May 24, 1938. G. B. WAGNER 2,118,580

REFRIGERATING APPARATUS

Filed Aug. 28, 1934 3 Sheets-Sheet 1

Fig. 1.

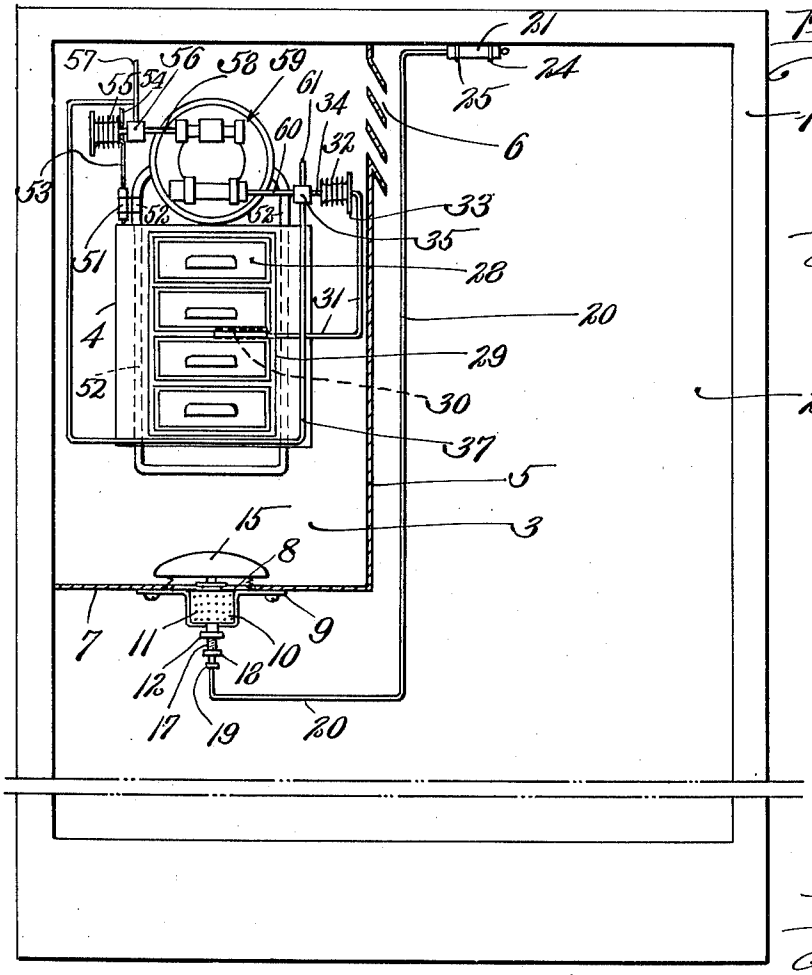


Fig. 3.

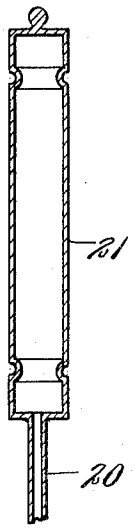


Fig. 4a.

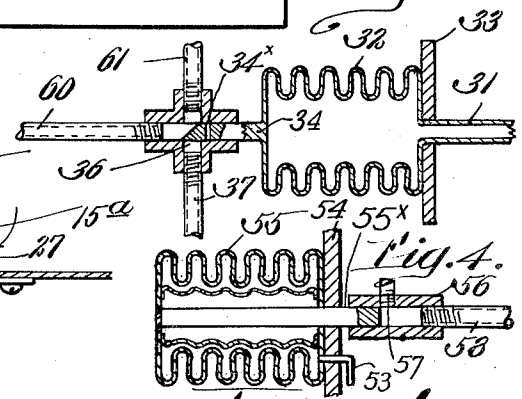
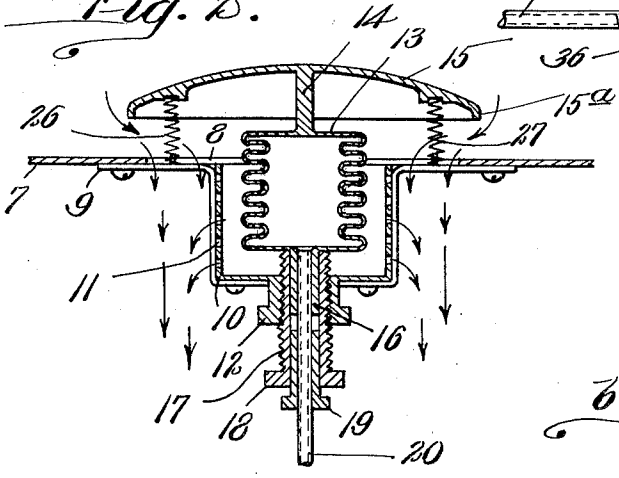


Fig. 4.

