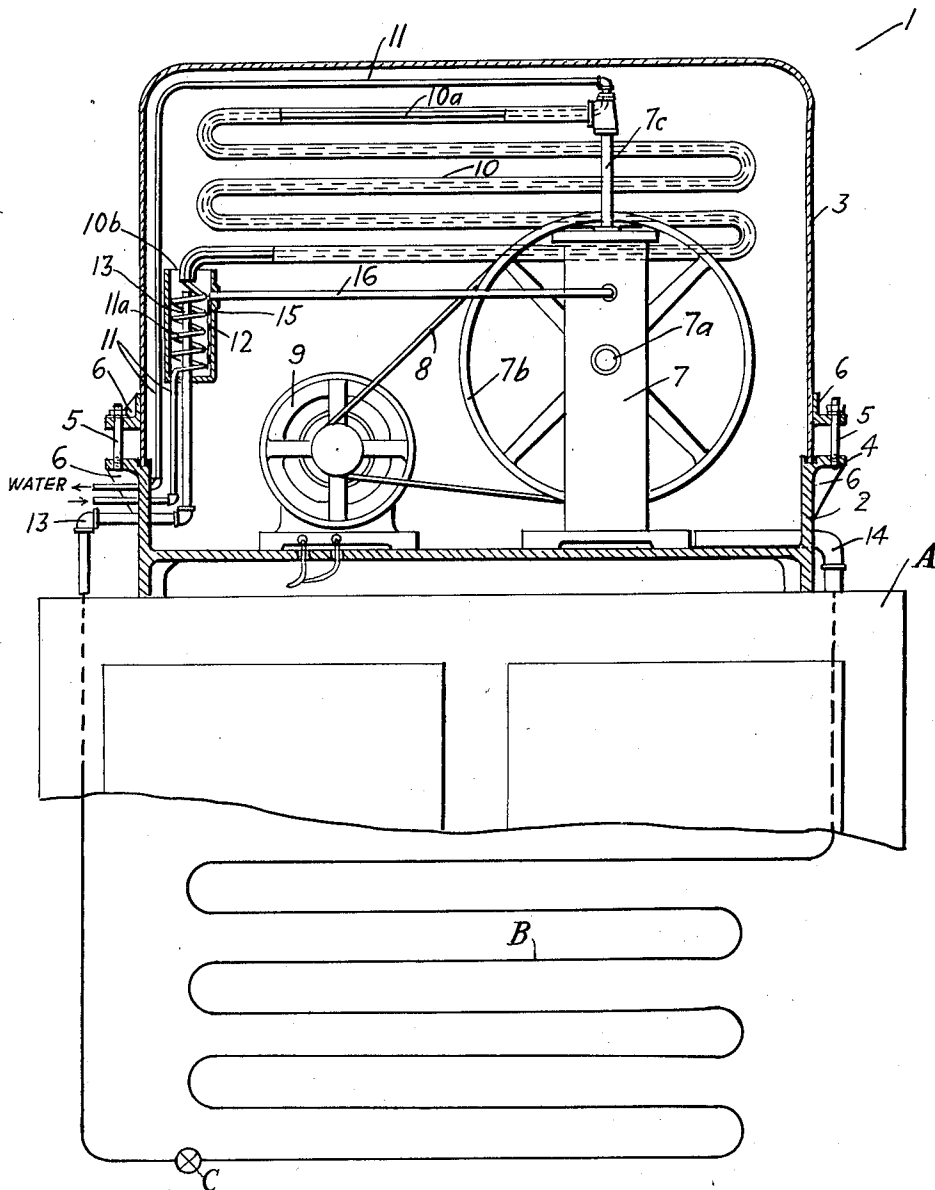


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REFRIGERATING APPARATUS

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UNITED STATES PATENT OFFICE.

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REFRIGERATING APPARATUS.

Application filed August 13, 1925. Serial No. 49,913.

The present invention relates to apparatus for producing refrigeration mechanically.

In refrigerating apparatus of the type described as heretofore used much trouble has been experienced in confining the refrigerant. Leakage of the refrigerant not only eventually impairs or destroys the efficiency of the apparatus but also has many disagreeable, if not actually dangerous, features. Practically all of the ordinary refrigerants are inflammable and some of them are explosive. They usually have a disagreeable or offensive odor and certain of them are poisonous. The refrigerant lost by leakage is replaced by air, which in the conventional system interferes with the operation of the system. The air thus admitted ordinarily contains water vapor which combines chemically with certain refrigerants producing acids which attack and corrode the apparatus. Leakage most frequently develops and is practically confined to the packings of the compressor or pump.

Among the objects of the invention are to prevent the escape of refrigerant from the system, to eliminate packings on the compressor shaft, and in general to simplify and improve the structure and arrangement of refrigerating apparatus of the described type in the interest of more satisfactory and efficient service.

