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(54) **A lubricating oil composition**

Schmierölzusammensetzung

Composition d'huile lubrifiante

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(73) Proprietor: **NIPPON OIL COMPANY, LIMITED**
Tokyo (JP)

(72) Inventors:
- **Kagaya, Mineo**
  Fujisawa-shi, Kanagawa (JP)
- **Ishimaru, Mitsuaki**
  Tsurumi-ku, Kanagawa (JP)
- **Ishii, Hiroaki**
  Kawasaki-shi, Kanagawa (JP)

(74) Representative: **Silverman, Warren et al**
HASELTINE LAKE & CO.
Hazlitt House
28 Southampton Buildings
Chancery Lane
London WC2A 1AT (GB)

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EP 0 535 990 B1

Description

The present invention relates to a lubricating oil composition and more particularly to a lubricating oil composition which is excellent in biodegradability, high-temperature cleanliness and anti-seizure performance and is therefore conducive to environmental protection.

DE-A-2551173 describes a lubricant composition comprising a neutral complex ester formed from

(a) polyvalent branched aliphatic alcohols with 2-4 primary hydroxy groups and 4-10 carbon atoms and
(b) di- and/or trimeric fatty acids produced by polymerisation of unsaturated fatty acids with 16-18 carbon atoms, and
(c) saturated straight or branched chain aliphatic monocarboxylic acids with 6-16 carbon atoms, with the amount of hydroxy group esterified by monocarboxylic acids amounting to 50 to 90%. These complex esters are highly viscous and usable as engine oils for two-stroke engines, *inter alia.*

Two-stroke engines, however, raise problems as to possible environmental pollution since they discharge an unburned engine oil as an accompaniment of their exhaust gases due to their lubrication mechanism. For example, outboard engines used in rivers, lakes or oceans discharge exhaust gases containing unburned oil into the water thereby to raise problems as to water pollution due to unburned oil. Chain saws and other forestry machinery may also cause the pollution of forests and rivers due to the unburned oil.

In Europe, these has been much activity concerning attempts to establish laws, regulations and standards on the biodegradability of two-stroke engine oils from the standpoint of environmental protection. Because of this, attempts have been made to develop two-stroke engine oils having biodegradability and such oils have already been sold by several oil makers. These oils, in all cases, comprise, as a specific base oil an ester compound (based on a mixture of saturated and unsaturated fatty acid esters each having 16 - 18 carbon atoms) and a mineral oil-based solvent. They contain an amino amide type ashless dispersant as an additive.

These commercially available oils already passed the TC-WII test which is a performance standard of oils for outboard engines. However, when these oils are used in recently manufactured high-performance water-cooled outboard engines and air-cooled engines, they are considered to raise problems as to ring sticking and piston seizure due to their insufficient thermal stability as a lubricating oil.

Because of this, a biodegradable lubricating oil having better thermal stability and excellent lubricity has been sought.

An object of the present invention is to provide a lubricating oil having excellent performances in respect of biodegradability, high-temperature cleanliness, lubricity and anti-seizure performance. Another object is to provide a method for lubrication comprising the use of such a lubricating oil as above.

The present inventors made intensive studies to aim mainly at solving the above problems and, as the result of their studies, they found out that a lubricating oil comprising predetermined esters as main components satisfies the above-mentioned requirements, thus achieving the present invention.

More particularly, in a first aspect of the present invention, a lubricating oil composition, in contrast to DE-A-2551173, comprises as the main component an ester mixture, the ester mixture consisting of (A) 60 - 95 % by weight of an ester of a hindered alcohol with a straight-chain saturated fatty acid having 8 - 12 carbon atoms, and (B) 5 - 40 % by weight of a complex ester of a hindered alcohol with a straight-chain saturated fatty acid having 8 - 12 carbon atoms and also with an aliphatic dibasic acid having 2 - 50 carbon atoms.

