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(54) **LUBRICATING COMPOSITION**

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(57) **ABSTRACT**

In the field of lubricating compositions, notably lubricant compositions for automobile vehicles, in particular to the field of lubricant compositions for transmissions, for gear boxes or for bridges, there is disclosed a lubricating composition including at least 30% by weight of the composition of at least one monoester, at least one polyalphaolefin oil (PAO) for which the kinematic viscosity measured at 100° C. ranges from 40 to 3,000 $mm^2 \cdot s^{-1}$ and at least one polyalphaolefin oil (PAO) for which the kinematic viscosity measured at 100° C. ranges from 1.5 to 10 $mm^2 \cdot s^{-1}$. Also disclosed is the use of this lubricating composition for reducing the fuel consumption of a vehicle equipped with a transmission, notably with a bridge or a gear box, lubricated by this lubricating composition.

LUBRICATING COMPOSITION

[0001] The invention relates to the field of lubricating compositions, notably lubricating compositions for automobile vehicles, in particular the field of lubricating compositions for transmission, for gear box or for a bridge. The lubricating composition according to the invention comprises at least 30% by weight of the composition of at least one monoester, at least a polyalphaolefin oil (PAO) for which the kinematic viscosity measured at 100 C ranges from 40 to 3,000 $mm^2 \cdot s^{-1}$ and at least one polyalphaolefin oil (PAO) for which the kinematic viscosity measured at 100° C. ranges from 1.5 to 10 $mm^2 \cdot s^{-1}$. The invention also relates to the use of this lubricating composition for reducing the fuel consumption of a vehicle equipped with a transmission, notably with a bridge or a gear box, lubricated by means of this lubricating composition.

[0002] Oils for gear boxes or for a bridge, and more generally oils for gears, should fulfill many requirements, notably related to the driving comfort (perfect switching of gears, silent operation, operation without any incident, great reliability), to the lifetime of the assembly (reduction of wear during cold gear switching, no deposits and great thermal stability and to oxidation, lubrication safety at high temperatures, stable viscosity situation and absence of any shear losses, long lifetime) as well as the taking into account of environmental aspects (lower fuel consumption, reduction of oil consumption, low release of noise, easy discharge).

[0003] These are usually requirements imposed to oils for gear boxes with manual control and for axle gears.

[0004] As regards the requirements imposed to oils of automatic gear boxes (ATF oils for automatic transmission fluids), because of their use, it appears for ATF oils very specific requirements which are high constancy of the friction coefficient during the whole dwelling time for an optimum switching of gears, excellent stability to ageing for long oil change intervals, good viscosity-temperature strength in order to guarantee perfect operation with a hot engine and a cold engine and sufficient compatibility of seal with different elastomers used in the transmission gaskets so that the latter do not swell, do not shrink and do not become fragile.

[0005] Moreover, in the automotive field, searching for reduction of the CO_2 emissions forces development of lubricating products giving the possibility of reducing the friction in the gear boxes and in the bridge differentials. This reduction of the friction in gear boxes and in bridge differentials has to be obtained for different operating conditions. These reductions of friction should relate to the internal frictions of the lubricant but also the frictions of the elements making up the gear boxes or the bridge differentials, in particular metal elements.

[0006] The nature of the lubricating compositions for automobile engines has an influence on the emission of pollutants and on the fuel consumption. The lubricating compositions for engines for vehicles giving the possibility of saving energy are often designated by "fuel-eco" (FE), in English terminology. Such "fuel-eco" oils have been developed for fulfilling these new needs. The reduction of the energy losses is therefore a constant search in the field of lubricating compositions for vehicles.

[0007] The lubricating compositions for vehicles should therefore have improved properties and performances. It is notably necessary to provide alternative lubricating compositions, in particular lubricating compositions having a high viscosity index (VI) as well as a low traction coefficient.

[0008] The sought lubricating compositions should have a high viscosity index in order to avoid energy losses under cold conditions because of friction but also for keeping hot a sufficient lubricant film on the lubricated elements. A high viscosity index therefore guarantees a lesser drop in the viscosity when the temperature increases.

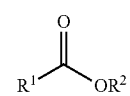
[0009] It is also necessary to provide alternative lubricating compositions having good resistance to oxidation.

[0010] Therefore, there exists a need for having lubricating compositions for transmissions of vehicles which give the possibility of providing a solution to all or part of the problems of lubricating compositions of the state of the art.

