July 24, 1928. 1,678,147

J. G. KING ET AL

VALVED FITTING FOR REFRIGERATING APPARATUS

Original Filed May 7, 1923 2 Sheets-Sheet 1

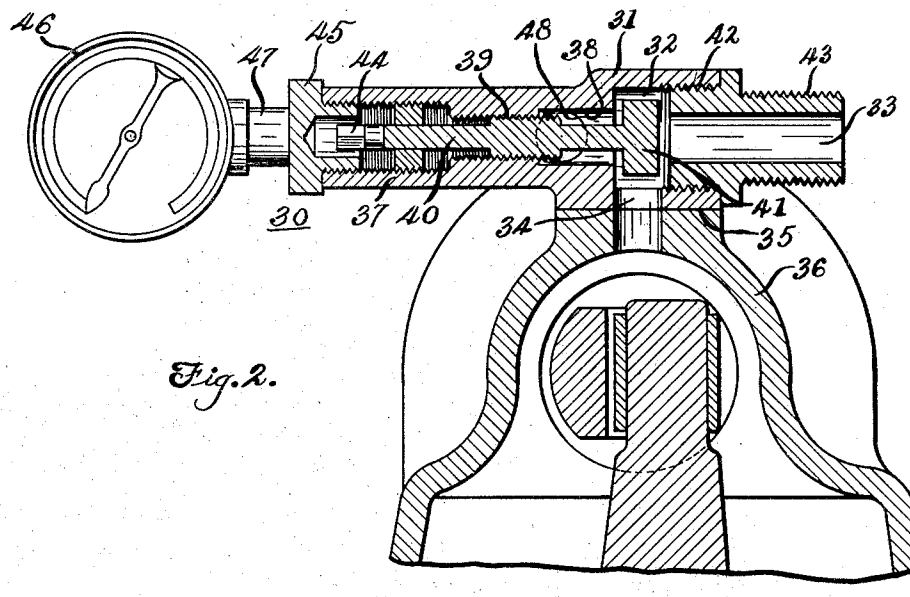


Fig. 2.

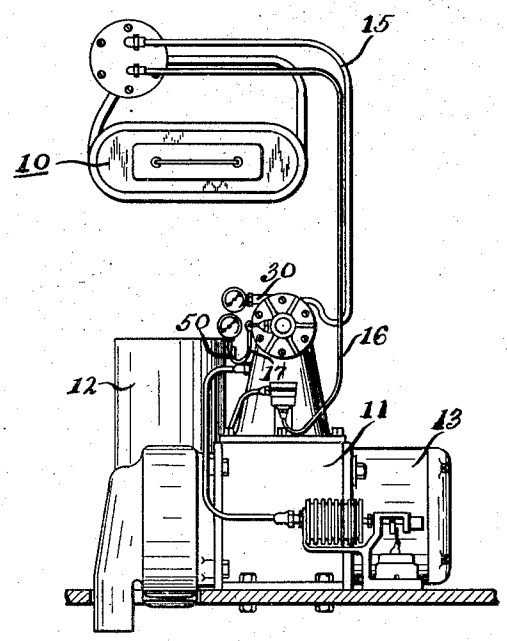


Fig. 1.

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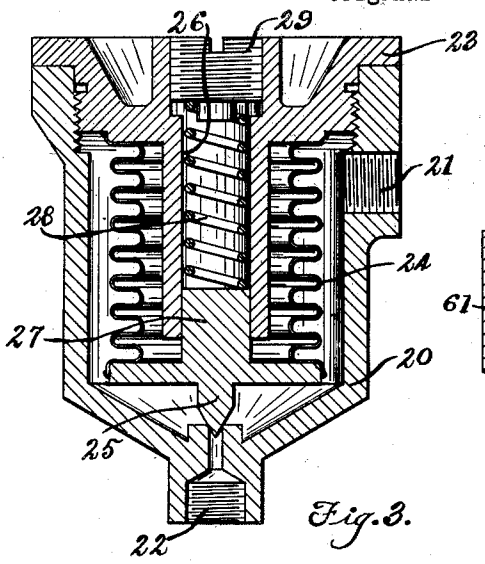


Fig. 3.

