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(71) Applicant: **Shell Internationale Research Maatschappij B.V.**
2596 HR Den Haag (NL)

(72) Inventor: **The designation of the inventor has not yet been filed**

(74) Representative: **Matthezing, Robert Maarten et al**
Shell International B.V.
Intellectual Property Services
P.O. Box 384
2501 CJ The Hague (NL)

(54) **Lubricating composition**

(57) The present invention provides a lubricating composition comprising a base oil and one or more additives, wherein the base oil comprises a Fischer-Tropsch derived base oil and wherein the lubricating composition has:
- a kinematic viscosity at 100°C (according to ASTM D 445) of at least 3.6 cSt;
- a Brookfield Viscosity at -40°C (according to DIN 51398) of less than 10,000 mPas; and

wherein the composition comprises less than 1.0 wt.% of a VI improver, based on the total weight of the composition.

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Description

[0001] The present invention relates to a lubricating composition comprising a base oil and one or more additives for particular use as (but not limited to) a transmission fluid.

[0002] Transmission fluids are well known in the art and are used in for example an automatic transmission (ATF), a manual transmission (MTF), a dual clutch transmission (DCT), a continuously variable transmission (CVT), transfer cases (TC), axles, hydraulic and power steering systems in the automotive industry. Transmission fluids may also be used for lubrication, power transfer and other purposes in various industrial applications.

[0003] Typically, transmission fluids contain a base oil (usually consisting of a mixture of base oils), a Viscosity Index (VI) improver (such as a thickener) and a performance additive package containing one or more performance additives for providing protection against e.g. oxidation, rust, corrosion, wear, (micro-)pitting, scuffing, foaming etc. as well as for improving properties such as contamination handling, rheological properties, smell and colour.

[0004] As for example disclosed in EP-A-1 553 158, the VI improver may be a polyisoalkylene component having a relatively high molecular weight, or an alternative thickening agent such as olefin copolymers, polyalkylmethacrylates and styrene-maleic esters. As is shown in the Examples of EP-A-1 553 158 (see the table in paragraph [0084]), the use of 6.5 to 8.0 wt.% VI improver results in an increase in kinematic viscosity (at 100°C) from 4.01 cSt to 5.2 cSt or above.

[0005] A disadvantage of the use of the above or other VI-improvers (or thickeners) is that the use of these components leads to a reduced shear stability of the fluid, i.e. a permanent viscosity decrease of the fluid during operation. A reduced shear stability is also observed for those VI improvers that are added to the composition as a pour point depressant. Examples of the latter VI improvers include (but are not limited to) polyalkylmethacrylates.

[0006] However, it is problematic to formulate transmission fluids with mineral base oils without the use of a substantial amount of VI improvers in order to meet stringent demands on kinematic viscosity (at e.g. 100°C) in combination with stringent demands on Brookfield Viscosity (at e.g. -40°C). As an example, the reference fluids without VI improver as disclosed in the above-mentioned EP-A-1 553 158 ("Baseline 1" and "Baseline 1A") show a kinematic viscosity at 100°C of 4.01 cSt and a Brookfield viscosity at -40°C of 17,000.

[0007] In this respect it is noted that the person skilled in the art would perceive the value for the Brookfield viscosity at -40°C of 17,000 mPas to be unfavourably high for e.g. a modern automatic transmission fluid, a modern dual wet clutch fluid, a modern CVT fluid or a modern transfer case fluid.

[0008] It is an object of the present invention to minimize the above or other problems.

[0009] It is another object of the present invention to provide alternative lubricating compositions, in particular for use as transmission fluids which meet stringent conditions of kinematic viscosity (at elevated temperatures) and Brookfield Viscosity (at cold temperatures).

[0010] One or more of the above or other objects can be obtained by the present invention by providing a lubricating composition comprising a base oil and one or more additives, wherein the base oil comprises a Fischer-Tropsch derived base oil and wherein the lubricating composition has:

- a kinematic viscosity at 100°C (according to ASTM D 445) of at least 3.6 cSt;
- a Brookfield Viscosity at -40°C (according to DIN 51398) of less than 10,000 mPas; and

wherein the composition comprises less than 1.0 wt.% of a VI improver, based on the total weight of the composition.

[0011] An important advantage of the present invention is that - in addition to improved shear stability properties - desirable fuel economy properties can be obtained. The latter is a result of the relatively low kinematic viscosity (in the range from 40°C to 100°C) of the lubricating composition according to the present invention.

[0012] A further advantage of the present invention is that it is possible to formulate such lubricating composition without the need to use Group IV base oils (PAOs; poly-alpha olefin base oils); a disadvantage of using such PAOs is the high cost of manufacture thereof and the relatively high CO_2 footprint of PAOs.

[0013] There are no particular limitations regarding the base oil used in lubricating composition according to the present invention (provided that the base oil comprises at least a Fischer-Tropsch derived base oil and provided that the requirements in respect of the lubricant composition according to the present invention are met), and various conventional mineral oils, synthetic oils as well as naturally derived esters such as vegetable oils may be conveniently used.

[0014] The base oil used in the present invention may - in addition to the Fischer-Tropsch derived base oil - conveniently comprise mixtures of one or more mineral oils and/or one or more synthetic oils; thus, according to the present invention, the term "base oil" may refer to a mixture containing more than one base oil, including at least one Fischer-Tropsch derived base oil. Mineral oils include liquid petroleum oils and solvent-treated or acid-treated mineral lubricating oil of the paraffinic, naphthenic, or mixed paraffinic/naphthenic type which may be further refined by hydrofinishing processes and/or dewaxing.