Fig. 2.



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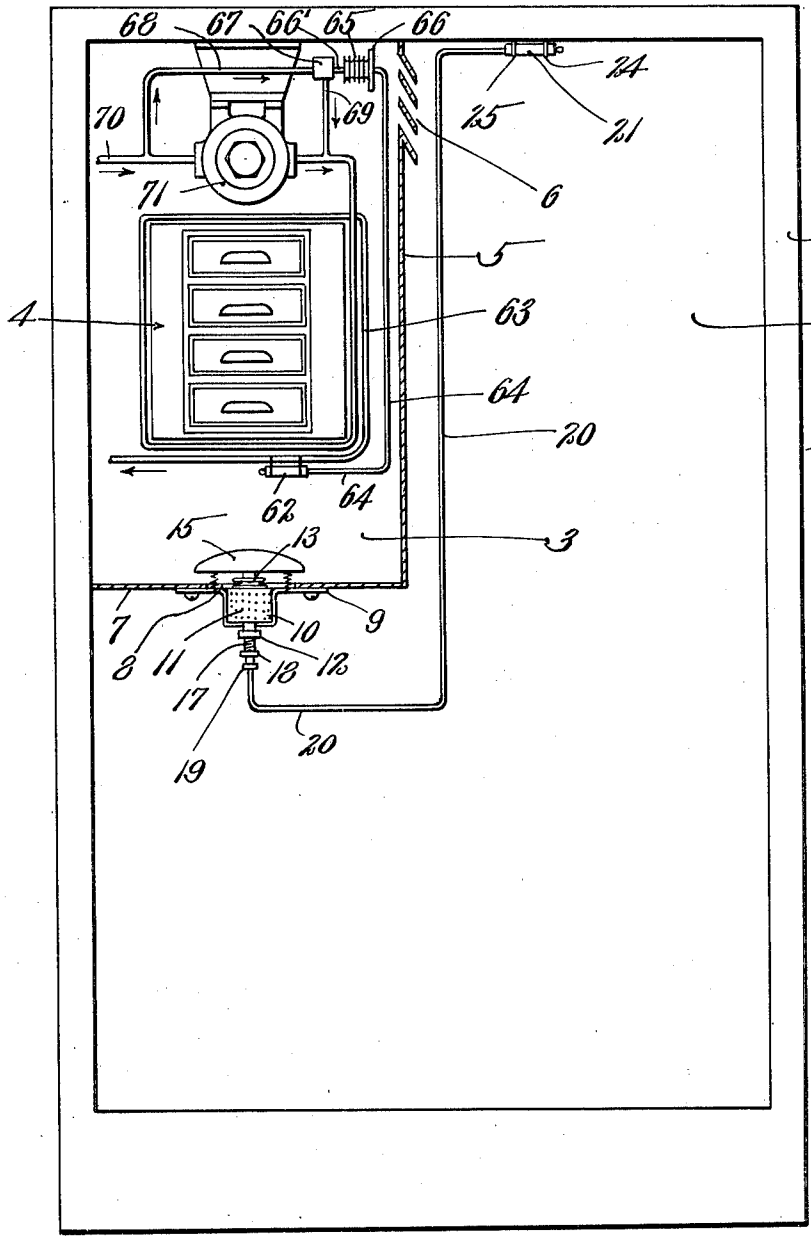


Fig. 5.

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REFRIGERATING APPARATUS

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Fig. 6.

