Oct. 28, 1941.　　E. M. CORMACK　　2,260,608

METHOD OF DEHYDRATING REFRIGERATION UNITS

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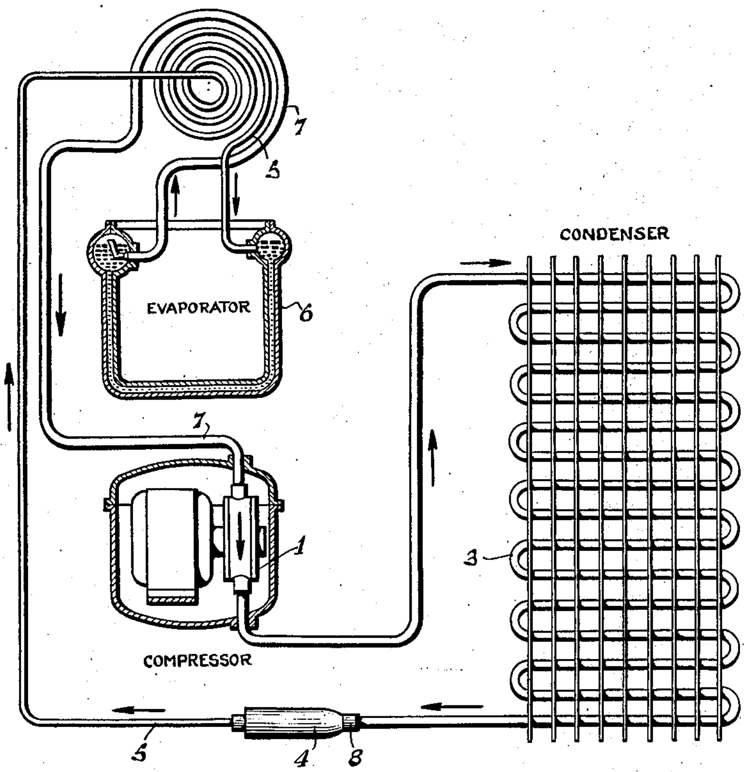

Fig. 1

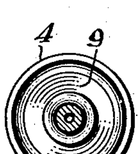

Fig. 3

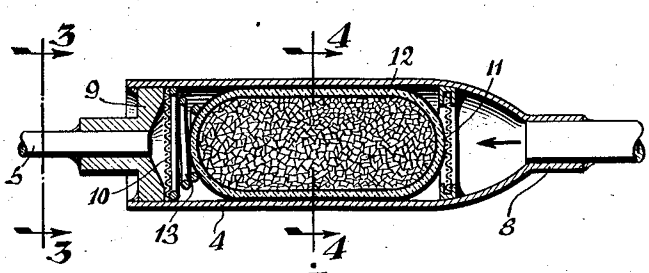

Fig. 2

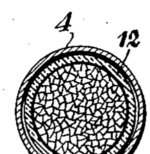

Fig. 4

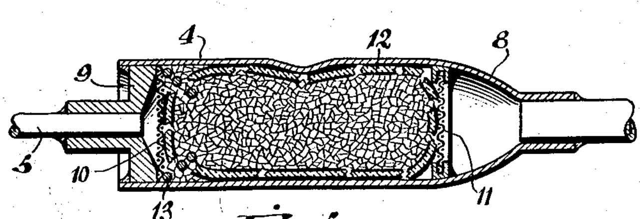

Fig. 5

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METHOD OF DEHYDRATING REFRIGERATION UNITS

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10 Claims. (Cl. 62—115)

This invention relates to a method of and means for dehydrating a refrigerator unit or system and the like, and particularly for what may be termed ultimate dehydration, effective after the unit has been conventionally dehydrated, supplied with the refrigerant, sealed, and the service of the system started.

In the manufacture of electric refrigerating systems, particularly with systems using a compressor, it is important to free the system of water and water vapor, since the same is likely to freeze in certain parts of the system and interfere with its operation. Dry absorption systems also require freedom from moisture. It has been customary to dehydrate such systems either piece by piece before assembly or at the time the complete system is assembled. In the former case the presence of undesired water vapor within the sealed system is difficult to avoid for the interior of the system and its component parts is unavoidably exposed to the moisture of the surrounding air during the interval between drying the parts and assembling them. Where a desiccant is incorporated in the system at the time the same is assembled and sealed and the unit subsequently dehydrated in its entirety the desiccant is exposed, during such operation, to the moisture contained in the system and its efficiency reduced to an extent where it is likely to fail to perform its function of taking up water vapor.

A feature of the present invention is the incorporation of a desiccant in the system in a rupturable container or capsule, which may be accomplished at or just prior to complete assembly or at any time afterwards, thus avoiding exposing the charge of desiccant to atmospheric moisture, and ensuring the presence of a fresh and efficient desiccating charge in the system during use.

