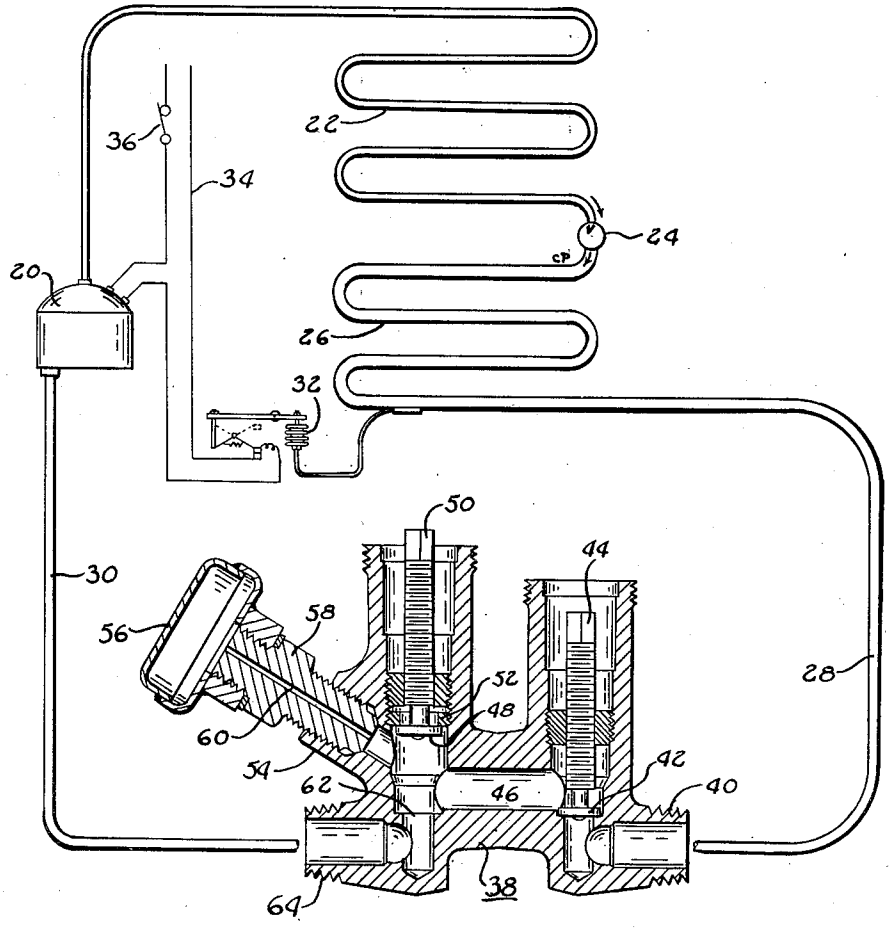
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REFRIGERATING APPARATUS

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REFRIGERATING APPARATUS

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This invention relates to refrigerating apparatus and more particularly to a method of and apparatus for adding a fluid to a refrigerating system.

In service, it sometimes happens that moisture is found in a refrigerating system. This moisture flows with the refrigerant through the system and freezes at the point of expansion. The ice thus formed clogs the system. When this occurs it is customary to add an anti-freeze, such as methyl alcohol. However, there have been difficulties in adding the anti-freeze and in controlling the amount added, since only a small amount is required, and any excess is undesirable. It is of course, necessary to prevent as far as possible the entrance of air into the system while the anti-freeze is being added.

It is an object of my invention to provide an improved method of apparatus for conveniently adding an accurately determined quantity of fluid to a refrigerating system without damaging any part of the system or admitting any substantial amount of air.

It is another object of my invention to provide an improved charging device in which a definite amount of a fluid can be added to a refrigerating system without error at a safe rate by any serviceman.

It is another object of my invention to provide a simple, reliable method of and apparatus for adding an anti-freeze liquid to a refrigerating system from a completely filled container of definite volume at a safe rate and for insuring essentially complete transfer of the fluid from the container to the system without the loss of any substantial amount of refrigerant from the system or entrance of any substantial amount of air into the system.

