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(54) **METHOD OF VISCOSITY CONTROL**

VERFAHREN ZUR REGULIERUNG DER VISKOSITÄT

PROCEDE DE REGULATION DE VISCOSITE

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(73) Proprietor: **The Lubrizol Corporation
Wickliffe, OH 44092 (US)**

(72) Inventors:
• **BREON, Lewis, D.
Wickliffe, OH 44092 (US)**
• **PATEL, Jayram, D.
Wickliffe, OH 44092 (US)**
• **SAMBUCHINO, Roy
Wickliffe, OH 44092 (US)**

- **WILKES, Mark, F.
Belper Derby DE56 1QN (GB)**
- **GRIFFITHS, Simon
Belper Derby DE56 1QN (GB)**
- **PRICE, David
Belper Derby DE56 1QN (GB)**
- **GAHAGAN, Michael, P.
Belper Derby DE56 1QN (GB)**

(74) Representative: **D Young & Co LLP
120 Holborn
London EC1N 2DY (GB)**

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DescriptionFIELD OF INVENTION

5 **[0001]** The present invention relates to a method of viscosity control by lubricating an internal combustion engine comprising at least one of a crankcase, a gear, and a wet-clutch with a lubricating composition.

BACKGROUND OF THE INVENTION

10 **[0002]** It is well known for lubricating oils to contain a number of additives used to protect the engine from wear and provide viscosity control. Common additives for engine lubricating oils include zinc dialkyldithiophosphate (ZDDP) an antiwear additive. It is believed that ZDDP antiwear additives protect the engine by forming a protective film on metal surfaces. Viscosity modifiers with a number average molecular weight above 100,000 are known in crankcase applications as viscosity modifiers because they help control high temperature viscometrics in multi-grade lubricants. Viscosity mod-
15 ifiers in various applications are known from, e.g., U.S. Patent 5,112,509.

[0003] Current and future government legislation regulating exhaust emissions from internal combustion engines that contain exhaust treatment devices are requiring a reduction in the phosphorus and metal content of engine oils used in these engines. This reduction in the phosphorus and metal content of engine oils is being implemented because it is thought that they can adversely affect the performance of exhaust treatment devices.

20 **[0004]** However, any reduction in the performance of catalytic converters caused by phosphorus poisoning tends to result in increased amounts of greenhouse gases such as nitric oxide and/or ash formation. Furthermore, reducing the amount of ZDDP will increase the amount of wear in an engine crankcase.

[0005] In an internal combustion engine with a wet-clutch (e.g. a 4-stroke motorcycle engine) legislation regulating exhaust emissions affects/restricts the amount of emissions. However, as the internal combustion engine has a common
25 oil reservoir, the oil must be suitable for a crankcase application and a gear, a transmission system or a clutch mechanism which all have higher operating conditions resulting in a severe wear environment. Therefore removing antiwear chemistry, such as, a phosphorus containing compound will tend to increase the amount of wear in the gear, transmission or clutch. If a conventional crankcase viscosity modifier (with a number average molecular weight of 100,000 or more) is employed in combination with reduced amounts of antiwear chemistry, it is believed that surface film break down due
30 to the viscosity modifier shear will give rise to increased wear. The surface film break down is believed to be due to reduction in high temperature viscosity of a lubricating oil proportional to the rate of shear of the viscosity modifier.

[0006] It would be advantageous to have a method of viscosity control for an internal combustion engine with a wet-clutch capable of imparting at least one of wear control, acceptable fuel economy, acceptable high temperature visco-
35 metrics and increased lubricant oil service drains. The present invention provides a method of viscosity control for said internal combustion engine and capable of imparting at least one of wear control, acceptable fuel economy, acceptable high temperature viscometrics and increased lubricant oil service drains.