[0011] Thus, the invention provides a lubricating composition comprising

[0012] (a) at least 30% by weight of the composition of at least one monoester of formula (I)

(I)



[0013] wherein

[0014] R^1 represents a hydrocarbon group, either saturated or unsaturated, linear or branched, comprising from 14 to 24 carbon atoms;

[0015] R^2 represents a hydrocarbon group, either saturated or unsaturated, linear or branched, comprising from 2 to 18 carbon atoms

[0016] (b) at least one polyalphaolefin oil (PAO) for which the kinematic viscosity measured at 100° C. according to the ASTM D445 standard ranges from 40 to 3,000 $mm^2 \cdot s^{-1}$,

[0017] (c) at least one polyalphaolefin oil (PAO) for which the kinematic viscosity measured at 100° C. according to the ASTM D445 standard ranges from 1.5 to 10 $mm^2 \cdot s^{-1}$.

[0018] The composition according to the invention comprises at least one monoester (a), at least a polyalphaolefin oil (b) and at least a polyalphaolefin oil (c). It may only comprise a single monoester (a), a single polyalphaolefin oil (b) and a single polyalphaolefin oil (c). It may also comprise one, two or three monoesters (a) but also one, two or three polyalphaolefin oils (b) or further one, two or three polyalphaolefin oils (c).

[0019] The monoester (a) present within the lubricating composition according to the invention is a monoester of formula (I). Preferably for the monoester (a) of formula (I) according to the invention, R^1 represents a hydrocarbon group, either saturated or unsaturated, linear or branched, comprising from 14 to 20 carbon atoms, preferentially from 14 to 18 carbon atoms, more preferentially from 16 to 18 carbon atoms. Also preferably for the monoester (a) of formula (I) according to the invention, R^2 represents a hydrocarbon group, either saturated or unsaturated, linear or branched, comprising from 3 to 14 carbon atoms, preferentially from 4 to 12 carbon atoms, more preferentially from 4 to 10 carbon atoms.

[0020] Advantageously, the monoester (a) present within the lubricating composition according to the invention is a monoester of formula (I) wherein

[0021] R^1 is a linear group and R^2 is a branched group; or

[0022] R^1 is a branched group and R^2 is a linear group; or

[0023] R^1 and R^2 are linear groups; or

[0024] R^1 and R^2 are branched groups.

[0025] Preferably, the monoester (a) present within the lubricating composition according to the invention is a monoester of formula (I) wherein R^1 and R^2 are linear groups. In a particularly preferred way, the monoester (a) present within the lubricating composition according to the invention is a monoester of formula (I) wherein R^1 and R^2 represent independently a group selected from among

[0026] a linear saturated group;

[0027] a branched saturated group comprising from 1 to 5 branched chains;

[0028] a branched saturated group for which the branched chains comprise from 1 to 5 carbon atoms;

[0029] a branched saturated group comprising from 1 to 5 branched chains and for which the branched chains comprise from 1 to 5 carbon atoms.

[0030] Also preferably, the monoester (a) present within the lubricating composition according to the invention is a monoester of formula (I) wherein R^1 and R^2 are selected from among

[0031] a linear saturated group;

[0032] a branched saturated group comprising from 1 to 5 branched chains;

[0033] a branched saturated group for which the branched chains comprise from 1 to 5 carbon atoms

[0034] a branched saturated group comprising from 1 to 5 branched chains and for which the branched chains comprise from 1 to 5 carbon atoms.

[0035] Also preferably, a single R^1 or a single R^2 is selected from either one of these groups.

[0036] Preferably, the monoester (a) is of formula (I) wherein

[0037] R^1 is a saturated group and R^2 is an unsaturated group; or

[0038] R^1 is an unsaturated group and R^2 is a saturated group; or

[0039] R^1 and R^2 are saturated groups; or

[0040] R^1 and R^2 are unsaturated groups.

[0041] A monoester (a) of formula (I) wherein R^1 is a saturated group and R^2 is a saturated group is particularly preferred. A monoester (a) of formula (I) wherein R^1 is an unsaturated group and R^2 is a saturated group is more particularly preferred.

[0042] The monoester (a) of formula (I) according to the invention may be selected from many monoesters. Preferably, it is selected from among stearates, preferably alkyl stearates and alkenyl stearates; more preferentially C_4-C_{10} alkyl stearates, in particular butyl stearate, pentyl stearate, hexyl stearate, heptyl stearate, octyl stearate, nonyl stearate, decyl stearate. Also preferably, it is selected from among oleates, preferably alkyl oleates and alkenyl oleates, more preferentially C_4-C_{10}-alkyl oleates, in particular butyl oleate, pentyl oleate, hexyl oleate, heptyl oleate, octyl oleate, nonyl oleate, decyl oleate.

