, a proportionate single passageway may be had. Disposed in the opening 70 is a fan 80 driven by a motor 82. The motor 82 is wired in parallel circuit with the motor-compressor unit 30 to power supply lines 85, 86. A thermostatic control 88 responsive to the air

temperature within the freezer compartment 12, is wired in series circuit from a power supply line to the motor-compressor unit 30 and to the motor 82. When the air temperature within the freezer compartment 12 rises above a predetermined level the thermostatic control 88 will simultaneously energize both the compressor unit and fan motor and will maintain their operation until the temperature has been lowered to a predetermined low value at which time both will be simultaneously de-energized.

The operation of the fan 80 withdraws air from both compartments to be comingled and passed into the space or area 72. Air from the compartment 14 is withdrawn through the passageway 76 to be mixed with the air being withdrawn from the compartment 12 as they pass through the opening 60. The comingled air divides to flow in opposed directions from the area 72 to pass in heat transfer relation with a respective section of the evaporator. The air cooled by the evaporator section 42 passes through the outlet 64 while the air cooled by the evaporator section 40 passes through the outlet 62. Both outlets 62, 64 discharge the air into the freezer compartment 12.

The outlets 62, 64 are arranged to offer no restriction to the flow entering the compartment 12. As this flow includes the air withdrawn from both compartments there will be a corresponding increase in air pressure within the compartment 12 relative to a decrease in air pressure within the compartment 14 and this condition will divert a portion of the cooled air passing from the outlet 64 to enter the passageways 78 for return to the compartment 14. This diversion flow will continue as long as a pressure differential exists between the two compartments.

To maintain or to vary the temperature within the compartment 14 there is provided an air flow restrictor which includes a manually operated damper 90 to control the warm air flow into the passageway 76. The damper comprises a slide plate 92 in which are arranged different sized openings 94, 95. By sliding the plate across the entrance of the passageway 76 until a selected opening 94, or 95 is aligned with the opening 76 the withdrawal flow is sufficiently altered to vary the temperature within compartment 14.

From the foregoing it will be appreciated that a single evaporator may service two separated side by side compartments and maintain each compartment at respectively different temperature levels. The evaporator's construction and arrangement within the freezer compartment against the upright partition wall provides an air flow communication with the other compartment through relatively short, inexpensive through the wall passageways without sacrifice of insulation thickness in any part of the cabinet.

The disposition of the evaporator and the arrangement of the air circulation passageways also induces air movement within each compartment during the period the fan is inoperative. As the compartment 14 is maintained at a higher or warmer temperature than the compartment 12 this warmer air will flow through the passageway 78 and downwardly across the evaporator to be cooled and enter the lower portion of the compartment 12 where it will induce the warmer air to rise and circulate to the evaporator by entering through opening 62. Also the colder air from the compartment 12 enters through passageway 76 the warmer compartment 14 where it will induce an air circulation by moving downwardly with the warmer air rising to circulate towards the passageway 78. Though this circulation is not intended to maintain temperatures it does serve to make for uniformity of temperature in all areas of each compartment during the period the compressor and fan are inoperative.

Although only a preferred form of the invention has been illustrated, and that form described in detail, it will be apparent to those skilled in the art that various modifications may be made therein without departing from

the spirit of the invention or from the scope of the appended claims.

I claim:

1. A refrigerator having a low temperature zone and a higher temperature zone and comprising:
 - heat absorbing means disposed in the low temperature zone having separated spaced apart heat absorbing sections,
 - means for withdrawing and comingling the air from both temperature zones,
 - said means being arranged intermediate the said separated heat absorbing sections to direct different portions of the comingled air over different heat absorbing sections and thereafter each cooled portion entering said low temperature zone, and
 - means interconnecting said zones in open air flow interchange to equalize the pressure differential therebetween.
2. A refrigerator having a low temperature zone and a higher temperature zone, said zones being adjacent to each other being separated by a vertically upright insulated partition wall, said improvement comprising:
 - heat absorbing means disposed in said low temperature zone next adjacent said upright insulated partition wall,
 - said heat absorbing means consisting of separated heat absorbing sections,
 - means for withdrawing and comingling the air from both temperature zones and including a passageway through said wall for withdrawing air therethrough from said high temperature zone to said means,
 - said means being arranged intermediate said separated heat absorbing sections to direct different portions of the comingled air over different heat absorbing sections and thereafter each cooled portion entering said low temperature zone, and
 - air passage means interconnecting said zones in open air flow interchange and having its opening with said low temperature zone in the area of discharge of one of said heat absorbing sections.
3. The refrigerator of claim 2 including duct means enclosing said heat absorbing sections and having outlets arranged therewith whereby the cooled air leaving each heat absorbing section enters a different area of said low temperature zone.
4. The refrigerator of claim 2 including air flow control means associated with said air withdrawing means, and said air flow control means being adjustable to proportion the withdrawal of the air being withdrawn from at least one of said temperature zones.
5. A two temperature refrigerator comprising:
 - a refrigerator cabinet having two separate insulated compartments including a low temperature freezer compartment and a higher temperature above freezing storage compartment arranged in side by side relation and having a common upright insulated partition wall separating said compartments, the improvement comprising:
 - a second upright wall within said freezer compartment in spaced relation to said partition wall forming therewith for a portion of the height of said partition wall a vertically extended open ended passageway,
 - each open end of said passageway being an outlet in open communication with a different area of said freezer compartment,
 - an opening in said second wall intermediate said outlets to provide an air flow entry from said freezer compartment into said vertically extended passageway,
 - an evaporator for circulating refrigerant and being formed in two separated heat absorbing sections interconnected in refrigerant series flow relation,

5

said evaporator being disposed within said vertical passageway having said separated heat absorbing sections disposed on opposite sides of said opening and each section being extended toward a different open end of said passageway from said opening,

a conduit extending through said upright partition wall and being extended therefrom to interconnect in open air flow communication said storage compartment with said opening,

fan means disposed in said opening and being operable for withdrawing air through said conduit and said opening from each of said compartments, comingling the air and passing it into said vertical passageway whereby different portions of the comingled air will pass into heat transfer relation with different heat absorbing sections and thereafter enter different areas of said freezer compartment,

an open passageway interconnecting said compartments and being extended transversely through said upright partition wall.

6. The two temperature refrigerator of claim 5 including:

said open passageway terminating in said low tempera-

6

ture freezer compartment next adjacent one of said outlets of said vertical passageway.

7. The two temperature refrigerator of claim 5 including:

5 flow control means associated with said conduit and being adjustable to vary the withdrawal of air from said higher temperature storage compartment.

8. The two temperature refrigerator of claim 7 including:

10 control means responsive to the air temperature within said freezer compartment, and

circuit means coupling said control means and said fan means to control the operation of said fan means.

References Cited

UNITED STATES PATENTS

2,794,325	6/1957	Shearer	62—419
2,812,642	11/1957	Jacobs	62—187
2,815,649	12/1957	Di Angelus	62—419
2,907,180	10/1959	Mann	62—187
3,137,146	6/1964	Wallenbrock	62—419
3,232,071	2/1966	Wallenbrock	62—277

WILLIAM J. WYE, *Primary Examiner.*