SUMMARY OF THE INVENTION

40 **[0007]** This invention provides a method of lubricating an internal combustion engine comprising a crankcase and at least one of a gear and a wet-clutch, said method comprising supplying to said crankcase and to at least one of said gear and wet-clutch a lubricating composition comprising:

- (a) an oil of lubricating viscosity; and
- 45 (b) a viscosity modifier with a number average molecular weight from about 1000 to about 75,000, wherein the viscosity modifier is a poly(meth)acrylate, wherein the viscosity modifier has a Shear Stability Index (SSI) as determined by CEC L-45-A-99 of 22 or less,

wherein the lubricating composition has a SAE viscosity grade from XW-Y, wherein X is from 0 to about 20 and Y is
50 from about 20 to about 50; and wherein the lubricating composition has a phosphorus content from a metal hydrocarbyl dithiophosphate of 0.12 wt % or less, wherein the internal combustion engine is a 4-stroke motorcycle engine.

DETAILED DESCRIPTION OF THE INVENTION

55 **[0008]** This invention provides a method of lubricating an internal combustion engine comprising a crankcase and at least one of a gear and a wet-clutch, said method comprising supplying to said crankcase and to at least one of the gear and wet-clutch a lubricating composition comprising: (a) an oil of lubricating viscosity; and (b) a viscosity modifier with a number average molecular weight from 1000 to 75,000, wherein the lubricating composition has a SAE viscosity grade

from XW-Y, wherein X is from 0 to 20 and Y is from 20 to 50; and wherein the lubricating composition has a phosphorus content from a metal hydrocarbyl dithiophosphate of 0.12 wt % or less.

Internal Combustion Engine

[0009] The internal combustion engine of the invention typically comprises a crankcase, a gear and a wet-clutch. Optionally the internal combustion engine further comprises a manual or automatic transmission. In one embodiment the gear is from a gearbox.

[0010] As used herein the term "wet-clutch" is known to a person skilled in the art as meaning one that contains a clutch plate(s) that is bathed or sprayed by a lubricant, e.g., that of the transmission, and the lubricating oil gets between the plate(s).

[0011] In one embodiment the internal combustion engine has a common oil reservoir supplying the same lubricating composition to the crankcase and at least one of a gear and a wet-clutch. In certain embodiments the lubricating composition is supplied to the crankcase and to the gear (or multiplicity of gears), or to the crankcase and the wet clutch, or to the crankcase and both the gear (or gears) and the wet clutch.

[0012] The internal combustion engine is suitable for motorcycles for example motorcycles with a 4-stroke internal combustion engine.

Oil of Lubricating Viscosity

[0013] The lubricating composition includes natural or synthetic oils of lubricating viscosity; oil derived from hydrocracking, hydrogenation or hydrofinishing; and unrefined, refined and re-refined oils, and mixtures thereof.

[0014] Natural oils include animal oils, vegetable oils, mineral oils and mixtures thereof. Synthetic oils include hydrocarbon oils, silicon-based oils, and liquid esters of phosphorus-containing acids. Synthetic oils may be produced by Fischer-Tropsch gas-to-liquid synthetic procedure as well as other gas-to-liquid oils. In one embodiment the polymer composition of the present invention is useful when employed in a gas-to-liquid oil. Often Fischer-Tropsch hydrocarbons or waxes may be hydroisomerised.

[0015] In one embodiment the base oil is a polyalphaolefin (PAO) including a PAO-2, PAO-4, PAO-5, PAO-6, PAO-7 or PAO-8 (the numerical value relating to Kinematic Viscosity at 100 °C). The polyalphaolefin in one embodiment is prepared from dodecene and in another embodiment from decene. Generally, the polyalphaolefin suitable as an oil of lubricating viscosity has a less than that of a PAO-20 or PAO-30 oil, the reason being that a polyalphaolefin with a viscosity higher than a PAO-30 is typically too viscous for effective lubrication of an internal combustion engine.

[0016] Oils of lubricating viscosity may also be defined as specified in the American Petroleum Institute (API) Base Oil Interchangeability Guidelines. In one embodiment the oil of lubricating viscosity comprises an API Group I, II, III, IV, V, VI oil or mixtures thereof, and in another embodiment API Group II, III, IV oil or mixtures thereof. In another embodiment the oil of lubricating viscosity is a Group III or IV base oil and in another embodiment a Group IV base oil. If the oil of lubricating viscosity is an API Group II, III, IV, V or VI oil there may be up to 40 wt % and in another embodiment up to a maximum of 5 wt % of the lubricating oil an API Group I oil present.

