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⑤④ **Lubricant compositions for autotraction.**

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EP-A- 0 089 709
EP-A- 0 154 363
US-A- 2 758 975

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Description

This invention relates to an improved lubricant composition for use in internal combustion engines.

It is known in the art to use synthetic bases in formulating lubricant compositions both of single grade and of multigrade type. In this respect, synthetic bases are able to eliminate or at least alleviate the drawbacks often encountered when using only mineral bases, these requiring 1) the presence of extremely fluid fractions to obtain the desired viscosity at low temperature and to limit volatility, 2) the presence of a high percentage of viscosity index improvers to improve the initial VI, and 3) other additives for satisfying all the other lubricant performance requirements.

For use in internal combustion engines, lubricant compositions must possess certain characteristics, namely thermal stability, oxidation resistance, low volatility and such viscosity-temperature characteristics as to allow both cold starting and good lubrication at maximum operating temperature.

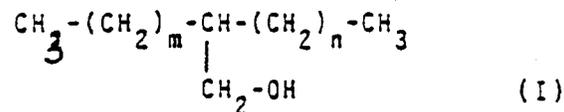
Lubricant compositions which have been proposed for this purpose include those containing higher dialkyl carbonates in combination with a mineral oil and usual additives. These compositions, which are described, for example, in US-A-2 387 999, US-A-2 758 975, US-A-3 642 858 and EP-A-89 709, result in various improvements as compared with compositions based on carboxylic esters, in particular in relation to increased thermal, hydrolytic and oxidative stability.

A particular class of higher alkyl carbonates has now been found, which results in a general rheological and engine performance improvement in the lubricant compositions in which they are incorporated, and thus make them desirable for use as high performance lubricant compositions for 4-stroke gasoline and Diesel engines.

The invention, therefore, provides an automotive lubricant composition consisting of:

- a) from 0% to 90% by weight of a mineral oil base;
 - b) from 0% to 90% by weight of a synthetic oil base;
 - c) from 5% to 50% by weight of a dialkyl carbonate;
 - d) from 6% to 12% by weight of conventional additives, and
 - e) from 0% to 15% of by weight of viscosity-index improvers and pour point improvers,
- characterized in that

component c) is the product of the transesterification of a dialkyl carbonate with an alcoholic mixture consisting of at least 98% by weight of branched alcohols having the general formula:



wherein m is an integer and n is nil or an integer, with the proviso that the total number of carbon atoms in the molecule (I) is from 10 to 18.

It is preferred that the total number of carbon atoms in the molecule (I) is from 13 to 16.

A preferred composition as defined above is one in which:

- Component a) is present in an amount of from 0% by weight to 60% by weight;
- Component b) is present in an amount of from 20% by weight to 60% by weight;
- Component c) is present in an amount of from 15% by weight to 30% by weight;
- Component d) is present in an amount of from 8% by weight to 10% by weight, and
- Component e) is present in an amount of from 5% by weight to 10% by weight.

As to component a) it can be a lubricating oil obtained by distilling and refining petroleum and has a Viscosity Index V.I. of from 102 to 108, a pour point of from -12°C to -6°C and a Noack evaporation loss of from 12% to 42%.

Component b) can be the product of the polymerization of terminal or internal olefins, or of the isomerization and/or alkylation of petroleum fractions.

Component d) can comprise dispersants, antiwear additives, metal passivators and copper deactivators, superbasic and neutral detergents, and antioxidants.

Component e) can comprise viscosity-index-raising additives and pour point depressants.

Preferred mixtures are those in which the $-\text{CH}_2-\text{OH}$ group of (I) is prevalently in position 2 of the chain.

Mixtures of alcohols (I) suitable for the purpose include the branched fraction of the oxo-alcohols obtained by hydroformylation, using carbon monoxide and hydrogen, of linear or essentially linear olefins with a statistical internal or terminal double bond, operating with cobalt or rhodium catalysts. This branched oxo-alcohol fraction can be separated from the linear fraction by fractional crystallization operating in the presence of a

hydrocarbon or ether solvent, as described for example in US-A-4,670,606. According to this patent, a mixture of linear and branched chain oxo-alcohols is dissolved in a liquid hydrocarbon solvent containing from 3 to 5 carbon atoms in the molecule, or in methyl tert-butyl ether. The solution is cooled to a temperature within the range of -20°C to -52°C to cause separation of a solid phase consisting of the linear oxo-alcohols, and a liquid phase consisting of a solution of the branched oxo-alcohols in the chosen solvent. The branched oxo-alcohols can generally be separated from this solution with a purity of the order of 95%, and be purified by further crystallization to obtain the mixture of alcohols (I) suitable for the purposes of the present invention, with a purity exceeding 98% and preferably exceeding 99%.