In a second aspect of the present invention, a lubricating oil composition comprises (I) 100 parts by weight of an ester mixture consisting essentially of (A) 60 - 95 % by weight of an ester of a hindered alcohol and a straight-chain saturated fatty acid having 8 - 12 carbon atoms, and (B) 5 - 40 % by weight of a complex ester of a hindered alcohol with both a straight-chain saturated fatty acid having 8 - 12 carbon atoms and an aliphatic dibasic acid having 2 - 50 carbon atoms, and (II) not more than 30 parts by weight of a hydrocarbon-based solvent and/or a lubricating base oil.

The present invention will now be explained hereunder in more detail.

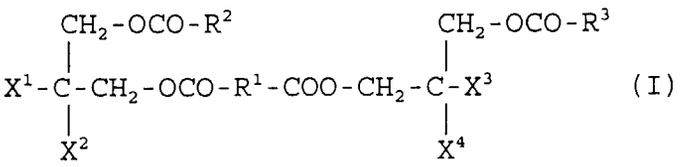
The ester mixture used in the present invention as the main ingredient is a mixture of (A) an ester of a hindered alcohol and a straight-chain saturated fatty acid having 8 - 12 carbon atoms, and (B) a complex ester of a hindered alcohol with both a straight-chain saturated fatty acid having 8 - 12 carbon atoms and an aliphatic dibasic acid having 2 - 50 carbon atoms.

In the preparation of this component (A), the hindered alcohol used is one in which the β-carbon atom of the hydroxyl group is a quaternary carbon atom. More specifically, the hindered alcohol preferably used includes dihydric to tetrahydric alcohols having 5 - 10 carbon atoms, and dimers and trimers thereof, such alcohol being exemplified by neopentyl glycol, 2-methyl-2-propyl-1, 3- propanediol, trimethylol ethane, trimethylol propane (TMP), trimethylol butane, pentaerythritol (PET), di- (trimethylol propane), tri- (trimethylol propane), di- (pentaerythritol) and tri(pentaerythritol).

The straight-chain saturated fatty acids having 8 - 12 carbon atoms used in the present invention include caprylic acid, pelargonic acid, capric acid and lauric acid. Furthermore, such fatty acids may be used in the form of a derivative such as an acid anhydride, acid halide and metal salt of the acids. In the preparation of the component (A), at least two different acids among these fatty acids may be esterified with the same hindered alcohol, or the resulting ester may have a hydroxyl group therein which remains without being esterified.

In the preparation of the component (B), the same hindered alcohol and the saturated fatty acid having 8 12 carbon atoms as may be used in the preparation of the above component (A) may be employed. The new specifically aliphatic dibasic acids having 2 - 50 carbon atoms used in said preparation include oxalic acid, malonic acid, succinic acid, glutaric acid, adipic acid, pimeric acid, suberic acid, azelaic acid and sebacic acid, as well as other acids having more carbon atoms than the above-mentioned acids. Among these acids, those having 6 - 40 carbon atoms are desirably used.

The component (B) may be exemplified by a complex ester represented by the following general formula (I).



(I)

wherein X^1 to X^4 may be identical with or different from each other and each represents an alkyl group having 1 - 4 carbon atoms or a group having the general formula $-CH_2-OCO-R^4$ (R^4 being an alkyl group having 7 - 11 carbon atoms). Also, in the formula (I), R^1 represents an alkylene or alkenylene group having 1 - 48 carbon atoms with the proviso that when the number of carbon atoms of a dibasic acid is 2, R^1 does not exist in the formula I. R^2 to R^4 may be identical with or different from each other and each represents a straight-chain alkyl group having 7 - 11 carbon atoms. In this case, R^1 corresponds to the alkylene group of a dibasic acid having 3 - 50 carbon atoms, while R^2 to R^4 each corresponds to the alkyl group of a straight-chain saturated fatty acid having 8 - 12 carbon atoms.