[0017] In one embodiment the lubricating composition has a SAE viscosity grade from XW-Y, wherein X is from 0 to 20 and Y is from 20 to 50.

[0018] In one embodiment X is chosen from 0, 5, 10, 15 or 20.

[0019] In one embodiment Y is chosen from 20, 25, 30, 35, 40, 45 or 50.

[0020] The oil of lubricating viscosity in one embodiment is present from 2 wt % to 99.5 wt % of the lubricating composition, in another embodiment from 29 wt % to 98.25 wt % of the lubricating composition and in another embodiment from 40 wt % to 97 wt % of the lubricating composition. Examples of suitable amounts of an oil of lubricating viscosity include 55 wt %, 60 wt %, 65 wt %, 70 wt %, 75 wt % or 80 wt %.

Viscosity Modifier

[0021] The viscosity modifier of the invention includes at least one poly(meth)acrylate.

[0022] The viscosity modifier in one embodiment is present from 0.5 wt % to 95 wt %, in another embodiment 0.75 wt % to 70 wt % and in another embodiment 1 wt % to 40 wt % of the lubricating composition. Examples of a suitable amount of viscosity modifier include 8 wt %, 10 wt %, 12 wt %, 14 wt %, 16 wt %, 18 wt %, 20 wt %, 22 wt %, 24 wt %, 30 wt %, 35 wt %, or 55 wt %.

[0023] The viscosity modifiers (which may also be dispersant viscosity modifiers, as further described below) are known in the art and commercially available from a number of corporations, including The Lubrizol Corporation, Degussa AG and Rohmax GmbH.

[0024] The viscosity modifier has a Shear Stability Index (SSI) as determined by CEC L-45-A-99 of 22 or less, 20 or

less or 18 or less. In one embodiment the viscosity SSI is 2 or more or 4 or more. Examples of suitable ranges of SSI include 2 to 22 or 4 to 18.

[0025] The viscosity modifier has a number average molecular weight from 1000 to 75,000, in another embodiment 2000 to 60,000, in another embodiment 6000 to 50,000 and in another embodiment 8000 to 40,000. In one embodiment the viscosity modifier has a number average molecular weight from 1000 to 20,000 and in another embodiment from 25,000 to 40,000. In one embodiment the dispersant viscosity modifier has a number average molecular weight that is the same as the ranges given for the viscosity modifier.

Poly(meth)acrylates

[0026] The viscosity modifier is a poly(meth)acrylate, preferably with a number average molecular weight of 10,000 to 35,000, 12,000 to 20,000 or 25,000 to 35,000.

[0027] In one embodiment the poly(meth)acrylate viscosity modifier includes copolymers of (i) a methacrylic acid ester containing 9 to 30 carbons in the ester group, (ii) a methacrylic acid ester containing 7 to 12 carbons in the ester group wherein the ester group contains a 2-(C₁₋₄ alkyl)-substituents and optionally (iii) at least one monomer selected from the group consisting of a methacrylic acid ester containing from 2 to 8 carbon atoms in the ester group and which are different from methacrylic acid esters used in (i) and (ii) above. A more detailed description of polymethacrylate viscosity modifiers can be found in US Patent Number 6,124,249.

[0028] In one embodiment the viscosity modifier is a functionalized poly(meth)acrylate. The poly(meth)acrylate is functionalized with a nitrogen containing monomer thus forming a dispersant viscosity modifier. In one embodiment the nitrogen containing monomer is incorporated into the poly(meth)acrylate through standard copolymerization techniques. The nitrogen containing monomer includes a vinyl substituted nitrogen heterocyclic monomer, a dialkylaminoalkyl (meth)acrylate monomer, a dialkylaminoalkyl (meth)acrylamide monomer, a tertiary-(meth)acrylamide monomer and mixtures thereof. The alkyl groups can contain 1 to 8, or from 1 to 3 carbon atoms. In one embodiment, the dispersant viscosity modifier is a poly(meth)acrylate.

