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REFRIGERATION SYSTEM CONTAINING NOVEL REFRIGERANT

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This invention relates to a refrigeration system containing a refrigerant adapted to increase the capacity of the system.

It is customary practice to design a line of refrigeration equipment so that various units in the line provide different capacities. A disadvantage of the usual procedure resides in the fact that any line of refrigeration equipment contains gaps between the units. That, of course, requires that under some circumstances units of greater capacity than required be provided for a specific purpose. Such practice increases undesirably the cost of the refrigeration system required.

The chief object of the present invention is to provide a refrigeration system designed for use with a specific refrigerant, the capacity of such system being increased by the use of the novel refrigerant of the present invention in place of the refrigerant for which the system is designed.

An object of the invention is to provide a refrigerant mixture adapted for use in apparatus designed specifically for the chief component of the mixture which provides an increase in capacity when the refrigeration system is operated under normal conditions, the pressure of the mixture being such as not to affect deleteriously the various connections of the system.

A further object is to provide a novel mixture of refrigerants capable of use in a system designed for symmetrical dichlorotetrafluoroethane which provides an increase in capacity over the capacity provided when the system is operated employing symmetrical dichlorotetrafluoroethane as a refrigerant. Other objects of our invention will be readily perceived from the following description.

We have found a mixture of symmetrical dichlorotetrafluoroethane and monofluorodichloromethane to be particularly advantageous for the purposes described above. This specific mixture is adapted for use with equipment designed for the use of symmetrical dichlorotetrafluoroethane as a refrigerant when it is necessary to operate such equipment to provide an increase in capacity above rated capacity of the equipment but still below the capacity of the next unit in the line.

Such mixture also permits equipment designed for use with symmetrical dichlorotetrafluoroethane as a refrigerant to be operated with the same motor at the same speed to provide an increase in capacity.

Symmetrical dichlorotetrafluoroethane possesses a boiling point of 38.4° F. at atmospheric pressure while monofluorodichloromethane possesses

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a boiling point of 48.0° F. at atmospheric pressure (14.7 lbs. per square inch). Symmetrical dichlorotetrafluoroethane at a temperature of 104° F. provides a pressure of about 49.5 pounds per square inch absolute which may be regarded as normal or 100%. Monofluorodichloromethane at a temperature of 104° F. possesses a pressure of about 42.9 lbs. per square inch absolute. According to Raoult's law any mixture of such materials should possess a pressure between the two extremes. Contrary to this law, however, the addition of symmetrical dichlorotetrafluoroethane to monofluorodichloromethane increases the pressure over a reasonably wide range to provide a highly desirable increase in capacity. Such increase in capacity amounts to as much as about 11% over that provided by symmetrical dichlorotetrafluoroethane. Such increase in capacity amounts to about 28% over that provided by monofluorodichloromethane.

The present invention is directed to any mixture of such materials providing an increase in capacity over the capacity provided by symmetrical dichlorotetrafluoroethane alone under the same conditions of use. Our invention includes any mixture of symmetrical dichlorotetrafluoroethane and monofluorodichloromethane capable of providing an increase in capacity up to about 11% in refrigerating apparatus designed for use with symmetrical dichlorotetrafluoroethane when the apparatus is operated at a given speed over the capacity possessed by the equipment when symmetrical dichlorotetrafluoroethane alone is used at the same speed.

The azeotrope of symmetrical dichlorotetrafluoroethane and monofluorodichloromethane provides the greatest increase in capacity when employed in equipment designed for use with symmetrical dichlorotetrafluoroethane as a refrigerant. When symmetrical dichlorotetrafluoroethane and monofluorodichloromethane are mixed in an amount comprising approximately 70 parts by weight of symmetrical dichlorotetrafluoroethane and 30 parts by weight of monofluorodichloromethane an azeotrope is formed having a constant boiling point of approximately 104° F. at an absolute pressure of approximately 54.8 lbs. per square inch.

The use of the azeotropic mixture in refrigerating equipment designed for symmetrical dichlorotetrafluoroethane permits decreased temperatures to be obtained while operating the compressor with the same motor at the same speed. The use of the azeotropic mixture of symmetrical dichlorotetrafluoroethane and monofluorodichlo-

romethane increases the capacity of the equipment as recited above. The increase in capacity is as great as 11% by employing the azeotrope in place of symmetrical dichlorotetrafluoroethane in refrigerating equipment designed for use with symmetrical dichlorotetrafluoroethane alone.

