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(54) **Water-based energy transmitting fluid composition.**

(57) Aqueous composition having a viscosity of at least 10.10^{-6} m^2/s centistokes at 40°C which contain up to about 80 percent by weight of water, at least 0.1 percent by weight of an acidic lubricity agent and an effective amount of an anti-wear additive which is the combination of a nitroaromatic compound component and a hydroxyl substituted aromatic acid component exhibit enhanced anti-wear and lubricity properties.

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BACKGROUND OF THE INVENTORY

This invention relates to fluid compositions useful especially for transmitting energy in mechanical systems and, more particularly, to water-based compositions useful in transmitting hydraulic energy having enhanced lubricity and anti-wear properties.

Water-based hydraulic fluids are well known and have been used commercially for a number of years especially in applications where fire resistance is desired. One commonly used class of such water-based fluids, as disclosed, for example, in U.S. Patent No. 2,602,780 to Zisman et al. and U.S. Patent No. 2,768,141 to Langer et al., contain water soluble glycols or glycol ethers for low temperature protection and a high molecular weight polymeric thickener such as water soluble poly(alkylene oxide) polymers for viscosity control. Such compositions also contain a variety of additives in "packages" that are added to enhance lubrication, corrosion protection, and other performance characteristics necessary for hydraulic devices and lubricants.

Water based hydraulic fluids commonly have high noninflammability, good temperature stability, and a relatively low cost, but generally have poorer anti-wear characteristics than petroleum-based fluids. Fluids used in energy transmission systems must possess sufficient lubricity and mechanical stability to enable them to be used in the self-lubricated pumps, valves etc. employed in commercial hydraulic systems. Good lubricating properties, especially good lubricity and

film strength, are particularly important in reducing the wear of moving components of hydraulic systems where the clearance between frictional surfaces may be very small and pressures may be very high.

Heretofore, various attempts have been made to improve the lubricating properties and/or poor anti-wear properties of these fluids including, for example, modifying the poly(alkylene oxide) polymers generally added as viscosity control agents; incorporating additives such as conventional oil improvers, E.P. agents, corrosion inhibitors, and sequestering agents; and incorporating special water soluble additives such as the oxyalkylene adducts of polyamides disclosed in U.S. Patent No. 3,992,312 to Genjida et al. However, none of these methods have been found to be completely effective, particularly where anti-wear resistance under high pressure conditions is desired, and the development of water-based fluids that would meet these requirements would be highly desirable. Moreover, it would also be desirable to provide energy transmitting fluids that contain more water than the 50 percent to which such known fluids are generally limited in commercial applications.

SUMMARY OF INVENTION

In accordance with the present invention there is provided a water-based energy transmitting and lubricating fluid having enhanced anti-wear properties which comprises an aqueous composition having a viscosity of at least about 10 centistokes ($10 \cdot 10^{-6}$ m^2/s) at 40°C which

contains up to about 80 percent by weight of water and has incorporated therein at least 0.1 percent by weight of an acidic lubricity agent and an amount of an anti-wear additive which is effective in enhancing the anti-wear characteristics of said composition, said anti-wear additive comprising the combination of a hydroxyl substituted aromatic acid component and a nitroaromatic compound component. Compositions of the invention may also contain from 0 to about 50 percent by weight of a water soluble glycol or glycol ether having 2 to about 14 carbon atoms used as a freezing point depressant and from about 5 to about 50 percent by weight of a water-soluble polymeric viscosity control agent.

Also provided in accordance with the present invention is a method for enhancing the anti-wear properties of water-based energy transmitting fluids containing an acidic lubricity agent which comprises incorporating in said water-based energy transmitting fluid an anti-wear additive comprising the combination of a hydroxyl substituted aromatic acid component and a nitroaromatic compound component in an amount which is effective in enhancing the anti-wear characteristics of said fluid compositions.

It has been found that the particular combination of anti-wear additive components herein disclosed is efficient in enhancing the anti-wear and lubricity properies of water-based energy transmitting compositions which also contain conventional acidic lubricity agents and makes possible the preparation of

such compositions with as much as 80 percent by weight of water, a significantly greater amount of water than may be used in water-based compositions heretofore employed as energy transmission fluids.