[0029] Useful nitrogen containing monomers include vinyl pyridine, N-vinyl imidazole, N-vinyl pyrrolidinone, and N-vinyl caprolactam, dimethylaminoethyl acrylate, dimethylaminoethyl methacrylate, dimethylaminobutylacrylamide dimethylamine propyl methacrylate, dimethylaminopropylacrylamide, dimethylaminopropylmethacrylamide, dimethylaminoethylacrylamide, tertiary butyl acrylamide or mixtures thereof.

[0030] The poly(meth)acrylate polymeric dispersant viscosity modifier includes a copolymer derived from a (meth)acrylate monomer containing an alkyl group with 1 to 30 carbon atoms, in another embodiment 1 to 26 carbon atoms and in another embodiment 1 to 20 carbon atoms. The alkyl group includes mixtures derived from an alcohol containing 1 to 4 carbon atoms, 8 to 10 carbon atoms, 12 to 14 carbon atoms, 12 to 15 carbon atoms, 16 to 18 carbon atoms or 16 to 20 carbon atoms. Examples of commercially available alcohol mixtures include the following products sold under the brand names of Dobanol™ 25, Neodol™ 25, Lial™ 125, and Alchem™ 125. In one embodiment the alcohol is a single alcohol, i.e., not a mixture.

[0031] The (meth)acrylate monomer includes those derived from natural or synthetic sources. When derived by synthetic sources the (meth)acrylate monomer may be prepared using known direct esterification and/or transesterification processes.

[0032] In one embodiment the poly(meth)acrylate polymeric dispersant viscosity modifier is derived from a methyl (meth)acrylate monomer and at least one other (meth)acrylate monomer including an alkyl group with 8 to 20 carbon atoms, in another embodiment 10 to 18 carbon atoms and in another embodiment 12 to 15 carbon atoms. The methyl (meth)acrylate monomer is in the range from 1 wt % or more of the poly(meth)acrylate, in another embodiment in the range from 8 wt % or more of the poly(meth)acrylate and in another embodiment in the range from 10 wt % or more of the poly(meth)acrylate. Upper limits on the amount of methyl (meth)acrylate include 40 wt % of the poly(meth)acrylate, in another embodiment 30 wt % of the poly(meth)acrylate and in another embodiment 20 wt % of the poly(meth)acrylate.

Metal Hydrocarbyl Dithiophosphate

[0033] In one embodiment of the invention the composition further contains a metal hydrocarbyl dithiophosphate. The amount of the metal hydrocarbyl dithiophosphate present is enough to provide a phosphorus content in the lubricating composition from said metal hydrocarbyl dithiophosphate of 0.12 wt % or less.

[0034] In one embodiment the phosphorus content in the lubricating composition from a metal hydrocarbyl dithiophosphate is below 0.1 wt %, in another embodiment below 0.085 wt %, in another embodiment below 0.06 wt % or lower. In one embodiment the lower limit of the phosphorus content in the lubricating composition from a metal hydrocarbyl dithiophosphate is 0 ppm or higher, in another embodiment 50 ppm or higher, in another embodiment 125 ppm or higher and in another embodiment 200 ppm or higher. Examples of suitable ranges include 50 ppm to 0.1 wt % or 125 ppm to 0.085 wt %.

[0035] Examples of a metal hydrocarbyl dithiophosphate include zinc dihydrocarbyl dithiophosphates (often referred to as ZDDP, ZDP or ZDTP). In one embodiment the number of carbon atoms of each hydrocarbyl group is 2 to 30, 3 to 14 or 4 to 10.

[0036] Examples of suitable zinc hydrocarbyl dithiophosphates compounds may include those with a hydrocarbyl group of octyl, 2-ethylhexyl, methylpentyl-isopropyl, 2-ethylhexyl-isopropyl, pentyl-isobutyl or mixtures thereof.

Additional Performance Additives

[0037] In one embodiment of the invention the composition optionally includes at least one additional performance additive. The additional performance additive includes at least one of metal deactivators, detergents, dispersants, extreme pressure agents, antiwear agents, antioxidants, corrosion inhibitors, foam inhibitors, demulsifiers, pour point depressants, friction modifiers, seal swelling agents and mixtures thereof. In one embodiment the additional performance additives may be used alone or in combination.