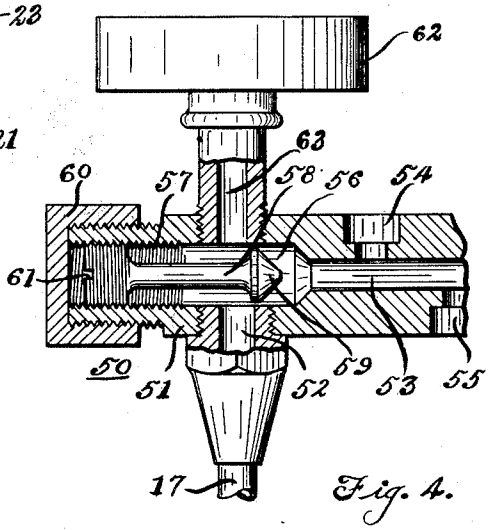


Fig. 4.

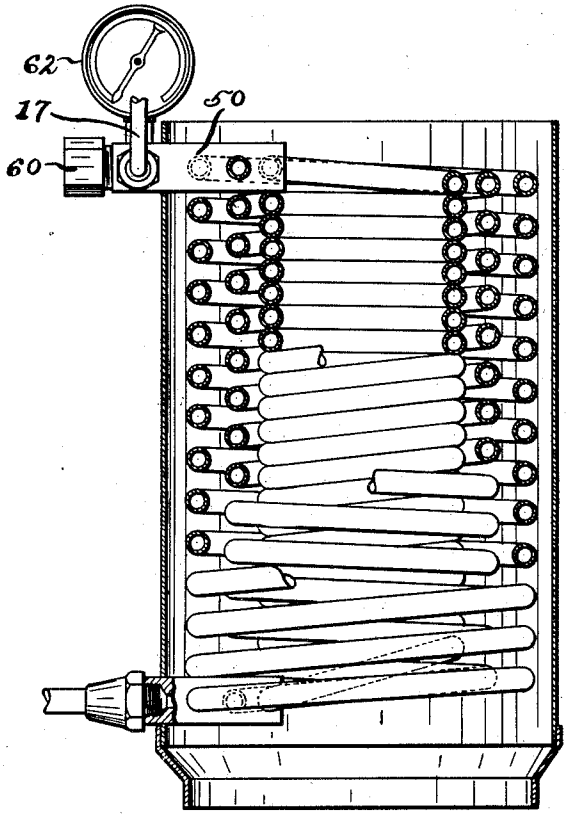


Fig. 5.

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UNITED STATES PATENT OFFICE.

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VALVED FITTING FOR REFRIGERATING APPARATUS.

Original application filed May 7, 1923, Serial No. 637,136. Divided and this application filed July 30, 1927. Serial No. 209,587.

This invention relates to refrigerating apparatus, particularly, altho not exclusively, adapted to household refrigerators, the present application being a division of our application Serial No. 637,136, filed May 7, 1923.

It is among the objects of the invention involved in the present application to provide a complete refrigerating system which, altho assembled as a unit, may be readily taken apart for the repair and replacement of parts of the system.

It is also an object to provide improved means for shutting off communication between various parts of the system so that such parts may be separated and replaced without loss of refrigerant.

More specifically it is an object to provide an improved fitting or coupling for connecting the various parts of the system, which coupling contains an improved shut-off valve and permits the disconnection of the various parts of the system.

It is a further object of the invention to provide a valve which may be readily operated and which is proof against refrigerant leaking out of or air leaking into, the system.

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

In the drawings

Fig. 1 is a diagrammatic representation of a refrigerating system embodying the invention;

Fig. 2 is an enlarged cross-section of one form of coupling containing a refrigerant shut-off valve;

Fig. 3 is a cross-section of a refrigerant control valve;

Fig. 4 is a cross-section of another form of coupling having a refrigerant shut-off valve, and

Fig. 5 is a sectional view of a condenser.

Referring to the drawing, the system includes an evaporator or cooling element 10 which is supplied with liquid refrigerant and from which gaseous refrigerant is withdrawn by a refrigerating unit including a compressor 11, a condenser 12, and a motor 13 for driving the compressor. The particular form of the evaporator, compressor and condenser and their accompanying controls form no part of the present invention, and any suitable devices of this character known in the art may be employed. The evaporator is described in detail in Jesse G. King's application, Serial No. 642,366, filed May 30, 1923, and the devices constituting the refrigerating unit are more fully described in our previous application referred to above.

The evaporator is connected to the intake side of the compressor by a pipe 15 through which the gaseous refrigerant is withdrawn, and is connected to the condenser through the liquid supply pipe 16. The discharge side of the compressor is connected to the condenser through the conduit 17.