Such a mixture of alcohols (I) is then transesterified with a dialkyl carbonate to give component c) of the composition of the present invention. This reaction can be effected by bringing the reagents into contact in the presence of a basic catalyst operating at high temperature and under reduced pressure, and eliminating the lower aliphatic alcohol evolved as the reaction by-product, as is well known in the art and described in the examples given in EP-A-89,709. Preferred dialkyl carbonates are dimethyl carbonate and diethyl carbonate. Active transesterification catalysts useful for the purpose are sodium methylate and sodium ethylate. On termination of the transesterification reaction the long-chain dialkyl carbonate is recovered to constitute component c) of the composition of the present invention, its characteristics falling generally within the following value ranges (general and preferred):

20	Average molecular weight:	340-560 (preferred 420-510)
25	Viscosity 100°C cSt (ASTM D455):	3-12 (preferred 4-8)
	Viscosity -30°C cP (ASTM D2602):	800-5000
30	Viscosity index V.I. (ASTM D2270):	120-140
	Pour point (°C) (ASTM D97):	-60 to -30
	Flash point COC (°C) (ASTM D92):	220-350
35	Noack volatility (%) (DIN 51581):	15-2
	Copper corrosion (ASTM D130):	Classif. 1 slight tarnish
40	TAN (mg KOH/g) (ASTM D 974):	0.01-0.05

Such a dialkyl carbonate also has desirable characteristics in relation to low temperature rheology values, oxidation stability, elastomer compatibility, biodegradability and toxicity.

Component d) of the composition of the present invention consists of a parcel of additives usually used in lubricants and specifically dispersants, antiwear and antirust additives, metal passivators and copper deactivators, detergent additives (superbasic and neutral) and antioxidants. These additives are usually chosen from the following classes of compounds: alkyl/alkenyl succinimides, succinic esters; alkyl/aryl dithiophosphates of zinc and olefins; ethoxylates, esters and hemiesters of substituted succinic acids; unsaturated or carbonyl compounds of chelating action; heterocyclic compounds; metal salts (neutral and superbasic) of alkyl and aryl sulphonic acids, salicylic acids, phenols and substituted phenols; sterically hindered amines and phenols; sulphurated compounds.

Component e) of the composition of the present invention consists of a collection of additives able to raise the viscosity index and lower the pour point of the resultant lubricant composition.

These additives are usually chosen from the following classes of compounds: olefinic copolymers, methacrylic copolymers, olefinic/methacrylic copolymers. Said additives can also have other properties such as antioxidant, dispersant and antiwear, together with the basic properties of viscosity index and pour point improvers.

Typical lubricant compositions suitable for four-stroke gasoline and diesel engines contain the aforesaid

components in the following weight percentages:

Composition	1	2	3	4	5	6
a)	60	40	20	0	0	0
b)	10	20	30	40	42	44
c)	10	20	30	40	42	44
d)	10	10	10	10	8	6
e)	10	10	10	10	8	6

The long-chain dialkyl carbonate used as component c) in the lubricant compositions enables lubricant compositions for autotraction to be formulated possessing unexpectedly good overall rheological and engine performance characteristics. In this respect, the particular dialkyl carbonate structure enables a high viscosity index, a low pour point and a low volatility to be obtained simultaneously. In addition the high polarity of the carbonate group together with its structural characteristics enables high engine performance to be obtained together with a reduction in the level of addition of component d). In particular the high polarity results in good dispersing action towards engine sludge (enabling dispersants to be reduced by about 30% in the lubricant composition), the greasing of metal surfaces subject to wear (enabling antiwear additives to be reduced by about 20% in the lubricant composition), and an antirust and electrochemical protection action on ferrous and non-ferrous metal surfaces (enabling antirust additives, metal passivators and copper deactivators to be reduced by about 30%). The high thermal and oxidative stability of component c) enables the antioxidant additives to be reduced by about 30% in the lubricant composition, and the absence of acid compounds deriving from decomposition phenomena enables the superbasic detergent additives to be reduced by about 20%. Finally, component c) of the composition is practically inert towards the elastomers usually present in the lubrication circuit. As a result, lubricant compositions can be formulated with a medium-high nitrogen content, avoiding the addition of specific additives normally introduced to overcome the elastomer compatibility tests scheduled in the most severe specifications such as CCMC and VW specifications.

It should be noted that in the known art oxo-alcohols are described as alcohols suitable for preparing long-chain dialkyl carbonates for lubricant compositions, however without separation of the linear fraction from the branched fraction. According to the present invention the use of the mixture of alcohols (I) with the aforesaid characteristics is critical in order to obtain the required characteristics for the dialkyl carbonates and for the lubricant compositions which incorporate them, as will be apparent from the experimental examples which are given hereinafter to better illustrate the present invention.

EXAMPLE 1

A mixture of oxo-alcohols of the following characteristics is used:

- number of carbon atoms 13-16
- average molecular weight 220
- linear fraction 40%
- branched fraction 60%

This oxo-alcohol mixture is the product of the hydroformylation of substantially linear olefins with carbon monoxide and hydrogen in the presence of a catalyst.

The mixture is subjected to fractional crystallization at low temperature in the presence of a hydrocarbon solvent as described in US-A-4,670,606, to separate a solid linear alcohol fraction from a liquid fraction containing 95% by weight of branched alcohols. This liquid fraction is purified by a second fractional crystallization similar to the first, to separate a liquid fraction with a branched alcohol content exceeding 99% by weight.