[0043] As other monoesters which may be suitable according to the invention, mention may be made of linoleates, preferably alkyl linoleates and alkenyl linoleates, more preferentially C_4-C_{10}-alkyl linoleates, in particular butyl linoleate, pentyl linoleate, hexyl linoleate, heptyl linoleate, octyl linoleate, nonyl linoleate, decyl linoleate. Mention may also be made of palmitoleates; palmitates; linolenates; eicosenoates; esters of erucic acid; esters of nervonic acid.

[0044] The monoester (a) of formula (I) according to the invention may also be selected from alkene monoesters and alkyl monoesters, preferably C_2-C_{10}-alkyl monoesters, in particular ethyl monoesters, propyl monoesters, butyl monoesters, pentyl monoesters, hexyl monoesters, heptyl monoesters, octyl monoesters, nonyl monoesters, decyl monoesters.

[0045] Advantageously, the lubricating composition according to the invention comprises from 30 to 70% by weight of the monoester composition of formula (I). Also advantageously, the lubricating composition according to the invention comprises from 30 to 60% by weight of the composition or from 30 to 50% by weight of the monoester composition of formula (I).

[0046] In addition to the monoester (a), the lubricating composition according to the invention comprises at least two polyalphaolefin oils (b) and (c). These are hydrogenated PAOs. The polyalphaolefin oil (b) is a heavy PAO. It has a kinematic viscosity measured at 100° C. according to the ASTM D445 standard ranging from 40 to 3,000 $mm^2 \cdot s^{-1}$. The polyalphaolefin oil (c) is a lightweight PAO. It has a kinematic viscosity measured at 100° C. according to the ASTM D445 standard ranging from 1.5 to 10 $mm^2 \cdot s^{-1}$.

[0047] Preferably, the kinematic viscosity of the polyalphaolefin oil (b), measured at 100° C. according to the ASTM D445 standard, ranges from 40 to 1,500 $mm^2 \cdot s^{-1}$. More preferably, the kinematic viscosity of the polyalphaolefin oil (b), measured at 100° C. according to the ASTM D445 standard, ranges from 40 to 300 $mm^2 \cdot s^{-1}$.

[0048] Also preferably, the average molecular mass by weight of the polyalphaolefin oil (b) is greater than 2,500 Da or ranges from 2,500 to 80,000 Da. More preferably, the average molecular mass by weight of the polyalphaolefin oil (b) ranges from 4,000 to 50,000 Da.

[0049] In a particularly preferred way, the polyalphaolefin oil (b) has a kinematic viscosity, measured at 100° C. according to the ASTM D445 standard, ranging from 40 to 1,500 $mm^2 \cdot s^{-1}$ and an average molecular mass by weight ranging from 2,500 to 80,000 Da or from 4,000 to 50,000 Da. In a more particularly preferred way, the polyalphaolefin oil (b) has a kinematic viscosity, measured at 100° C. according to the ASTM D445 standard, ranging from 40 to 300 $mm^2 \cdot s^{-1}$ and an average molecular mass by weight ranging from 2,500 to 80,000 Da or from 4,000 to 50,000 Da.

[0050] Preferably, the kinematic viscosity of the polyalphaolefin oil (c), measured at 100° C. according to the ASTM D445 standard, ranges from 1.5 to 10 $mm^2 \cdot s^{-1}$ or from 2 to 10 $mm^2 \cdot s^{-1}$. More preferably, the kinematic viscosity of the polyalphaolefin oil (c), measured at 100° C. according to the ASTM D445 standard, ranges from 1.5 to 8 $mm^2 \cdot s^{-1}$ or from 2 to 8 $mm^2 \cdot s^{-1}$.

[0051] Also preferably, the average molecular mass by weight of the polyalphaolefin oil (c) is less than 500 Da or ranges from 50 to 500 Da. More preferably, the average molecular mass by weight of the polyalphaolefin oil (c) ranges from 50 to 350 Da or from 50 to 300 Da.

[0052] In a particularly preferred way, the polyalphaolefin oil (c) has a kinematic viscosity, measured at 100° C. according to the ASTM D445 standard, ranging from 1.5 to 8 $mm^2 \cdot s^{-1}$ and an average molecular mass by weight ranging from 50 to 500 Da or from 50 to 350 Da or from 50 to 300 Da or else a kinematic viscosity, measured at 100° C. according to the ASTM D445 standard, ranging from 2 to 8 $mm^2 \cdot s^{-1}$ and an average molecular mass by weight ranging from 50 to 500 Da or from 50 to 350 Da or from 50 to 300 Da.

