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RUST PREVENTING TURBINE OIL

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This invention relates to lubricating oil com-
positions and more particularly to a mineral lu-
bricating oil which resists rust formation on iron
and steel surfaces in the presence of water and
is especially free from the tendency to form emul-
sions in the presence of water.

Oils used for the lubrication of steam turbines
and other machinery which is much in contact
with water may successfully be treated with cer-
tain rust preventing agents, such as metallic
naphthenates, metallic sulfonates and the like
which have the property of causing the metal
surface to be preferentially wetted with the oil
instead of water, thus preventing or substantially
reducing the actual contact of the water with the
metal surface and the ensuing rust formation.
An objectionable feature usually resulting from
the use of such compounds is the tendency of the
additives to cause the formation of an emulsion
of the oil with the water, and this is especially
objectionable in the lubrication of steam tur-
bines. It is highly desirable, therefore, to pre-
pare lubricating oil compositions which are free
from the emulsion-forming tendency and which
at the same time offer substantial resistance to
rust formation in the presence of water. In the
case of marine turbines the oil should also pre-
vent rusting in the presence of sea water.

The emulsions which may be formed when the
blended lubricating oils are brought into contact
with water are of two types, depending upon the
type of corrosion resisting additive which is used.
Metallic soaps or salts containing alkali metals
tend to promote the formation of oil-in-water
emulsions, while soaps or salts of the polyvalent
metals promote water-in-oil emulsions. It has
been found, in accordance with the present in-
vention, that when, in addition to the corrosion
preventing compounds, an additional compound
is added to the lubricating oil which is of the op-
posite emulsion-forming type, it is possible, by
properly adjusting the relative quantities of the
two additives, to reduce the emulsion-forming
property of the oil blend to a minimum and to
produce thereby a blend which is practically non-
emulsifying. That is, if the corrosion resisting
agent is of the type which tends to form oil-in-
water emulsions, the second additive should be
of the type which tends to form water-in-oil
emulsions. Both of these additives may be of a
corrosion resisting type, and the invention is
preferably practiced by using a combination of an
alkali metal mahogany sulfonate and a polyvalent
metal naphthenate as the rust resisting compo-
nent of the lubricating oil.

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When a turbine oil is to be prepared, the lu-
bricating oil base is preferably a highly refined
oil of from 50 to 1,500 seconds viscosity (Saybolt)
at 100° F. However, the invention is not limited
to the preparation of turbine oils, but is appli-
cable to lubricants for the bearings of machinery
which is much in contact with water, such as in
paper mills and refrigerating equipment, as well
as to crankcase lubricants, steam engine lu-
bricants, hydraulic fluids, textile oils, cutting oils
and insulating oils, and in general in all cases
where a mineral oil is used under conditions in
which it may pick up or absorb small amounts of
water from atmospheric condensation or from
other sources of contamination.

The additives which promote oil-in-water
emulsions and possess rust resisting properties in-
clude particularly the alkali mahogany sulfonates.
Rust resisting additives which tend to form wa-
ter-in-oil emulsions include especially the naph-
thenates of polyvalent metals, such as calcium,
zinc, lead, copper, aluminum, beryllium and re-
lated metals. When a rust preventing additive
of each of the two types is added to the lubricat-
ing oil, the quantity of each salt is preferably
from 0.01% to 1.0% by weight, based on the lu-
bricating oil.

The following is an example of the desirable
properties which may be obtained by combining
two different types of metallic soaps in an oil
blend in accordance with the present invention.

Example

Several blends of sodium mahogany sulfonates
and zinc naphthenate in different proportions in
a highly refined mineral oil of approximately 390
seconds viscosity Saybolt at 100° F., and blends
containing combinations of these additives, were
prepared and subjected to a corrosion test and an
emulsion test which will be described below.

The corrosion test employed was the test
known as the Navy 2190T Salt Water Corrosion
Test (Specification 14-D-15 (INT), F-C(3),
March 1, 1943), which consisted in suspending a
polished steel specimen in a mixture of the oil
under test with 10% by volume of synthetic sea
water containing 11 grams of $MgCl_2 \cdot 6H_2O$, 1.2
grams $CaCl_2$, 4.0 grams Na_2SO_4 and 25 grams
 $NaCl$ per liter, and agitating for 48 hours at
140° F.

The emulsion test employed was the Navy
Emulsion Test (Federal Specification VV-L-791b,
Method 320.13, February 19, 1942), which con-
sisted in agitating 40 cc. of the oil with 40 cc.
of distilled water at 130° F. to obtain thorough

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mixing, followed by settling at 130° F. for 30 minutes and reading the volume of emulsion remaining after this time, 3 cc. or less being considered satisfactory. This procedure was repeated using 1% NaCl solution in place of the distilled water.

The results of these tests as applied to the various blends prepared are shown in the following table:

Sample	Corrosion test (degree of rusting)	Navy emulsion test (cc. emulsion after ½ hr.)	
		With distilled water	With 1% NaCl solution
Mineral oil.....	Heavy.....	0	0
Mineral oil+0.02% zinc naphthenate.....	do.....	0	0
Mineral oil+0.05% zinc naphthenate.....	Light.....	0	0
Mineral oil+0.10% zinc naphthenate.....	Trace.....	0	0
Mineral oil+0.50% zinc naphthenate.....	do.....	28	0
Mineral oil+0.02% sodium mahogany sulfonate.....	Heavy.....	1	1
Mineral oil+0.05% sodium mahogany sulfonate.....	Trace.....	37	0
Mineral oil+0.10% sodium mahogany sulfonate.....	Nil.....	34	3
Mineral oil+0.05% zinc naphthenate+0.02% sodium mahogany sulfonate.....	Trace.....	2	0
Mineral oil+0.05% zinc naphthenate+0.05% sodium mahogany sulfonate.....	Nil.....	½	0

The above data show that sea water rusting cannot be stopped by the use of zinc naphthenate alone in concentrations up to 0.5%, and that when as much as 0.5% zinc naphthenate is used the blend is poor in emulsion-forming properties. With sodium mahogany sulfonate alone, sea water rusting can be stopped by the use of 0.1% in the oil, but the emulsion-forming properties are again very poor. The use of 0.05% sodium mahogany sulfonate was not sufficient to prevent rusting, and even this quantity produced a large amount of emulsion. The use of the combination of the metallic soaps gave much better results, and the combination of 0.05% of each of the two soaps gave the best results among the

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blends tested, as the corrosion was entirely prevented and only a very small amount of emulsion was formed in the distilled water test and none was formed in the 1% NaCl test.

The oil compositions of the present invention may contain other ingredients in addition to the corrosion resisting metallic salts. Thus the oils may contain sludge dispersers, thickeners, viscosity index improvers, oiliness agents, antioxidants, dyes, etc.

This invention is not to be considered as limited by any of the examples mentioned or described herein, which are given for illustrative purposes only, but is to be limited solely by the terms of the appended claims.

We claim:

1. A mineral lubricating oil containing dissolved therein about 0.01% to about 1.0% of an alkali metal mahogany sulfonate and about 0.01% to about 1.0% of a polyvalent metal naphthenate, the ratio of the quantities of the two additives being adjusted so that the oil blend exhibits substantially no emulsifying tendency in the presence of water.

2. A mineral lubricating oil containing dissolved therein about 0.05% of sodium mahogany sulfonate and about 0.05% of zinc naphthenate.

3. A mineral lubricating oil composition according to claim 1 in which the polyvalent metal naphthenate is zinc naphthenate.

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