DESCRIPTION OF THE INVENTION

In accordance with the present invention, the water-based energy transmitting fluid is an aqueous composition having a viscosity of at least 10 $\cdot 10^{-6}$ m^2/s centistokes at 40°C which contains up to 80 percent by weight of water and a conventional acidic lubricity agent to which has been added an anti-wear and lubricity additive which is the combination of a hydroxyl substituted aromatic acid component and a nitroaromatic compound component.

The acidic lubricity agents suitable for use in compositions of the invention are well known materials which are conventionally used as lubricity improvers in water-based hydraulic and the like fluids. Such suitable acidic materials include, for example, saturated and unsaturated aliphatic carboxylic and polycarboxylic acids having at least 6 carbon atoms such as caproic acid, caprylic acid, pelargonic acid, capric acid, lauric acid, myristic acid, palmitic acid, stearic acid, oleic acid, linolic acid, undecanoic acid, oxalic acid, malonic acid, succinic acid, glutaric acid, adipic acid, maleic acid, fumaric acid, glutaconic acid, butenetricarboxylic acid; aromatic carboxylic acids such as benzoic acid, dimethylbenzoic acid, phthalic acid, terephthalic acid, isophthalic acid and trimellitic

acid; alkali metal or organic amine salts of said aliphatic and aromated carboxylic acids such as morpholine; polymerized fatty acids (dimer acids); oxycarboxylic acids such as malic and tartaric acid; and lecto-dicarboxylic acids such as acetonedicarboxylic acid.

As a general rule, the acidic lubricity agent may be present in an amount between about 0.1 and 10 percent by weight and are conventionally used in an amount between about 0.5 and 2 percent by weight of the water-based composition, but greater amounts of said agent may be employed if desired for particular applications.

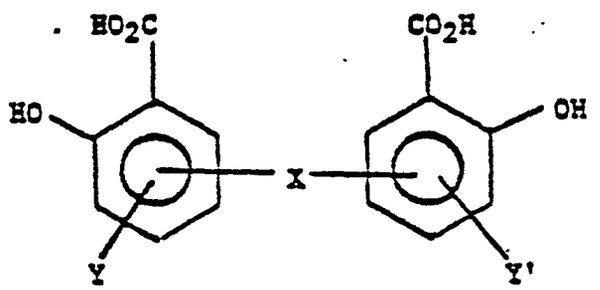
An essential component of the compositions of the invention is an anti-wear additive which is the combination of a hydroxyl substituted aromatic acid component and a nitroaromatic compound component.

Nitroaromatic compounds which are suitable for use as an anti-wear additive component in compositions of the invention are mononuclear aromatic compounds having at least one substituent nitro group. Such suitable nitroaromatic compounds are the nitro-substituted aromatic acids and compounds such as nitroaromatic salts, esters, and the like, that, in situ, effect the formation of the acid anion. Exemplary suitable nitroaromatic compounds are 3- nitrobenzoic acid, 4- nitrophthalic acid, 4- nitroisophthalic acid, 3,5- dinitrobenzoic acid, p-nitrocinnamic acid, and the like, and alkali metal, amine, or ammonium salts thereof.

Hydroxyl substituted aromatic acids which are

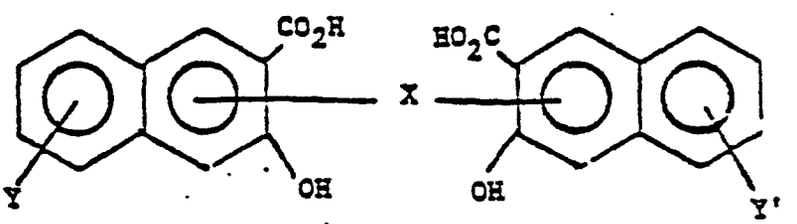
suitable for use in combination with said nitroaromatic compounds are the mononuclear hydroxyl-substituted aromatic acids such as, for example, salicylic acid, and dihydroxy substituted benzoic acid and the bridged dimer of hydroxyl-substituted aromatic carboxylic acids of the general formula:

1)



or

2)



wherein X is a sulfur atom or a chemically stable group selected from lower alkylene, sulfonyl, and amino groups, and Y and Y' may be the same or different, and are a hydrogen atom, hydroxyl group, amino group, alkyl group, or sulfonyl group.