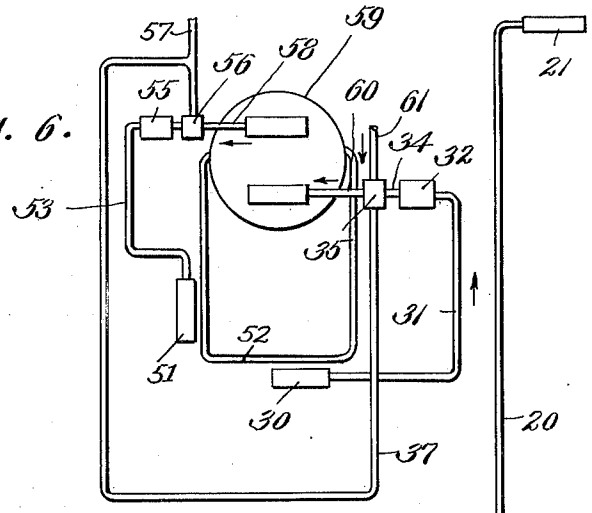
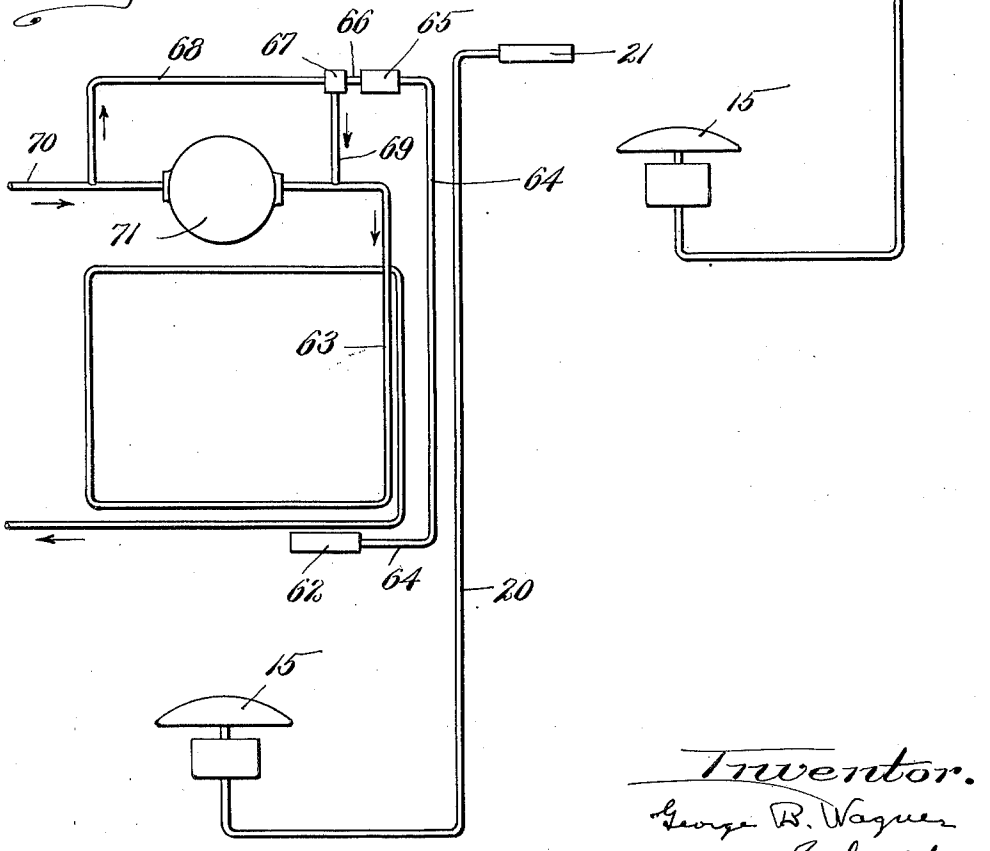


Fig. 7.



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Patented May 24, 1938

2,118,580

UNITED STATES PATENT OFFICE

2,118,580

REFRIGERATING APPARATUS

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Application August 28, 1934, Serial No. 741,758

8 Claims. (Cl. 62—3)

This invention relates to improvements in refrigerating apparatus of the compressor-condenser-expander circuit type in which refrigeration is produced by absorption of heat by the expansion of volatile liquid, and is particularly applicable to household refrigerating apparatus in which the expansion coils are located in a refrigerating compartment and enclose a liquid-freezing unit such as a series of drawers provided with removable sectional partitions in which ice cubes are formed.

The invention is disclosed herein as embodied in usual types of household refrigerating apparatus which comprise a compressor operated by an electric motor, a high pressure conductor including a condenser extending from the high pressure side of the condenser to an expansion unit or boiler which is provided with coils surrounding the liquid-freezing unit and a low pressure or vapor conductor which leads from the expansion unit to the low pressure side of the compressor. In apparatus of this type the current supplied to the electric motor is controlled by a "vacuum pressure" valve which acts in response to variations in vapor pressure in the refrigerating circuit to start the motor in response to rise above a predetermined range of temperature for which the valve is set, or to stop the motor when the temperature of the refrigerating compartment drops below said predetermined range.

In refrigerating apparatus of this type the normal action of the refrigerating mechanism causes an accumulation of frost upon the refrigerating coils which surround the liquid-freezing unit and the frost acts as an insulating coating which reduces the transfer of heat between the refrigerating coil and the air circulating within the refrigerating compartment, thereby diminishing the efficiency of the refrigerating apparatus.

One of the objects of the invention is to provide novel means for automatically defrosting the refrigerating coils.