[0053] In a more particularly preferred way, the polyalphaolefin oil (c) has a kinematic viscosity, measured at 100° C. according to the ASTM D445 standard, ranging from 1.5 to 6 $mm^2 \cdot s^{-1}$ and an average molecular mass by weight ranging from 50 to 500 Da or from 50 to 350 Da or from 50 to 300 Da or else a kinematic viscosity, measured at 100° C. according to the ASTM D445 standard, ranging from 2 to 6 $mm^2 \cdot s^{-1}$ and an average molecular mass by weight ranging from 50 to 500 Da or from 50 to 350 Da or from 50 to 300 Da.

[0054] As a particular polyalphaolefin oil (c) according to the invention, mention may also be made of a kinematic viscosity oil at 100° C., measured according to the ASTM D445 standard, ranging from 3 to 4 $mm^2 \cdot s^{-1}$, further comprising 50% by weight of 9-methyl-11-octyl-henicosane, a trimer of 1-decene.

[0055] The respective proportions of polyalphaolefin oils (b) and (c) within the lubricating composition according to the invention may vary. Preferably, the lubricating composition according to the invention comprises from 5 to 30%, preferably from 5 to 25%, by weight of the composition of a polyalphaolefin oil (b). Also preferably, the lubricating composition according to the invention comprises from 5 to 70%, preferably from 30 to 70%, by weight of the composition of a polyalphaolefin oil (c). The respective proportions of polyalphaolefin oils (b) and (c) within the lubricating composition according to the invention may also vary according to the targeted application for the lubricating composition according to the invention. Thus, for a use as a lubricant for a gear box, the lubricating composition according to the invention may comprise from 1 to 40% by weight of the composition of a polyalphaolefin oil (b) and from 30 to 69%, by weight of the composition of a polyalphaolefin oil (c).

[0056] Generally, in addition to the monoester (a) and to the polyalphaolefin oils (b) and (c), the lubricating composition according to the invention may comprise other oils as well as additives. The lubricating composition according to the invention may comprise any type of mineral lubricant base oil, either synthetic or natural, animal or vegetable, adapted to its use.

[0057] The base oils used in the lubricating compositions according to the invention may be oils of mineral or synthetic origin belonging to the groups I to V according to the classes defined in the API classification (or their equivalents according to the ATIEL classification) (table A) or mixtures thereof.

TABLE A

	Content of saturated substances	Sulfur content	Viscosity index (VI)
Group I Mineral oils	<90%	>0.03%	80 ≤ VI < 120
Group II Hydrocracked oils	≤90%	≤0.03%	80 ≤ VI < 120
Group III Hydrocracked or hydro-isomerized oils	≤90%	≤0.03%	≤120
Group IV	Polyalphaolefins (PAOs)		
Group V	Esters and other bases not included in groups I to IV		

[0058] The mineral base oils useful according to the invention include all types of bases obtained by atmospheric distillation and in vacuo of crude oil, followed by refinery operations such as extraction with a solvent, deasphalting, deparaffining with a solvent, hydrotreatment, hydrocracking, hydroisomerization and hydrofinishing. Mixtures of synthetic and mineral oils may also be used.

[0059] Generally there is no limitation as to the use of different lubricating bases for producing the lubricating compositions according to the invention, except that they should have properties, notably of viscosity, viscosity index, sulfur content, resistance to oxidation, adapted to a use for engines or for vehicle transmissions.

[0060] The base oils of the lubricating compositions according to the invention may also be selected from among synthetic oils, such as certain esters of carboxylic acids and of alcohols, as well as from among polyalphaolefins. The other polyalphaolefins used a base oils are for example obtained from monomers comprising from 4 to 32 carbon atoms, for example from octene or decene, and the viscosity of which at 100° C. is comprised between 1.5 and 15 $mm^2 \cdot s^{-1}$ according to the ASTM D445 standard. Their average molecular mass by weight is generally comprised between 250 and 3,000 Da according to the ASTM D5296 standard.

[0061] Advantageously, the lubricating composition according to the invention comprises at least 50% by mass of base oils based on the total mass of the composition. More advantageously, the lubricating composition according to the invention comprises at least 60% by mass, or even at least 70% by mass of base oils based on the total mass of the composition. Also advantageously, the lubricating composition according to the invention comprises from 75 to 99.9% by mass of base oils based on the total mass of the composition.

[0062] Many additives may be used for the lubricating composition according to the invention.

[0063] The preferred additives for the lubricating composition according to the invention are selected from among detergent additives, anti-wear additives, friction modifying additives, extreme pressure additives, dispersants, flow point improvers, anti-foam agents, thickeners and mixtures thereof.