In this invention, the content of the above component (A) is 60 to 95%, preferably 70 to 90%, by weight based on the total weight of the specific base oil. The content of the above component (B) is 5 to 40%, preferably 10 to 30%, by weight, based on the total weight of the specific base oil. When the contents of the above components (A) and (B) do not fall respectively within the above ranges, the resulting composition will not possess appropriate viscosity. In addition, when the content of the above component (B) exceeds 40% by weight, the resulting composition will undesirably possess insufficient biodegradability. Furthermore, the composition of the present invention should have a kinematic viscosity of preferably 6 to 15 mm^2/s at a temperature of 100 °C.

The lubricating oil composition of the present invention may contain the above ester mixture alone. However, it may further contain a known hydrocarbon-based solvent and/or a known lubricating base oil as required. This hydrocarbon-based solvent may be one which is usually used for two-stroke engine oils, and it is exemplified by a petroleum-based hydrocarbon solvent and/or a synthesized hydrocarbon solvent each having a boiling point of 150 to 300 °C at atmospheric pressure. Specifically, these solvents are illustrated by Stoddard solvent, mineral spirits, kerosene fractions, n-paraffins, i-paraffins and propylene oligomers.

The lubricating base oil may be any which is usually used as a base oil for lubricating oils and it is exemplified by paraffinic and naphthenic mineral oils prepared by refining lubricating oil fractions which are obtained by distilling crude oils under atmospheric or a reduced pressure; poly-α-olefins (1-octene oligomer, 1-decene oligomer, etc.); polybutene, alkylbenzenes; alkylnaphthalenes; polyglycols; diesters (ditridecylglutarate, di-2-ethylhexyl adipate); diisodecyl adipate; di-tridecyl adipate; di-2-ethyl hexyl sebacate; esters of polyols with a straight-chain chain fatty acid having up to 7 or at least 13 carbon atoms or with a branched-chain fatty acid (trimethylolpropane stearate, trimethylolpropane oleate, pentaerithritol 2-ethylhexanoate, etc.); polyphenylethers; fluorine-based oils; and silicone-oils.

When the solvent and/or a lubricating base oil other than the above-mentioned ester mixture (the specific base oil) are/is to be added to the ester mixture, it is preferable to add the solvent and/or the lubricating base oil in a total amount of up to 30 parts, preferably up to 20 parts, by weight per 100 parts by weight of the specific base oil consisting of the ester mixture so as not to cause deterioration of the excellent thermal stability, lubricity and also biodegradability which are the features of this invention.

Moreover, the composition of this invention may incorporate various kinds of known additives for the purpose of further improving the performance of the composition, as required. The additives include basic calcium sulfonate, basic calcium phenate, basic calcium salicylate, alkenyl succinic acid imide, benzyl-amine, a detergent such as a polyalkenylamine, a pour point depressant such as a polymethacrylate, a rust preventing agent and an anti-foaming agent.

These additives may be added alone or jointly. They may be added in any optional amount and, usually, they may

each be added in an amount of up to 30, preferably 0.5 - 15, parts by weight per 100 parts by weight of the specific base oil.

Although the lubricating oil compositions of this invention are suitable especially for two-stroke engines such as outboards and chain saws, since they have excellent biodegradability, they are preferably used in engines for two-wheeled vehicles such as mopeds and motorcycles, and in portable power unit engines for lawnmowers and power generators. Furthermore, they can be used as a four-stroke engine oil, a hydraulic oil, a gear oil and a metal processing oil.

The present invention will be better understood by way of Examples and Comparative examples, without however, being limited to these Examples.

1. biodegradability and thermal stability

The biodegradability and thermal stability which are fundamental performance features of the oil compostions of this invention were evaluated.

(1) biodegradability

The biodegradability was measured by the coulometer method using a closed-system oxygen consumption measurement apparatus in a method usually called the MITI method which is one of the test methods prescribed by the Chemical Substances Control Law in Japan. In this method, incubation is effected at a temperature of 25°C for a period of time of 14 days.

