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ANTICORROSION PACKING ASSEMBLY

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This invention relates to an anticorrosion packing assembly, particularly to packing material adapted for use therein, and to an anticorrosion friction material.

In an assembly comprising packing or friction material, water and a metal member constituted of corrodible material of the type of iron, corrosion frequently occurs at a rate that is very undesirable. For example, valves having stems of iron packed with certain asbestos compositions have been found to undergo rapid corrosion when wetted with water and then allowed to stand in contact with air.

It is a purpose of the present invention to provide an anticorrosion packing or friction material that may be disposed in contact with a member of the type of an iron valve stem and in the presence of moisture and air, with minimization or complete elimination of the corrosion of the member for a substantial period of time. Other objects and advantages of the invention will appear from the description that follows.

The invention will be particularly illustrated by the description of an assembly including packing and a member constituted of iron as the corrodible material, the term iron being used to include steel.

I have found that the rate of corrosion of an iron valve stem in contact with water and packing material, such as lubricated asbestos fibres, may be greatly reduced by the intimate association with the packing material of a compound selected from the following group: a secondary sodium hydrogen phosphate, tertiary sodium phosphate, potassium chromate, potassium dichromate, sodium bicarbonate, sodium carbonate, and sodium tetraborate. The compounds including sodium or potassium are illustrative of the corresponding salts of the less expensive alkali metals in general, which may be used instead of the particular ones enumerated above. While particularly good results have been obtained with the sodium and potassium salts of the acid radicals listed, there may be used similar compounds that are equivalent for the present purpose.

If the minimized corrosion is desired for a temporary period only, the agent associated with the packing may be sodium silicate, primary sodium phosphate, lead chromate, or lead acetate, for example. It will be understood, however, that agents giving the more permanent anticorrosion properties are preferred.

The method of making the anticorrosion packing member involves the impregnation or otherwise intimate association of the anticorrosion agent with the asbestos fibres, forming a large part of the packing material. Thus, the water-soluble anticorrosion agent may be formed into an aqueous solution and impregnated into asbestos fibres before the latter are lubricated. For example, strands of loose asbestos yarn or roving may be fabricated into the base material for the packing, as by being braided in conventional manner. The fabricated material is then immersed in or impregnated by an aqueous solution of the anticorrosion agent, the impregnated material is subjected to drying, suitably at an elevated temperature, to remove the water, and lubricant consisting of a viscous plastic mixture of graphite or graphite mixed with a lubricating oil or grease, for instance, is forced by pressure into the previously impregnated fabricated base.

The amount of anticorrosion agent required is relatively small. Thus, there may be used an amount of anticorrosion agent corresponding approximately to 2 to 10 parts by weight for 100 parts of fabricated fibrous base material.

It has been found that when a packing so made is used in contact with a metal member constituted of a corrodible material of the type of iron and in the presence of water, corrosion of the said member is practically eliminated, even though air has access to the wet packed assembly.

Once the surprising result has been obtained various theories or explanations may be advanced to account for the result.

While it is understood that the present invention is not limited to any theory or explanation, the following comments are made as representing largely the explanation of the mechanism of reduction of the rate of corrosion. Material of the type of iron, as the term is used herein, is a material that is corrodible in the presence of water and air and, when immersed in water, tends to dissolve at its superficial portion, to a slight extent at least, to produce ions which have a positive charge and leave the undissolved material electronegatively charged. This condition prevails, also, when the iron is present as one of the elements of a galvanic couple, packing material of the type described constituting the other element and water serving as the connecting medium. But, when an anticorrosion agent, of the type described, is associated with the packing material in the galvanic couple, there is a decrease in the electronegative charge on the said metal member or actually reversion of the polarity of the couple. Thus, the packing now becomes electronegative with respect to the metal member. This effect occurs when the concen-

tration of anticorrosion agent in the aqueous medium bathing the packing and the metal member is very low. Thus, a concentration of 2.5 parts of trisodium phosphate (expressed as $Na_3PO_4.12H_2O$) present in 100 parts by weight of the aqueous bathing medium has been found adequate to reverse the polarity.

The quantitative effect of the presence of an anticorrosion agent upon the electrode potentials of a steel member, water, and a packing material in contacting relationship, is illustrated by the following data. With no anticorrosion agent present in the packing, and with water constituting the medium in the galvanic couple, the packing material had a potential of plus 185 millivolts and the steel had a negative potential of 498 millivolts, thus making the packing material electropositive with respect to the steel rod by 683 millivolts. When trisodium phosphate in increasing amounts was associated with the packing material, as described above, the electronegativity of the packing, with respect to the steel, was augmented until finally the sign of the potential difference was actually reversed. Thus, when the aqueous medium was saturated with trisodium phosphate, the packing material showed an electrode potential of minus 154 millivolts and the steel rod showed an electrode potential of plus 214 millivolts, thus making the packing material electronegative with respect to the steel rod by 368 millivolts. It will be understood that the electrode potential of each element, stated separately, represents the potential difference from the aqueous medium taken as of zero potential.

In applying the lubricant to the fabricated base material impregnated with the anticorrosion agent, the lubricant tends to seal the anticorrosion agent within the packing and thereby reduce the rate at which the anticorrosion agent may be leached from the packing by water coming in contact with the packing during the use thereof.

When, for example, anticorrosion friction material is to be made, asbestos fibres may be impregnated with an anticorrosion agent as described, the fibres, either with or without being first fabricated into a base material, then associated with a rubber or other conventional friction compound in a usual manner, and the friction compound then hardened.

The details that have been given are for the purpose of illustration, not restriction, and variation therefrom may be made within the scope of the appended claims.

What I claim is:

1. A packing member, for use in contact with a metal member constituted of corrodible material of the type of iron and in the presence of water, comprising packing material including a lubricated asbestos fibre composition and an agent associated therewith and adapted to increase the electronegativity of the packing material with respect to the water.

2. A packing member, for use in contact with a metal member constituted of corrodible material of the type of iron and in the presence of water, comprising packing material including a lubricated asbestos fibre composition and an agent associated therewith and selected from a group consisting of the following: a secondary or tertiary alkali metal phosphate, an alkali metal bicarbonate or carbonate, and an alkali metal tetraborate.

3. An article of manufacture, for use in contact with a metal member constituted of corrodible material of the type of iron and in the presence of water, comprising asbestos fibres, a water-soluble anticorrosion agent associated with the said fibres, and a water-insoluble material disposed over the said agent and reducing the rate of leaching out by water.

4. A packing member, for use in contact with water and a corrodible material of the type of iron, comprising asbestos fibres, a water-soluble compound impregnated into the fibres and adapted to make the packing member electronegative with respect to water, and a water-insoluble material disposed over the impregnated fibres, the proportion of the said compound being approximately 2 to 10 parts by weight for 100 parts of the fibres.

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