In this manner a mixture of alcohols of formula (I) is obtained having the following distribution:

- C₁₃ alcohol content 6% by weight

- C₁₄ alcohol content 48% by weight
- C₁₅ alcohol content 42% by weight
- C₁₆ alcohol content 4% by weight

5 EXAMPLE 2

The mixture of branched alcohols (I) obtained in Example 1 is transesterified with dimethyl carbonate operating with sodium ethylate as catalyst, as described in European patent application No. 89,709, to obtain a dialkyl carbonate (I) with an average molecular weight of 470 and having the following characteristics:

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Viscosity 100°C cSt	4.16
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Viscosity -30°C cP	1600
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Viscosity index V.I.	125
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Pour point (°C)	-40
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COC Flash point (°C)	240
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Noack volatility (%)	13
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Copper corrosion	Classif. 1 slight tarmish
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TAN (mg KOH/g)	0.05
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EXAMPLE 3

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For comparison purposes the linear and branched oxo-alcohol mixture obtained in the hydroformylation reaction is transesterified (without previous separation) with dimethyl carbonate using sodium ethylate as catalyst in accordance with Example 2, to obtain a dialkyl carbonate (II) with an average molecular weight of 470, a viscosity index of 130, a pour point of +12°C and a Noack volatility of 15%.

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EXAMPLE 4

The lubricant composition (A) of the present invention and the comparison lubricant composition (B) are prepared in accordance with the following Table I.

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TABLE I

Composition	(A)	(B)
mineral base oil	43	43
synthetic base oil	10	10
dialkyl carbonate (I)	30	--
dialkyl carbonate (II)	--	30
additives parcel	8	8
viscosity index and pour point improvement additives	9	9

The compositions (A) and (B) are subjected to a series of rheological and laboratory tests aimed at evaluating the extent to which they satisfy the requirements of the European Sequence scheduled by constructors for CCMC oil classification and the requirements of the American sequence scheduled by constructors for API oil classification. The results are given in the following Table II.

TABLE II

Rheological and laboratory evaluation			
Characteristics	Comp. (A)	Comp. (B)	Limits*
viscosity at 100°C (cSt)	13.5	13.7	12.5-16.3
viscosity at -25°C (cPs)	3450	>6000	3500 max
BPT (°C)	-39	-15	-30 max
stable pour point (°C)	-42	-18	-35 max
HTS viscosity at 150°C			
10 ⁶ sec ⁻¹ (cPs)	3.6	3.6	3.5 min
Noack volatility (%)	12	14	13 max
elastomer compatibility	yes	yes	
foaming	no	no	

* specification API and CCMC limits for 5W/40 grading.

From the foregoing data it can be seen that the lubricant composition (A) in accordance with the present invention satisfies all the requirements of the American API and European CCMC Sequences. In contrast, the comparison lubricant composition (B) does not satisfy the requirements of viscosity at -25°C, BPT, stable pour point or Noack volatility. This behaviour is related to the different physico-chemical characteristics of the dialkyl

carbonates (I) and (II) used in the compositions.

With regard to the engine tests scheduled by the same American API and European CCMC sequences, both the lubricant compositions satisfy all tests by a wide margin on the set limits. However only by using the dialkyl carbonates (I) of the present invention are lubricant compositions obtained which have optimum performance characteristics from both the engine and rheological aspects.

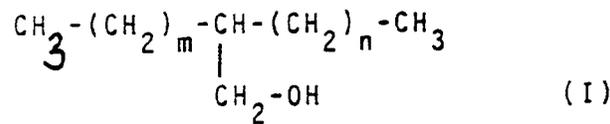
Claims

Claims for the following Contracting States : AT, BE, CH, DE, DK, FR, GB, GR, LI, LU, NL, SE

1. An automotive lubricant composition consisting of:

- a) from 0% to 90% by weight of a mineral oil base;
 - b) from 0% to 90% by weight of a synthetic oil base;
 - c) from 5% to 50% by weight of a dialkyl carbonate;
 - d) from 6% to 12% by weight of conventional additives, and
 - e) from 0% to 15% of by weight of viscosity-index improvers and pour point improvers,
- characterized in that

component c) is the product of the transesterification of a dialkyl carbonate with an alcoholic mixture consisting of at least 98% by weight of branched alcohols having the general formula:



wherein m is an integer and n is nil or an integer, with the proviso that the total number of carbon atoms in the molecule (I) is from 10 to 18.

2. Composition according to claim 1, wherein said alcoholic mixture used to prepare component c) is the branched fraction of the oxo alcohols that are obtained by hydroformylating with hydrogen and carbon monoxide predominantly linear olefins having a statistic internal or terminal double bond by the agency of a Co-based or an Rh-based catalyst, said branched fraction being separated from the linear fraction by fractional crystallization in the presence of a hydrocarbonaceous or an ethereal solvent.