Decomposition degree is represented by the following formula.

$$\text{Decomposition degree} = [(\text{BOD}-B)/\text{TOD}] \times 100$$

BOD: Biological Oxygen Demand of a test substance (Value found, mg)

B: Oxygen consumption by a culture medium into which activated sludge has been inoculated (Value found, mg)

TOD: Theoretical Oxygen Demand required for complete oxidation of the test substance (Value calculated, mg).

The value for TOD was determined by calculating the molecular formula obtained from the elemental analysis of the test substance (oil).

A test substance which showed a decomposition degree of 35 to 40 % in this test is considered to have undergone almost complete biodegradation, and, therefore, the biodegradability standard for the compositions of this invention has been determined in conformity with said decomposition degree.

(2) Thermal stability

Thermal stability was evaluated by a hot tube test (HTT) (This test is described in SAE Paper 81619, 1988). This test was carried out by installing a glass tube in an electric furnace and then pushing a test oil upwardly through the glass tube with air. The oil was degraded by being subjected to heat and oxidation when it passed through the glass tube. In this test, a merit rating is represented by the shade of lacquer-like color of a deposit on the inner wall of the glass tube. The merit rating is between 10 points when no deposit is found, and 0 point when a deposit is black in color. Because there is comparatively good correlation between piston cleanliness found by engine tests and HTT merit rating, the HTT is utilized as a screening test before subjecting the oil to an engine test. The compositions of this invention were produced which exhibit a HTT merit rating of at least 5 points at 280°C, 16 hrs as standard therefor.

The test results thus obtained are shown in Table 1.

Table 1

Example · Comp. Example	Component (A) wt. %		Component (B) wt. %		Other oils, parts by weight based on 100 parts by weight of (A) + (B)	Additives, parts by weight based on 100 parts by weight of (A) + (B)	Test result for biodegrability (MITI method) decomposition degree %	Test result for HTT at 280°C, over 16 hrs. the best = 10, the worst = 0
	A-1	A-2	B-1	B-2				
Ex. 1	95	-	5	-	0	ashless dispersant A 20	39	7
Ex. 2	60	-	-	40	diluent 5	ashless dispersant B 15	40	8
Ex. 3	-	80	20	-	diluent 10	ashless dispersant B 15	45	8
Ex. 4	80	-	20	-	diluent 5	ashless dispersant B 15	51	7
Ex. 5	-	70	-	30	mineral oil (SAE30) 5	ashless dispersant C 5 metallic detergent 1	39	7
Ex. 6	-	95	-	5	diluent 5	ashless decomposer B 25	38	5
Comp. Ex. 1	100 wt.% of TMP ester consisting mainly of fatty acid having 18 carbon atoms						45	3
Comp. Ex. 2	100 wt.% of PET ester consisting of fatty acid having 8 carbon atoms and iso-structure						3	10

Notes:
ashless dispersant A: bis type succinimide
ashless dispersant B: benzyl amine + aminoamide
ashless dispersant C: bis type succinimide
metallic detergent : basic calcium sulfonate

Table 1 (Continued)

Comp. Ex.	Component (A) wt. %		Component (B) wt. %		Other oils, parts by weight based on 100 parts by weight of (A) + (B)	Additives, parts by weight based on 100 parts by weight of (A) + (B)	Test result for biodegrability (MITI method) decomposition degree %	Test result for HTT at 280°C, over 16 hrs. the best = 10, the worst = 0
	A-1	A-2	B-1	B-2				
Comp. Ex. 3	(A-1) 100 wt.%						45	10
Comp. Ex. 4	(A-2) 100 wt.%						40	10
Comp. Ex. 5	(B-1) 100 wt.%						24	10
Comp. Ex. 6	(A-1) 50 wt.%, (B-1) 50 wt.%						30	10
Comp. Ex. 7	commercially available biodegradable two-cycle engine oil-1						43	0
Comp. Ex. 8	commercially available biodegradable two-cycle engine oil-2						40	0
Comp. Ex. 9	commercially available low-smoke exhaust gas type two-stroke engine oil-1						8	10
Comp. Ex. 10	commercially available mineral base oil for two-stroke engine oil						14	3
Comp. Ex. 11	commercially available low-smoke exhaust gas type two-stroke engine oil-2						10	3

