Dec. 20, 1932. O. M. SUMMERS 1,891,249

REFRIGERATING APPARATUS

Filed March 31, 1930 2 Sheets-Sheet 1

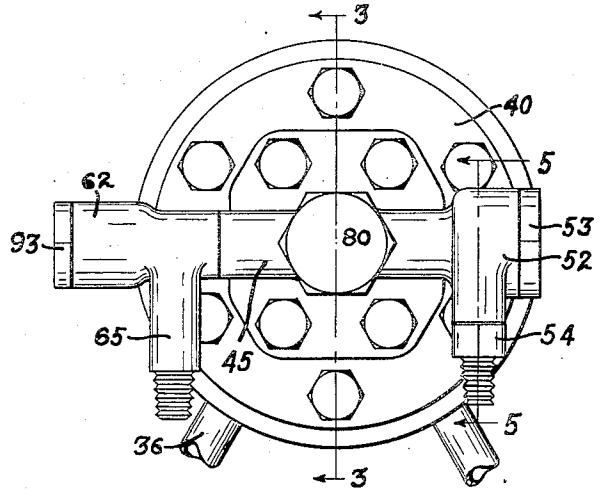


Fig. 2

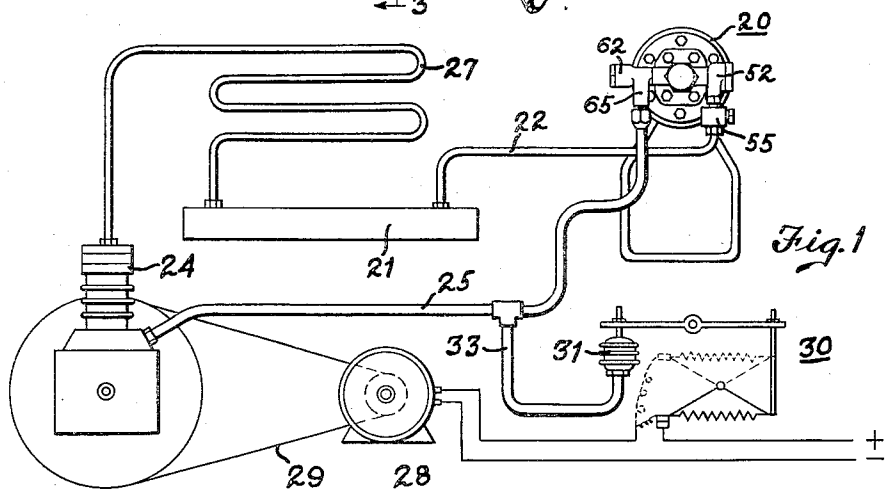


Fig. 1

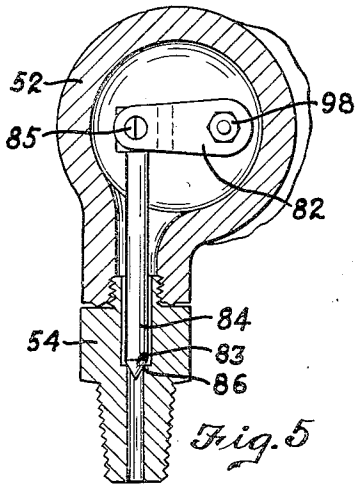


Fig. 5

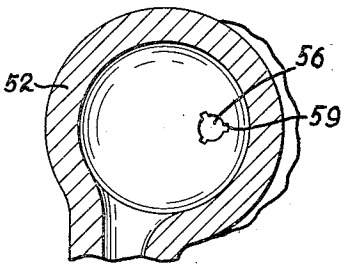


Fig. 6

INVENTOR
Otto M. Summers
BY
Spencer, Hardman and Fish
ATTORNEY

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REFRIGERATING APPARATUS

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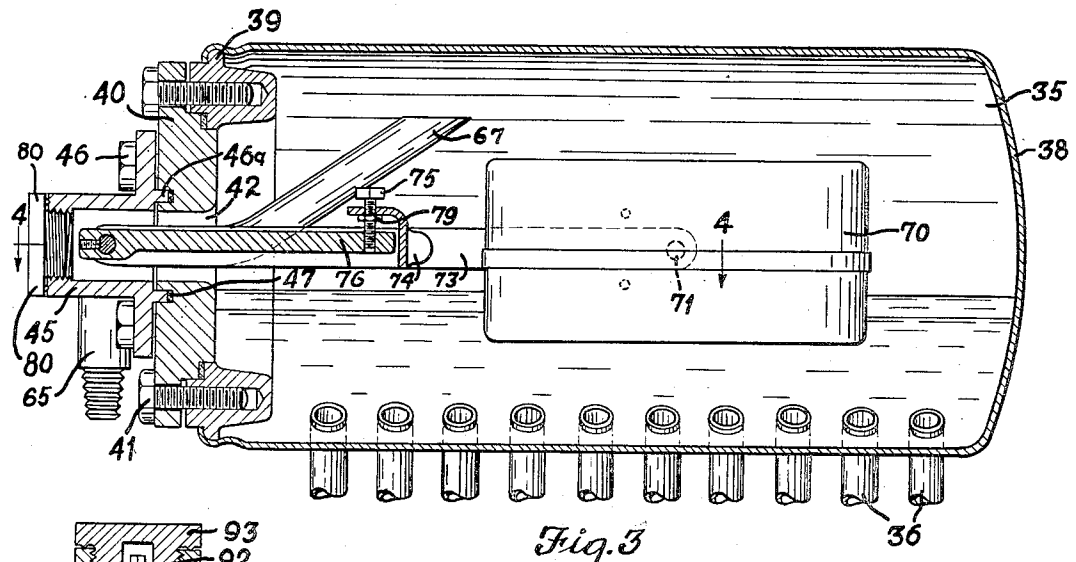