Another feature is the provision of means whereby the container may be broken and the confined charge released into the system, either at the time of assembly or at any time afterwards. Such means may be extrinsic of the system or may be comprised within the system, as by utilizing the pressure of the gas therein to cause rupture of the container.

It is an object of the invention to provide a simple and economical structure embodying these features and to utilize them in the manufacture and use of refrigerating equipment.

A further object is to provide means for inserting a complete, fresh desiccating charge within the system, so that it is kept intact until such time as it is desired to disrupt the container within which it is confined and to free it for performing its dehydrating function within the system.

Another object of the invention is to provide for confining the fragments of the disrupted container within a screened chamber or cage to avoid the likelihood of its clogging the system.

The novel features that I consider characteristic of my invention are set forth in the appended claims. The invention itself, however, both as to its organization and its method of operation, together with additional objects and advantages thereof, will best be understood from the following description of a specific embodiment, when read in connection with the accompanying drawing, in which:

Figure 1 is a diagrammatic view of a commercial refrigeration system with which the present invention is incorporated.

Figure 2 is a detailed longitudinal section of a chamber or shell, a frangible container or capsule disposed within the shell and a desiccant charge confined within the capsule.

Figure 3 is a sectional view taken on line 3—3, Figure 2.

Figure 4 is a sectional view taken on line 4—4, Figure 2.

Figure 5 is a view similar to Figure 2, showing the shell deformed and the desiccant-containing capsule ruptured to expose the desiccant to the refrigerant.

For the purposes of exemplification, and by preference, the present invention is shown in its application to a refrigeration system of domestic type utilizing a compressor without, however, limiting its use to this field. The diagram of the system shown in Figure 1 is conventional and used only to aid in a clear understanding of the present invention, and to designate a most appropriate location of the desiccant-containing capsule in the system and as a part thereof.

It is to be understood that the systems in which the invention is best adapted for use are those using a chlorinated and fluorinated saturated hydrocarbon of the paraffin series, such as those known under the trade name "Freon," but the invention may be used with advantage in systems utilizing sulfur dioxide, carbon dioxide, methyl formate, etc.

Referring to the drawing, 1 indicates an electric motor and compressor completely enclosed, forming a sealed power unit. A high pressure gas discharge tube connects with the outlet of the compressor, and extends to and connects with the intake end of a condenser 3. The opposite end of the condenser is in conduit or tube connection with the intake end of a shell 4, the latter providing a chamber for a desiccant in the path of the liquid refrigerant passing from the condenser to the capillary tube 5. The tube 5 connects the outlet end of the shell 4 with an evaporator 6. The desiccant is therefore interposed in and located at a most appropriate point for contact with the liquid refrigerant in the high pressure side of the system, so that it may efficiently absorb and remove from circulation any moisture contained therein. The desiccant may however be placed in any other part of the system.

The evaporator is represented as a double wall casing to provide a jacketed chamber, having an inlet in communication with the capillary tube 5, and an outlet in connection with a conductor or tube 7 which in turn connects with the inlet port of the compressor. A section of the capillary tube 5 and the suction tube 7 are shown in adjacent parallelism and constitute a heat exchanger. The refrigerant leaving the evaporator in the form of a cool low pressure gas is drawn down the suction tube to the compressor. The cool gas in the suction tube cools the high pressure liquid refrigerant in the capillary tube leading from the drier shell 4 to the evaporator before it enters the evaporator to increase the efficiency of the unit.

From the suction tube, the low pressure gas enters the compressor, wherein it is compressed and forced out through the discharge tube and into the condenser. As the high pressure gas passes through the condenser, it is cooled and caused to liquefy in the lower portion of the condenser, from which the liquid is conducted into the drier shell 4.

The dehydrator shell is shown as oblong, cylindrical, or bottle form, with its head end 8 reduced to provide a hub extension for joining the same with the end of a tube to make a brazed or soldered union. The opposite open end of the shell is provided with a closure head or cap 9 sealed to the shell after a desiccant has been deposited in the shell. The cap has a hub extending from its outer side for making a tube connection therewith. The inner side of the cap is recessed and covered with a screen or wire gauze 10, and likewise the inlet opening of the shell may be similarly protected by a screen 11. It will be understood that the shape and structure of the dehydrator shell may be varied in many ways without departing from the spirit of the invention.

In the refrigeration system, the shell is preferably located to provide a junction for the condenser outlet and capillary tube, so that the liquid refrigerant leaving the condenser is exposed to the desiccant in the shell to remove any moisture entrained therein before entering the capillary tube.