Notes:

(A-1) : TMP ester of saturated fatty acid having 8-12 carbon atoms (mean molecular weight : 600)

(A-2) : PET ester of saturated fatty acid having 8-12 carbon atoms (mean molecular weight : 800)

(B-1) : TMP complex ester consisting of saturated fatty acid having 8-12 carbon atoms and aliphatic dibasic acid having 36 carbon atoms (mean molecular weight : 1300)

(B-2) : PET complex ester consisting of saturated fatty acid having 8-12 carbon atoms and aliphatic dibasic acid having 36 carbon atoms (mean molecular weight : 1300)

diluent : kerosene

Examples 1 to 6, which identify compositions of this invention, exhibited excellent biodegradability and thermal stability as compared with the Comparative Examples:

(1) Comparative Example 1 uses a TMP ester which consists mainly of a fatty acid (oleic acid) having 18 carbon atoms. This ester exhibited good biodegradability, but, however, showed poor thermal stability as compared with the composition of the present invention.
(2) Comparative Example 2 uses a PET ester which consists of a branched-chain fatty acid having 8 carbon atoms. This PET ester exhibited low biodegradability although it exhibited good thermal stability.
(3) Comparative Examples 3 and 4 used therein, alone, oils which were the same as components (A-1) and (A-2) of this invention, respectively. Each of these oils exhibited good biodegradability and thermal stability. However, when either of said oils is used alone as a lubricating oil, it shows a kinematic viscosity of less than 6 mm^2/s at 100°C. This viscosity is too low as a base oil for a two-stroke engine oil, and therefore, these oils are likely to exhibit insufficient lubricity and insufficient antiseizure performance. In addition, Comparative Example 5 used therein, alone, an oil which was the same as the component (B) of this invention. Unlike the oils in Comparative Examples 3 and 4, the oil used alone in Comparative Example 5 exhibited a kinematic viscosity of higher than 30 mm^2/s at 100°C, and raised problems as to its detergency and fluidity.
(4) Comparative Example 6 used therein an oil prepared by mixing the components (A) and (B) of this invention. The oil so prepared exhibited inferior biodegradability since the mixing ratio was outside that specified for the composition of this invention.
(5) Comparative Examples 7 and 8 show commercially-available biodegradable two-stroke engine oils respectively. These oils use therein the same ester as used in Comparative Example 1 as a main component of the base oil. In contrast to these Comparative Examples, it is apparent that the compositions of this invention set out in Examples 1 to 6 were remarkably improved in thermal stability. In addition, Comparative Example 9 shows a polybutene base oil for a commercially-available low-smoke exhaust gas type two-stroke engine oil. This polybutene base oil exhibits good thermal stability in the HTT, but it has low biodegradability. Comparative Example 10 shows a mineral base oil for two-stroke engine oil, and Comparative Example 11 shows an oil for a commercially-available low-smoke exhaust gas type two-stroke engine oil, in which the base oil has partly been replaced by a polybutene base oil. Such a mineral base oil possesses poor thermal stability and biodegradability.
(6) As shown in the Examples, the composition of this invention comprises the components (A) and (B) in the specified mixing ratio thereby enabling the composition to have a suitable range of viscosity values for use in two-stroke engine oils, and also to exhibit excellent lubricity as well as excellent biodegradability and thermal stability which are important properties of the composition of this invention.

2. Engine test results

(1) High-temperature cleanliness test on motorcycle engines

Using an air-cooled two-stroke, 123cc displacement single engine for motorcycles, a high-temperature cleanliness test was carried out under conditions of an engine speed of 7000rpm, full engine load, a plug gasket temperature of 260°C, a fuel:oil mixing ratio of 20:1 and test time of 3hrs.