3. Composition according to claim 1, wherein the total number of carbon atoms in (I) is from 13 to 16.

4. Composition according to claim 1, wherein the component c) has the following properties:

- Average molecular weight 340-560
- Kinematic viscosity at 100°C:
(ASTM D455) 3.10⁻⁶ m²/s-12.10⁻⁶ m²/s (3 cSt-12 cSt)
- Dynamic viscosity at -30°C:
(ASTM D2602) 0,8 Ns/m²-5 Ns/m² (800 cP-5000 cP)
- Viscosity Index V.I.(ASTM D2270) 120-140
- Pour Point (ASTM D97) -60°C to -30°C
- Flash Point COC (ASTM D92) 220°C-350°C
- Noack evaporation loss (DIN 51581) 12% to 2%
- Copper Corrosion (ASTM D130) Classif. 1 slight tarmish
- TAN (mg KOH/g) (ASTM D974) 0,01-0,05

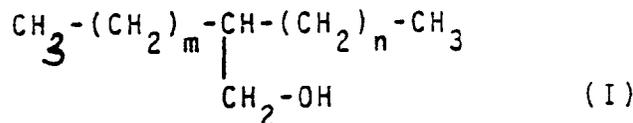
5. Composition according to Claim 1, wherein:

- Component a) is present in an amount of from 0% by weight to 60% by weight;
- Component b) is present in an amount of from 20% by weight to 60% by weight;
- Component c) is present in an amount of from 15% by weight to 30% by weight;
- Component d) is present in an amount of from 8% by weight to 10% by weight, and
- Component e) is present in an amount of from 5% by weight to 10% by weight.

6. Composition according to Claim 1, wherein the component a) is a lubricating oil obtained by distilling and refining petroleum and has a Viscosity Index V.I. of from 102 to 108, a pour point of from -12°C to -6°C and a Noack evaporation loss of from 12% to 42%.
- 5 7. Composition according to Claim 1, wherein the component b) is the product of the polymerization of terminal or internal olefins, or of the isomerization and/or alkylation of petroleum fractions.
8. Composition according to Claim 1, wherein the component d) comprises dispersants, antiwear additives, metal passivators and copper deactivators, superbasic and neutral detergents, and antioxidants.
- 10 9. Composition according to Claim 1, wherein the component e) comprises viscosity-index-raising additives and pour point depressants.
- 15 10. Composition according to Claim 4, wherein the component c) has an average molecular weight of from 420 to 510 and a kinematic viscosity at 100°C (ASTM D455) of from $4 \cdot 10^{-6}$ m²/s to $8 \cdot 10^{-6}$ m²/s (4 cSt-8 cSt).

Claims for the following Contracting State : ES

- 20 1. Process for preparing an automotive lubricant composition, characterized in that it comprises the step of combining together:
- a) from 0% to 90% by weight of a mineral oil base;
- b) from 0% to 90% by weight of a synthetic oil base;
- 25 c) from 5% to 50% by weight of a dialkyl carbonate, which is the product of the transesterification of a dialkyl carbonate with an alcoholic mixture consisting of at least 98% by weight of branched alcohols having the general formula:



- 30 wherein m is an integer and n is nil or an integer, with the proviso that the total number of carbon atoms in the molecule (I) is from 10 to 18;
- 35 d) from 6% to 12% by weight of conventional additives, and
- e) from 0% to 15% of by weight of viscosity-index improvers and pour point improvers,

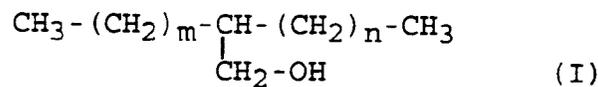
- 40 2. Process according to Claim 1, characterized in that said alcoholic mixture used to prepare component c) is the branched fraction of the oxo alcohols that are obtained by hydroformylating with hydrogen and carbon monoxide predominantly linear olefins having a statistic internal or terminal double bond by the agency of a Co-based or an Rh-based catalyst, said branched fraction being separated from the linear fraction by fractional crystallization in the presence of a hydrocarbonaceous or an ethereal solvent.
- 45 3. Process according to Claim 1, characterized in that the total number of carbon atoms in (I) is from 13 to 16.
4. Process according to Claim 1, characterized in that the component c) has the following properties:
- | | |
|------------------------------------|--|
| Average molecular weight | 340-560 |
| Kinematic viscosity at 100°C: | |
| (ASTM D455) | $3 \cdot 10^{-6}$ m ² /s- $12 \cdot 10^{-6}$ m ² /s (3 cSt-12 cSt) |
| Dynamic viscosity at -30°C: | |
| (ASTM D2602) | 0,8 Ns/m ² -5 Ns/m ² (800 cP-5000 cP) |
| Viscosity Index V.I.(ASTM D2270) | 120-140 |
| Pour Point (ASTM D97) | -60°C to -30°C |
| Flash Point COC (ASTM D92) | 220°C-350°C |
| Noack evaporation loss (DIN 51581) | 12% to 2% |
| Copper Corrosion (ASTM D130) | Classif. 1 slight tarmish |
| TAN (mg KOH/g) (ASTM D974) | 0,01-0,05 |
- 55