To attain these objects I utilize two valves provided in the suction line of a compressor refrigerating system. The one valve nearest the compressor is provided with a plug connection which opens into the interior of the valve. In preparing to add the anti-freeze, the refrigerating apparatus is stopped and both valves are closed thereby isolating the interior of the valve from the refrigerating system. The blind plug is then removed and a container completely filled with the desired amount of anti-freeze replaces the plug in the plug connection of the valve. The container connection is provided with a restricted passage connecting it with the interior of the valve. The valve with the plug connection is then opened, but in opening the valve it remains sealed from the atmosphere by the use

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of a second seat. The refrigerating system is then started by closing the control switch and it operates until all of the anti-freeze fluid is withdrawn from the container through the capillary passage. The valve with the plug connection is then closed and the anti-freeze container is removed and replaced by the blind plug. The system is restored to operation by opening both valves.

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

In the drawing, the figure is a diagrammatic representation of a compression refrigerating system provided with two valves in the suction line showing my charging device connected for charging the system with anti-freeze according to my invention.

Referring now to the drawing, there is shown a sealed motor-compressor unit 20 for compressing the refrigerant and for forwarding the compressed refrigerant to a condenser 22 where the refrigerant is liquefied and flows under the control of a suitable flow control device 24, such as an expansion valve, to the evaporating means 26 where the refrigerant evaporates under reduced pressure and is returned to the compressor though the suction lines 28 and 30. The operation of the compressor 20 is controlled by a thermostatic switch 32 which is responsive to the temperature of the evaporator 26 for opening and closing the electric circuit 34 which supplies the electric energy to the sealed unit 20. A manual switch 36 is also connected in the electric circuit 34 for shutting down the refrigerating system.

The suction line 28 connects to one end of a double valve member 38, the other end of which connects to the suction line 30. This valve member 38 has an inlet connection 40 leading to the one-way valve 42 having a key connection 44 at the upper end of its threaded stem. The stem threads through a threaded insert in the valve body so that when the stem is rotated by the key, the valve 42 will be moved either to the open or closed position, according to the direction of rotation. The passage 46 connects the discharge side of the valve 42 with the inlet side of the valve 48. The valve 48 is likewise provided with a key connection 50 by which it may be rotated to closed or open position. The valve 42 is shown in its lowermost position against its seat thus closing the con-

nection to the suction line 28. The valve 48 is shown in its uppermost position against the upper seat 52. The valve body 38 adjacent the valve 48 is provided with a plug connection 54 which normally contains a blind plug. This connection however, may be used for attaching a pressure gauge.

As shown in the figure, however, the charging device embodying my invention is shown connected to the plug connection 54. This charging device includes a container 56 having a volume exactly equal to the volume of the anti-freeze which it is desired to add to the refrigerant in the system. This anti-freeze may, for example, be methyl alcohol and the container may have a volume of 5 cc. The container 56 is connected by the fitting 58 with the plug connection 54. The fitting 58 is provided with a restricted passage 60 which preferably has a diameter less than 1/64". This passage 60 connects the interior of the container 56 with the interior of the valve body 38 above the lower valve seat 62 provided for the valve 48. The discharge side of the seat 62 connects with the discharge connection 64 which is connected to the suction line 30.

In the normal operation of the system a blind plug closes the plug connection 54 and both valves 48 and 42 are in their upper or open positions. The stem chamber for each valve stem in the valve body 38 may be closed by a sealing cap. Should it be found that freezing is occurring within the refrigerating system it is customary to add a small amount of an anti-freeze, such as 5 cc. of methyl alcohol. To do this, according to my invention, the switch 36 is first opened and after the sealing caps are both removed, a key is used to operate both valves 42 and 48 to their lower or closed positions. The blind plug is then removed from the plug connection 54 and is replaced by the charging device shown, containing 5 cc. of methyl alcohol or other suitable anti-freeze. The valve 48 is then moved to its upper position by turning the stem by the key connection 50 until it rests against the upper seat 52. The switch 36 is then closed and the switch 32 will have been closed because the evaporator 26 will be warm due to the fact that the system was idle since the time that the switch 36 was opened. The figure shows the system in this condition.