If the compressor designed for use with symmetrical dichlorotetrafluoroethane and for operation on 60 cycle current at 1750 R. P. M. is operated on 50 cycle current, the speed of the compressor is reduced. Substitution of the azeotropic mixture of the invention in place of symmetrical dichlorotetrafluoroethane under such circumstances provides an increase in capacity of about 11% thereby permitting a substantial recovery of the lost capacity caused by the reduction in speed.

The refrigerating equipment may be designed for use at a condensing temperature of approximately 100° F. and at an evaporating temperature of approximately 10° F. In operation the mixture may be condensed at a condensing temperature of approximately 100° F. then transferred to the evaporator or heat exchanger and evaporated at a temperature of approximately 10° F. to provide the required heat transfer, the mixture being compressed and the cycle being repeated.

While the specific azeotrope recited above provides the greatest increase in capacity under the conditions described, it will be understood that any mixture of symmetrical dichlorotetrafluoroethane and monofluorodichloromethane which provides greater pressure serves to increase the capacity of the compressor over the capacity provided by symmetrical dichlorotetrafluoroethane.

The respective amounts of symmetrical dichlorotetrafluoroethane and monofluorodichloromethane in the azeotrope vary in accordance with temperature and pressure. That is, the amount of symmetrical dichlorotetrafluoroethane contained in the azeotrope changes gradually as the temperature for example increases. The amount of symmetrical dichlorotetrafluoroethane contained in the azeotrope recited above is based on 54.8 lbs. per square inch absolute pressure and a boiling point of approximately 104° F.

This invention provides a refrigeration system containing a novel refrigerant which permits an increase in capacity of the system. The azeotrope of the present invention provides greater cycle efficiency than is provided by dichlorotetrafluoroethane. The refrigerant so provided effectively closes the gaps in a line of equipment designed for use with symmetrical dichlorotetrafluoroethane and serves as a ready and adequate replacement for symmetrical dichlorotetrafluoroethane under various conditions.

While we have described a preferred embodiment of our invention it will be understood the invention is not limited thereto since it may be otherwise embodied within the scope of the following claims.

We claim:

1. In a refrigeration system employing a positive displacement compressor, a refrigerant consisting of a mixture of symmetrical dichlorotetrafluoroethane and monofluorodichloromethane having a pressure at a predetermined temperature greater than the pressure of either component at such temperature.

2. In a refrigeration system, a refrigerant comprising a vapor and a liquid in equilibrium with one another and consisting of a mixture of symmetrical dichlorotetrafluoroethane and monofluorodichloromethane having a pressure at a predetermined temperature greater than the pressure of either component at such temperature.

3. In a refrigeration system, a refrigerant comprising a vapor and a liquid in equilibrium with one another, the composition of the vapor being the same as the composition of the liquid, said refrigerant consisting of the azeotrope of symmetrical dichlorotetrafluoroethane and monofluorodichloromethane having a pressure at a predetermined temperature greater than the pressure of either component at such temperature.

4. A refrigeration system according to claim 3 in which the azeotrope contains 70 parts by weight of symmetrical dichlorotetrafluoroethane and 30 parts by weight of monofluorodichloromethane at a temperature of about 104° F. and at a pressure of about 54.8 p. s. i. a.

5. A refrigerant for use in a compression refrigeration system consisting of a mixture of symmetrical dichlorotetrafluoroethane and monofluorodichloromethane having a pressure at a predetermined temperature greater than the pressure of either component at such temperature.

6. A refrigerant according to claim 5 in which the mixture has azeotropic properties and contains approximately 70% by weight of symmetrical dichlorotetrafluoroethane.

7. A method of increasing the capacity of a refrigeration system in which the steps consist in evaporating within the system a refrigerant consisting of a mixture of symmetrical dichlorotetrafluoroethane and monofluorodichloromethane having a greater pressure at a predetermined temperature than the pressure at said temperature of either component forming the refrigerant, compressing and condensing the refrigerant in a refrigeration cycle in said system.

8. The process of producing refrigeration which consists in evaporating with the absorption of heat in a refrigeration cycle a mixture of symmetrical dichlorotetrafluoroethane and monofluorodichloromethane having azeotropic properties and having a pressure at a predetermined temperature greater than the pressure of either component at such temperature.

9. The process of producing increased refrigeration effect in a refrigeration cycle designed for using symmetrical dichlorotetrafluoroethane consisting in evaporating a mixture of symmetrical dichlorotetrafluoroethane and monofluorodichloromethane having azeotropic properties, compressing and condensing the evaporated mixture to produce refrigeration effect substantially 11% greater than that produced by the use of symmetrical dichlorotetrafluoroethane alone in such cycle.

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