The desiccant to be supplied in the system is confined within an hermetic dispensing capsule 12 of glass or other frangible material capable of being ruptured within the surrounding shell 4 at the time or after the system has been sealed and is ready for service. The shell 4 is preferably constructed of copper or other suitable metal of such gauge that it may be deformed with facility and caused to break the capsule 12. In this manner the desiccant is protected against exposure to moisture during handling and during the assembly of the refrigerating unit, and a convenient means provided by which the desiccant may be loaded into the shell so that it is protected and held intact until it is desired to make it available within the sealed system. It is to be understood that the capsule constitutes a sealed receptacle capable of being ruptured within the shell by force or impact applied extrinsically of the shell by deforming the shell or by suitable puncturing means, or without deforming the shell as by causing the capsule to rupture by the refrigerant pressure.

As shown most clearly in Figure 4 the capsule 12 is of lesser diameter than the interior of the shell 4, so that there is a space between the two, the cross-sectional area of which is preferably greater than the cross sectional area of the capillary tube 5. Thus the capsule does not obstruct the channel from the condenser to the capillary tube and the system may be operated while the desiccant is still sealed within its confining body. I also provide the desiccant in a physical state which permits the flow of liquid between the granules or particles when the desiccant has been freed for contact therewith, so that even when the capsule is broken there is no substantial obstruction to the normal flow of liquid through the system.

The desiccant is preferably activated alumina which may be prepared by loading a suitable alumina hydroxide into a capsule and heating and evacuating the capsule. The desiccant may however be anhydrous calcium sulphate, silica gel, or any other suitable dehydrating composition. A liquid dehydrator such as methyl alcohol may be used if desired.

It will be understood that the capsule may be evacuated of gas, or it may be filled with refrigerating gas under the pressure of the system, or with an inert gas, such as nitrogen. In the latter case it may be desirable to provide a purging outlet in the vapor section of the high side of the system.

The dehydrator can be released for functioning within the refrigerator system at any time, either during original assembly, after assembly, or after being put into service. Its installation during original assembly enables it to be held intact during unit dehydration in the conventional manner as by heating and evacuation, and while supplying the refrigerant to the system and the desiccant need not be put into use until the refrigeration system is ready for or in service. As previously explained, this insures that the desiccant will come in contact with the refrigerant at a time when it possesses all of its moisture absorbing power.

In the application of the desiccant in the manner described, a definite and appropriate amount of desiccant may be supplied to the system, as may be required for the capacity of the system. The container or capsule 12 at one end is seated against a spring 13 to sustain the same yieldingly and to prevent its accidental breakage.

It is comprehended that various methods may be employed for rupturing or breaking the container, even to the provision of a special contrivance for this purpose, accessible from the exterior of the shell or otherwise and of a character that it is not susceptible to cause leakage. Such variations of the exemplary structure herein described will readily appear to persons skilled in the art.

This application is a continuation-in-part of my prior application, Serial No. 286,863, filed July 27, 1939.

Having described my invention, I claim:

1. The method of dehydrating a refrigerating system containing a condensable gas comprising

loading a desiccant into a frangible body and sealing same therewithin, inserting said sealed body into a deformable shell, incorporating said shell in the liquid side of the system, and thereafter deforming said shell thereby rupturing said sealed body and exposing the desiccant to the liquid within the system.

2. The method of dehydrating a refrigerating system containing a condensable gas comprising loading a desiccant into a body, sealing the desiccant therewithin, inserting said body into a shell, incorporating said shell in the liquid side of the system, sealing said system and thereafter rupturing said body.

3. The method of dehydrating a refrigerating system containing a condensable gas comprising loading a desiccant into a body, sealing the desiccant therewithin, incorporating said body in the system, sealing said system and thereafter rupturing said body.

4. The method of dehydrating a refrigerating system containing a condensable gas comprising loading a desiccant into a frangible body and sealing same therewithin, incorporating said body in the system, dehydrating and sealing the system and thereafter rupturing said body.

5. The method of dehydrating a refrigerating system containing a condensable gas comprising loading a desiccant into a frangible body and sealing same therewithin, incorporating said body in the system, sealing the system and thereafter rupturing said body.

6. The method of dehydrating a refrigerating system containing a gas comprising sealing a desiccant in a body, incorporating said body in the system and sealing the same and thereafter effecting contact of the desiccant with the gas.

7. The method of removing water and water vapor from the gas of a refrigerating system comprising providing a deformable chamber within such system, inserting a sealed capsule therewithin containing a desiccant, and then sealing the system, and thereafter deforming said chamber and breaking said capsule whereby the contents thereof are made available for contact with the gas of said system.

8. In a refrigerating system the combination with a compressor, a condenser, a restricted flow device and an evaporator, of a rupturable container disposed within said system adapted and arranged to be ruptured after the system is assembled and sealed.

9. In combination with a closed refrigerating system containing a gas, a sealed container for holding a desiccant, said container being itself sealed within said system, and means for releasing the desiccant from confinement within said container.

10. A device for holding a desiccant within a closed refrigeration system comprising a deformable container, a rupturable capsule therein adapted to be ruptured by deformation of said container and means for connecting said container within said system.

ELBERT M. CORMACK.