[0038] In one embodiment the total combined amount of the other performance additive compounds present ranges from 0 wt % to 30 wt %, in another embodiment from 1 wt % to 25 wt % and in another embodiment 2 wt % to 20 wt % or from 3 wt % to 10 wt % of the lubricating composition. Although one or more of the other performance additives may be present, it is common for the other additional performance additives to be present in different amounts relative to each other.

[0039] If the present invention is in the form of a concentrate (which may be combined with additional oil to form, in whole or in part, a finished lubricant), the ratio of the various additives to the oil of lubricating viscosity and/or to diluent oil include the ranges of 80:20 to 10:90 by weight.

[0040] Friction modifiers include fatty amines, esters such as borated glycerol esters, fatty phosphites, fatty acid amides, fatty epoxides, borated fatty epoxides, alkoxyated fatty amines, borated alkoxyated fatty amines, metal salts of fatty acids, fatty imidazolines, condensation products of carboxylic acids and polyalkylene-polyamines, amine salts of alkylphosphoric acids, molybdenum dithiocarbamate or mixtures thereof. Antioxidants include sulphurised olefins, hindered phenols, diphenylamines. Detergents include neutral or overbased, Newtonian or non-Newtonian, basic salts of alkali, alkaline earth and transition metals with one or more of a phenate, a sulphurised phenate, a sulphonate, a carboxylic acid, a phosphorus acid, a mono- and/or a di- thiophosphoric acid, a saligenin, an alkylsalicylate, a salixarate or mixtures thereof. Dispersants include N-substituted long chain alkenyl succinimide as well as post-treated versions thereof. Post-treated dispersants include those further treated by reaction with materials such as urea, boron, thiourea, dimercaptothiadiazoles, carbon disulphide, aldehydes, ketones, carboxylic acids, hydrocarbon-substituted succinic anhydrides, nitriles, epoxides and phosphorus compounds.

[0041] Antiwear agents include compounds such as metal thiophosphates, especially zinc dialkyldithiophosphates; phosphoric acid esters or salt thereof; phosphites; and phosphorus-containing carboxylic esters, ethers, and amides; antiscuffing agents including organic sulphides and polysulphides, such as benzyldisulphide, bis-(chlorobenzyl) disulphide, dibutyl tetrasulphide, di-tertiary butyl polysulphide, di-tert-butylsulphide, sulphurised Diels-Alder adducts or alkyl sulphenyl N'-N'-dialkyl dithiocarbamates. Extreme pressure (EP) agents including chlorinated wax, organic sulphides and polysulphides, such as benzyldisulphide, bis-(chlorobenzyl) disulphide, dibutyl tetrasulphide, sulphurised methyl ester of oleic acid, sulphurised alkylphenol, sulphurised dipentene, sulphurised terpene, and sulphurised Diels-Alder adducts; phosphosulphurised hydrocarbons, metal thiocarbamates, such as zinc dioctyldithiocarbamate and barium heptylphenol diacid; may also be used in the composition of the invention.

[0042] Additional performance additives such as corrosion inhibitors include octylamine octanoate, condensation products of dodecyl succinic acid or anhydride and a fatty acid such as oleic acid with a polyamine; metal deactivators including derivatives of benzotriazoles, thiadiazoles such as dimercaptothiadiazole and its derivatives, 1,2,4-triazoles, benzimidazoles, 2-alkyldithiobenzimidazoles or 2-alkyldithiobenzothiazoles; foam inhibitors including copolymers of ethyl acrylate and 2-ethylhexylacrylate and optionally vinyl acetate; demulsifiers including polyethylene glycols, polyethylene oxides, polypropylene oxides and (ethylene oxide-propylene oxide) polymers; pour point depressants including esters of maleic anhydride-styrene, polymethacrylates, polyacrylates or polyacrylamides; and seal swell agents including Exxon Necton-37™ (FN 1380) and Exxon Mineral Seal Oil (FN 3200); may also be used in the composition of the invention.