5. Process according to Claim 1, characterized in that:
 Component a) is present in an amount of from 0% by weight to 60% by weight;
 Component b) is present in an amount of from 20% by weight to 60% by weight;
 Component c) is present in an amount of from 15% by weight to 30% by weight;
 Component d) is present in an amount of from 8% by weight to 10% by weight, and
 Component e) is present in an amount of from 5% by weight to 10% by weight.
6. Process according to Claim 1, characterized in that the component a) is a lubricating oil obtained by distilling and refining petroleum and has a Viscosity Index V.I. of from 102 to 108, a pour point of from -12°C to -6°C and a Noack evaporation loss of from 12% to 42%.
7. Process according to Claim 1, characterized in that the component b) is the product of the polymerization of terminal or internal olefins, or of the isomerization and/or alkylation of petroleum fractions.
8. Process according to Claim 1, characterized in that the component d) comprises dispersants, antiwear additives, metal passivators and copper deactivators, superbasic and neutral detergents, and antioxidants.
9. Process according to Claim 1, characterized in that the component e) comprises viscosity-index-raising additives and pour point depressants.
10. Process according to Claim 4, characterized in that the component c) has an average molecular weight of from 420 to 510 and a kinematic viscosity at 100°C (ASTM D455) of from $4 \cdot 10^{-6} \text{ m}^2/\text{s}$ to $8 \cdot 10^{-6} \text{ m}^2/\text{s}$ (4 cSt-8 cSt).

Patentansprüche

Patentansprüche für folgende Vertragsstaaten : AT, BE, CH, DE, DK, FR, GB, GR, LI, LU, NL, SE

1. Kraftfahrzeug-Schmiermittelzusammensetzung, bestehend aus:
 a) 0 bis 90 Gew.-% einer Mineralölbasis;
 b) 0 bis 90 Gew.-% einer synthetischen Ölbasis;
 c) 5 bis 50 Gew.-% eines Dialkylcarbonats;
 d) 6 bis 12 Gew.-% an konventionellen Additiven und
 e) 0 bis 15 Gew.-% an Viskositätsindexverbesserern und Pourpointverbesserern,
 dadurch gekennzeichnet, daß die Komponente c) das Produkt der Umesterung eines Dialkylcarbonats mit einem Alkoholgemisch ist, das zu wenigstens 98 Gew.-% aus verzweigten Alkoholen mit der allgemeinen Formel:



besteht, worin m eine ganze Zahl ist und n null oder eine ganze Zahl bedeutet, mit der Maßgabe, daß die Gesamtkohlenstoffatomanzahl im Molekül (I) von 10 bis 18 beträgt.

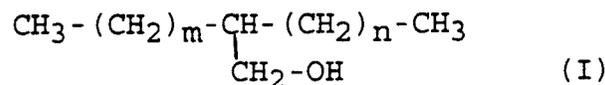
2. Zusammensetzung nach Anspruch 1, worin das zur Herstellung von Komponente c) verwendete Alkoholgemisch die verzweigte Fraktion der Oxoalkohole ist, die durch Hydroformylieren von vorwiegend linearen Olefinen mit einer statistischen inneren oder endständigen Doppelbindung mit Wasserstoff und Kohlenmonoxid unter Einwirkung eines Katalysators auf Co-Basis oder auf Rh-Basis erhalten werden, welche verzweigte Fraktion von der linearen Fraktion durch fraktionierte Kristallisation in Anwesenheit eines Kohlenwasserstoff-hältigen oder eines etherischen Lösungsmittels abgetrennt wird.
3. Zusammensetzung nach Anspruch 1, worin die Gesamtkohlenstoffatomanzahl in (I) von 13 bis 16 beträgt.
4. Zusammensetzung nach Anspruch 1, worin die Komponente c) die folgenden Eigenschaften aufweist:

	Mittleres Molekulargewicht	340-560
	Kinematische Viskosität bei 100°C (ASTM D455)	
	3.10 ⁻⁶ m ² /s - 12.10 ⁻⁶ m ² /s	(3 cSt-12 cSt)
	Dynamische Viskosität bei -30°C(ASTM D2602)	
5	0,8 Ns/m ² - 5 Ns/m ²	(800 cP - 5.000 cP)
	Viskositätsindex V.I.(ASTM D2270)	120 - 140
	Pourpoint (ASTM D97)	-60°C bis -30°C
	Flashpoint COC (ASTM D92)	220°C - 350°C
	Noack-Verdampfungsverlust (DIN 51581)	12 % bis 2 %
10	Kupferkorrosion (ASTM D130)	Klassifizierung 1 geringfügiges Anlaufen
	Gesamtsäurezahl TAN (mg KOH/g)	
	(ASTM D974)	0,01 - 0,05

5. Zusammensetzung nach Anspruch 1, worin
- die Komponente a) in einer Menge von 0 bis 60 Gew.-% vorliegt;
 - die Komponente b) in einer Menge von 20 bis 60 Gew.-% vorliegt;
 - die Komponente c) in einer Menge von 15 bis 30 Gew.-% vorliegt;
 - die Komponente d) in einer Menge von 8 bis 10 Gew.-% vorliegt und
 - die Komponente e) in einer Menge von 5 bis 10 Gew.-% vorliegt.
6. Zusammensetzung nach Anspruch 1, worin die Komponente a) ein durch Destillieren und Raffinieren von Erdöl erhaltenes Schmieröl ist und einen Viskositätsindex V.I. von 102 bis 108, einen Pourpoint von -12°C bis -6°C und einen Noack-Verdampfungsverlust von 12 % bis 42 % aufweist.
7. Zusammensetzung nach Anspruch 1, worin die Komponente b) das Produkt der Polymerisation endständiger oder innerer Olefine oder der Isomerisierung und/oder Alkylierung von Erdölfractionen ist.
8. Zusammensetzung nach Anspruch 1, worin die Komponente d) Dispergiermittel, Antiverschleißadditive, Metallpassivatoren und Kupferdesaktivatoren, überbasische und neutrale Detergentien und Antioxidantien umfaßt.
9. Zusammensetzung nach Anspruch 1, worin die Komponente e) Viskositätsindex-erhöhende Additive und Pourpointerniedriger umfaßt.
10. Zusammensetzung nach Anspruch 4, worin die Komponente c) ein mittleres Molekulargewicht von 420 bis 510 und eine kinematische Viskosität bei 100°C (ASTM D455) von 4.10⁻⁶ m²/s bis 8.10⁻⁶ m²/s (4 cSt - 8 cSt) aufweist.

