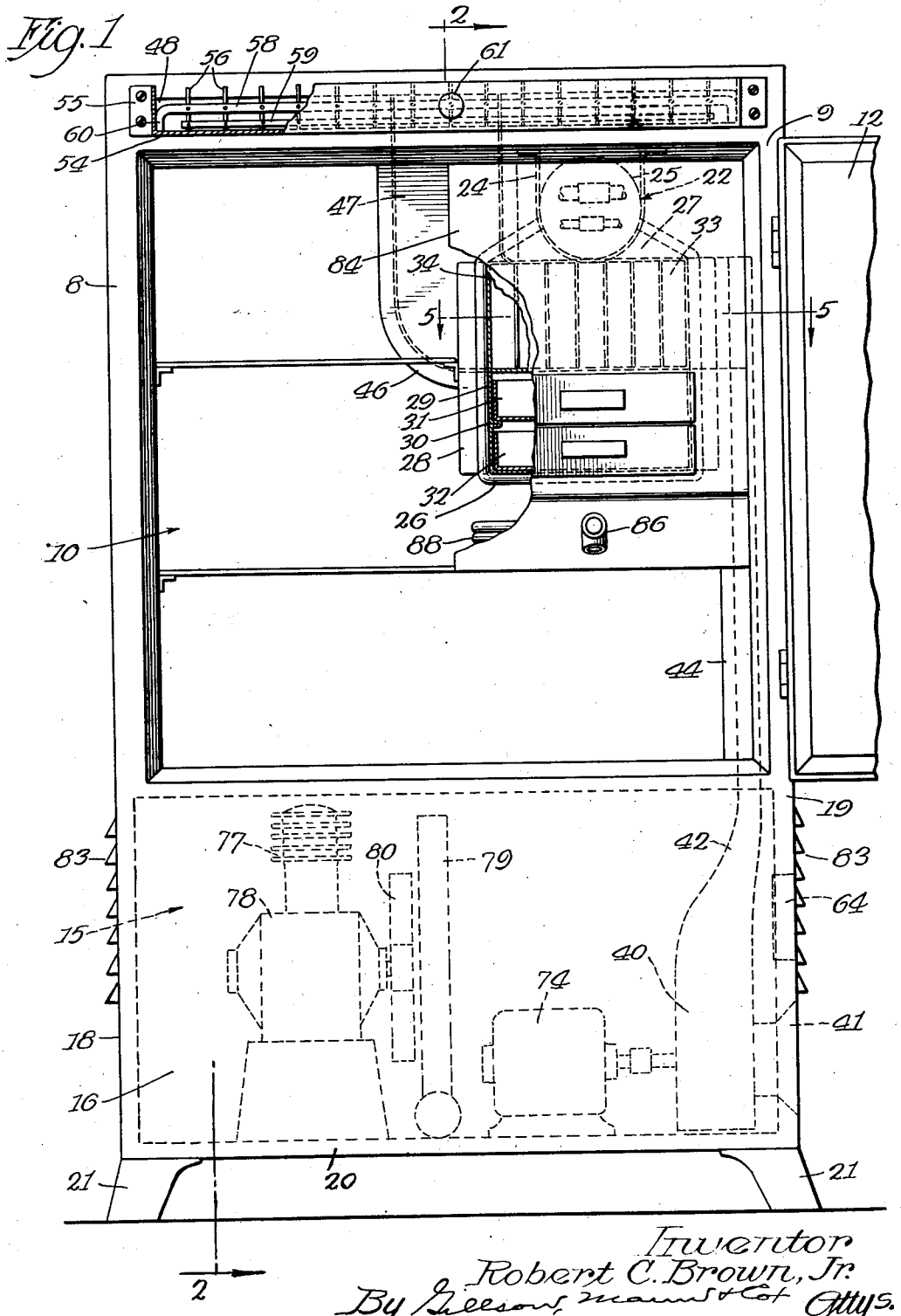
May 7, 1935. R. C. BROWN, JR 2,000,879

DOMESTIC REFRIGERATOR

Filed March 21, 1932 3 Sheets-Sheet 1