I am aware that various means have been provided for defrosting refrigerating coils, but in such apparatus the defrosting of the refrigerating coils also reduces the temperature in the liquid-freezing unit, thereby melting to a greater or lesser extent the congealed liquid therein. One of the principal objects of the invention is to provide mechanism operable in conjunction with the defrosting of the refrigerating coils to maintain a sufficiently low temperature in the liquid-freezing unit to prevent melting of the ice cubes, or other frozen material in the liquid-freezing unit.

Another object of the invention is to provide a household refrigerating apparatus having a refrigerating chamber enclosing the refrigerating apparatus of the character described, and a relatively large chamber for the food, with means automatically controlling the circulation of the air through the refrigerating chamber and the food-containing chamber.

These and other objects and features of the invention will more fully appear from the following description and the accompanying drawings, and will be particularly pointed out in the claims.

The invention is illustrated herein as applied to a household refrigerator in which the refrigerating unit may be of a flooded system type or of the dry expansion system.

In the drawings

Figure 1 is a front view of a household refrigerator having a refrigerating system of the flooded type, with the door omitted, embodying my invention;

Figure 2 is a section, on a larger scale, of the damper and associated parts, shown in Figure 1;

Figure 3 is a section, on a larger scale, of the gas bulb shown in Figure 1;

Figure 4 is a section, on a larger scale, of the automatic valve described below; and

Figure 4a is a sectional detail described below; and

Fig. 5 is a front view of a household refrigerator having a refrigerating system of the expansion type embodying the invention;

Figure 6 is a refrigerant circuit diagram of the form shown in Figure 1; and

Figure 7 is a refrigerant circuit diagram of the form shown in Figure 5.

The present invention comprises the embodiment in a refrigerator of a usual type such as that illustrated of means operable during the defrosting of the main refrigerating coils to maintain a temperature in the liquid-freezing unit which will prevent the melting of the ice cubes or other material contained in the trays of such unit.

The refrigerators illustrated in the accompanying drawings comprise a casing 1 having a compartment 2 for food and a refrigerating compartment 3 containing a float chamber or an expansion chamber with a coil or coils leading therefrom around a liquid-freezing unit 4 containing a vertical series of drawers in which water or other liquid material is frozen to produce ice cubes or a frozen delicacy.

The refrigerating mechanism is of a usual character in which liquid under pressure is supplied to the float chamber or expansion chamber

by a suitable compressor having a condenser in the high pressure line and a low pressure pipe leading from the float chamber or expansion chamber to the low pressure side of the compressor. The compressor does not run continuously, but is controlled by a pressure vacuum control switch of a usual type which operates to cause the motor to start in response to decrease in vapor pressure below a predetermined narrow range in the conduit leading to the low pressure side of the compressor for which the valve is set and to arrest the motor upon increase in vapor pressure above said narrow range, the variations in vapor pressure being dependent upon like variations in temperature in the refrigerating compartment. Inasmuch as the starting and stopping of the compressor in the normal operation of usual refrigerating mechanisms of this type is dependent upon a narrow range of variations in temperature in the refrigerator, frost will accumulate upon the main coils of the refrigerating mechanism and, as above stated, will interfere with efficient refrigerating action.

In the older types of apparatus it was necessary to stop the compressor for a lengthy period of time to permit the frost to melt from the expansion coils and from the metal walls of the liquid freezing unit. The present invention comprises thermostatically controlled mechanism automatically operable to defrost the refrigerating mechanism rapidly and to cause the resumption of refrigeration in such manner as to avoid melting of the ice cubes or congealed material in the liquid freezing unit without interfering with the normal operation of the compressor.

The invention also comprises in combination with such means for minimizing changes in temperature in the refrigerating compartment of means for controlling the circulation of cold air from the refrigerating compartment through the food compartment to the refrigerating compartment.

In the refrigerators illustrated in the accompanying drawings compartment 3 has well 5 provided with louvers 6 and has bottom wall 7 provided with a relatively large opening 8 leading to the food compartment 2. To the bottom of wall 7 is attached flat metal strap 9 to which is fastened cylindrical metal member 10 perforated at 11. Cylindrical member 10 is open at the top and has an internally threaded boss 12 at the bottom.

Bellows 13 has attached to its top a stem 14 integral with dome-shaped damper or closure 15 having annular lip 15a. The bottom of bellows 13 has a perforated extension 16 which is slidably mounted in externally threaded sleeve 17, the latter engaging the threading of boss 12 and having flange 18 for convenience in adjusting. Mounted in sleeve 17 is a perforated rubber nipple 19. One end of tube 20 extends through nipple 19 and through the extension 16, being soldered to the latter, and conducting gas into bellows 13. The other end of tube 20 has an ordinary gas bulb 21 annularly indented at 22 and 23 to receive straps 24 and 25, the latter holding the bulb to the casing.