Patentansprüche für folgenden Vertragsstaat : ES

1. Verfahren zur Herstellung einer Kraftfahrzeug-Schmiermittelzusammensetzung, dadurch gekennzeichnet, daß es die Stufe des Kombinierens der folgenden Komponenten umfaßt:
- a) 0 bis 90 Gew.-% einer Mineralölbasis;
 - b) 0 bis 90 Gew.-% einer synthetischen Ölbasis;
 - c) 5 bis 50 Gew.-% eines Dialkylcarbonats, das das Produkt der Umesterung eines Dialkylcarbonats mit einem Alkoholgemisch ist, das zu wenigstens 98 Gew.-% aus verzweigten Alkoholen mit der allgemeinen Formel:



- besteht, worin m eine ganze Zahl ist und n null oder eine ganze Zahl bedeutet, mit der Maßgabe, daß die Gesamtkohlenstoffatomanzahl im Molekül (I) von 10 bis 18 beträgt;
- d) 6 bis 12 Gew.-% an konventionellen Additiven und
 - e) 0 bis 15 Gew.-% an Viskositätsindexverbesserern und Pourpointverbesserern.

2. Verfahren nach Anspruch 1, dadurch gekennzeichnet, daß das zur Herstellung von Komponente c) verwendete Alkoholgemisch die verzweigte Fraktion der Oxoalkohole ist, die durch Hydroformylieren von vor-

wiegend linearen Olefinen mit einer statistischen inneren oder endständigen Doppelbindung mit Wasserstoff und Kohlenmonoxid unter Einwirkung eines Katalysators auf Co-Basis oder auf Rh-Basis erhalten werden, welche verzweigte Fraktion von der linearen Fraktion durch fraktionierte Kristallisation in Anwesenheit eines Kohlenwasserstoff-haltigen oder eines etherischen Lösungsmittels abgetrennt wird.

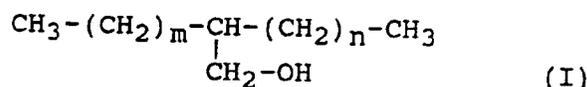
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3. Verfahren nach Anspruch 1, dadurch gekennzeichnet, daß die Gesamtkohlenstoffatomanzahl in (I) von 13 bis 16 beträgt.
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4. Verfahren nach Anspruch 1, dadurch gekennzeichnet, daß die Komponente c) die folgenden Eigenschaften aufweist:
- | | |
|--|--|
| Mittleres Molekulargewicht | 340 - 560 |
| Kinematische Viskosität bei 100°C | (ASTM D455) |
| 3.16 ⁻⁶ m ² /s - 12.10 ⁻⁶ m ² /s | (3 cSt-12 cSt) |
| Dynamische Viskosität bei -30°C | (ASTM D2602) |
| 0,8 Ns/m ² - 5 Ns/m ² | (800 cP - 5.000 cP) |
| 15 Viskositätsindex V.I. (ASTM D2270) | 120 - 140 |
| Pourpoint (ASTM D97) | -60°C bis -30°C |
| Flashpoint COC (ASTM D92) | 220°C - 350°C |
| Noack-Verdampfungsverlust (DIN 51581) | 12 % bis 2 % |
| 20 Kupferkorrosion (ASTM D130) | Klassifizierung 1 geringfügiges Anlaufen |
| Gesamtsäurezahl TAN (mg KOH/g) | |
| (ASTM D974) | 0,01 - 0,05 |
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5. Verfahren nach Anspruch 1, dadurch gekennzeichnet, daß
- die Komponente a) in einer Menge von 0 bis 60 Gew.-% vorliegt;
 - die Komponente b) in einer Menge von 20 bis 60 Gew.-% vorliegt;
 - die Komponente c) in einer Menge von 15 bis 30 Gew.-% vorliegt;
 - die Komponente d) in einer Menge von 8 bis 10 Gew.-% vorliegt und
 - die Komponente e) in einer Menge von 5 bis 10 Gew.-% vorliegt.
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6. Verfahren nach Anspruch 1, dadurch gekennzeichnet, daß die Komponente a) ein durch Destillieren und Raffinieren von Erdöl erhaltenes Schmieröl ist und einen Viskositätsindex V.I. von 102 bis 108, einen Pourpoint von -12°C bis -6°C und einen Noack-Verdampfungsverlust von 12 % bis 42 % aufweist.
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7. Verfahren nach Anspruch 1, dadurch gekennzeichnet, daß die Komponente b) das Produkt der Polymerisation endständiger oder innerer Olefine oder der Isomerisierung und/oder Alkylierung von Erdölfractionen ist.
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8. Verfahren nach Anspruch 1, dadurch gekennzeichnet, daß die Komponente d) Dispergiermittel, Antiverschleißadditive, Metallpassivatoren und Kupferdesaktivatoren, überbasische und neutrale Detergentien und Antioxidantien umfaßt.
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9. Verfahren nach Anspruch 1, dadurch gekennzeichnet, daß die Komponente e) Viskositätsindex-erhöhende Additive und Pourpointerniedriger umfaßt.
10. Verfahren nach Anspruch 4, dadurch gekennzeichnet, daß die Komponente c) ein mittleres Molekulargewicht von 420 bis 510 und eine kinematische Viskosität bei 100°C (ASTM D455) von 4.10⁻⁶ m²/s bis 8.10⁻⁶ m²/s (4 cSt - 8 cSt) aufweist.