The invention comprises the disposing of certain of the apparatus, at least the prime mover and the compressor, within a sealed fluid tight casing or container and connecting the interior of the casing to the high side of the refrigerating system. The condenser may be disposed either inside or outside the casing as desired, but the connection of the high side pressure to the casing is by preference at a point beyond the condenser. The invention is particularly adapted for use with refrigerants of the type described in my copending application No. 603,998 filed Nov. 29, 1922 operating in accordance with the process set forth in my copending application No. 15,172 filed Mar. 12, 1925 on account of the low pressures obtaining on the high side of this system, but the invention is by no means confined thereto.

In order to illustrate the invention and the manner of its operation one concrete embodiment thereof is disclosed in the accompanying drawing in which the sealed casing or container for the refrigerating apparatus is

disclosed in section as mounted upon a refrigerator cabinet, largely broken away, the remaining parts of the apparatus including the refrigerating element for the cabinet and the connections thereto being diagrammatically illustrated.

In the embodiment shown, A indicates the upper portion of a refrigerating cabinet upon which is mounted the refrigerating unit 1 which includes a casing preferably of metal, having a base 2 and a cover 3. The lower edge of the cover seats in a groove 4 in the base which groove contains suitable semi-plastic sealing material, the parts of the casing being held in sealed engagement by bolts 5 engaging projecting portions or brackets 6 on the base and cover respectively. Within the casing is mounted the compressor 7, which may be of any suitable or preferred type (that shown having a double ended piston) and has a crank shaft 7^a upon which is mounted a fly wheel 7^b over which runs a belt 8 driven by a prime mover such as the electric motor 9 also mounted within the casing. The discharge pipe 7^c of the compressor leads to a condenser 10. While the condenser may be of any suitable or desired type and may be mounted either on the inside or on the outside of the casing as desired, the condenser shown is the conventional double pipe type disposed within the casing. Leads 11 passing through the base 2 supply the cooling medium, in the present instance water, to the inner pipe 10^a of condenser 10. Condenser 10 discharges into an open receptacle 12 mounted within the casing, thereby connecting the interior of the casing to the high pressure side of the refrigerating system. An overflow pipe 13 extends upwardly within the receptacle 12 and terminates somewhat below the discharge end 10^b of the condenser. Pipe 13 leads out of the casing through a sealed opening and connects with a coil or refrigerating element within cabinet A, diagrammatically indicated at B, by a throttle device C which may be an expansion valve or a Venturi nozzle. A connection from the top of the refrigerating element B is diagrammatically indicated extending to the intake pipe 14 of compressor 7, which pipe passes through a sealed opening in base 2 of the casing.

The water connection to condenser 10 preferably includes coils 11^a within receptacle 12 for absorbing heat from the contents

of the receptacle thereby to insure a body of condensed or liquid refrigerant within the receptacle. Means such as wicking 15 extending through a pipe 16 may be utilized to conduct some of the liquid refrigerant from receptacle 12 into compressor 7 to lubricate the same. The use of liquid refrigerant as a lubricant for the compressor is disclosed in my copending application Serial No. 705,809 filed April 11, 1924.

In operation the gaseous portions of the refrigerant are drawn from the top of the refrigerating element B, compressed in pump 7, and discharged under pressure into condenser 10 where at least a portion of the vapor of the liquid refrigerant is condensed to liquid, the compressed refrigerant issuing in liquid and gaseous form from the outlet 10^b. The gaseous portion of the refrigerant fills the interior of the casing while the liquid portion gathers in receptacle 12, both the liquid and the gaseous refrigerant passing off through the overflow or outlet pipe 13, whence it expands up through the refrigerating element B absorbing heat from cabinet A and completing the cycle. Since the interior of the casing is open to the high pressure side of the system no fluid tight packings are used or required for the crank shaft 7^a of the pump.

From the above it will be apparent that the present invention makes provision for the assembly into a compact unit of the entire refrigerating apparatus except for the refrigerating element and the immediate connections thereto, that the sealing of the casing practically eliminates all refrigerant leakage with its attendant disagreeable and dangerous features, and that the present invention avoids the necessity of providing packed joints which are difficult to maintain in a fluid tight condition.

As stated previously, the invention is particularly adapted for use in closed cycle systems utilizing as a refrigerant a physical mixture of a liquid and a gas substantially inert to and insoluble in the liquid in accordance with the method disclosed and claimed in my copending application, Serial No. 15,172 filed Mar. 12, 1925.

While but one form of the invention has been herein shown and described it is to be understood that the invention is not limited to the specific details thereof but covers all changes, modifications and adaptations within the scope of the appended claims.