Interposed between the damper and straps 9 are small coiled springs 26 and 27 which compensate for the weight of the damper and give smooth vertical operation, preventing tilting.

The bulb 21, located at the top of compartment 2, is filled with suitable gas expansible and contractible under changes of temperature and when the temperature in the food compartment 2 rises the gas in bulb 21 expands, and expands bellows 13 with the result that the damper or closure 15 is raised allowing a larger opening between bottom wall 7 and lip 15a and consequently allowing more cold air from compartment 3 to circulate through opening 8 and perforations 11 and into the food compartment 2, this circulation being indicated by arrows in Figures 1 and 2. Then when the temperature falls in compartment 2, the gas in bulb 21 contracts and therefore the pressure of the gas in bellows 13 decreases and the bellows contracts lowering the damper 15, thereby reducing the vertical space between the damper 15 and the wall 7. The damper is shown in Figures 1 and 2 in a position midway of its possible extreme open position and possible extreme closed position and its position may be adjusted prior to ordinary operation by turning sleeve 17 in boss 12.

In using my mechanism the air circulates from the refrigerating unit through opening 8 and thence through the storage compartment and thence through louvers 6 back to the refrigerating compartment, this circulation being due to the greater density of cold air compared with the density of warm air.

If the temperature of the storage compartment rises above the point desired, the gas in bulb 21 expands and exerts pressure on bellows 13, opening damper 15 so as to increase the flow of cold air from compartment 3 to compartment 2. When the temperature drops below the desired point the gas pressure in bellows 13 will drop proportionately closing the damper 15 sufficiently to decrease the flow of cold air to maintain the temperature in the storage compartment at the desired point. In this way I provide a substantially even and uniform temperature in the storage compartment 2. It will be understood that the damper may be raised above the position shown in Figure 2 and may also be lowered to a position in contact with wall 7.

The perforations 11 are used to decrease the resistance to the air flow.

The increase of resistance is caused principally by air being more or less pocketed in member 10 and the perforations 11 relieve this resistance by permitting air to flow outwardly through them, the air being cold and therefore naturally heavy and an outlet to compartment 2 is necessary.

I prefer to have the top of my damper sloping, as shown, to act as a watershed of possible dripping from the refrigerating coil of unit 4.

By raising or lowering the bellows in member 10 the amount of pressure necessary to give the desired travel of the damper is varied and the bellows may be so raised or lowered by adjustment members 18 and 12 and held at the desired point of adjustment.

After member 18 has been adjusted on member 12 rubber member 19 is forced inwardly and by its friction on tube 20 and sleeve 17 holds flange 18 and sleeve 17 firmly in adjusted position.

The invention is illustrated in Fig. 1 as embodied in a flooded system of refrigerating apparatus of the usual type which comprises a float chamber 59 into which liquid under pressure is supplied from a compressor and condenser of the usual type (not shown) through a pipe 61 and valve casing 35 containing a normally open valve, hereinafter to be described, and pipe 60 leading to the float chamber 59. An expansion coil 52, which may be in the form of loops, surround a liquid refrigerating unit 29 having a casing en-

closing a usual series of drawers in which liquid is frozen to produce ice cubes or other frozen material. Vaporization of the liquid which occurs in the expansion coil 52 is drawn from the upper portion of the float chamber or expansion chamber through a pipe 58 and valve casing 56 having a normally open valve, hereinafter to be described, and pipe 57 to the low pressure side of a condenser.

The present invention comprises means operable when a predetermined amount of frost accumulates upon the expansion coil 52 to arrest the circulation of the refrigerant, thereby to cause defrosting of the coil 52. In the construction shown in Fig. 1 a thermo-sensitive element, preferably a bulb 51 containing an expansible volatile fluid, is mounted upon and in proximity to the coil 52. A pipe 53 leads from the bulb 51 to and communicates with a bellows 55 which is mounted upon a bracket 54 suitably secured to the wall of the refrigerating compartment 3. A valve 55x having a stem extends through said bracket and axially through the bellows 55 and is secured to the wall of the bellows remote from the bracket, and is slidably mounted in the valve casing 56 and the vapor pressure in the bulb and bellows is such as normally to hold the valve 55x in open position, as illustrated in Fig. 4, thereby establishing communication between the pipe 58 and the pipe 57 which leads to the low pressure side of the condenser.

When during the normal operation of the refrigerating apparatus sufficient frost accumulates upon the coil 52 effectively to engage the bulb 55, the temperature within the bulb will be reduced, thereby causing a contraction of the gas contained in the bellows 55 which will cause such collapsing of the bellows as to move the valve 55x across the lower end of the pipe 57, thereby interrupting the circulation of the refrigerant through the float chamber 59 and the expansion coil 52. The closing of the valve 55 will thereupon produce a reduction in the vapor pressure on the low pressure side of the compressor, thus causing the arrest of the motor which actuates the compressor. Refrigeration in the expansion coils 52 will thereupon cease and the coil will become defrosted by absorption of heat from the air within the refrigerating chamber 3.