Fig. 1



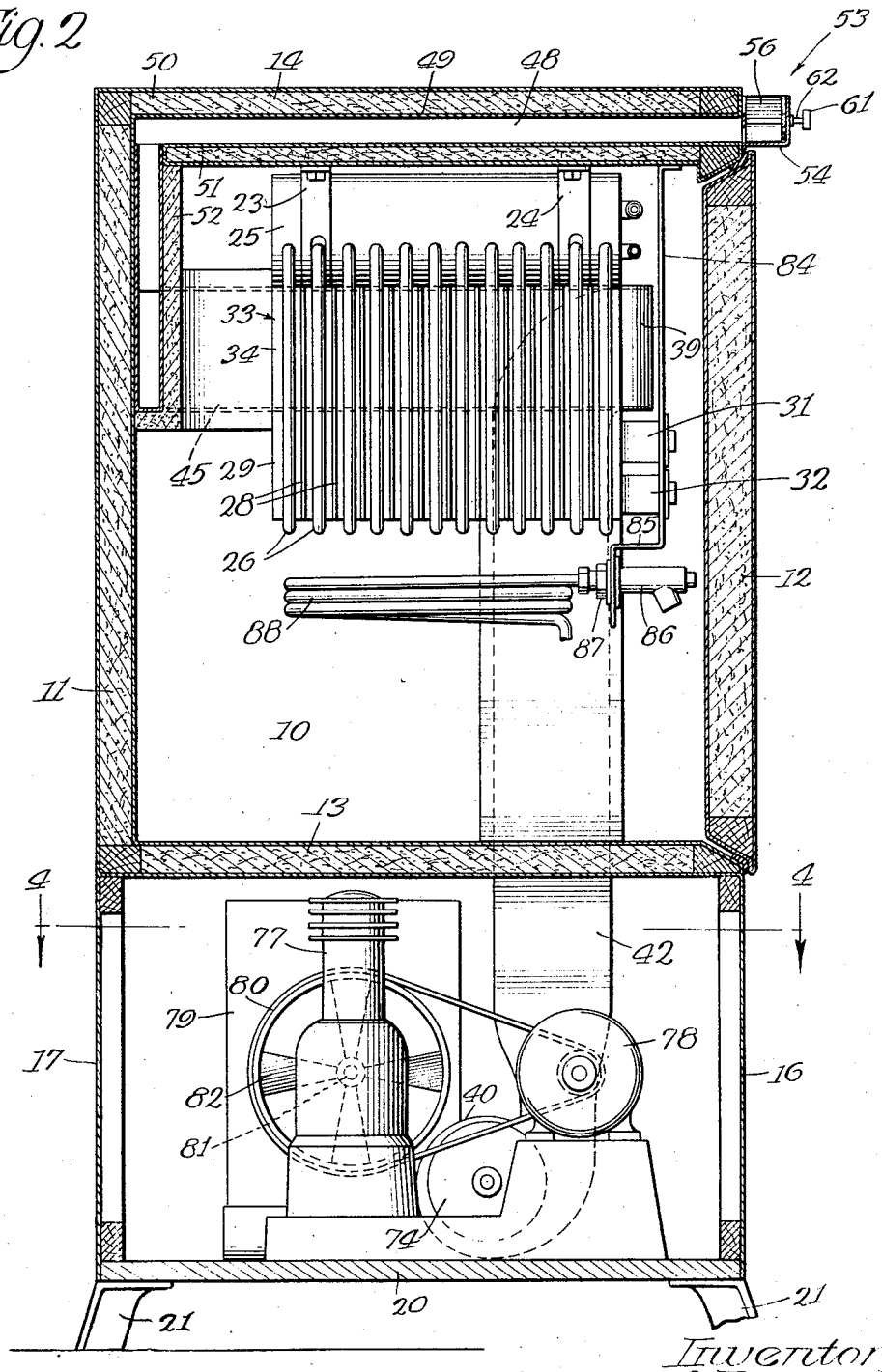
Inventor
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DOMESTIC REFRIGERATOR

