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METHOD OF PREVENTING COPPER PLATING

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9 Claims (Cl. 62—178)

This invention, which is, in part, a continuation of that disclosed in my earlier applications Ser. No. 176,634, filed November 26, 1937, now matured into Patent No. 2,186,028, issued Jan. 10, 1940, and Ser. No. 216,589, filed June 29, 1938, relates to the field of refrigeration. More particularly, it relates to the reduction of copper plating in refrigerating systems which use mineral oils as lubricants and refrigerants, such as methyl chloride, methylene chloride, and those described in U. S. Patent Re. 19,265, some of which bear the trade name Freon, and all of which are halogen derivatives of aliphatic hydrocarbons of which at least one halogen is fluorine. Examples of those compounds are: CCl_3F, CCl_2F_2, $CHCl_2F$, $CHClF_2$, CHF_3, CH_2ClF, $C_2Cl_3F_3$, $C_2Cl_2F_4$, $C_2HCl_2F_3$, C_2HClF_4, $C_2H_2ClF_3$, and $C_2H_3ClF_2$.

In refrigeration systems where, for example, methyl chloride is used as refrigerant, the usual procedure consists in compressing, condensing, and evaporating the refrigerant in a closed cycle. For the moving parts of the refrigeration system, more particularly for the compressor or motor-compressor unit, generally mineral oil is used as lubricant. Since complete separation of the refrigerant and the lubricant is not possible, a small amount of the lubricant is continuously carried along with the refrigerant, which must be returned to the moving parts to prevent lubricant starvation of these moving parts.

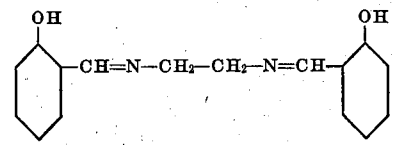
In such refrigeration systems a phenomenon is observed which is known as "copper plating." This copper plating often occurs on the moving parts of the refrigeration system, such as on the pistons, centrifugal compressors and valves, a plate or layer of copper being deposited which may cause serious trouble in the operation of these parts and may even cause failure of the entire refrigeration system.

Although the cause of this phenomenon is not definitely known, it is believed that copper is removed from parts of the refrigeration system formed of copper or copper alloys, such as from copper tubings in the condenser, is suspended or dissolved in the lubricant as the lubricant is carried along by the refrigerant, and is deposited on, or replaces, parts of the apparatus formed of other metals.

Heretofore attempts to prevent this objectionable phenomenon have generally proven only partly successful.

The object of the present invention is to provide means to decrease copper plating in refrigeration systems using refrigerants of the indicated types. Other objects will be apparent hereinafter.

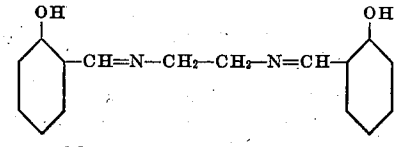
The objects of the invention are accomplished by the incorporation in the refrigerating system of the substance called disalicylal ethylene diamine, which is represented by the formula:



Advantageously it may be included in the lubricant. My invention is based on the discovery that, by addition of disalicylal ethylene diamine to mineral oils used for lubricating moving parts in refrigerating systems, copper plating can be greatly reduced and, in most instances, entirely eliminated.

My improved process for eliminating copper plating is especially useful in refrigeration systems wherein halogenated hydrocarbons such as methyl chloride are utilized as the refrigerant. I have found that by the use of my improved lubricant in such refrigeration systems, copper plating can be substantially avoided. In all cases in which copper plating occurs copper plating is reduced to such an extent that the moving parts will not be seriously impaired in their operation, even in heavy duty refrigeration systems where copper plating has been found especially harmful.

The use of mineral oils to which disalicylal ethylene diamine,



has been added not only reduces copper plating in various household and industrial refrigeration systems, wherein it formerly occurred, but also makes possible the extended use of those refrigerants in whose presence the plating occurs in heavy duty refrigeration systems.

In practice the system should be freed from free oxygen and moisture as completely as is reasonably possible, as in the present approved practice. When utilizing methyl chloride and a high grade mineral oil optimum results are obtained with about .1% of disalicylal ethylene diamine, based on the lubricant weight, copper plating being practically eliminated in most instances. Lesser amounts of disalicylal ethylene diamine, such as amounts equivalent to 0.05%,

will also be effective, it being understood that different amounts may be selected in order to obtain optimum results in each system. Larger amounts may also be used without waste in some instances, but 1% is often sufficient for all purposes. All percentages given are by weight based on the weight of the lubricating oil used to lubricate the system, to which the disalicylal ethylene diamine is added.

My invention is not to be limited to the use of the specified numerical amounts of disalicylal ethylene diamine, as the amount may be varied within wide limits without departing from the scope of my invention as defined by the appended claims.

I claim:

1. In a method of refrigeration which comprises condensing and evaporating a refrigerant of the class described the step which comprises condensing the refrigerant and evaporating it in the presence of a mineral oil containing disalicylal ethylene diamine.

2. In a method of refrigeration which comprises condensing and evaporating methyl chloride, the step which comprises compressing said methyl chloride in the presence of a mineral oil containing from 0.05 to 1% of disalicylal ethylene diamine.

3. In a method of refrigeration comprising condensing and evaporating methyl chloride refrigerant, the step which comprises compressing said methyl chloride in the presence of a mineral oil containing substantially 0.1% disalicylal ethylene diamine.

4. A refrigerating system comprising an apparatus having copper and other metals exposed to the refrigerating medium, and a refrigerating medium containing disalicylal ethylene diamine.

5. A refrigerating system comprising copper and other metals, and containing disalicyal ethylene diamine, a refrigerant of the class described, and a mineral oil lubricant.

6. In a method of refrigeration which comprises condensing and evaporating the refrigerant CCl_2F_2, the step which comprises condensing and evaporating the refrigerant in the presence of a mineral oil containing disalicylal ethylene diamine.

7. A refrigerating system comprising an apparatus having copper and ferrous metals exposed to the refrigerating medium, and a refrigerating medium containing CCl_2F_2 and disalicylal ethylene diamine.

8. In a method of refrigeration which comprises condensing and evaporating the refrigerant CCl_3F, the step which comprises condensing and evaporating the refrigerant in the presence of a mineral oil containing disalicylal ethylene diamine.

9. A refrigerating system comprising an apparatus having copper and ferrous metals exposed to the refrigerating medium, and a refrigerating medium containing CCl_3F and disalicylal ethylene diamine.

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