Exemplary suitable bridged dimer acids are methylene or sulfur bridged, hydroxyl-substituted aromatic carboxylic acids such as 5,5'

methylenedisalicylic acid, pamoic acid, and thiodisalicylic acid. The compound may be present in the composition as a salt such as an alkali metal, amine, or ammonium salt.

In compositions of this invention, it is essential that both a nitroaromatic compound and a hydroxyl substituted acid be present in order to prepare water-based compositions that exhibit enhanced anti-wear and lubricity properties. As a general rule, the combination of anti-wear additive components hereinabove described should be present in a combined amount sufficient to impart the desired degree of anti-wear properties and lubricity to the composition, depending upon the operating conditions and service requirement for a particular application. The amount of the combination of anti-wear additive components that should be present will be called herein an "effective amount," which is defined as being the minimum amount required to achieve the anti-wear properties and lubricity required for a particular application. While the amount of each of the anti-wear additive components and the "effective amount" of the combination thereof may vary somewhat depending on the application, the amount of each of the additive components present should be at least about 0.0025 gram-moles per liter (generally about 0.003 weight percent) and preferably from about 0.01 to about 0.50 or even more, gram-moles per liter of aqueous composition (generally between about 0.01 to about 10 percent by weight). The relative proportions of and the maximum amount of each of the additive components and the

combination thereof that should be present is not critical, with economic factors generally determining the use of amounts greatly in excess of that actually required.

The water-based compositions of the invention should have a viscosity of at least 10 centistokes ($\cdot 10^{-6}$ m^2/s) at 40°C and may contain up to about 80 percent by weight of water. In general, the viscosity of the aqueous composition of the invention may vary depending upon the energy transmission application for which it is intended and the temperature range over which it will be used. For example, energy transmitting fluids such as hydraulic fluids may have viscosities in the range of about 25 to 150 centistokes ($\cdot 10^{-6}$ m^2/s) at 40°C, and preferably in the range of about 30 to 85 centistokes, and lubricating fluids may be used with similar viscosity requirements. While it is desirable to be able to provide an energy transmitting fluid which contains the greatest amount of water in order to provide fire resistance characteristics, it is also important that such fluid have a viscosity range that is capable of operating in existing equipment, as well as providing adequate boundary lubrication and lubrication for mechanical components. Accordingly, the water content of the compositions of the invention may vary in the range of from about 20 percent to about 80 percent, and preferably from about 30 percent to about 70 percent by weight.

To achieve the range of viscosities that may be desired for a particular application and wherein the

water content of such compositions may be varied over a broad range, a water-soluble polymeric viscosity control and/or thickening agent is generally employed in an amount that ranges from about 5 percent to 50 percent, and preferably from about 10 to 20 percent by weight of the composition. Water-soluble polymers that are suitable for use as viscosity control agents in the compositions of the invention are poly(alkylene oxide) polymers. Such polymers are known compounds which, even though of high molecular weight, are water-soluble. In general, these polymers will contain oxyethylene groups or both oxyethylene groups and higher oxyalkylene groups such as oxypropylene and oxybutylene groups either in random or block distribution in their molecules, and will have average molecular weights from 400 to about 40,000, or even higher. The amount of oxyethylene groups in the molecule is such that the poly(alkylene oxide) polymers are soluble in water at ordinary temperatures, and the amount of oxypropylene or higher oxyalkylene groups is such that the poly(alkylene oxide) remains liquid at ordinary temperatures up to an average molecular weight of 40,000 and higher or may melt at temperatures below about 60°C. The oxypropylene/ oxyethylene ratio may vary from zero to about unity. These poly(alkylene oxide) polymers may be made by processes well known in the art by reacting ethylene oxides or mixtures of ethylene oxide and propylene oxide or higher alkylene oxide with a compound having at least one active hydrogen atom up to as many as six such active hydrogen atoms including, for example, water,

monohydroxylic alcohols such as ethanol and propanol, dihydroxylic alcohols such as ethylene glycol, trihydroxylic alcohols such as glycerine and trimethylopropane, tertahydroxylic alcohols such as pentaerythritol, hexahydroxylic alcohols such as sorbitol, and mono- or poly- functional amines such as butylamine and ethylene diamine. The poly(alkylene oxide) products of such reaction will have linear or branched oxyethylene or oxyethylene-higher oxyalkylene chains and such chains will terminate with hydroxyl groups. Some or all of these hydroxyl groups may be etherified by reaction with a dialkyl sulfate such as diethyl sulfate.