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Fig. 2



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Fig. 3

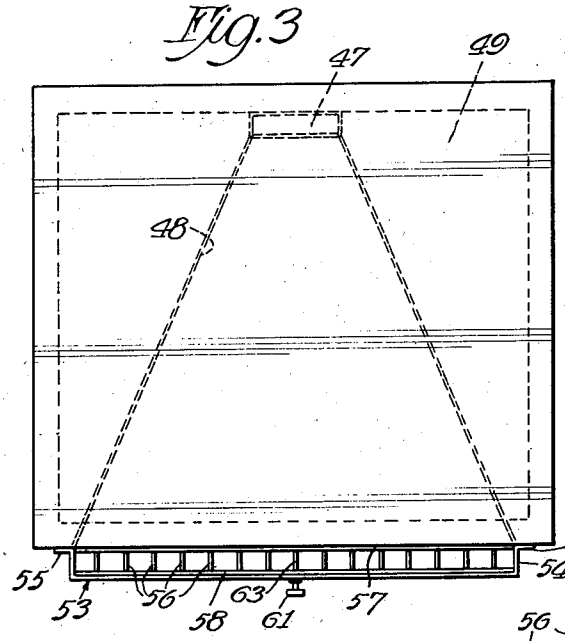


Fig. 5

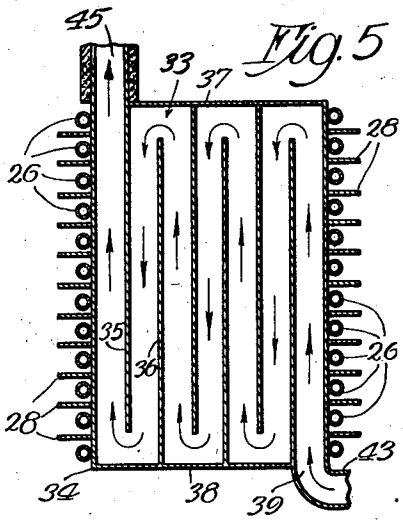


Fig. 6

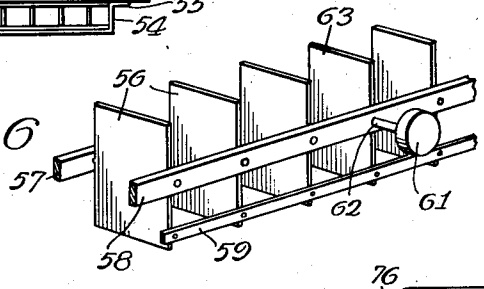
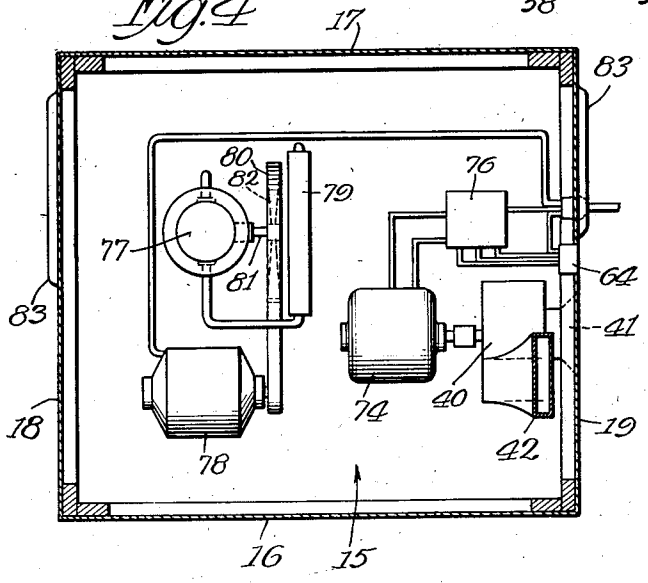


Fig. 4



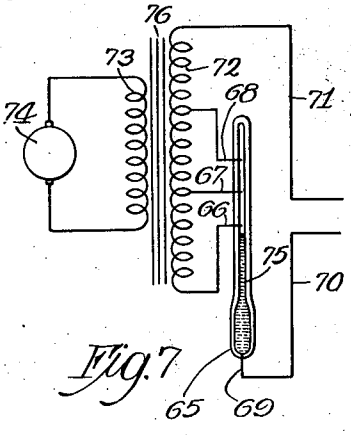


Fig. 7

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Patented May 7, 1935 2,000,879

UNITED STATES PATENT OFFICE

2,000,879

DOMESTIC REFRIGERATOR

Robert C. Brown, Jr., Evanston, Ill.