One of the principal objects of the invention consists in providing means for preventing melting of the ice cubes, or other liquid material, in the liquid-freezing unit during the defrosting operation.

In the construction shown in Fig. 1 an auxiliary expansion coil 37, which may be in the form of a loop, leads from the valve casing 35 around the liquid-freezing unit and in proximity thereto and communicates with the pipe 57 which leads to the low pressure side of the compressor. The valve in the valve casing 35 is a two-way valve adapted, as heretofore stated, normally to establish communication between the pipes 61 and 60, but thermostatically operable by variations in the mean temperature in the liquid-refrigerating unit to close the communication between the pipes 61 and 60 and to establish restricted communication between the pipe 61 and the auxiliary expansion coil 37.

In the construction shown in Fig. 1 a bulb 30 containing a volatile fluid is mounted in the liquid-freezing unit, preferably between two of the drawers thereof, in such manner as to be subject to the mean temperature within said unit, and is connected by a pipe 31 to a bellows 32 which is mounted upon a bracket 33 suitably secured to the wall of the refrigerating compartment 3. The opposite end of the bellows 32 has fixedly secured to it a two-way valve which, as illustrated in Fig. 4^a, has a beveled end normally positioned by the vapor pressure in the bellows 32 to establish communication between the pipe 61 and pipe 60. The valve 34 is provided with a restricted passage or port 34x so positioned that when the valve 34 is moved to the left, Fig. 4^a, sufficiently to close the passage between the pipes 61 and 60 to establish restricted communication between the pipe 60 and the auxiliary coil 37. Inasmuch as the opposite end of the auxiliary coil 37 is in communication with the low pressure side of the condenser through the pipe 57 vaporization of the refrigerant will take place in the pipe 37, thus causing the auxiliary coil 37 to constitute a refrigerating coil which being of much less capacity than the main expansion coils 52 will absorb sufficient heat from the liquid-freezing unit to prevent melting of the ice or congealed material in the liquid-freezing unit during the defrosting of the main coils 52.

It may be pointed out that while the motor which actuates the compressor may be arrested upon closure of the valve 55x, as above described, the admission of the refrigerant into the auxiliary coil 37 which communicates directly with the pipe 57 will raise the vapor pressure in the low pressure line leading to the compressor sufficiently to start the compressor, thereby forcing liquid refrigerant under pressure through the pipe 61 in the manner aforesaid.

By reason of this construction therefore defrosting of the main coils of the refrigerating apparatus is automatically accomplished at such intervals as to maintain maximum efficiency of the refrigerating apparatus and without melting of the frozen material in the liquid-freezing unit, thereby economizing the use of power which otherwise would be required to freeze such material as is melted in the liquid-freezing unit.

While the construction illustrated in Fig. 1 and above described comprises means for defrosting the expansion coils 52 by shutting off communication between the expansion chamber and the pipe leading to the low pressure side of the condenser, defrosting of the main coils can also be accomplished if such mechanism is omitted by the operation of the thermostatic mechanism which effects the shutting off of communication between the pipe 61 through which liquid under pressure is supplied to the float chamber and concurrently therewith the establishing of communication between the pipe 61 and the auxiliary coil 37 which is of less capacity, for it will be obvious that if by reason of accumulation of frost upon the main expansion coils 52 the mean temperature within the liquid freezing unit rises and thereby shuts off communication between the pipe 61 and pipe 62 circulation of the refrigerating means will cease in a short time, so that the rise in temperature in the refrigerating compartment 3 will defrost the coils, while the refrigerant passing through the auxiliary coil 37 will maintain a sufficiently low temperature to prevent melting of the ice cubes.

In Figure 5, I show my invention as applied to a dry expansion system, this being the form I prefer for commercial work.

In Figure 5 the parts 1 to 27 are like those in Figures 1 to 3. Bulb 62 is suitably mounted on the refrigerating coil 63. Conduit 64, integral

with bulb 62, leads to bellows 65 and is integral with said bellows, plate 66 providing an anchorage for the bellows and being suitably attached to the bellows and suitably attached within compartment 3. Bellows 65 has a valve 66' extending into a valve casing 67 from which extend conduits 68 and 69. Conduit 68 leads from the liquid line 70 to the casing 67. Conduit 69 leads to the coil 63 from the valve casing 67. The expansion valve 71 is connected to the liquid line 70 and to the freezing coil 63 forming the ordinary cycle of refrigeration.