Fig. 3

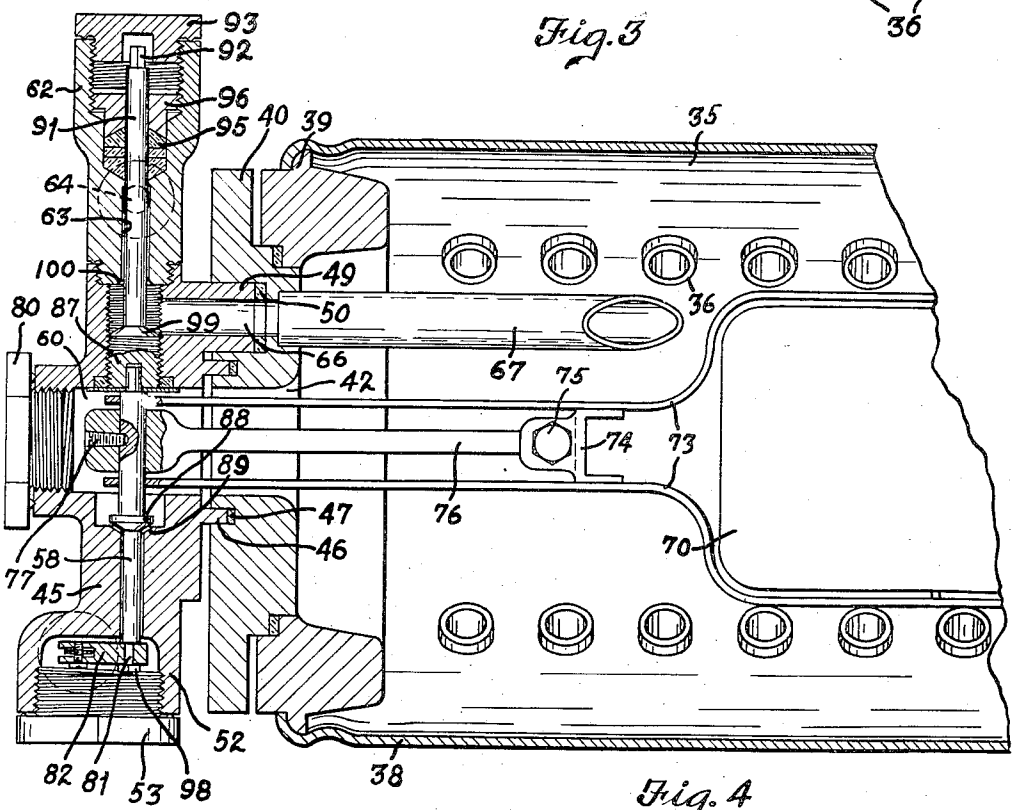


Fig. 4

INVENTOR
Otis M. Summers
BY
Spencer, Hardman and Fehr
ATTORNEY

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UNITED STATES PATENT OFFICE

OTTO M. SUMMERS, OF DAYTON, OHIO, ASSIGNOR TO FRIGIDAIRE CORPORATION, OF DAYTON, OHIO, A CORPORATION OF DELAWARE

REFRIGERATING APPARATUS

Application filed March 31, 1930. Serial No. 440,501.

The present invention relates to refrigerating apparatus and more particularly to the control of the refrigerant in the apparatus and to the mechanism of the control.

One of the objects of the present invention is to provide for the more ready removal of certain valve elements and for preventing the escape of refrigerant during such removal.

In carrying out the above it is a further object of the invention to isolate the valve element, which is to be removed, from the other parts of the refrigerating apparatus so that the refrigerant will not escape from said other parts of the refrigerating apparatus during removal of such valve element.

Another object of the present invention is to provide improved means for adjusting a float so as to control the height of the liquid refrigerant level which is normally controlled by such float.

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 form of the invention is clearly shown.

In the drawings

Fig. 1 is a diagrammatic view of a refrigerating system including the present invention;

Fig. 2 is a fragmentary view of the upper end of an evaporator shown in Fig. 1 on a larger scale;

Fig. 3 is a longitudinal sectional view taken on line 3—3 of Fig. 2;

Fig. 4 is a fragmentary sectional view taken on line 4—4 of Fig. 3 but on a somewhat larger scale than Fig. 3;

Fig. 5 is a fragmentary sectional view taken on line 5—5 of Fig. 3 but along a somewhat larger scale showing a needle valve in position, and

Fig. 6 is a view similar to Fig. 5 but in which the valve and valve operating mechanism and the lower coupling is removed.