As shown in Table 2, the composition of this invention in Example 3 showed excellent anti-seizure performance between the piston and the cylinder as compared with Comparative Examples 7 and 8 which show the performance of commercially-available biodegradable two-stroke engine oils. This composition of Example 3 also showed excellent piston cleanliness without ring sticking after the test.

Table 2

Test oils		Ex. 3	Comp. Ex. 7	Comp. Ex. 8
ring sticking,	top ring	10	0	6
	second ring	10	0	6
ring land	top	4.1	1.5	3.8
	second	5.6	0.3	4.1
piston skirt		9.4	5.3	9.2
undercrown		2.9	0.6	2.0
Total: 60 points (full marks)		42.0	7.7	33.1

Table 2 (continued)

Test oils	Ex. 3	Comp. Ex. 7	Comp. Ex. 8
Note: Since the piston seizure took place within 2.5 hours in Comparative Example 7, Comparative Example 7 shows the piston cleanliness at that time			

(2) Cleanliness test on engine for electric generator

Using a 63cc displacement single-cylinder engine as employed for a generator, an engine cleanliness test was carried out under conditions of full engine load (800 W) and test time of 5hrs. A plug gasket temperature was set at 200°C by covering about 50% of the air intake of a forced cooling fan. The test was carried out at a fuel:oil mixing ratio of 50 : 1 (mixing lubrication).

As shown in Table 3, use of the composition of Example 4 according to this invention led to excellent piston cleanliness without causing ring sticking as compared with Comparative Example 7 which was for a commercially available biodegradable two-stroke engine oil and with Comparative Example 8 which is for use of a mineral base oil. The composition of Example 4 also yielded extremely low cylinder head deposits.

Table 3

Test oils		Ex. 4	Comp. Ex. 7	Comp. Ex. 10
ring sticking,	top ring	10	8	10
	second ring	10	10	10
ring land	top	6.7	1.0	1.6
	second	8.2	5.3	4.4
piston skirt		10	9.3	9.2
undercrown		10	2.2	1.6
cylinder head		10	8.9	5.7
Total: 70 points (full marks)		64.9	44.7	42.5

(3) Engine cleanliness test on chain saw engine

An engine cleanliness test was carried out on a single-cylinder engine used for a chain saw engine and having a displacement of 45 cc, under conditions of an engine speed of 9000rpm, full engine load, a plug gasket temperature of 280°C, a fuel:oil mixing ratio of 50:1 and test time of 30 hrs (mixing lubrication).

As shown in Table 4, the composition of Example 4 according to this invention showed excellent ring sticking resistance and piston cleanliness as compared with Comparative Example 11 which was an oil to be used as a commercially-available low-smoke type two-stroke engine oil.

Table 4

Test oils		Ex. 4	Comp. Ex. 11
ring sticking,	top ring	7.0	5.0
	second ring	10	10
ring land	top	8.4	3.9
	second	9.5	5.2
piston skirt		10	9.0
undercrown		2.4	0.9
Total: 60 points (full marks)		47.3	34.0

As described above, several indications of excellent performance in respect of the composition according to this invention were provided in the tests, and, further, the same results were obtained even in other engine tests. In addition, the composition of this invention has already passed the TC-WII which is a standard of NMMA (National Marine Man-

ufacturers Association) for two-stroke engine oils for use in outboard engines and has also passed the CEC L-33-T-82 which is a test method for evaluating biodegradability of two-stroke engine oils for outboard engines (the method of biodegradability test is different from the MITI method of Japan) and which indicates that a standard for biodegradability is at least 67 % biodegradation (for example, Example 4 exhibited a decomposition degree of 87 %, and, on the other hand, Comparative Example 7 showed 67 % in this test method).

As will be understood from the above, the composition according to this invention is a lubricating oil which can prevent piston ring sticking and piston seizure which have become problems in the market.