In this condition the motor-compressor unit 20 operates and gradually pumps fluid from the suction line 30 and the interior of the valve body 38, thereby reducing the pressure therein. This reduction in pressure causes the anti-freeze to flow out of the container 56 at a very slow rate which is limited by reason of the extremely small size of the passage 60. It is necessary to prevent the sudden addition of anti-freeze to the system, since the dumping of a material amount of liquid into the suction line practically instantaneously would cause a slug of liquid to be pumped into the compressor. Since liquid is almost incompressible, the compressor is likely to be damaged thereby. Therefore the passage 60 is made with a diameter of less than 1/64", so that the anti-freeze liquid is drawn into the suction line 30 so slowly that the compressor will not be damaged thereby.

The refrigerating system is allowed to operate a sufficient time until it is certain that all of the liquid has been drawn from the container 56. The compressor 20 is capable of pulling a sufficient vacuum to cause the anti-freeze to vaporize within the container, thus assuring complete removal of the liquid anti-freeze from this container 56. In this way it is assured that no matter what the relative position of the container 56 and the passage 60, complete removal of the liquid contents of the container 56 is assured if the refrigerating system is operated for a sufficient length of time.

When the refrigerating system has been operated for a designated length of time, the switch 36 may be opened and the valve 48 moved downwardly into sealing contact with its lower seat 62. The charging device, composed of the container 56 and the fitting 58, is then removed and replaced by the usual blind plug to seal the plug connection 54. The valves 48 and the valve 42 are then opened to their normal operating positions and the sealing caps are placed over the valve stem openings of the valve body 38. The suction lines 28 and 30 now have communication through the valve body 38 and the system may be operated in the usual manner. During the adding of the anti-freeze the system will have become warm enough to melt any ice in any part of the system. The anti-freeze will mix with the water or moisture in the system and prevent any further freezing of the fluid in the system.

The container 56 may be filled with the anti-freeze solution by the serviceman. To do this, the fitting 58 is unscrewed from the container 56 and the container 56 is filled with the anti-freeze. The fitting 58 is then screwed into place forcing out all the air and any excess anti-freeze so that only the exact desired amount of anti-freeze remains, free of air.

While I have described a method of apparatus for adding an anti-freeze to the system it is obvious that other liquids may be added in the same manner.

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, as may come within the scope of the claims which follow.

What is claimed is as follows:

1. The method of adding a specifically desired quantity of liquid to a compression refrigeration system which includes first sealing a point of connection on the suction line between the evaporator and the compressor from the remainder of the system, and secondly connecting a container containing a measured body of said liquid to said point of connection, then establishing communication between the suction side of said compressor and the body of said liquid, starting said compressor and throttling the flow of liquid into said system and continuing the operation of the compressor and the throttled flow of liquid until essentially the entire measured body of liquid is drawn into the system, then sealing the point of connection from the remainder of the system, sealing the point of connection from the atmosphere and opening the thus sealed point of connection to the remainder of the system.

2. A compression refrigerating system including a one-way valve and a two-way valve connected in the suction line of the system, a sealed charging device connected to said two-way valve, said charging device including a container having substantially the exact volume of the fluid desired to be added to the system, said charging device including a connection between the interior of said container and said two-way valve provided with a restricted portion for restricting the flow of fluid from the container into the system.

3. A compression refrigerating system having a suction line provided with two valves located near each other, a charging device including a container and a connection between the container and the valve nearest the compressor, said container having a volume equal to the volume of fluid it is desired to add to the system, said connection including a restricted portion for restricting the flow of fluid out of the container into the system.

4. A compression refrigerating system having a suction line provided with two valves located near each other, a charging device including a container and a connection between the container and the valve nearest the compressor, said container having a volume equal to the volume of liquid it is desired to add to the system.

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