Referring to the drawings for the purpose of illustrating the present invention, I have shown a refrigerating system of the compressor-condenser-expander type and the improvement has been specifically applied to the evaporator of such system. The system herein shown includes an evaporator 20 on the low pressure side of the refrigerating system. Refrigerant is delivered to the evaporator 20 from a receiver 21 through a pipe 22 and is withdrawn from the evaporator 20 by a compressor 24 through a pipe 25, the pipe 25 being connected to the low side of the compressor and preferably as shown to the crank case. The high pressure side of the compressor 24 is connected to a condenser 27 which empties into the receiver 21. The compressor is preferably driven by a motor 28 driven by a belt 29 and is started and stopped in response to temperature of the evaporator by means of the pressure within the evaporator. The control for the motor includes a snap switch 30 which is actuated by a metallic bellows 31 connected with the low pressure side of the refrigerating system by a pipe 33. This pipe is preferably connected to the low pressure pipe 25.

The evaporator is herein shown as comprising a liquid chamber 35 which functions as a header for pipes 36 which lead refrigerant to a zone or place to be cooled. The liquid chamber is a drawn sheet metal tube 38, one end thereof being opened and carries a ring 39 which is suitably bonded to the tube so as to prevent leaks. A head 40 is removably secured to the ring 39 and in place by bolts 41. This head is provided with an opening 42.

A valve fitting 45 is secured to the head 40 by bolts 46. A circular projection 46*a* fits within a circular recess within the head 40 containing packing 47 for sealing the connection between the fitting 45 and the head 40. A boss 49 is formed on the fitting 45 and extends into an opening in the head 40, which opening also receives packing 50 for sealing the connection.

The fitting 45 merges into a valve housing 52 having an opening which is closed by removable plug 53. This housing is connected with the liquid pipe of the refrigerating system through coupling 54 and a shut off valve 55 (see Fig. 1). A conduit 56 (see Fig. 6) connects the housing 52 with the chamber 35.