Another known class of water-soluble polymers that are suitable as thickeners or viscosity control agents are the polymer adducts of alkyl phenols and alkylene oxides such as, for example, the ethylene oxide/propylene oxide adducts of alkyl phenol disclosed in U.S. Patent No. 2,768,141 to Langer et al. and the ethoxylated dinonyl phenol disclosed in U.S. Patent No. 3,379,644 to Katzenstein.

Also suitable as viscosity control agents are the water-soluble polyalkyl methacrylates disclosed, for example, in U.S. Patent No. 3,352,783 to McCord which generally results from the polymerization of alkyl methacrylates in which the alkyl groups can have an average of from about 3 to 10 carbon atoms. The urethane polymers such as disclosed in U.S. Patent No. 3,352,783 are other suitable water-soluble polymers for use as a viscosity control agent.

Other suitable water-soluble polymers are, for example, polyamide esters such as disclosed in U.S. Patent No. 3,341,573 to Shibe and polyamide alkoxylates such as disclosed in U.S. Patent No. 3,992,312 to Genjida et al.

In accordance with the present invention, preferred embodiments of the compositions of the invention may also contain a water-soluble freezing point depressant. The water-soluble freezing point depressants conventionally employed are glycols or glycol ethers having 2 to about 14 carbon atoms such as ethylene glycol, diethylene glycol, triethylene glycol, ethylene glycol ethers such as the ethyl, methyl, propyl and butyl ethers thereof, and similar ethers of diethylene and triethylene glycol. In general, it is preferred to use the simpler polyols as represented by ethylene glycol, propylene glycol, butylene glycol, glycerine, and diethylene glycol. As the basis of the energy transmitting fluid of the invention, it is preferable to use proportions of said glycols or glycol ethers which will give, in combination with water, the low temperature servicability desired.

The energy transmission fluids of this invention may also contain other components conventionally used in water-based fluids such as corrosion, oxidation, and foam inhibitors, pH conditioners, dyes, sequestering agents and the like which may be used in small amounts from about 0.01 to about 5 to 10 percent by weight of the composition. Exemplary of such materials that may be used are

corrosion inhibitors including monoethanolamine, monoisopropanolamine, diethanolamine, triethanolamine, ethylenedieamine, dimethylethanolamine, diethylene-triamine, cyclohexylamine, morpholine, 1,4-bis (2-aminoethyl)pyperadine, 2-heptadecyl-1-(2-hydroxyethyl)imidazoline, derivatives thereof such as alkaline oxide adducts, alkali metal salts of carboxylic acids and the like; pH conditioners including organic amines as mentioned as corrosion inhibitors and alkali metal hydroxides; antioxidants including benzotriazole, mercaptobenzoimidazole, and mercaptobenzothiazole; foam inhibitors including silicones of the emulsion type; dyes including basic dyes and acid dyes; and sequestering agents such as aminocarboxylic acids and derivates thereof including ethylenediamotetraacetic acid, diethylenetriaminepentaacetic acid, sodium or copper salts thereof, and oxycarboxylic acids and derivates thereof such as tartaric acid and sodium gluconate.

In preparing the water-based compositions of the invention, each of the components used may be added in any order of addition, or combinations of some of them may be prepared prior to incorporating in the composition. In general, each of the components to be used should be water-soluble or previously made into a water-soluble form such as the alkali metal or ammonium salts thereof, or should be capable of being solubilized in situ.