Application March 21, 1932, Serial No. 600,135

7 Claims. (Cl. 62—116)

This invention relates to a domestic refrigerator in which an air cooling system is incorporated for cooling the air outside of the refrigerator; which is provided with means for furnishing a continuous supply of running ice water; which will freeze ice cubes in an exceedingly short interval of time; and which costs little more than conventional refrigerators which lack these features.

Further and other objects and advantages will become apparent as the disclosure proceeds and the description is read in conjunction with the accompanying drawings, in which

Fig. 1 is a front view of a preferred form of the invention with parts broken away to expose the cooling unit;

Fig. 2 is a vertical section taken on the line 2—2 of Fig. 1;

Fig. 3 is a plan view showing the means for distributing the cooled air;

Fig. 4 is a horizontal, sectional view taken on the line 4—4 of Fig. 2 looking into the machinery compartment;

Fig. 5 is a horizontal section taken through the air cooling conduit on the line 5—5 of Fig. 1;

Fig. 6 is a fragmentary perspective view illustrating the adjustable shutter mechanism which controls the angle at which the cooled air emerges from the refrigerator; and

Fig. 7 is a schematic wiring diagram illustrating one means for automatically controlling the speed of the blower fan.

The invention, by way of illustration, has been shown applied to a conventional refrigerator cabinet comprising a food chamber 10, bounded by rear wall 11, door 12, side walls 8 and 9, bottom wall 13, and top wall 14, all constructed of suitable insulating material such as commonly used in refrigerator constructions. Beneath the food chamber is a compartment 15 which houses the refrigerating machinery and other mechanism. The compartment has front and rear walls 16 and 17, respectively, and side walls 18 and 19.

The entire cabinet rests on a base 20 equipped with legs 21.

A cooling unit, generally designated 22, is suspended from the top wall of the food chamber 10 by brackets 23 and 24 and comprises a header 25 having depending loops or ducts 26 which form an intermediate freezing zone 27. Fins 28 are preferably associated with the ducts to increase the area of the cooling surface.

Thus far, the refrigerator construction which has been described is of conventional design and no further description is believed necessary. It will be understood, however, that other types of refrigerator boxes may be used in place of the one illustrated and described and that other cooling units may be substituted for the unit 22.

An open metallic sleeve 29 occupies the lower portion of the freezing zone 27 and preferably is in thermal contact with the refrigerant ducts 26. The sleeve is creased on each side at 30 to support an ice tray 31. A second tray 32 seats upon the bottom of the sleeve.

The upper portion of the freezing zone 27 is occupied by a tortuous air cooling conduit 33 comprising a metallic sleeve 34 in thermal contact with the refrigerant ducts 26 and preferably in thermal contact with the bottom of the header 25. The sleeve is divided into a plurality of intercommunicating passageways by metallic walls or partitions 35 and 36, the former being fixed to the rear wall 37 of the sleeve and the latter being fixed to the front wall 38 of the sleeve.

Air from the exterior of the refrigerator is adapted to be introduced into the cooling conduit 33 through an opening 39 in the sleeve, and on passing through the conduit, some of its heat will be absorbed by the walls of the sleeve and the partition walls 35 and 36, all of which are either in direct or indirect thermal relation with the refrigerant ducts. It will be understood that a greater cooling effect may be obtained if desired by forming a portion or all of the sleeve and partition walls of double wall construction, and allowing refrigerant to circulate through the hollow walls.

Air is supplied to the cooling conduit 33 by a fan or blower 40 having an intake 41 through the wall 19 of the machinery compartment and discharging laterally into a vertical conduit 42 connected at its upper end to the conduit 33 by an elbow 43. The conduit 42 is preferably placed alongside the wall 9 of the food chamber and is covered by a sheathing of insulating material 44 to prevent undesirable heat transference between the air in the food chamber and the conduit.

The air emerges from the unit 33 through a rearwardly extending conduit 45 which jogs at 46 towards the center of the rear wall 11 and then continues upwardly at 47 where it connects with a flaring passageway 48 occupying the space 49 between upper and lower portions 50 and 51, respectively, of the top wall 14. The conduit 45 is also sheathed by insulating material, as shown at 52.