50 **Revendications**

Revendications pour les Etats contractants suivants : AT, BE, CH, DE, DK, FR, GB, GR, LI, LU, NL, SE

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1. Composition lubrifiante pour automobiles, constituée de :
- a) 0 % à 90 % en poids d'une base huile minérale,
 - b) 0 % à 90 % en poids d'une base huile synthétique,
 - c) 5 % à 50 % en poids d'un carbonate de dialkyle,

- d) 6 % à 12 % en poids d'additifs classiques, et
 e) 0 % à 15 % en poids d'agents améliorant l'indice de viscosité et d'agents améliorant le point d'écoulement, **caractérisée** en ce que le constituant c) est le produit résultant de la transestérification d'un carbonate de dialkyle avec un mélange alcoolique constitué d'au moins 98 % en poids d'alcools ramifiés répondant à la formule générale :



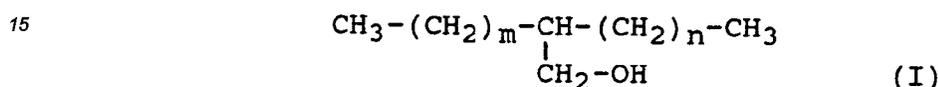
dans laquelle m est un nombre entier et n est égal à zéro ou est un nombre entier, étant entendu que le nombre total d'atomes de carbone de la molécule (I) est de 10 à 18.

2. Composition selon la revendication 1, pour laquelle ledit mélange alcoolique, utilisé pour la préparation du constituant c), est la fraction ramifiée des alcools oxo qui sont obtenus par hydroformylation avec de l'hydrogène et du monoxyde de carbone, d'oléfines essentiellement linéaires, possédant une double liaison terminale ou une double liaison statistique interne, à l'aide d'un catalyseur à base de cobalt ou d'un catalyseur à base de rhodium, ladite fraction ramifiée étant séparée de la fraction linéaire par cristallisation fractionnée, en présence d'un solvant hydrocarboné ou d'un solvant étheré.
3. Composition selon la revendication 1, pour laquelle le nombre total d'atomes de carbone de la molécule (I) est de 13 à 16.
4. Composition selon la revendication 1, pour laquelle le constituant c) présente les propriétés suivantes :
- Masse moléculaire moyenne : 340 - 560
 - Viscosité cinématique à 100°C (ASTM D455) : $3 \cdot 10^{-6}$ m²/s à $12 \cdot 10^{-6}$ m²/s (3 cSt à 12 cSt)
 - Viscosité dynamique à -30°C (ASTM D2602) : 0,8 N.s/m² à 5 N.s/m² (800 cP à 5000 cP)
 - Indice de viscosité V.I. (ASTM D2270) : 120-140
 - Point d'écoulement (ASTM D97) : -60°C à -30°C
 - Point éclair COC (ASTM D92) : 220°C - 350°C
 - Perte à l'évaporation Noack (DIN 51581): 12 % à 2 %
 - Corrosion du cuivre (ASTM D130) : classement 1 légère ternissure
 - Indice d'acide total (mg de KOH/g) (ASTM D974) : 0,01 à 0,05
5. Composition selon la revendication 1, dans laquelle le constituant a) est présent en une proportion de 0 % en poids à 60 % en poids, le constituant b) est présent en une proportion de 20 % en poids à 60 % en poids, le constituant c) est présent en une proportion de 15 % en poids à 30 % en poids, le constituant d) est présent en une proportion de 8 % en poids à 10 % en poids, et le constituant e) est présent en une proportion de 5 % en poids à 10 % en poids.
6. Composition selon la revendication 1, dans laquelle le constituant a) est une huile lubrifiante, obtenue par distillation et raffinage du pétrole, et présente un indice de viscosité V.I. de 102 à 108, un point d'écoulement de -12°C à -6°C et une perte à l'évaporation Noack de 12 % à 42 %.
7. Composition selon la revendication 1, dans laquelle le constituant b) est le produit de la polymérisation d'oléfines terminales ou d'oléfines internes, ou de l'isomérisation et/ou de l'alkylation de fractions de pétrole.
8. Composition selon la revendication 1, dans laquelle le constituant d) comprend des dispersants, des additifs anti-usure, des agents de passivation des métaux et des agents de désactivation du cuivre, des détergents superbasiques et des détergents neutres, et des antioxydants.
9. Composition selon la revendication 1, dans laquelle le constituant e) comprend des additifs élevant l'indice de viscosité et des agents abaissant le point d'écoulement.

