

UNITED STATES PATENT OFFICE

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NONCORROSIVE HYDRAULIC FLUIDS

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1

The invention described herein may be manufactured and used by or for the Government for governmental purposes without payment to us of any royalty thereon.

This invention relates to a new class of compositions of matter which are useful as hydraulic fluids or as de-icing fluids for aircraft. Broadly stated, this class of compositions comprises substantially anhydrous, homogeneous solutions of small amounts of liquid aliphatic ketones in alkyl phosphoric ester; the corrosiveness of the esters toward metals being inhibited by the presence of the liquid ketones.

One object of the invention is to provide a non-freezing, fireproof hydraulic fluid which is harmless to most common metals.

Another object is to provide an improved de-icing fluid which is both fireproof and non-freezing and which is harmless to most common metals.

Another object is to provide compositions of matter useful as specified above which are substantially harmful to magnesium castings or forgings.

We do not intend to convey the idea that all of our compositions are harmless to all of the common metals, since this is not true. It is true, however, that each one of our compositions is harmless to a substantial number of the common metals. One subdivision of our new class of compositions is substantially harmless to magnesium objects.

Among the phosphoric esters which we may employ are trimethyl, tri-ethyl, tri-N-propyl, tri-butyl, tri-amyl and tri-octyl. Among the ketones which we may employ are acetone, methyl-ethyl, di-iso-butyl and methyl-iso-butyl. Any ketone or any mixture of ketones may be used as an inhibitor for any of the above phosphoric esters. We prefer di-iso-butyl ketone as an inhibitor since it has the greatest inhibitory effect on corrosion and because it has the lowest volatility. The choice of alkyl phosphoric ester is governed by the metal with which the composition will come in contact and by the function of the fluid.

Of the liquids tested, tri-ethyl phosphate solutions appear to be least satisfactory with aluminum, tri-butyl phosphate with iron and tri-octyl phosphate with copper. With magnesium, the only satisfactory solutions appear to be those containing tri-ethyl phosphate. These may contain up to 2 per cent of water.

2

At low temperatures, i. e., 32° F. or below, there is no corrosion problem; inhibitors are not necessary. At such temperatures we prefer however to use the inhibitors as fluidity-conferring or viscosity-reducing agents so that the anhydrous phosphoric esters will flow through tubing. Otherwise some of these esters would be too viscous. At higher temperatures, however, uninhibited compositions have marked corrosive effects.

The amount of the ketone that is to be added to the phosphoric ester ranges from 0.5 per cent to 2.0 per cent by weight. While the presence of more ketone may be permissible to meet viscosity requirements and go as high as 5 per cent, still 1 per cent is the preferred amount and is sufficient to meet anti-corrosion requirements except as in the exceptional cases of individual metals as stated above. It is preferred that the solutions be anhydrous, although the presence of 1 per cent of water will do no harm except in the case of steel, particularly when it is cadmium-plated. Water up to 2 per cent aids the passivating action of these inhibitors on magnesium.

The solutions described are fireproof and substantially non-corrosive to the common metals, except as noted.

We claim as our invention:

1. A composition of matter consisting of 95 per cent to 99.5 per cent of triethyl phosphate and 0.5 per cent to 5 per cent by weight of di-iso-butyl ketone.

2. A composition of matter consisting of 95 per cent to 97.5 per cent of triethyl phosphate, 0.5 per cent to 5 per cent by weight of di-iso-butyl ketone and water up to 2 per cent by weight.

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