I claim as my invention:

1. In apparatus of the type described, in combination, a fluid tight casing, a compressor and a prime mover therefor sealed within said casing, a condenser into which said compressor discharges, and means connecting the interior of said casing to the discharge of said condenser.

2. In apparatus of the type described, in

combination, a fluid tight casing, a compressor and a prime mover therefor sealed within said casing, a condenser connected to the high side of said compressor, and an open receptacle within said casing into which said condenser discharges, whereby the interior of said casing is connected to the discharge or high pressure side of said compressor.

3. In a closed cycle system for producing refrigeration mechanically, the combination with a refrigerator containing a refrigerating element, of a refrigerating unit in the form of a casing having the rest of the refrigerating apparatus sealed therewithin, including prime mover; compressor and condenser, the condenser connection being interrupted at one point to place the interior of said casing in connection with the high side of said system thereby to enable the system to operate properly without fluid tight packings for the compressor shaft.

4. In a refrigerating system, in combination, a refrigerator, a refrigerating coil therein, a casing having connections to the top and to the bottom of said coil, a condenser, a compressor, and a motor for driving the latter, the three elements last named being sealed in a fluid tight manner within said casing, and an open receptacle within said casing from which one of said connections leads and into which said condenser discharges.

5. In apparatus of the type described, in combination, a fluid tight casing, a compressor and a prime mover therefor sealed within said casing, a water condenser of the double pipe type into which said compressor discharges, an open receptacle within said casing into which said condenser discharges, the water connection to said condenser being arranged to absorb heat from the contents of said receptacle.

6. In apparatus of the type described, in combination, a fluid tight casing, a compressor and a prime mover therefor sealed within said casing, a water condenser of the double pipe type into which said compressor discharges, an open receptacle within said casing into which said condenser discharges, the water connection to said condenser having coils disposed within said receptacle to absorb heat from the contents thereof.

7. In a closed cycle system for producing refrigeration mechanically the combination with a refrigerator containing a refrigerating element, of a refrigerating unit in the form of a casing having a base and a cover arranged to be sealed to said base to form a fluid tight compartment, the remaining refrigerating apparatus comprising condenser, compressor and prime mover being mounted in said compartment, an open receptacle within said compartment into which said condenser discharges, thereby placing said compartment in communication with the

high pressure side of said system, an over-flow from said receptacle connected through the base of said casing to the lower part of said refrigerating element, and a connection from the upper portion of said element through said base to the intake of said compressor.

8. In apparatus of the type described, in combination, a compressor, a prime mover, and a condenser, a fluid tight casing having said compressor and said prime mover sealed therewithin, an open receptacle within said casing into which said condenser discharges thereby connecting said casing to high side pressure, and suitable connections between said parts and through the walls of said casing to enable the same to be connected into and form a part of a closed cycle refrigerating system.

9. In apparatus of the type described, in combination, a compressor, a prime mover, and a condenser, a fluid tight casing having said compressor and said prime mover sealed therewithin, an open receptacle within said casing into which said condenser discharges thereby connecting said casing to high side pressure, means for extracting heat from the contents of said receptacle, and suitable connections through the walls of said casing to enable the same to be connected into and form a part of a closed cycle refrigerating system.

10. In apparatus of the type described, in combination, a compressor, a prime mover, and a double-pipe condenser, a fluid tight casing having said compressor and said prime mover sealed therewithin, an open receptacle within said casing into which said condenser discharges thereby connecting said casing to high side pressure, means utilizing the cooling medium for said condenser to ex-

tract heat from the contents of said receptacle, and suitable connections through the walls of said casing to enable the same to be connected into and form a part of a closed cycle refrigerating system.

11. In apparatus of the type described, in combination, a compressor, a prime mover, and a condenser, a fluid tight casing having said compressor and said prime mover sealed therewithin, an open receptacle within said casing into which said condenser discharges thereby connecting said casing to high side pressure, and suitable connections between said parts and through the walls of said casing to enable the same to be connected into and form a part of a closed cycle refrigerating system, one of said connections being arranged to withdraw at the same time gas from said casing and liquid from said receptacle.

12. In apparatus of the type described, in combination, a compressor, a prime mover, and a condenser, a fluid tight casing having said compressor and said prime mover sealed therewithin, an open receptacle within said casing into which said condenser discharges thereby connecting said casing to high side pressure, means for extracting heat from the contents of said receptacle and suitable connections through the walls of said casing to enable the same to be connected into and form a part of a closed cycle refrigerating system, including a conduit having its open end adjacent the top of said receptacle so as to withdraw at the same time both liquid from said receptacle and gas from said casing.

Signed by me at Detroit, Michigan, this 5 day of August, 1925.

RANSOM W. DAVENPORT.