[0064] Preferably, the lubricating composition according to the invention comprises at least one additive improving the flow point or PPD agent (for depressant point or agent for reducing the flow point). By slowing down the formation of crystals of paraffin, the agents for reducing the flow point generally improve the cold behavior of the lubricating composition according to the invention. As examples of agents reducing the flow point, mention may be made of alkyl polymethacrylates, polyacrylates, polyarylamides, polyalkylphenols, polyalkylnaphthalenes, polyalkyl styrenes.

[0065] The lubricating composition according to the invention may also comprise at least one anti-wear additive, at least one extreme pressure additive or mixtures thereof.

[0066] The anti-wear additives and the extreme pressure additives protect the surfaces during friction by forming a protective film adsorbed on these surfaces. There exists a great variety of anti-wear additives. Preferably for the lubricating composition according to the invention, the anti-wear additives are selected from among phosphorus-sulfur additives like metal alkylthiophosphates, in particular zinc alkylthiophosphates, and more specifically zinc dialkyldithiophosphates or ZnDTP. The preferred compounds are of formula $Zn((SP(S)(OR^3)(OR^4))_2$, wherein R^3 and R^4, either identical or different, independently represent an alkyl group, preferably an alkyl group including 1 to 18 carbon atoms. The phosphates of amines are also anti-wear additives which may be used in the lubricating composition according to the invention. However, the phosphorus brought by these additives may act as a poison for the catalytic systems of automobiles since these additives generate ashes. It is possible to minimize these effects by partly substituting the amine phosphates with additives not providing phosphorus, such as, for example, polysulfides, notably sulphur-containing olefins. Advantageously, the lubricating composition according to the invention may comprise from 0.01 to 6% by mass, preferentially from 0.05 to 4% by mass, more preferentially from 0.1 to 2% by mass based on the total mass of the lubricating composition, of anti-wear additives and of extreme pressure additives.

[0067] Advantageously, the lubricating composition according to the invention may comprise at least one friction modifying additive. The friction modifying additive may be selected from among a compound providing metal elements and a compound without any ashes. From among the compounds providing metal elements, mention may be made of complexes of transition metals such as Mo, Sb, Sn, Fe, Cu, Zn for which the ligands may be hydrocarbon compounds comprising oxygen, nitrogen, sulphur or phosphorus atoms. The friction modifying additives without any ashes are generally of organic origin and may be selected from among monoesters of fatty acids and of polyols, alkoxylated amines, alkoxylated fatty amines, fatty epoxides, borate fatty epoxides; the fatty amines or the esters of glycerol with a fatty acid. According to the invention, the fatty compounds comprise at least one hydrocarbon group comprising from 10 to 24 carbon atoms. Advantageously, the lubricating composition according to the invention may comprise from 0.01 to 2% by mass or from 0.01 to 5% by mass, preferentially from 0.1 to 1.5% by mass or from 0.1 to 2% by mass based on the total mass of the lubricating composition, of a friction modifying additive.

[0068] Advantageously, the lubricating composition according to the invention may comprise at least one antioxidant additive. The antioxidant additive generally gives the possibility of delaying the degradation of the lubricating composition during operation. This degradation may notably be expressed by the formation of deposits, by the presence of sludges or by an increase in the viscosity of the lubricating composition. The antioxidant additives notably act as radical inhibitors or destructors of hydroperoxides. From among the antioxidant additives currently used, mention may be made of the antioxidant additives of the phenolic type, the antioxidant additives of the amine type, the antioxidant phosphorus-sulfur-containing additives. Certain of these antioxidant additives, for example the phosphorus-sulfur-containing antioxidant additives, may be generators of ashes. The phenolic antioxidant additives may be without any ashes or else be in the form of neutral or basic metal salts. The antioxidant additives may notably be selected from among sterically hindered phenols, sterically hindered phenol esters, and sterically hindered phenols comprising a thioether bridge, diphenylamines, diphenylamines substituted with at least one C_1-C_{12} alkyl group, N,N'-dialkyl-aryl-diamines and mixtures thereof. Preferably according to the invention, the sterically hindered phenols are selected from among the compounds forming a phenol group for which at least one carbon in vicinity to the carbon bearing the alcohol function is substituted with at least one C_1-C_{10} alkyl group, preferably a C_1-C_6 alkyl group, preferably a C_4 alkyl group, preferably with the ter-butyl group. The aminated compounds are another class of antioxidant additives which may be used, optionally in combination with the phenolic antioxidant additives. Examples of aminated compounds are the aromatic amines, for example the aromatic amines of formula $NR^5R^6R^7$ wherein R^5 represents an aliphatic group or an aromatic group, optionally substituted, R^6 represents an aromatic group, optionally substituted, R^7 represents a hydrogen atom, an alkyl group, an aryl group or a group of formula $R^8S(O)_zR^9$ wherein R^8 represents an alkylene group or an alkenylene group, R^9 represents an alkyl group, an alkenyl group or an aryl group and z represents 0, 1 or 2. Sulfurized alkyl phenols or their salts of alkaline and earth-alkaline metals may also be used as antioxidant additives. Another class of antioxidant additives is that of copper-containing compounds, for examples thio- or dithio-phosphates of copper, salts of copper and carboxylic acids, dithiocarbamates, sulfonates, phenates, acetylacetonates of copper. The salts of copper I and II, the salts of succinic acid or anhydride may also be used. The lubricating composition according to the invention may contain other types of antioxidant additives known to one skilled in the art. Advantageously, the lubricating composition comprises at least one antioxidant additive without any ashes. Also advantageously, the lubricating composition according to the invention comprises from 0.5 to 2% by weight based on the total mass of the composition, of at least one antioxidant additive.