[0043] The following examples provide an illustration of the invention. These examples are non exhaustive and are not intended to limit the scope of the invention.

EXAMPLES

Example 1 and Reference Examples 1-2

[0044] Lubricating compositions are prepared by blending additives as shown in Table 1 into a 10W-40 lubricant. The lubricating compositions have a phosphorus content in the lubricating composition from a metal hydrocarbyl dithiophos-

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phate of less than 0.12 wt %. The compositions prepared are:

Table 1

Example	Polymer Type	Number Average Molecular Weight
REF1	Commercially available Olefin copolymer	Over 100,000
REF2	Commercially available Olefin copolymer	84,000
EX1	Polymethacrylate	15,000

Viscosity Test

[0045] A viscosity test to determine Shear Stable Index (SSI) is carried out employing (i) a KRL Rig at 80 °C for 20 hours and the methodology of CEC L-45-A-99; and (ii) separately an Orbahn™ Rig and the methodology of CEC-14-A-93_30. Generally, better results are obtained for examples with lower percentage reductions in viscosity. Further acceptable results are obtained when the percentage loss in viscosity is 12 % or less. The results obtained are shown in Table 2.

Table 2

Example		SOT /----	EOT -- KRL	% Loss Rig-	SSI ----/		SSI (Orbahn)
REF1	KV ₁₀₀	14.96	7.94	46.93	76		25
	KV ₄₀	98.2	48.50	50.61	-		-
REF2	KV ₁₀₀	11.86	10.30	13.15	26		0
	KV ₄₀	77.39	65.52	15.34	-		-
EX1	KV ₁₀₀	12.72	11.68	8.18	14		0
	KV ₄₀	83.60	75.35	9.87	-		-

[0046] Footnote to Table 2, SOT is defined as Start of Test; and EOT is defined as End of Test and "-" represents unmeasured values.

[0047] The results indicate that the presence of the viscosity modifier with a number average molecular weight from 1000 to 75,000 has acceptable shear stability and is suitable for viscosity control in an internal combustion engine comprising a crankcase and at least one of a gear and a wet-clutch. Further, the viscosity modifier is capable of imparting at least one of wear control, acceptable fuel economy, acceptable high temperature viscometrics and increased lubricant oil service drains. Furthermore, the results indicate that a polymer with a low Shear Stability Index of 26 and a number average molecular weight of above 75,000 provides poor a viscosity control performance.

[0048] In this specification the terms "hydrocarbyl substituent" or "hydrocarbyl group," as used herein are used in its ordinary sense, which is well-known to those skilled in the art. Specifically, it refers to a group primarily composed of carbon and hydrogen atoms and attached to the remainder of the molecule through a carbon atom and which does not exclude the presence of other atoms or groups in a proportion insufficient to detract from the molecule having a predominantly hydrocarbon character. In general, no more than two, in one aspect no more than one, non-hydrocarbon substituent will be present for every ten carbon atoms in the hydrocarbyl group; typically, there will be no non-hydrocarbon substituents in the hydrocarbyl group. A more detailed definition of the terms "hydrocarbyl substituent" or "hydrocarbyl group," is provided in US Patent Number 6,583,092.

[0049] As used herein the term poly(meth)acrylate and other generic stems with (meth)acryl means polymethacrylate, polyacrylate or other acryl or methacryl moieties.

[0050] Unless otherwise indicated, each chemical or composition referred to herein should be interpreted as being a commercial grade material which may contain the isomers, by-products, derivatives, and other such materials which are normally understood to be present in the commercial grade. It is to be understood that the upper and lower amount, range, and ratio limits set forth herein may be independently combined. Similarly, the ranges and amounts for each element of the invention may be used together with ranges or amounts for any of the other elements.