In using the form of Figure 5, the frost on refrigerating coil 63 contacting bulb 62 reduces the pressure of the gas in bellows 65 and consequently reduces the pressure in valve casing 67 permitting the valve to open and increasing the refrigerating gas pressure in coil 63 by admitting the relatively warm liquefied refrigerant through conduit 68 and through valve 66', to conduct 69, thus causing the pressure to correspond with a temperature of 36° (which is a suitable melting point), which causes the frost on coil 63 to run off as water until such time as bulb 62 is free of contact with the frost whereby the increased pressure in bulb 62, due to the rise in temperature, expands the bellows of valve 66', closing the valve and then returns the refrigerating system to its normal condition.

During the defrosting the temperature in compartment 2 starts to rise due to the rise in temperature in unit 4. This rise of temperature in compartment 2 raises the gas pressure in bulb 21 which feeds back through conduit 20 into bellows 11, expanding the bellows and opening damper 15 permitting air to circulate more rapidly into compartment 2 to maintain the proper temperature of the latter. The refrigerating unit 4 returning to its normal refrigerating cycle creates a rapid drop in temperature in compartment 3. As the damper 15 is now open wide, the temperature in compartment 2 drops very rapidly, which drop contracts the gas in bulb 21 allowing the pressure in bellows 11 to recede through conduit 20 closing the damper the proper amount to maintain an even temperature in compartment 2.

In the circuit shown in Figure 6 the liquid refrigerant enters through conduit 61 through valve casing 35, entering the cooling coil through conduit 60, returning to the refrigerating compressor through conduit 58, and through valve casing 56 to conduit 57 to the compressor. Frost accumulating on coil 52 (shown in Figure 1) reduces the pressure in gas bulb 51 reducing the pressure in bellows 55, closing valve 56, thus stopping refrigeration in coil 52. The temperature rising in ice compartment 4 (see Figure 1) increases the pressure in bulb 30 through conduit 31 to bellows 32, which operates bellows 32, opening valve 35, permitting refrigerant to flow through coil 37, at a predetermined pressure and returning to the compressor by way of conduit 57, being by-passed through valve casing 56.

In the circuit shown in Figure 7 the liquid refrigerant enters through conduit 70, passes through expansion valve 71 where the pressure is reduced to zero pounds, thence passes through coil 63, in which coil refrigeration takes place, back to the compressor. Now at the time of frost accumulation the gas pressure in bulb 62 is reduced, reducing the pressure in bellows 65 which opens valve 67, which has a set orifice raising the gas pressure by by-passing additional refrigerant from conduit 70 through conduit 68, valve casing 67 to conduit 69 and conduit 63, which now operates the coil at a pressure of 14 pounds until such time as the frost is melting. These pressures are preferable when using SO_2 gas, which, when working at 14 pounds pressure, is above the freezing point but is still a good cooling point.

What I claim is:

1. In a refrigerating apparatus having a liquid-freezing unit, a circuit for a volatile refrigerant having expansion means including a coil surrounding said unit, means in said circuit for supplying liquid refrigerant under pressure to said expansion means, and means for removing the vapor therefrom at a reduced pressure, a valve in said circuit, thermostatically operable valve-actuating means having a thermo-sensitive element located in proximity to said coil and operable when sufficient frost accumulates on said coil effectively to contact said thermo-sensitive element to cause a change in the circulation of said refrigerant which will cause defrosting of the coil.

2. In a refrigerating apparatus having a liquid-freezing unit, a circuit for a volatile refrigerant having expansion means including a coil surrounding said unit, means in said circuit for supplying liquid refrigerant under pressure to said expansion means, and means for removing the vapor therefrom at a reduced pressure, a normally open valve in said circuit, thermostatically operable valve-actuating means having a thermo-sensitive element located in proximity to said coil and operable when sufficient frost accumulates on said coil effectively to contact said thermo-sensitive element to close said valve thereby arresting circulation of said refrigerant until frost is melted from said coil.

3. In a refrigerating apparatus having a liquid-freezing unit, a circuit for a volatile refrigerant having expansion means including a coil surrounding said unit, means in said circuit for supplying liquid refrigerant under pressure to said expansion means, and means for removing vapor from said coil at a reduced pressure, a by-pass conduit around said expansion means communicating with said coil, a normally open two-way valve establishing communication between said expansion means and said coil, thermostatically operable means for actuating said valve having a thermo-sensitive element located in proximity to said expansion coil and operable when sufficient frost accumulates on said coil effectively to engage said thermo-sensitive element to cause said valve to close communication between said expansion means and said coil and to by-pass the liquid around said expansion means into said coil thereby interrupting vaporization of the refrigerant in said coil and subjecting it to the higher temperature of the liquid refrigerant by-passed around said expansion means.