This conduit forms a bearing for a rotating shaft 58 and in order that the refrigerant flows more readily, the conduit may comprise one or a plurality of slots 59. This conduit leads into an enlarged chamber 60 which is in alignment with the opening 42 in the head 40.

Opposite the housing 52, the fitting 45 carries a coupling 62. This coupling has a conduit 63 in longitudinal alignment with the conduit 56 and is formed similar to conduit 56. This conduit 63 connecting with a passage 64 in nipple 65 connects with the pipe 25 and the other end thereof connects with a passage 66 formed in the hollow boss 49. The head 40 carries an inwardly and upwardly extending outlet pipe 67 for withdrawing gaseous refrigerant from the free space above the liquid level in the casing 35. Thus refrigerant is delivered from the receiver 22 through the shut off valve 55, coupling 54, housing 52, conduit 56, chamber 60 and passage 42 to the interior of the chamber 35 and the refrigerant is withdrawn from the chamber 35 through the pipe 67, opening 66, conduit 63, passage 64 and pipe 25 to the compressor.

The means for controlling the flow of refrigerant from the high pressure side of the refrigerating system to the evaporator is controlled by a float 70. If desirable, the float can be filled with wood or other suitable material to prevent collapsing same in the event that excessive high pressure is present in the chamber 35. The float 70 is pivotally supported at 71 on arms 73. Although during operation of the system, the arms are fixed relative to shaft 58, these arms are arranged for pivotal movement about the shaft 58. A tie member 74 is secured to the arms 73 and is screw-threaded to receive an adjusting screw 75. An arm 76 is removably secured to the shaft 58 by a screw 77 and is adjustably connected with the arm 73 through the tie member 74 and screw 75, the arm 76 being screw-threaded to receive the screw 75, which screw is located in adjusted position by a lock nut 79. An opening is provided in the fitting 45, for access to screw 77 and a plug 80 is secured in sealing relation with the fitting for closing said opening.

The shaft 58 extends into the housing 52 and is provided with a square shank 81 which carries a valve arm 82. A valve 84 is pivotally attached to the valve arm 82 by a screw 85 and cooperates with a valve seat formed in coupling 54. It will be apparent from the drawings that a rising or lowering of the float will cause a lowering or rising of the valve 84 respectively. The relative position of the float with respect to the valve can be regulated by the screw 75 and in this manner the liquid level in the chamber 35 may be regulated.

One end of the shaft 58 is journalled within the conduit opening 56 and the other end of the shaft is journalled in a plug 87. This plug 87 is screw-threaded into the fitting 45 and when moved inwardly from the position shown in Fig. 4 causes a longitudinal sliding movement to be imparted to the shaft 58. A valve 88 is formed integral with the shaft 58 and is arranged to cooperate with the valve seat 89 formed in the fitting 45 so that when the shaft 58 is slid longitudinally, the valve will close the conduit 56 to prevent the flow of refrigerant from the housing 52 to the interior of the casing 35 and will prevent the flow of refrigerant from the interior of casing 35 to the housing when the plug 53 is removed. The shank 91 of the plug 87 extends to the exterior of the refrigerating system and is provided with a key hold 92 for manipulating same. This key hold is accessible when a plug 93 is removed. Packing 95 and a gland 96 therefor are provided for preventing the escape of refrigerant along the stem 91 when the plug 93 is removed.

In the event that the valve 83 or its seat 86 is injured, these elements can be removed without dismantling the entire valve operating mechanism and without the escape of a material quantity of refrigerant. It is necessary only to close the shut off valve 55 and shut off valve 88 to isolate the housing 52 from the remainder of the system and then by removing plug 53 and nut 98 or screw 85, the valve 83 and the seat 86 can be removed. Preferably the shut off valve is first closed and the compressor operated so as to withdraw a certain amount of refrigerant from the evaporator and thus substantially exhaust the housing 52 whereby when the plug 53 is removed substantially no refrigerant, if any, will escape. Likewise it is possible that only a small quantity of air can enter the system.

