

TITLE

Metal Containing Hydraulic Compositions

FIELD OF INVENTION

The present invention relates to a lubricating composition containing an oil of lubricating viscosity, a metal containing antiwear agent and a metal containing dispersant. The invention further provides for a method for lubricating a mechanical device such as a hydraulic system.

BACKGROUND OF THE INVENTION

[0001] It is known to employ a metal containing antiwear agent such as zinc dialkyl dithiophosphate in a lubricating composition suitable for a hydraulic system, circulating oil or another industrial oil. However zinc dialkyl dithiophosphate forms deposits such as resins, sludges and varnish in the hydraulic system. These deposits impair the performance of the hydraulic systems by causing valve sticking and unresponsive control. Additionally, the cleaning of these systems is difficult since the deposits are difficult to remove without mechanical abrasion.

[0002] International publication WO96/035765 discloses a lubricating composition with a rust reducing or preventing amount of 0.1 to 3 wt % of a metal synthetic aryl sulphonate and 0.01 to 2 wt % of an aliphatic succinic acid or anhydride. Further the use of substituted polyisobutylene succinic acid or anhydride derivatives of polyol esters or polyamines are excluded because lubricating compositions that contain said additive do not exhibit acceptable rust resistance properties.

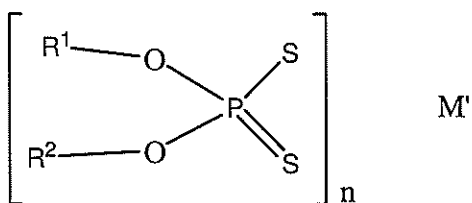
[0003] US Patents 4,419,251 and 4,419,252 disclose aqueous lubricants with oil-in-water characteristics containing a dispersant/emulsifier system and an antiwear/rust inhibiting package.

[0004] US Patent 5,262,073 discloses a lubricating composition containing a zinc dispersant, 0.3 to 1 wt % of calcium nonyl di-naphthalene synthetic sulphonate detergent and 0.09 to 0.85 wt % of calcium alkylphenate.

[0005] US Patent 6,677,281 discloses a lubricating composition containing a metal sulphonate, an ashless alkenyl succinimide and a borated polyolefin dispersant.

What is claimed is:

1. A method for lubricating a mechanical device ~~requiring industrial fluids, hydraulic fluids, turbine oils, circulating oils, or combinations thereof,~~ wherein the mechanical device is a hydraulic system or a turbine, the method comprising supplying the mechanical device with a lubricating composition comprising:
- (a) an oil of lubricating viscosity;
- (b) about 0.1 wt % to about 1.5 wt % of a metal containing dispersant, wherein the metal is zinc, and wherein the metal containing dispersant is a N-substituted long chain alkenyl succinimide or long chain alkenyl ester, partial ester or salt thereof;
- (c) about 0.2 to about 1 wt % of a metal di-hydrocarbyl-substituted dithiophosphate, wherein at least one hydrocarbyl group is a branched primary hydrocarbyl 2-ethylhexyl group, and wherein the metal is zinc; and
- (d) optionally one or more additives comprising a detergent, an antioxidant, a corrosion inhibitor, a carboxylic acid or anhydride, or mixtures thereof.
2. The method of claim 1, wherein the mechanical device is a hydraulic system.
3. The method of claim 1 ~~or 2~~, wherein the metal ~~of the metal-containing dispersant~~ comprises polyisobutylene succinimide complex or salt with a zinc compound or cation.
4. ~~The method of any one of claims 1 to 3, wherein the metal containing dispersant comprises N-substituted long chain alkenyl succinimides or long chain alkenyl esters, partial esters or salts thereof.~~
5. ~~The method of any one of claims 1 to 3, wherein the metal containing dispersant comprises polyisobutylene succinimide complex or salt with a zinc compound or cation.~~
- ~~6.~~ 4. The method of any one of claims 1 to 5, wherein the metal di-hydrocarbyl-substituted dithiophosphate comprises those represented by the formula:



wherein M' comprises ~~zinc metal~~; and both R¹ and R² are hydrocarbyl groups ~~or mixtures thereof~~, with the proviso that at least one of R¹ and R² is a 2-ethylhexyl branched primary hydrocarbyl group, ~~or mixtures thereof~~.

5 ~~75.~~ The method of claim ~~64~~, wherein both R¹ and R² are 2-ethylhexyl branched primary hydrocarbyl groups.

8. ~~The method of claim 6 or 7, wherein the branched hydrocarbyl groups comprise at least one of 2-ethylhexyl, iso-octyl, iso-nonyl, iso-decyl, iso-dodecyl, iso-pentadecyl, 2-methyl-1-pentyl, isobutyl, 2-propyl-1-decyl or mixtures thereof.~~

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9. ~~The method of any one of claims 1 to 8, wherein the metal dihydrocarbyl dithiophosphate is present in ranges from 0.01 to 5 wt %, or from 0.1 to 2 wt %, or from 0.2 to 1 wt %.~~

15 ~~106.~~ The method of any one of claims 1, wherein the lubricating composition ~~to 9 further comprising comprises~~ one or more additives from a detergent, an antioxidant, a corrosion inhibitor, a carboxylic acid or anhydride, or mixtures thereof.

14 ~~7.~~ The method of claim ~~106~~, wherein the detergent comprises at least one of calcium dinonyl naphthalene sulphonate, calcium didecyl naphthalene sulphonate, didodecyl naphthalene sulphonate, calcium dipentadecyl naphthalene sulphonate, or mixtures thereof.

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12 ~~8.~~ The method of claim ~~106~~, wherein the corrosion inhibitor comprises a benzotriazoles, 1,2,4-triazoles, or mixtures thereof.

13 ~~9.~~ The method of claim ~~106~~, wherein the carboxylic acid or anhydride ~~comprises polyisobutylene succinic acid or anhydride thereof, or mixtures thereof.~~

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14 ~~10.~~ The method of claim ~~106~~, wherein the antioxidant comprises a hindered phenol, or mixtures thereof.

1511. The method of ~~any one of claims 1 to 14~~, wherein the lubricating composition comprises:

(a) -about 86 to -about 99.9 wt % of an oil of lubricating viscosity;

(b) -about 0.1 to -about 1.5 wt % of ~~a~~the metal containing dispersant;

5 (c) about 0.24 to about 21 wt % of ~~a~~the metal di-hydrocarbyl-substituted dithiophosphate, wherein at least one hydrocarbyl group is a ~~branched primary~~ hydrocarbyl2-ethylhexyl group;

(d) ~~about~~ 0.001 to -about 1.5 wt % of a detergent;

(e) -about 0.01 to -about 1.5 wt % of an antioxidant;

10 (f) -about 0.0005 to -about 1 wt % of a corrosion inhibitor;

(g) -about 0.001 to -about 1 wt % of a carboxylic acid or anhydride ; and

(h) 0 to about 5 wt % of other performance additives.