4. A refrigerating apparatus having a liquid-freezing unit, an expansion chamber having a main expansion coil surrounding said unit, and an auxiliary expansion coil, of less capacity than said main coil, associated with said unit, means for alternatively supplying a liquid refrigerant under pressure to said expansion chamber or to said auxiliary coil, and means for removing the vapor at relatively low pressure from said expansion chamber and said auxiliary coil, means for defrosting said main coil upon rise of temperature in said refrigerating apparatus caused by insulation of the heat absorbing means by ac-

cumulation of frost thereon, thermostatic means continuously subject to the mean temperature of said liquid-freezing unit, and means operable during the defrosting operation upon a predetermined rise in said mean temperature to cause refrigerant to flow into and vaporize within said auxiliary coil thereby to maintain said unit at a temperature which will prevent the melting of the frozen liquid therein.

5. A refrigerating apparatus having a liquid-freezing unit, an expansion chamber having a main expansion coil surrounding said unit, and an auxiliary expansion coil, of less capacity than said main coil, associated with said unit, means for alternatively supplying a liquid refrigerant under pressure to said expansion chamber or to said auxiliary coil, and means for removing the vapor at relatively low pressure from said expansion chamber and said auxiliary coil, thermostatic means continuously subject to the mean temperature existing in said liquid-freezing unit, and means operable by said thermostatic means upon a predetermined rise in said mean temperature to arrest the supply of liquid refrigerant to said expansion unit thereby to defrost the main coil and alternatively to supply said refrigerant to said auxiliary coil for vaporization therein, thereby to maintain said unit at a temperature which will prevent the melting of the frozen liquid therein.

6. A refrigerating apparatus having a liquid-freezing unit, an expansion chamber having a main expansion coil surrounding said unit, an auxiliary coil of less capacity surrounding said unit, a conduit for a liquid refrigerant under pressure having a valve casing provided with passages leading respectively to said expansion chamber and to said auxiliary coil, a two-way valve in said conduit selectively operable to establish communication with said expansion chamber or with said auxiliary coil, means for removing vapor at reduced pressure from said expansion chamber and said auxiliary coil, thermostatically operable means subject to the temperature within said liquid-freezing unit normally positioning said valve to supply liquid refrigerant to said expansion chamber and operable upon rise of temperature in said liquid-freezing unit to cause said valve to arrest the supply of liquid refrigerant to said expansion chamber and to establish restricted communication between said supply and said auxiliary coil.

7. A refrigerating apparatus having a liquid-freezing unit, an expansion chamber having a main expansion coil surrounding said unit, an auxiliary coil of less capacity surrounding said unit, a conduit for a liquid refrigerant under pressure having a valve casing provided with passages leading respectively to said expansion chamber and to said auxiliary coil, a two-way valve in said conduit selectively operable to establish communication with said expansion chamber or with said auxiliary coil, means for removing the vapor from said expansion chamber and said auxiliary coil at a relatively low pressure, means for actuating said valve comprising an expansible bellows normally positioning said valve to establish communication between the supply of liquid refrigerant and said expansion chamber, a bulb containing a volatile fluid located within said unit and communicating with said bellows, operable by the expansion of said volatile fluid upon a predetermined rise in the mean temperature in said liquid-freezing unit to expand said bellows and cause said valve to arrest the supply of liquid refrigerant to said expansion chamber and establish communication with said auxiliary coil, thereby to cause the defrosting of said main coil, but by the vaporization of liquid in said auxiliary coil to maintain said liquid-freezing unit at a temperature which will prevent melting of the frozen liquid therein.

8. A refrigerator comprising a storage compartment, a relatively smaller refrigerating compartment within said storage compartment having an aperture in its bottom wall and an aperture in a wall adjacent the top thereof for the circulation of air from the refrigerating compartment through the storage compartment, refrigerating mechanism in said refrigerating compartment comprising a liquid-freezing unit, an expansion chamber having an expansion coil surrounding said liquid-freezing unit, means for supplying a liquid refrigerant under pressure to said expansion chamber, and means for removing the vapor therefrom at relatively low pressure, thermostatic means operable by contact of frost accumulating upon said expansion coil to cause a change in circulation of said refrigerant which will cause the defrosting of the coil, a thermostatically operable valve for the aperture in the bottom of said refrigerating compartment, and thermo-sensitive means subject to the temperature in said storage compartment for actuating said thermostatically operable valve to control the circulation of air through said refrigerating compartment and said storage compartment so as to maintain a substantially uniform temperature in the storage compartment.

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