[0069] The lubricating composition according to the invention may also comprise at least one detergent additive. The detergent additives generally allow reduction of the formation of deposits at the surface of the metal parts by dissolution of the secondary oxidation products and of the combustion secondary products. The detergent additives which may be used in the lubricating composition according to the invention are generally known to one skilled in the art. The detergent additives may be anionic compounds comprising a long lipophilic hydrocarbon chain and a hydrophilic head. The associated cation may be a metal cation of an alkaline or earth-alkaline metal. The detergent additives are preferentially selected from among salts of alkaline metals or earth-alkaline metals of carboxylic acids, sulfonates, salicylates, naphthenates, as well as salts of phenates. The alkaline and earth-alkaline metals are preferentially calcium, magnesium, sodium or barium. These metal salts generally comprise the metal in a stoichiometric amount or else in excess, therefore in an amount greater than the stoichiometric amount. These are then overbased detergent additives; the excess metal providing the overbased nature to the detergent additive is then generally in the form of an insoluble metal salt in oil, for example a carbonate, a hydroxide, an oxalate, an acetate, a glutamate, preferentially a carbonate. Advantageously, the lubricating composition according to the invention may comprise from 2 to 4% by weight of a detergent additive based on the total mass of the lubricating composition.

[0070] Advantageously, the lubricating composition according to the invention may also comprise at least one dispersant agent. The dispersant agent may be selected from among Mannich bases, succinimides and derivatives thereof. Also advantageously, the lubricating composition according to the invention may comprise from 0.2 to 10% by mass of a dispersant agent based on the total mass of the lubricating composition.

[0071] Advantageously, the lubricating composition may also comprise at least one polymer improving the viscosity index. As examples of polymers improving the viscosity index, mention may be made of polymeric esters, homopolymers or copolymers, either hydrogenated or non-hydrogenated, of styrene, of butadiene and isoprene, polymethacrylates (PMA). Also advantageously, the lubricating composition according to the invention may comprise from 1 to 15% by mass based on the total mass of the polymeric lubricating composition improving the viscosity index.

[0072] The invention also relates to the use as a lubricant of the lubricating composition according to the invention. Preferably, the lubricating composition according to the invention is useful for lubricating a system of gears, in particular a vehicle transmission, notably a bridge or a gear box.

[0073] The composition according to the invention is also advantageously used for reducing the fuel consumption of an engine, in particular of a vehicle engine. Preferably, the composition according to the invention is used for reducing the fuel consumption of a vehicle equipped with a transmission, notably a bridge or a gear box, lubricated by means of this composition.

[0074] The invention also relates to the use of at least one lubricating composition according to the invention for reducing the traction coefficient of a transmission oil, preferably for reducing the traction coefficient of an oil for gear boxes, in particular of a gear box of a vehicle.

[0075] The invention also relates to the use for reducing the traction coefficient of a lubricating composition comprising at least one heavy PAO (b) and at least one lightweight PAO (c) and at least 30% by weight of a composition of a monoester (a) of formula (I) defined according to the invention.

[0076] The uses of the lubricating composition according to the invention comprise the contacting of at least one element of the transmission, in particular of the gear box or of the bridge, with a lubricating composition according to the invention.

[0077] By analogy, the particular, advantageous or preferred features of the lubricating composition according to the invention, as well as of the monoester (a) and of the polyalphaolefin oils (b) and (c), define the particular, advantageous or preferred uses according to the invention.

[0078] The different aspects of the invention will be the object of the examples which follow. They are provided as an illustration.