In accordance with the present invention, there is also provided a method whereby the anti-wear and lubricity characteristics of a water-based energy

transmission fluid may be enhanced by adding to an aqueous composition having a viscosity of at least 10 centistokes ($10 \cdot 10^{-6}$ m^2/s) at 40°C which contains up to about 80 percent by weight of water and has incorporated therein an acidic lubricity agent as hereinabove described, an anti-wear additive which comprises the combination of nitroaromatic compound component and a hydroxyl substituted aromatic acid in an "effective amount" to enhance the anti-wear and lubricity properties thereof. Such additive components may be in the alkali metal or ammonium salt solubilized form thereof or in a form that is solubilized in situ.

In an alternate embodiment, in the event that the water-base fluid composition to be treated does not contain an acidic lubricity agent as herein described, such component may be added to the fluid when the anti-wear additive components are added.

The invention will become more clear when considered together with the following examples, which are set forth as being merely illustrative of the invention and which are not intended, in any manner, to be limitative thereof. Unless otherwise indicated, all parts and percentages are by weight.

Example 1

Measurement of the wear and lubricating properties of the water-based energy transmitting compositions of this invention, as well as the compositions used for comparison purposes are performed on a hydraulic fluid test stand as described in ASTM D-2882-74 "Vam Pump Testing of Petroleum Hydraulic

Fluids". The operational conditions for the tests are as follows:

Pump	Vickers V104, 30 lpm (8gpm) Vane Pumps
Pump Speed	1200 rpm
Pump Pressure	123 kg/cm^2 (1750 psig) 1207,5 N/cm^2 134 kg/cm^2 (1900 psig) 1311 N/cm^2 141 kg/cm^2 (2000 psig) 1380 N/cm^2
Fluid Temperature	66°C
Fluid Quantity	5000 ml

The apparatus and procedure described above are used to evaluate the wear of metal pump cam ring and vanes using various water-based compositions of this invention in comparison with a composition prepared without the anti-wear additive of the invention. The proportion of ingredients used in preparing the compositions evaluated in this Example are summarized below:

	Composition (%)			
	A	B	C	D
Deionized Water	40	40	40	40
Ethylene Glycol	43	43	44	43
Polymeric Thickener	16.9	13.65	13.255	13.7
Capric Acid	1.0	1.0	1.0	1.0
(DMEA)[a]	1.0	1.0	1.0	1.0
(MIPOLA)[b]	0.5	0.5	0.5	0.5
Copper Wear Additive	0.1	0.1	0.1	0.1
3,5-Dinitrobenzoic Acid	-	0.2	0.1	0.4
(3,5-DNBA gram-moles/ liter)[c]	-	(0.01)	(0.005)	(0.02)
5,5'-Methylene-disalicylic Acid	-	0.15	0.075	0.3
(MDA gram-moles/ liter)[c]	-	(0.01)	(0.005)	(0.02)

[a] DMEA - Dimethylethanolamine

[b] MIPOLA - Monisopropanolamine

[c] gram-moles equivalent of weight percent added

The polymeric thickener used in the compositions of this Example is a water-soluble product

available under the trademark designation UCON 75-H-380,000 from Union Carbide Corporation. The copper wear additive is available commercially under the trademark designation REOMET 41 from Ciba-Geigy Corp.

The results of the wear tests are summarized in Table I.

TABLE I

Pump Test Data	Composition A	B	C	D
Wear (mg/100 hours)[a]				
Pump Discharge Pressure 1750 psig (123 kg/cm^2) 1207,5 N/cm^2	3100	250	-	735
Pump Discharge Pressure 1900 psig (134 kg/cm^2) 1311 N/cm^2	-	380	300	-

[a] wear of cam ring and vanes

It is apparent from the data shown that the lubricity (anti-wear) properties at high pressures of compositions B to D is vastly superior to the lubricity of composition A which did not contain the anti-wear additive of the invention.

Example 2

The apparatus and procedure described in Example 1 is used to evaluate the lubricity (anti-wear properties) of water-based compositions containing the anti-wear additive of the invention and these are compared with compositions prepared with one or the other of the anti-wear additive components but not with the combination thereof. The proportions of ingredients used and the lubricity test results are summarized in Table II. The polymeric thickener of Example 1 was used

in the compositions of this Example.

It is apparent from the data in Table II that compositions A and B which contain the anti-wear additive of the invention exhibit greatly superior wear resistance properties than composition C which did not contain any anti-wear additive components and Compositions D and E, which did not contain the combination of anti-wear additive components.