10. Composition selon la revendication 4, dans laquelle le constituant c) présente une masse moléculaire moyenne de 420 à 510 et une viscosité cinématique à 100°C (ASTM D455) de $4 \cdot 10^{-6}$ m²/s à $8 \cdot 10^{-6}$ m²/s (4 cSt à 8 cSt).

5 **Revendications pour l'Etat contractant suivant : ES**

1. Procédé de préparation d'une composition lubrifiante pour automobiles, **caractérisé** en ce qu'il comprend l'étape consistant à combiner ensemble :
- a) de 0 % à 90 % en poids d'une base huile minérale,
 b) de 0 % à 90 % en poids d'une base huile synthétique,
 c) de 5 % à 50 % en poids d'un carbonate de dialkyle, qui est le produit résultant de la transestérification d'un carbonate de dialkyle avec un mélange alcoolique constitué d'au moins 98 % en poids d'alcools ramifiés répondant à la formule générale :



- dans laquelle m est un nombre entier et n est égal à zéro ou est un nombre entier, étant entendu que le nombre total d'atomes de carbone de la molécule (I) est de 10 à 18,
 d) de 6 % à 12 % en poids d'additifs classiques, et
 e) de 0 % à 15 % en poids d'agents améliorant l'indice de viscosité et d'agents améliorant le point d'écoulement.

2. Procédé selon la revendication 1, **caractérisé** en ce que ledit mélange alcoolique, utilisé pour la préparation du constituant c), est la fraction ramifiée des alcools oxo qui sont obtenus par hydroformylation avec de l'hydrogène et du monoxyde de carbone, d'oléfines essentiellement linéaires, possédant une double liaison terminale ou une double liaison statistique interne, à l'aide d'un catalyseur à base de cobalt ou d'un catalyseur à base de rhodium, ladite fraction ramifiée étant séparée de la fraction linéaire par cristallisation fractionnée, en présence d'un solvant hydrocarboné ou d'un solvant étheré.

3. Procédé selon la revendication 1, **caractérisé** en ce que le nombre total d'atomes de carbone de la molécule (I) est de 13 à 16.

4. Procédé selon la revendication 1, **caractérisé** en ce que le constituant c) présente les propriétés suivantes :

Masse moléculaire moyenne : 340 - 560
 Viscosité cinématique à 100°C
 (ASTM D455) : $3 \cdot 10^{-6}$ m²/s à $12 \cdot 10^{-6}$ m²/s (3 cSt à 12 cSt)
 Viscosité dynamique à -30°C
 (ASTM D2602) : 0,8 N.s/m² à 5 N.s/m² (800 cP à 5000 cP)
 Indice de viscosité V.I. (ASTM D2270) : 120-140
 Point d'écoulement (ASTM D97) : -60°C à -30°C
 Point éclair COC (ASTM D92) : 220°C - 350°C
 Perte à l'évaporation Noack (DIN 51581): 12 % à 2 %
 Corrosion du cuivre (ASTM D130) : classement 1 légère ternissure
 Indice d'acide total (mg de KOH/g)
 (ASTM D974) : 0,01 à 0,05

5. Procédé selon la revendication 1, **caractérisé** en ce que le constituant a) est présent en une proportion de 0 % en poids à 60 % en poids, le constituant b) est présent en une proportion de 20 % en poids à 60 % en poids, le constituant c) est présent en une proportion de 15 % en poids à 30 % en poids, le constituant d) est présent en une proportion de 8 % en poids à 10 % en poids, et le constituant e) est présent en une proportion de 5 % en poids à 10 % en poids.

6. Procédé selon la revendication 1, **caractérisé** en ce que le constituant a) est une huile lubrifiante, obtenue par distillation et raffinage du pétrole, et présente un indice de viscosité V.I. de 102 à 108, un point d'écoulement de -12°C à -6°C et une perte à l'évaporation Noack de 12 % à 42 %.

7. Procédé selon la revendication 1, **caractérisé** en ce que le constituant b) est le produit de la polymérisation d'oléfines terminales ou internes, ou de l'isomérisation et/ou de l'alkylation de fractions de pétrole.
- 5 8. Procédé selon la revendication 1, **caractérisé** en ce que le constituant d) comprend des dispersants, des additifs anti-usure, des agents de passivation des métaux et des agents de désactivation du cuivre, des détergents superbasiques et des détergents neutres, et des antioxydants.
9. Procédé selon la revendication 1, **caractérisé** en ce que le constituant e) comprend des additifs élevant l'indice de viscosité et des agents abaissant le point d'écoulement.
- 10 10. Procédé selon la revendication 4, **caractérisé** en ce que le constituant c) présente une masse moléculaire moyenne de 420 à 510 et une viscosité cinématique à 100°C (ASTM D455) de $4 \cdot 10^{-6}$ m²/s à $8 \cdot 10^{-6}$ m²/s (4 cSt à 8 cSt).

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