The additional work required of the refrigerant

in cooling the air passing through the conduit **33** inevitably results in maintaining the temperature of the refrigerant at a somewhat lower value than is ordinarily required for merely cooling the food chamber in the refrigerator and for freezing cubes in the ice trays. As a consequence, ice cubes may be made in a shorter interval of time with the refrigerator of this invention than is possible with present day refrigerators.

An adjustable deflector **53** is provided at the mouth of the passage **48** to control the angle at which the air is discharged into the room. The deflector comprises a right angle housing **54** secured by flanges **55** to the front wall of the refrigerator. A plurality of shutters **56** are trunnioned on bars **57** and **58** and have their lower portions connected by a bar **59**. The ends of the bars **57** and **58** may be bent downwardly at **60** to provide feet which rest upon the bottom of the housing **54**.

The shutters are controlled by a knurled screw **61** fixed to a shaft **62** that connects with the outer trunnion of the center shutter **63** and causes it to rotate. The bar **59** joining the lower portions of the shutters **63** will move the other shutters in unison with the shutter **63** when it is rotated by the operating screw **61**.

The shutter arrangement forms a convenient means for controlling the temperature in a room and particularly for controlling the temperature in a kitchen where refrigerators are usually installed. When the full effect of the air cooling is needed for lowering the temperature in the kitchen or other room in which the refrigerator is placed, the shutters are placed in a vertical position, causing the cold air to be forced upwardly to the top of the room.

The chilled air mixes with the warm air at the top of the room and becomes tempered, so that when it does fall to the lower part of the room by convection, or by forced circulation, it will not produce a cold draft on persons within the room. In this manner, the temperature of the room may be quickly brought down to its desired value without any discomfort to the occupants of the room.

In small apartments, it is posisble to use the refrigerator for cooling the entire apartment merely by setting the deflector so that the chilled air will be directed into the adjoining rooms. It will be noted that the angle of discharge is always above horizontal in order to obtain the advantages of tempering as described above.

It is desirable for the speed of the fan to bear some relationship to the temperature of the air which is being drawn into the cooling conduit. If the temperature of the room is comparatively high, the air should be passed through the tortuous conduit at a relatively high rate of speed in order to prevent excessive heat transference that might result in a cold draft, and to secure the maximum efficiency of operation by maintaining the temperature differential between the cooling unit and ambient air as high as possible.

This relationship between incoming air and the speed of the fan is accomplished by any suitable thermostatic means such for example as the one shown in Fig. 7.

The thermostat, generally designated **64**, which may be placed in the wall **19** of the machinery compartment adjacent to the air intake **41**, comprises a mercury bulb thermometer **65** into the sides of which are sealed leads **66**, **67** and **68**. A fourth lead **69** is sealed into the bottom of the bulb and connects with one side **70** of a source of electricity. The other side **71** of the line is connected to the primary winding **72** of a transformer **76** which is tapped at two points intermediate its ends by the leads **67** and **68** and which has its other end connected to the lead **66**. The secondary winding **73** of the transformer is in series with a suitable electric motor **74** which drives the fan **40**.

Below a certain predetermined temperature, represented by the height of the lead **66**, no current flows through the transformer and hence the motor is inactive. As the temperature in the room rises, the mercury **75** in the thermometer makes contact with the lead **66** and thereby completes an electrical circuit through the entire winding of the primary coil **72** which in turn causes the motor **74** to become energized. If the temperature in the room should rise sufficiently to establish contact between the mercury **75** and the lead **67**, a portion of the primary winding **72** should be shunted out, thereby increasing the speed of the motor. In the same manner, as contact is made between the mercury **75** and lead **68**, the motor is again speeded up by shunting out the central portion of the primary winding.

The refrigerating mechanism necessary for supplying liquid refrigerant to the cooling unit **22** may be of any suitable type and is here shown as comprising a compressor **77**, a motor **78**, and condenser **79**, preferably water-cooled. The pulley **80** which is mounted on the main shaft **81** of the compressor carries an internal fan **82** for cooling the condenser and, as customary, louvres **83** are provided in the side walls of the machinery compartment to afford good circulation. A thermostat, not shown, is located in the food chamber for controlling the operation of the refrigerating machinery in a manner well known to the art.

The front of the cooling unit **22** is screened from normal view by a cover plate **84**, offset at **85** to accommodate an ice water tap **86** secured to the plate by a holding nut **87**. A spiral water coil **88** is supported in any suitable manner below the cooling unit and connects at one end to the tap **86** and at the other to a source of water supply, such for example as the ordinary city water pipe.

