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INHIBITOR AND METHOD OF PREVENTING THE CHEMICAL ATTACK OF METALS

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12 Claims. (Cl. 252—5)

This invention relates to the provision of means for inhibiting the attack of metals by vaporized or gaseous acids or bases. Many inhibitors are available for retarding metal attack by chemicals in the liquid state. The use of such inhibitors however is limited to liquids and there exists a need, particularly in many of the mechanical arts, for a means for inhibiting the attack of metals by gaseous and vaporized chemicals.

One of the objects of this invention is to provide a means for inhibiting the attack of metals by vaporized or gaseous chemicals to which such metals are exposed.

Another object of this invention is that of providing a material for preventing chemical attack of metals by fluids which material operates and is effective in both its liquid and vapor phases.

A further object of this invention relates to the provision of an inhibitor for use in connection with the fluid refrigerant of a mechanical refrigerator.

With these and other objects in view, the invention consists of the novel compounds, combinations of compounds and methods for preventing the chemical attack of metals hereinafter disclosed and described in some of its embodiments and particularly pointed out in the appended claims.

For the purposes of explanation and illustration, I have selected mechanical refrigerators employing sulphur dioxide as a refrigerant to illustrate one use for my improved inhibitor and method of inhibiting metal attack by compounds existing in both the liquid and vaporized states. It is very important in refrigerators of this type that the sulphur dioxide be substantially free of moisture in order to prevent the formation of sulphurous or sulphuric acid.

By adding to the sulphur dioxide a small amount of a vaporizable inhibiting substance as for example an aldehyde and preferably formaldehyde, the formation of sulphurous or sulphuric acid in the system is not especially harmful by reason of the fact that the formaldehyde inhibits the attack of the metal by the acids so formed in the manner well known in the art of pickling inhibitors as will be found described in my United States Letters Patent No. 1,789,805, which was issued January 20, 1931.

Refrigerators employing sulphur dioxide are ordinarily of the compression type in which the gaseous refrigerant is compressed, condensed to liquid and then allowed to expand to a gas again which last change is utilized in absorbing heat and thus producing the refrigerating effect.

The boiling point of formaldehyde is such that it exists as a gas in the gas containing parts of the refrigerating system and there mixes with the gaseous sulphur dioxide and inhibits the attack of the metal parts of the system by any sulphurous acid in the gas occasioned by the admission of water vapor due to leaks in the system.

Under ordinary operating conditions of the refrigerator some if not all of the formaldehyde is condensed to a liquid in the high pressure side of the system and the liquefied formaldehyde then operates as an inhibitor in the liquefied sulphur dioxide and whatever acids may be present in such liquid while the gaseous formaldehyde passes through this part of the system on its way back to the low pressure side.

While a compressor type refrigerator employing sulphur dioxide as a refrigerant has been selected for the purpose of illustrating one example of the use of the invention, obviously there are many other uses for this invention. It should be understood also that the use of the invention is not limited to inhibiting metal attack by acids formed from sulphur dioxide as the invention is capable of use in connection with metal attacking bases and other acids nor is the invention limited to the use of an aldehyde or formaldehyde as the inhibitor as other compounds can be used for such purpose, the foregoing substances being cited merely to illustrate some of the modes for practicing the invention.

The aldehydes were selected as a class of compounds to illustrate the practicing of this invention by reason of the fact that they possess marked inhibitory powers and also because they constitute a series of compounds having different boiling points so that it is possible to select an aldehyde having the necessary physical properties as the inhibiting substance for a large number of different compounds, one of the essential requirements being this, that the inhibitor can exist in the gaseous state in the presence of the gas of the compound with which it is used. It is also advantageous, though not imperative, that the inhibitor have a boiling point as near to and preferably slightly above that of the substance with which it is used so that the two materials exist in the same state that is gaseous or liquid under the external conditions to which they are subjected.

Furthermore the foregoing procedure, uses and compounds were cited for purposes of illustration and explanation so that those skilled in the art will be able to practice the invention which

is not limited to details of procedure or to the precise ingredients recited or to mere matters of form or otherwise as the prior art and the appended claims may require under and subject to the range of equivalents appropriate in chemical cases.

Having thus described my invention what I claim is:

1. The method of inhibiting the attack of metals by reaction compounds of sulphur dioxide in a quantity of sulphur dioxide which comprises incorporating with the sulphur dioxide a small amount of an aldehyde which is capable of existing in a gaseous state under the external conditions to which the sulphur dioxide is subjected.

2. The method of inhibiting the attack of metals by relatively small amounts of sulphurous acid existing as an impurity in a quantity of sulphur dioxide which comprises incorporating with the sulphur dioxide a small amount of formaldehyde.

3. The method of treating substantially pure sulphur dioxide to inhibit metal attack by acids formed with the sulphur dioxide when exposed to water which comprises adding to the pure sulphur dioxide a small amount of an aldehyde having a boiling point close to that of sulphur dioxide.

4. The method of treating substantially pure sulphur dioxide to inhibit metal attack by acids formed with the sulphur dioxide when exposed to water which comprises adding to the pure sulphur dioxide a small amount of formaldehyde.

5. The method of inhibiting chemical metal attack on the working parts of a refrigerating system employing sulphur dioxide as a refrigerant occasioned by the presence of water in the system which comprises incorporating with the refrigerant a small amount of an aldehyde having a boiling point close to that of sulphur dioxide.

6. The method of inhibiting chemical metal attack on the working parts of a refrigerating system employing sulphur dioxide as a refrigerant occasioned by the presence of water in the system which comprises incorporating with the refrigerant a small amount of formaldehyde.

7. A substantially non-corrosive composition comprising a quantity of sulphur dioxide including sulphurous acid as an impurity and a small amount of an aldehyde having a boiling point close to that of sulphur dioxide for inhibiting the chemical attack of the sulphurous acid on metals.

8. A substantially non-corrosive composition comprising a quantity of sulphur dioxide including a sulphurous acid as an impurity and a small amount of formaldehyde for inhibiting the chemical attack of the sulphurous acid on metals.

9. A composition of matter comprising a quantity of substantially pure sulphur dioxide and a small amount of an aldehyde having a boiling point close to that of sulphur dioxide for inhibiting chemical attack on metals by reaction compounds which might be formed by the addition of water to the sulphur dioxide.

10. A composition of matter comprising a quantity of substantially pure sulphur dioxide and a small amount of formaldehyde for inhibiting chemical attack on metals by reaction compounds which might be formed by the addition of water to the sulphur dioxide.

11. A substantially non-corrosive refrigerant for refrigerators employing a compressor-condenser-expander circuit comprising a quantity of sulphur dioxide and a small amount of an aldehyde having a boiling point close to that of sulphur dioxide for inhibiting chemical attack on the metal parts of the refrigerator exposed to the refrigerant by sulphurous acid existing as an impurity in the refrigerant.

12. A substantially non-corrosive refrigerant for refrigerators employing a compressor-condenser-expander circuit comprising a quantity of sulphur dioxide and a small amount of formaldehyde for inhibiting chemical attack on the metal parts of the refrigerator exposed to the refrigerant by sulphurous acid existing as an impurity in the refrigerant.

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