TABLE II

Composition (%)

Ingredients	A	B	C	D	E
Deionized Water	40	40	38	40	40
Ethylene Glycol	43	-	45	44	44
Diethylene Glycol	-	43	-	-	-
Polymeric Thickener	14.05	14.05	13.8	13.2	13.25
Reomet 41	-	0.1	0.2	0.1	0.1
Benzotriazole	0.1	-	-	-	-
Capric Acid	1.0	1.0	1.5	1.0	1.0
DMEA[a]	1.0	1.0	1.0	1.0	1.0
MIPOLA[b]	0.5	0.5	0.5	0.5	0.5
3,5-Dinitrobenzoic Acid	0.2	0.2	-	0.2	-
(3,5-DNBA gram-moles/ liter)	(0.01)	(0.01)	-	(0.01)	-
5,5'-Methylenedisalicylic Acid	0.15	0.15	-	-	0.15
(5,5'-MDA gram-moles/ liter)	(0.01)	(0.01)	-	-	(0.01
Wear Test Data (mg/100 hours)					
Discharge Pressure 1750 psig 1207 N/cm^2	440	400	6800	3000	3000
Discharge Pressure 1900 psig 1311 N/cm^2	-	-	-	-	-

[a] DMEA - Dimethylethanolamine

[b] MIPOLA - monisopropanolamine

Example 3

Using the apparatus and procedure described in Example 1, the lubricity (anti-wear) properties of a series of fluid compositions containing various amounts of water are evaluated. The proportion of ingredients in each of the compositions and wear data obtained with each of the compositions is summarized in Table III.

TABLE III

Composition (%)

	A	B	C	D
Deionized Water	60	70	75	75
Ethylene Glycol	20	9	1	2.5
Polymeric Thickener	16.9	18.3		
Capric Acid	1.0	1.0	1.3	1.0
DMEA	1.0	1.0	1.0	1.0
MIPOLA	0.5	0.5	0.6	0.5
Reomet 41	0.1	0.1	0.1	0.1
Benzoic Acid	0.01	0.01		
3,5-Dinitrobenzoic Acid	0.1	0.1	0.5	0.1
(DNBA-gram-moles/liter)	(0.005)	(0.005)	(0.025)	(0.005)
Salicylic Acid	0.035	0.035	-	0.035
(gram-moles/liter)	(0.005)	(0.005)	-	(0.005)
5,5' Methylenedisalicylic	-	-	0.3	-
Pump Test Data (Wear-Mg/100 hours)				
Discharge Pressure				
690 N/cm^2 1000 psig	-	-	50	-
1207,5 N/cm^2 1750 psig	61	300	3000+	3950
1380 N/cm^2 2000 psig	89	-	-	-

Example 4

Using the apparatus and procedure of Example 1, the lubricity of a series of water-based fluid compositions using various types of acidic lubricity agents and anti-wear additive components are evaluated. The proportion of ingredients used in each of the compositions and pump-wear test results are summarized in Table IV. The Polymeric Thickener of Example 1 is used in the compositions of this Example.

It is apparent from the results shown that each of the compositions evaluated exhibited enhanced anti-wear properties though Composition E prepared with lauric acid as the acid lubricity agent exhibits somewhat higher wear.