In the operation of the system, as is known in the art, liquid refrigerant is evaporated in the evaporator 10 and the vapor is withdrawn by the compressor through the pipe 15, compressed, and delivered to the condenser 12 through the conduit 17, is liquefied in the condenser and returned to the evaporator through the liquid supply pipe 16.

In order to control the flow of liquid refrigerant from the condenser to the evaporator, I provide the refrigerant control valve shown in Fig. 3, placed at any suitable point in the liquid supply conduit 16. The valve includes a casing 20 having an inlet 21 connected to the condenser, and an outlet 22 connected to the evaporator. A screw plug 23 forms one end of the casing and has sealed to it one end of a metal bellows 24, the other end of which is sealed to, and carries a valve member 25 which controls the outlet 22. The screw plug 23 is formed with a sleeve 26 which acts as a guide for the valve stem 27 and also as a guide for the adjusting spring 28. The spring is adjusted and held against the valve stem by a small screw plug 29 threaded into the outer end of the sleeve. The space within the metal bellows is partly filled with a volatile liquid such as methyl chloride, which is sealed within the bellows by the screw plug 29.

The control valve operates as follows: The valve 25 is normally seated, closing the outlet 22 and preventing passage of refrigerant, which collects in the space between the bellows 24 and casing 20. As the com-

pressor continues to supply refrigerant to the condenser, the pressure increases until it overcomes the force of the spring 28 and the vapor contained within the bellows 24. This excess pressure opens the valve and forces the liquid contained in the valve casing thru the outlet and into the evaporator. When the pressure is reduced by the passage of a certain amount of liquid, the valve closes. The pressure or force exerted on the valve by the volatile liquid within the bellows varies with the temperature and thus regulates the pressure required to open the valve, and hence the amount of liquid which can pass the valve.

In order to permit the system to be readily disconnected without loss of refrigerant we place at suitable points in the connecting pipes couplings containing shut-off valves. As is shown by way of example in the drawings, the evaporator is connected to the system through a coupling 30, which contains a shut-off valve between the vapor line 15 and the intake of the compressor, and the condenser is connected to the compressor through a coupling 50 which also contains a shut-off valve. Such couplings may be placed wherever desired in the system.

As shown in Fig. 2 the coupling 30 includes a casing 31 and a valve chamber 32 which has an inlet 33 and an outlet 34. The casing is provided with a suitable surface 35 which may be attached to the cylinder block 36 of the compressor in any desired manner. Opposite the inlet the casing has an extension 37 provided with a bore 38 of smaller diameter than the valve chamber 32 and threaded as at 39 to receive a valve stem 40. The latter is provided with an enlarged head forming a valve 41 which may close the inlet 33. Preferably the inlet is in the form of a coupling threaded into the valve chamber as at 42 and provided with threads 43 for connection to the refrigerant pipe. The valve and valve stem may be removed from the casing through the opening provided by the removal of the coupling. The valve stem lies entirely within the extension 37 of the casing and is provided at its end with a square portion 44 adapted to receive a wrench for turning the stem. The casing is closed at this end by a screw plug or cap 45 which seals the casing and prevents the escape of any refrigerant which might leak past the threads 39. This cap is removed, of course, when it is desired to operate the valve. The shoulder between the bore 38 and the chamber 32 acts as a stop to limit the amount of travel of the valve head away from the inlet 33. If desired, a pressure gauge 46 may be connected to the valve casing by a pipe 47 communicating with the casing at the opening 48.

A similar type of coupling 50 between the condenser and the compressor is shown in Figs. 4 and 5. This includes a casing 51, an inlet 52, and an outlet 53 which may supply a plurality of condenser connections 54 and 55. The casing includes a valve chamber 56 open at one end and threaded at 57 to receive a valve stem 58 carrying a valve 59 adapted to close the outlet 53. The valve stem is removable through the open end of the casing which may be closed, when the valve is not being operated, by a screw cap 60. The valve stem is provided with a slot 61 adapted to receive a screw driver for operating the valve. A pressure gauge 62 may be connected to the valve chamber through opening 63.

In assembling the above described apparatus to form a refrigerating system, the couplings containing the shut-off valves are placed at points wherever it is anticipated that disconnection will be necessary. Suppose for example in the system described above it should be desired to replace the compressor. All that is necessary is for the shut-off valves contained in the couplings 30 and 50 to be closed and these couplings disconnected from the compressor. All refrigerant contained in the remainder of the system is thus prevented from escaping and the compressor may be removed and replaced without the necessity of first removing the refrigerant from the system.