Claims

1. A method of lubricating an internal combustion engine comprising a crankcase and at least one of a gear and a wet-clutch, said method comprising supplying to said crankcase and to at least one of said gear and wet-clutch a lubricating composition comprising:

(a) an oil of lubricating viscosity; and

(b) a viscosity modifier with a number average molecular weight from 1000 to 75,000, wherein the viscosity modifier is a poly(meth)acrylate, wherein the viscosity modifier has a Shear Stability Index (SSI) as determined by CEC L-45-A-99 of 22 or less,

wherein the lubricating composition has a SAE viscosity grade from XW-Y, wherein X is from 0 to 20 and Y is from 20 to 50; and wherein the lubricating composition has a phosphorus content from a metal hydrocarbyl dithiophosphate of 0.12 wt % or less, wherein the internal combustion engine is a 4-stroke motorcycle engine.

2. The method of claim 1, wherein the internal combustion engine has a common oil reservoir supplying the same lubricating composition to the crankcase and at least one of a gear and a wet-clutch.

3. The method of claim 1, wherein the lubricating composition is supplied to the crankcase and to the gear or multiplicity of gears.

4. The method of claim 1, wherein the lubricating composition is supplied to the crankcase and the wet clutch.

5. The method of claim 1, wherein the lubricating composition is supplied to the crankcase and both the gear (or gears) and the wet clutch.

6. The method of claim 1, wherein the viscosity modifier has a number average molecular weight from 2000 to 60,000, or from 8000 to 40,000.

7. The method of claim 1, wherein the viscosity modifier has a number average molecular weight from 1000 to 20,000, or from 25,000 to 40,000.

8. The method of claim 1, wherein the viscosity modifier is a functionalized poly(meth)acrylate.

9. The method of claim 8, wherein the poly(meth)acrylate is functionalized with a nitrogen containing monomer.

10. The method of claim 1, wherein the viscosity modifier is present in an amount from 0.5 wt % to 95 wt %, or from 1 wt % to 40 wt % of the lubricating composition.

11. The method of claim 1, wherein the viscosity modifier has a Shear Stability Index (SSI) as determined by CEC L-45-A-99 of 4 to 18.

Patentansprüche

1. Verfahren zum Schmieren eines Verbrennungsmotors, der ein Kurbelwellengehäuse sowie ein Getriebe und/oder eine Nasskupplung umfasst, wobei das Verfahren das Zuführen einer schmierenden Zusammensetzung zu dem Kurbelwellengehäuse und zu dem Getriebe und/oder der Nasskupplung umfasst, die Folgendes umfasst:

(a) ein Öl mit schmierender Viskosität und

(b) einen Viskositätsmodifizierer mit einem zahlengemittelten Molekulargewicht von 1000 bis 75.000, wobei es sich bei dem Viskositätsmodifizierer um ein Poly(meth)acrylat handelt, wobei der Viskositätsmodifizierer einen mittels CEC L-45-A-99 bestimmten Scherstabilitätsindex (SSI) von 22 oder weniger aufweist,

wobei die schmierende Zusammensetzung einen SAE-Viskositätsgrad von XW-Y aufweist, wobei X 0 bis 20 ist und Y 20 bis 50 ist, und wobei die schmierende Zusammensetzung einen Phosphorgehalt aus einem Metallhydrocarbyldithiophosphat von 0,12 Gew.-% oder weniger aufweist, wobei es sich bei dem Verbrennungsmotor um einen Viertakt-Motorradmotor handelt.