EXAMPLE 1: PREPARATION OF LUBRICATING COMPOSITIONS ACCORDING TO THE INVENTION

[0079] Decyl oleate (Stéarinerie Dubois) is mixed with a heavy PAO (a product Spectrasyn mPAO150 from Exxon—KV100 of about 150 $mm^2 \cdot s^{-1}$), a first lightweight PAO (product Spectrasyn 6 from Exxon—KV100 of about 6 $mm^2 \cdot s^{-1}$) and a second lightweight PAO (product Spectrasyn 8 from of Exxon—KV100 of about 8 $mm^2 \cdot s^{-1}$).

[0080] In an analogue way, a second composition according to the invention is prepared wherein the decyl oleate is replaced with butyl stearate (Stéarinerie Dubois). The respective amounts of the different constituents are shown in table 1 and are expressed in a mass % based on the mass of the final composition. The viscosity index (VI) is measured according to the ASTM D2270 standard.

TABLE 1

	Composition (1) according to the invention (%)	Composition (2) according to the invention (%)
decyl oleate	30	0
butyl stearate	0	30
heavy PAO (b)	8	10
lightweight PAO (c1) (Spectrasyn 6)	30	4
lightweight PAO (c2) (Spectrasyn 8)	32	56
Viscosity index (VI)	174	176

COMPARATIVE EXAMPLE 1: PREPARATION OF COMPARATIVE LUBRICATING COMPOSITIONS

[0081] Similarly to example 1, 3 comparative lubricating compositions are prepared by replacing decyl oleate respectively with methyl oleate (Stéarinerie Dubois), by methyl stearate (Stéarinerie Dubois) and by the isononyl isononanoate (Stéarinerie Dubois). The respective amounts of the different constituents are shown in table 2 and are expressed in mass % based on the mass of the final composition.

TABLE 2

	Comparative composition (1) (%)	Comparative composition (2) (%)	Comparative composition (3) (%)
methyl oleate	30	0	0
methyl stearate	0	30	0
isononyl isononanoate	0	0	30
heavy PAO (b)	13	12.3	13
lightweight PAO (c1) (Spectrasyn 6)	0	0	57
lightweight PAO (c2) (Spectrasyn 8)	57	57.7	0
Viscosity index (VI)	182	180	173

EXAMPLE 2: COMPARISON OF THE TRACTION COEFFICIENT OF THE COMPOSITIONS ACCORDING TO THE INVENTION AND OF THE COMPARATIVE LUBRICATING COMPOSITIONS

[0082] The traction coefficient of the prepared lubricating compositions is evaluated and the obtained results are shown in table 3.

TABLE 3

	Composition (1) according to the	Composition (2) according to the	Comparative composition (3)
traction coefficient (MTM: T = 40 C., V_e = 1 m.$^{-1}$, SRR = 20% load = 75N)	0.034	0.033	0.048

[0083] The lubricating compositions according to the invention have a better traction coefficient than the comparative lubricating compositions.

EXAMPLE 3: COMPARISON OF THE OXIDATION RESISTANCE PROPERTIES OF THE LUBRICATING COMPOSITION (1) ACCORDING TO THE INVENTION AND OF THE COMPARATIVE LUBRICATING COMPOSITION (1)

[0084] The oxidation resistance properties of the prepared lubricating compositions are evaluated according to the method A of the standard CEC-L48-A-00 and the obtained results are shown in the table 4. The more the variation of KV 100 (R KV 100) is significant, the lower is the resistance to oxidation. The larger the variation of KV 40 (R KV 40) is significant, the lower is the resistance to oxidation.

[0085] The more significant the variation of TAN (Total Acid Number, R TAN), the lower is the resistance to oxidation. The larger the PAI (Peak Area Increase), the lower is the resistance to oxidation.

TABLE 4

	Lubricating composition (1) according to the invention	Comparative lubricating composition (1)
Duration (h)	192	192
initial KV 100 (mm^2 · s^{-1})	6.68	6.79
final KV 100 (mm^2 · s^{-1})	7.88	11.08
R KV 100 (%)	18.01	63.18
initial KV 40 (mm^2 · s^{-1})	31.13	30.44
initial KV 40 (mm^2 · s^{-1})	37.79	60.15
R KV 40 (%)	21.39	97.60
Insoluble compounds	0	4 cm at the bottom
initial TAN	1.87	1.46
final TAN	3.48	4.12
R TAN (%)	1.6	2.7
PAI	<20	34

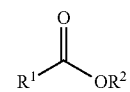
[0086] The lubricating composition according to the invention has a resistance to oxidation which is greater than that of the comparative lubricating composition. No deposit of insoluble compounds occurs with the lubricating composition according to the invention.

[0087] These results also show that the lubricating compositions according to the invention retain a high viscosity index and are therefore compatible with applications as lubricants for transmissions or engine lubricants.