Claims

1. A lubricating oil composition comprising an ester mixture as the main ingredient, the ester mixture consisting of

   (A) 60 - 95 % by weight of an ester of a hindered alcohol with a straight-chain saturated fatty acid having 8 - 12 carbon atoms, and
   (B) 5 - 40 % by weight of a complex ester of a hindered alcohol with a straight-chain saturated fatty acid having 8 - 12 carbon atoms and also with an aliphatic dibasic acid having 2 - 50 carbon atoms.

2. A lubricating oil composition comprising

   (I) 100 parts by weight of an ester mixture consisting of

      (A) 60 - 95 % by weight of an ester of a hindered alcohol with a straight-chain saturated fatty acid having 8 - 12 carbon atoms, and
      (B) 5 - 40 % by weight of a complex ester of a hindered alcohol with a straight-chain saturated fatty acid having 8 - 12 carbon atoms and also with an aliphatic dibasic acid having 2 - 50 carbon atoms,

   (II) not more than 30 parts by weight of a hydrocarbon based solvent and/or a lubricating base oil.

3. A method for lubrication comprising the use of a lubricating oil composition comprising an ester mixture as the main ingredient, the ester mixture consisting of

   (A) 60 - 95 % by weight of an ester of a hindered alcohol with a straight-chain saturated fatty acid having 8 - 12 carbon atoms, and
   (B) 5 - 40 % by weight of a complex ester of a hindered alcohol with a straight-chain saturated fatty acid having 8 - 12 carbon atoms and also with an aliphatic dibasic acid having 2 - 50 carbon atoms.

4. A method for lubrication comprising the use of a lubricating oil composition comprising

   (I) 100 parts by weight of an ester mixture consisting of

      (A) 60 - 95 % by weight of an ester of a hindered alcohol with a straight-chain saturated fatty acid having 8 - 12 carbon atoms and
      (B) 5 - 40 % by weight of a complex ester of a hindered alcohol with a straight-chain saturated fatty acid having 8 - 12 carbon atoms and also with an aliphatic dibasic acid having 2 - 50 carbon atoms, and

   (II) not more than 30 parts by weight of a hydrocarbon based solvent and/or a lubricating base oil.

5. A method for lubrication according to claim 3 or 4, which is applied to a two-stroke engine.

Patentansprüche

1. Schmierölzusammensetzung, die als Hauptbestandteil eine Estermischung umfaßt, bestehend aus

   (A) 60 bis 95 Gew.% Ester eines gehinderten Alkohols mit einer geradkettigen gesättigten Fettsäure mit 8 bis 12 Kohlenstoffatomen und
   (B) 5 bis 40 Gew.% komplexer Ester eines gehinderten Alkohols mit einer geradkettigen ungesättigten Fett-

säure mit 8 bis 12 Kohlenstoffatomen sowie mit einer aliphatischen dibasischen Säure mit 2 bis 50 Kohlenstoffatomen.

2. Schmierölzusammensetzung, beinhaltend

(I) 100 Gewichtsteile Estermischung, bestehend aus

(A) 60 bis 95 Gew.% Ester eines gehinderten Alkohols mit einer geradkettigen gesättigten Fettsäure mit 8 bis 12 Kohlenstoffatomen und
(B) 5 bis 40 Gew.% komplexer Ester eines gehinderten Alkohols mit einer geradkettigen gesättigten Fettsäure mit 8 bis 12 Kohlenstoffatomen sowie mit einer aliphatischen dibasischen Säure mit 2 bis 50 Kohlenstoffatomen,

(II) nicht mehr als 30 Gewichtsteile eines Lösungsmittels auf Kohlenwasserstoffbasis und/oder eines Schmierrohöls.

3. Schmierverfahren, wobei eine Schmierölzusammensetzung verwendet wird, die als Hauptbestandteil eine Estermischung beinhaltet, bestehend aus

(A) 60 bis 95 Gew.% Ester eines gehinderten Alkohols mit einer geradkettigen gesättigten Fettsäure mit 8 bis 12 Kohlenstoffatomen und
(B) 5 bis 40 Gew.% komplexer Ester eines gehinderten Alkohols mit einer geradkettigen gesättigten Fettsäure mit 8 bis 12 Kohlenstoffatomen sowie einer aliphatischen dibasischen Säure mit 2 bis 50 Kohlenstoffatomen.