TABLE IV

Composition

Ingredients	A	B	C	D	E	F	G
Deionized Water	40	40	40	44	44	40	40
Ethylene Glycol	44	44	44	40	40	44	44
Polymeric Thickener	13.15	12.99	13.05	13.12	13.04	13.07	14.65
Capric Acid	1.0	1.0	1.0	--	--	1.0	1.0
Lauric Acid	--	--	--	--	1.0	--	--
Pelargonic Acid	--	--	--	1.0	--	--	--
Benzoic Acid	--	0.01	--	0.01	0.01	0.01	0.01
DMEA	1.0	1.0	1.0	1.0	1.0	1.0	--
MIPOLA	0.5	0.5	0.5	0.5	0.5	0.5	--
Reomet 41	0.1	0.1	0.1	0.1	0.1	0.1	0.1
3,5-Dinitrobenzoic Acid	--	0.2	0.2	0.2	0.2	--	0.2
m-Nitrobenzoic Acid	--	--	--	--	--	0.17	--
R_T Nitrobenzoic Acid	0.1	--	--	--	--	--	--
Salicylic Acid	--	--	--	0.07	--	--	--
2,4-Dihydroxybenzoic Acid	--	--	--	--	--	--	0.8
Methylendisalicylic Acid	0.15	--	--	--	0.15	0.15	--
Disodium Pamoate	--	0.2	--	--	--	--	--
4,4'-Sulfonyldibenzoic Acid	--	--	0.15	--	--	--	--
Pump Test Wear (Mg/100 hours)							
Pressure 1750 psig 1207,5 N/cm^2	20	--	--	--	1700	32	75
1900/2000 psig 1311/1380 N/cm^2	--	280	350	145	--	--	--

PATENT CLAIMS

1. A water-based energy transmitting fluid having enhanced anti-wear properties which comprises an aqueous composition having a viscosity of at least 10 centistokes ($10 \cdot 10^{-6}$ m^2/s) at 40°C which contains up to about 80 percent by weight of water, at least 0.1 percent by weight of an acidic lubricity agent and an effective amount of an anti-wear additive which comprises the combination of a hydroxyl substituted aromatic acid component and a nitroaromatic compound component.

2. The water-based fluid of claim 1 which contains at least about 20 percent by weight of water.

3. The water-based fluid of claim 1 wherein said anti-wear additive comprises the combination of at least 0.0025 gram-moles/liter of said hydroxyl substituted aromatic acid component and at least 0.0025 gram-moles/liter of said nitroaromatic compound component.

4. The water-based fluid of claim 1 wherein said nitroaromatic compound component is a nitro substituted mononuclear aromatic acid.

5. The water-based fluid of claim 1 wherein said hydroxyl substituted aromatic acid component is a mononuclear hydroxyl-substituted aromatic acid or a bridged dimer of a hydroxyl-substituted aromatic carboxylic acid.

6. The water-based fluid of claim 1 wherein said acidic lubricity agent is a member selected from the group consisting of saturated and unsaturated aliphatic carboxylic and polycarboxylic acids having at least 6 carbon atoms, aromatic carboxylic acids and alkali metal or organic amine salts of said aliphatic and aromatic acids.

7. The water-based fluid of claim 1 wherein said aqueous composition comprises up to about 50 percent by weight of a glycol or glycol ether having 2 to about 14 carbon atoms.

8. The water-based fluid of claim 1 wherein said aqueous composition comprises a water-soluble polymeric viscosity control agent in an amount from about 5 percent to 50 percent by weight.

9. The method of enhancing the anti-wear and lubricity properties of a water-based energy transmitting fluid containing an acidic lubricity agent which comprises incorporating in said water-based fluid an effective amount of an anti-wear additive comprising the combination of a hydroxyl substituted aromatic acid component and a nitroaromatic compound component.

European Patent Office

EUROPEAN SEARCH REPORT

0055488
Application number
EP 81 11 0827

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
A	FR - A - 1 185 008 (S.A. DES USINES CHAUSSON) * Abstract a,f,g,j,k; page 1, column 2, paragraph 4 *	1-4,7
A	CHEMICAL ABSTRACTS, vol. 74, no. 10, 1971, page 108, abstract 44104u Columbus, Ohio, US & US - A - 279 845 (FILATOV P.G.) (20-08-1970) * Abstract *	1-4,7, 8
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CLASSIFICATION OF THE APPLICATION (Int. Cl. 3)

C 10 M 3/04
3/00

TECHNICAL FIELDS SEARCHED (Int.Cl. 3)

C 10 M

CATEGORY OF CITED DOCUMENTS

X: particularly relevant if taken alone
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P: intermediate document
T: theory or principle underlying the invention
E: earlier patent document, but published on, or after the filing date
D: document cited in the application
L: document cited for other reasons

&: member of the same patent family, corresponding document

X The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	24-03-1982	ROTSAERT

EPO Form 1503.1 06.78

European Patent Office

EUROPEAN SEARCH REPORT

Application number

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