The coil should be so spaced from the cooling unit that there is no danger of water freezing in the coil, and if necessary a shield may be interposed between the two to furnish adequate protection.

One outstanding advantage of the refrigerator construction above described is that a single refrigeration unit is employed to obtain cooling of the refrigerator, the freezing of ice cubes, the provision of a continuous supply of ice water, the cooling of the room in which the refrigerator is placed, and in some cases the cooling of adjacent rooms. All of these advantages are obtained with little additional cost in construction over the conventional domestic refrigerator.

The invention is not limited to the embodiment of the invention used above and in the drawings for the purpose of disclosure and illustration, for it may be embodied in many other forms within the scope of the appended claims.

What I claim, therefore, is:

1. A domestic refrigerator comprising an insulated cabinet having a food chamber therein, a door in a side wall of said chamber through which access is had to said chamber, a cooling unit associated therewith comprising a header, refrigerant ducts depending from the header and forming an intermediate freezing zone, ice trays supported in the freezing zone, a tortuous air conduit in the freezing zone, and means for forcing

air from the exterior of the cabinet through the conduit and discharging it back into the room at a reduced temperature, said conduit preventing its mingling with the air in said compartment.

2. A domestic refrigerator comprising an insulated cabinet having a food chamber therein, a door in a side wall of said chamber through which access is had to said chamber, a cooling unit associated therewith comprising a header, refrigerant ducts depending from the header and forming an intermediate freezing zone, ice trays supported in the freezing zone, a tortuous air conduit in the freezing zone, and means for forcing air from the exterior of the cabinet through the conduit, preventing its mingling with the air in said compartment and then discharging it back into the room at a reduced temperature, said means being thermostatically controlled by the temperature of the incoming air.

3. A domestic refrigerator comprising an insulated cabinet having a food chamber therein, a door in the side wall of said chamber affording access to said chamber, a cooling unit associated with the chamber and comprising spaced refrigerant ducts forming an intermediate freezing zone, ice trays in the freezing zone, and means for conducting air from the exterior of the cabinet through the freezing zone, preventing mingling of the same with the air in said chamber, and discharging it back into the room, at a reduced temperature.

4. In a domestic refrigerator, a cabinet, a cooling unit in the cabinet for cooling an interior chamber therein, an air conduit passing through the cooling unit, a fan adapted to force air from the exterior of the cabinet through the conduit, and means for automatically varying the speed of the fan to cause greater quantities of air to pass through the conduit when the temperature of the incoming air is relatively high.

5. In a domestic refrigerator, a cabinet, a cooling unit in the cabinet for cooling an interior chamber therein, an air conduit passing through the cooling unit, a fan adapted to force air from the exterior of the cabinet through the conduit, and thermostatic means for varying the speed of the fan in approximate proportion to the temperature of the incoming air.

6. A domestic refrigerator comprising a cabinet having a food compartment therein adapted to be cooled by a cooling element within the compartment, a door in the cabinet affording access to the compartment, a source of liquid refrigerant, means for circulating refrigerant from said source through the element, thereby to cool the air in the compartment, a heat exchange device in the cabinet of sufficient capacity for cooling air exterior of the cabinet, a conduit in series with the heat exchange device having inlet and outlet openings communicating with the air outside of the cabinet, means for forcing air through said conduit, said conduit preventing the air from outside of the cabinet commingling with air in the food compartment, and means for extracting heat units from the heat exchange device by refrigerant circulated from said source.

7. A domestic refrigerator comprising a cabinet having a food compartment therein adapted to be cooled by a cooling element within the compartment, a door in the cabinet affording access to the compartment, a source of liquid refrigerant, means for circulating refrigerant from said source through the element, thereby to cool the air in the compartment, a heat exchange device in the cabinet associated with the cooling element and of sufficient capacity for cooling air exterior of the cabinet, a conduit in series with the heat exchange device having inlet and outlet openings communicating with the air outside of the cabinet, means for forcing air through said conduit, said conduit preventing the air from outside the cabinet commingling with air in the food compartment, and means for extracting heat units from the heat exchange device by refrigerant circulated from said source.

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