2. Verfahren nach Anspruch 1, wobei der Verbrennungsmotor ein allgemeines Ölreservoir aufweist, aus dem dieselbe schmierende Zusammensetzung dem Kurbelwellengehäuse und dem Getriebe und/oder der Nasskupplung zugeführt wird.
- 5 3. Verfahren nach Anspruch 1, wobei die schmierende Zusammensetzung dem Kurbelwellengehäuse und dem Getriebe oder mehreren Getrieben zugeführt wird.
4. Verfahren nach Anspruch 1, wobei die schmierende Zusammensetzung dem Kurbelwellengehäuse und der Nasskupplung zugeführt wird.
- 10 5. Verfahren nach Anspruch 1, wobei die schmierende Zusammensetzung dem Kurbelwellengehäuse und sowohl dem Getriebe (bzw. den Getrieben) als auch der Nasskupplung zugeführt wird.
- 15 6. Verfahren nach Anspruch 1, wobei der Viskositätsmodifizierer ein zahlengemitteltes Molekulargewicht von 2000 bis 60.000 oder von 8000 bis 40.000 aufweist.
7. Verfahren nach Anspruch 1, wobei der Viskositätsmodifizierer ein zahlengemitteltes Molekulargewicht von 1000 bis 20.000 oder von 25.000 bis 40.000 aufweist.
- 20 8. Verfahren nach Anspruch 1, wobei es sich bei dem Viskositätsmodifizierer um ein funktionalisiertes Poly(meth)acrylat handelt.
9. Verfahren nach Anspruch 8, wobei das Poly(meth)acrylat mit einem stickstoffhaltigen Monomer funktionalisiert ist.
- 25 10. Verfahren nach Anspruch 1, wobei der Viskositätsmodifizierer in einer Menge von 0,5 Gew.-% bis 95 Gew.-% oder 1 Gew.-% bis 40 Gew.-% der schmierenden Zusammensetzung vorhanden ist.
11. Verfahren nach Anspruch 1, wobei der Viskositätsmodifizierer einen mittels CEC L-45-A-99 bestimmten Scherstabilitätsindex (SSI) von 4 bis 18 aufweist.
- 30

Revendications

- 35 1. Procédé de lubrification d'un moteur à combustion interne comprenant un carter et au moins un élément parmi un engrenage et un embrayage à bain d'huile, ledit procédé comprenant la fourniture audit carter et à au moins un élément parmi lesdits engrenage et embrayage à bain d'huile d'une composition lubrifiante comprenant :
 - (a) une huile de viscosité lubrifiante ; et
 - (b) un modificateur de viscosité avec un poids moléculaire moyen en nombre de 1000 à 75 000, le modificateur de viscosité étant un poly(méth)acrylate, le modificateur de viscosité ayant un indice de stabilité au cisaillement (SSI) tel que déterminé par la méthode CEC L-45-A-99 de 22 ou moins,

la composition lubrifiante ayant un grade de viscosité SAE de XW-Y, X allant de 0 à 20 et Y allant de 20 à 50 ; et la composition lubrifiante ayant une teneur en phosphore provenant d'un dithiophosphate d'hydrocarbyle métallique de 0,12 % en poids ou moins, le moteur à combustion interne étant un moteur de motocycle à 4 temps.
- 45
2. Procédé de la revendication 1, dans lequel le moteur à combustion interne a un réservoir d'huile commun fournissant la même composition lubrifiante au carter et à au moins un élément parmi un engrenage et un embrayage à bain d'huile.
- 50 3. Procédé de la revendication 1, dans lequel la composition lubrifiante est fournie au carter et à l'engrenage ou une multiplicité d'engrenages.
4. Procédé de la revendication 1, dans lequel la composition lubrifiante est fournie au carter et à l'embrayage à bain d'huile.
- 55 5. Procédé de la revendication 1, dans lequel la composition lubrifiante est fournie au carter et à la fois à l'engrenage (ou aux engrenages) et à l'embrayage à bain d'huile.

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6. Procédé de la revendication 1, dans lequel le modificateur de viscosité a un poids moléculaire moyen de 2000 à 60 000, ou de 8000 à 40 000.
7. Procédé de la revendication 1, dans lequel le modificateur de viscosité a un poids moléculaire moyen en nombre de 1000 à 20 000, ou de 25 000 à 40 000.
8. Procédé de la revendication 1, dans lequel le modificateur de viscosité est un poly(méth)acrylate fonctionnalisé.
9. Procédé de la revendication 8, dans lequel le poly(méth)acrylate est fonctionnalisé avec un monomère contenant de l'azote.
10. Procédé de la revendication 1, dans lequel le modificateur de viscosité est présent dans une quantité de 0,5 % en poids à 95 % en poids, ou de 1 % en poids à 40 % en poids de la composition lubrifiante.
11. Procédé de la revendication 1, dans lequel le modificateur de viscosité a un indice de stabilité au cisaillement (SSI) tel que déterminé par la méthode CEC L-45-A-99 de 4 à 18.

REFERENCES CITED IN THE DESCRIPTION

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