The plug 87, which during operation of the system, provides a bearing for shaft 58, provides a valve 99. The plug can be backed so that valve 99 seats on valve seat 100 formed on coupling 62 so that the evaporator may be closed from the suction line. Thus the plug may be used for closing the inlet or outlet of the evaporator. If it is desirable to disconnect the evaporator from the remainder of the system, the plug 87 is used for closing the outlet of the evaporator and the shut-off valve will be used for closing the inlet. Thus the evaporator may be charged with refrigerant and shipped for installation independently of the compressor unit or it can be removed from the system while charged.

While the form of embodiment of the invention as herein disclosed constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. Refrigerating apparatus comprising in combination, a refrigerant chamber, refrig-

erant flow control means including means responsive to the condition within said chamber and a valve operatively associated therewith, a housing for said valve, a coupling for connecting said housing with a refrigerant circulating means, said housing having an opening through which said valve can be removed, a removable cover for said opening, and a shut off valve between said first valve and float chamber for preventing the escape of refrigerant from the chamber when the cover is removed.

2. Refrigerating apparatus comprising in combination, a refrigerant chamber, refrigerant flow control means including means responsive to the condition within said chamber and a valve, a housing for said valve, a conduit between said housing and chamber, operating connection between said condition responsive means and valve passing through said conduit, a coupling for connecting said housing with a refrigerant circulating means, said housing having an opening through which said valve can be removed, a removable cover for said opening, and a shut off valve between said first valve and float chamber for preventing the escape of refrigerant from the chamber when the cover is removed.

3. Refrigerating apparatus comprising in combination, a refrigerant chamber, refrigerant flow control means including means responsive to the condition within said chamber and a valve, a housing for said valve, a conduit between said housing and chamber, operating connection between said condition responsive means and valve passing through said conduit, a coupling for connecting said housing with a refrigerant circulating means, said housing having an opening through which said valve can be removed, a removable cover for said opening, a shut off valve in said conduit, and a shut off valve between said first valve and float chamber for preventing the escape of refrigerant.

4. Refrigerating apparatus comprising in combination, a refrigerant chamber, refrigerant flow control means including means responsive to the condition within said chamber and a valve, a housing for said valve, a coupling for connecting said housing with a refrigerant circulating means, a conduit between said housing and chamber, operating connections between said condition responsive means and valve including a member extending through said conduit, a shut off valve element carried by said member for closing said conduit, said housing having an opening through which said first valve can be removed, a removable cover for said opening, and means for actuating said member for moving said valve element to closed position for preventing the escape of refrigerant from the chamber when the cover is removed.

5. Refrigerating apparatus comprising in combination, a float chamber for liquid refrigerant, a valve housing having an opening, a conduit between said housing and float chamber, a shaft extending through said conduit, a valve detachably carried by the shaft within said housing and removable through said opening, a float within the float chamber operatively connected with the shaft, a coupling for connecting said housing with a refrigerant circulating means, a removable cover for said opening, and a shut off valve for said conduit for preventing the escape of refrigerant from the chamber when the cover is removed.

6. Refrigerating apparatus comprising in combination, a float chamber for liquid refrigerant, a valve housing having an opening, a conduit between said housing and float chamber, a shaft extending through said conduit, a valve detachably carried by the shaft within said housing and removable through said opening, a float within the float chamber operatively connected with the shaft, a coupling for connecting said housing with a refrigerant circulating means, a removable cover for said opening, a shut off valve element carried by the shaft for closing said conduit, and means for moving said shaft to conduit closing position.

7. Refrigerating apparatus comprising in combination, a float chamber for liquid refrigerant, a valve housing having an opening, a conduit between said housing and float chamber, a shaft extending through said conduit, a valve detachably carried by the shaft within said housing and removable through said opening, a float within the float chamber operatively connected with the shaft, a coupling for connecting said housing with a refrigerant circulating means, a removable cover for said opening, a shut off valve element carried by the shaft and movable longitudinally for closing said conduit, and means for moving said shaft longitudinally to conduit closing position.

8. Refrigerating apparatus comprising in combination, a refrigerant chamber having an inlet and an outlet, a valve for controlling the flow through said inlet and a valve for controlling the flow through said outlet, and a single means for controlling either of said valves.

In testimony whereof I hereto affix my signature.

OTTO M. SUMMERS.