4. Schmierverfahren, wobei eine Schmierölzusammensetzung verwendet wird, beinhaltend

(I) 100 Gewichtsteile Estermischung, bestehend aus

(A) 60 bis 95 Gew.% Ester eines gehinderten Alkohols mit einer geradkettigen gesättigten Fettsäure mit 8 bis 12 Kohlenstoffatomen und
(B) 5 bis 40 Gew.% komplexer Ester eines gehinderten Alkohols mit einer geradkettigen gesättigten Fettsäure mit 8 bis 12 Kohlenstoffatomen sowie mit einer aliphatischen dibasischen Säure mit 2 bis 50 Kohlenstoffatomen,

(II) nicht mehr als 30 Gewichtsteile eines Lösungsmittels auf Kohlenwasserstoffbasis und/oder eines Schmierrohöls.

5. Schmierverfahren nach Anspruch 3 oder 4, das in einem 2-Takt-Motor verwendet wird.

Revendications

1. Composition d'huile lubrifiante comprenant, comme principal ingrédient, un mélange d'esters constitué de

A) 60 à 95 % en poids d'un ester d'un alcool stériquement encombré et d'un acide gras saturé à chaîne linéaire comportant de 8 à 12 atomes de carbone, et de
B) 5 à 40 % en poids d'un ester complexe d'un alcool stériquement encombré, d'un acide gras saturé à chaîne linéaire comportant de 8 à 12 atomes de carbone et d'un diacide aliphatique comportant de 2 à 50 atomes de carbone.

2. Composition d'huile lubrifiante comprenant

I) 100 parties en poids d'un mélange d'esters constitué de

A) 60 à 95 % en poids d'un ester d'un alcool stériquement encombré et d'un acide gras saturé à chaîne linéaire comportant de 8 à 12 atomes de carbone, et de
B) 5 à 40 % en poids d'un ester complexe d'un alcool stériquement encombré, d'un acide gras saturé à chaîne linéaire comportant de 8 à 12 atomes de carbone et d'un diacide aliphatique comportant de 2 à

50 atomes de carbone, et

II) au plus 30 parties en poids d'un solvant à base d'hydrocarbures et/ou d'une huile de base lubrifiante.

3. Procédé de lubrification, comportant le fait d'employer une composition d'huile lubrifiante comprenant, comme principal ingrédient, un mélange d'esters constitué de

A) 60 à 95 % en poids d'un ester d'un alcool stériquement encombré et d'un acide gras saturé à chaîne linéaire comportant de 8 à 12 atomes de carbone, et de
B) 5 à 40 % en poids d'un ester complexe d'un alcool stériquement encombré, d'un acide gras saturé à chaîne linéaire comportant de 8 à 12 atomes de carbone et d'un diacide aliphatique comportant de 2 à 50 atomes de carbone.

4. Procédé de lubrification, comportant le fait d'employer une composition d'huile lubrifiante comprenant

I) 100 parties en poids d'un mélange d'esters constitué de

A) 60 à 95 % en poids d'un ester d'un alcool stériquement encombré et d'un acide gras saturé à chaîne linéaire comportant de 8 à 12 atomes de carbone, et de
B) 5 à 40 % en poids d'un ester complexe d'un alcool stériquement encombré, d'un acide gras saturé à chaîne linéaire comportant de 8 à 12 atomes de carbone et d'un diacide aliphatique comportant de 2 à 50 atomes de carbone, et

II) au plus 30 parties en poids d'un solvant à base d'hydrocarbures et/ou d'une huile de base lubrifiante.

5. Procédé de lubrification, conforme à la revendication 3 ou 4, appliqué à un moteur à deux temps.