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. A fitting for connecting an evaporator into the refrigerant circuit of a refrigerating system, comprising a valve casing provided with a valve chamber and with inlet and outlet passageways communicating with said valve chamber, and a valve structure entirely enclosed within said valve casing for opening or closing one of said passageways.

2. A fitting for connecting an evaporator into the refrigerant circuit of a refrigerating system, comprising a valve casing provided with a valve chamber and with inlet and outlet passageways communicating with said valve chamber, and a manually adjustable valve structure entirely enclosed within said valve casing for opening or closing one of said passageways.

3. A fitting for connecting an evaporator into the refrigerant circuit of a refrigerating system, comprising a valve casing provided with a valve chamber and with inlet and outlet passageways communicating with said valve chamber, an adjustable valve structure in said chamber entirely enclosed by said casing for opening and closing one of said passageways, said casing being provided with an opening in the wall thereof

through which said valve may be inserted and removed, and a closure member for said opening and which is removably secured to said casing.

4. A fitting for connecting an evaporator into the refrigerant circuit of a refrigerating system, comprising a valve casing provided with a valve chamber and with inlet and outlet passageways communicating with said valve chamber, a valve structure supported within said chamber and entirely enclosed by said valve casing, said valve structure having a screw threaded engagement with said valve casing to permit the manual adjustment of said valve, said casing provided with an opening in the wall thereof through which said valve may be inserted and removed and through which access may be had to said valve for adjusting the same, and a closure member for said opening removably secured to said casing.

5. A fitting for connecting the refrigerant lines to an evaporator of a refrigerating apparatus, comprising a valve casing provided with a valve chamber and with inlet and outlet passageways communicating with said valve chamber, a valve supported within said chamber and enclosed by said valve casing, said valve having a screw threaded engagement with said valve casing to permit the manual adjustment of said valve, and means for limiting the opening movement of said valve.

6. A fitting for connecting the refrigerant lines to an evaporator of a refrigerating apparatus, comprising a valve casing provided with a valve chamber and with inlet and outlet passageways, and a valve structure enclosed within said valve casing or opening or closing one of said passageways, said casing being constructed to permit the securing of connections thereto communicating with said inlet and outlet passageways, one of said connections being arranged to be secured to the evaporator and the other connection being arranged to be secured to one of the refrigerant lines.

7. A fitting for refrigerant circuits of a refrigerating system, comprising a valve casing provided with a valve chamber and with inlet and outlet passageways communicating with said valve chamber, and a valve structure entirely enclosed within said valve casing for opening or closing one of said passageways.

8. A fitting for refrigerant circuits of a refrigerating system, comprising a valve casing provided with a valve chamber and with inlet and outlet passageways communicating with said valve chamber, and a manually adjustable valve structure entirely enclosed within said valve casing for opening or closing one of said passageways.

9. A fitting for refrigerant circuits of a refrigerating system, comprising a valve casing provided with a valve chamber and with inlet and outlet passageways communicating with said valve chamber, an adjustable valve structure in said chamber entirely enclosed by said casing for opening and closing one of said passageways, said casing being provided with an opening in the wall thereof through which said valve may be inserted and removed, and a closure member for said opening and which is removably secured to said casing.

10. A fitting for refrigerant circuits of a refrigerating system, comprising a valve casing provided with a valve chamber and with inlet and outlet passageways communicating with said valve chamber, a valve structure supported within said chamber and entirely enclosed by said valve casing, said valve structure having a screw threaded engagement with said valve casing to permit the manual adjustment of said valve, said casing provided with an opening in the wall thereof through which said valve may be inserted and removed and through which access may be had to said valve for adjusting the same, and a closure member for said opening removably secured to said casing.

11. A fitting for refrigerant lines of a refrigerating apparatus, comprising a valve casing provided with a valve chamber and with inlet and outlet passageways communicating with said valve chamber, a valve supported within said chamber and enclosed by said valve casing, said valve having a screw threaded engagement with said valve casing to permit the manual adjustment of said valve, and means for limiting the opening movement of said valve.

12. A fitting for refrigerant lines of a refrigerating apparatus, comprising a valve casing provided with a valve chamber and with inlet and outlet passageways, and a valve structure enclosed within said valve casing for opening or closing one of said passageways, said casing being constructed to permit the securing of connections thereto communicating with said inlet and outlet passageways, said connections being arranged to connect the fitting into the refrigerant circuit of a refrigerating apparatus including an evaporator.

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