1-23. (canceled)

24. A lubricating composition comprising

(a) at least 30% by weight of the composition of at least one monoester of formula (I)



(I)

wherein

R^1 represents a hydrocarbon group, either saturated or unsaturated, linear or branched, comprising from 14 to 24 carbon atoms;

R^2 represents a hydrocarbon group, either saturated or unsaturated, linear or branched, comprising from 2 to 18 carbon atoms;

(b) at least one polyalphaolefin oil (PAO) for which the kinematic viscosity measured at 100° C. according to the ASTM D445 standard ranges from 40 to 3,000 mm^2·s^1;

(c) at least one polyalphaolefin oil (PAO) for which the kinematic viscosity measured at 100° C. according to the ASTM D445 standard ranges from 1.5 to 10 mm^2·s^{-1}.

25. The lubricating composition according to claim **24** comprising from 30 to 70% of the monoester of formula (I) by weight of said composition.

26. The lubricating composition according to claim **24** for which R^1 is a saturated group and R^2 is an unsaturated group.

27. The lubricating composition according to claim **24** for which R^1 is an unsaturated group and R^2 is a saturated group.

28. The lubricating composition according to claim **24** for which R^1 and R^2 are saturated groups.

29. The lubricating composition according to claim **24** for which R^1 and R^2 are unsaturated groups.

30. The lubricating composition according to claim **24** for which

R^1 represents a hydrocarbon group, either saturated or unsaturated, linear or branched, comprising from 14 to 20 carbon atoms; or

R^2 represents a hydrocarbon group, either saturated or unsaturated, linear or branched, comprising from 3 to 14 carbon atoms; or

R^1 is a linear group and R^2 is a branched group; or

R^1 is a branched group and R^2 is a linear group; or

R^1 and R^2 are linear groups; or

R^1 and R^2 are branched groups.

31. The lubricating composition according to claim **24** for which only R^1, only R^2 or R^1 and R^2 are selected from among

a linear saturated group;

a branched saturated group comprising from 1 to 5 branched chains;

a branched saturated group for which the branched chains comprise from 1 to 5 carbon atoms;

a branched saturated group comprising from 1 to 5 branched chains and for which the branched chains comprise from 1 to 5 carbon atoms.

32. The lubricating composition according to claim **24** for which the monoester is selected from among

stearates; and

oleates.

33. The lubricating composition according to claim **24** for which the monoester is selected from among alkene monoesters and alkyl monoesters.

34. The lubricating composition according to claim **24** for which the kinematic viscosity of the polyalphaolefin oil (b), measured at 100° C. according to the ASTM D445 standard, ranges from 40 to 1,500 $mm^2 \cdot s^{-1}$.

35. The lubricating composition according to claim **24** for which the average molecular mass by weight of the polyalphaolefin oil (b) is greater than 2,500 Da.

36. The lubricating composition according to claim **24** for which the kinematic viscosity of the polyalphaolefin oil (c), measured at 100° C. according to the ASTM D445 standard, ranges from 1.5 to 10 $mm^2 \cdot s^{-1}$.

37. The lubricating composition according to claim **24** for which the average molecular mass by weight of the polyalphaolefin oil (c) is less than 500 Da.

38. The lubricating composition according to claim **24** comprising from 5 to 30% by weight of the composition of a polyalphaolefin oil (b).

39. The lubricating composition according to claim **24**, comprising from 5 to 70% by weight of the composition of a polyalphaolefin oil (c).

40. The lubricating composition according to claim **24** comprising

one, two or three monoesters (a); or

one, two or three polyalphaolefin oils (b); or

one, two or three polyalphaolefin oils (c); or comprising a single monoester (a), a single polyalphaolefin oil (b) and a single polyalphaolefin oil (c).

41. The lubricating composition according to claim **24** also comprising at least one additive.

42. A method of lubricating a system of gears comprising a step of applying at least one lubricating composition according to claim **24** to said system of gears.

43. A method of reducing the fuel consumption of an engine comprising a step of applying at least one lubricating composition according to claim **24** to the engine.

44. A method of reducing the fuel consumption of a vehicle equipped with a transmission comprising a step of lubricating said transmission with at least one lubricating composition according to claim **24**.

45. A method of reducing the traction coefficient of a transmission oil comprising a step of incorporating at least one lubricating composition according to claim **24** into said transmission oil.

46. A method of reduction of the traction coefficient of a lubricating composition comprising at least one heavy PAO (b) and at least one lightweight PAO (c), comprising a step of incorporating at least 30% by weight of a composition of a monoester (a) of formula (I) defined according to claim **24** into said lubricating composition.

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