[0015] Suitable base oils for use in the lubricating oil composition of the present invention are Group I-III mineral base oils, Group IV poly-alpha olefins (PAOs), Group I-III Fischer-Tropsch derived base oils and mixtures thereof. Preferably

the base oil (or base oil mixture if more than one base oil is used) meets the requirements (in particular with respect to VI, sulphur content and content of saturated hydrocarbons) of a Group II or Group III base oil, preferably of a Group III base oil.

[0016] By "Group I", "Group II", "Group III" and "Group IV" base oils in the present invention are meant lubricating oil base oils according to the definitions of American Petroleum Institute (API) for category I, II, III and IV. These API categories are defined in API Publication 1509, 15th Edition, Appendix E, April 2002.

[0017] Fischer-Tropsch derived base oils are known in the art. By the term "Fischer-Tropsch derived" is meant that a base oil is, or is derived from, a synthesis product of a Fischer-Tropsch process. A Fischer-Tropsch derived base oil may also be referred to as a GTL (Gas-To-Liquids) base oil. Suitable Fischer-Tropsch derived base oils that may be conveniently used as the base oil in the lubricating composition of the present invention are those as for example disclosed in EP 0 776 959, EP 0 668 342, WO 97/21788, WO 00/15736, WO 00/14188, WO 00/14187, WO 00/14183, WO 00/14179, WO 00/08115, WO 99/41332, EP 1 029 029, WO 01/18156 and WO 01/57166.

[0018] Synthetic oils include hydrocarbon oils such as olefin oligomers (including polyalphaolefin base oils; PAOs), dibasic acid esters, polyol esters, polyalkylene glycols (PAGs), alkyl naphthalenes and dewaxed waxy isomerates. Synthetic hydrocarbon base oils sold by the Shell Group under the designation "Shell XHVI" (trade mark) may be conveniently used.

[0019] Poly-alpha olefin base oils (PAOs) and their manufacture are well known in the art. Preferred poly-alpha olefin base oils that may be used in the lubricating compositions of the present invention may be derived from linear C_2 to C_{32}, preferably C_6 to C_{16}, alpha olefins. Particularly preferred feedstocks for said poly-alpha olefins are 1-octene, 1-decene, 1-dodecene and 1-tetradecene.

[0020] There is a strong preference for using a Fischer-Tropsch derived base oil over a PAO base oil, in view of the high cost of manufacture of the PAOs. Thus, preferably, the base oil contains more than 50 wt.%, preferably more than 60 wt.%, more preferably more than 70 wt.%, even more preferably more than 80 wt.%. most preferably more than 90 wt.% Fischer-Tropsch derived base oil. In an especially preferred embodiment not more than 5 wet.%, preferably not more than 2 wt.%, of the base oil is not a Fischer-Tropsch derived base oil. It is even more preferred that 100 wt% of the base oil is based on one or more Fischer-Tropsch derived base oils.

[0021] According to an especially preferred embodiment according to the present invention the composition comprises less than 20 wt.% of a Group IV base oil, preferably less than 10, more preferably less than 5, even more preferably less than 3, especially preferred less than 2, even more preferred less than 1 and most preferred 0 wt.% of a Group IV base oil.

[0022] The total amount of base oil incorporated in the lubricating composition of the present invention is preferably present in an amount in the range of from 60 to 99.5 wt.%, more preferably in an amount in the range of from 65 to 98 wt.% and most preferably in an amount in the range of from 70 to 96 wt.%, with respect to the total weight of the lubricating composition.

[0023] According to the present invention the base oil preferably has a kinematic viscosity at 100°C of at least 3.0 cSt (according to ASTM D445), preferably at least 4.0 cSt. Typically, the base oil has a kinematic viscosity at 100°C below 10.0, preferably below 8.5, more preferably below 7.0 cSt, or even below 5.5 cSt. In the event the base oil contains a blend of two or more base oils, it is preferred that the total contribution of the base oil to this kinematic viscosity is as indicated (preferably at least 3.0 cSt and typically below 10,0 cSt, etc.).

[0024] As mentioned above, the composition according to the present invention meets certain specific requirements for the kinematic viscosity at 100°C and the Brookfield Viscosity at -40°C.

[0025] Typically, the kinematic viscosity at 100°C (according to ASTM D 445) of the composition is between 3.6 and 6.0 cSt, more typically below 5.5 cSt. Preferably, the kinematic viscosity at 100°C of the composition is at least 3.7, preferably at least 3.9, more preferably at least 4.1, even more preferably at least 4.2, most preferably at least 4.5 cSt.

[0026] Typically, the Brookfield Viscosity at -40°C of the composition is between 2000 and 10,000 mPas and more typically above 4000 mPas. Preferably, the Brookfield Viscosity at -40°C of the composition is below 9000 mPas, preferably below 8000 mPas, more preferably below 7000 mPas, even more preferably below 6000 mPas.

[0027] The lubricating composition according to the present invention comprises less than 1.0 wt.% of a VI (Viscosity Index) improver, based on the total weight of the composition. The person skilled in the art readily understands what is meant by the term "VI improver".

[0028] More specifically, the lubricating composition according to the present invention comprises less than 1.0 wt.% of a VI (Viscosity Index) improver having a molecular weight of at least 300 average molecular weight (as determined by Gel Permeation Chromatography, in particular according to DIN 55672-1) and is selected from the group consisting of a polyisoalkylene component olefin copolymers, polyalkylmethacrylates, styrene-maleic esters and a combination thereof. The person skilled in the art readily understands what is meant by such VI improvers; in this respect it is noted that some VI improvers such as polyalkylmethacrylates also may have an effect on dispercancy. For a specific description of examples of these VI improvers, reference is made to EP-A-1 583 158, the teaching of which is hereby incorporated by reference.

[0029] Preferably, the VI improver has an average molecular weight of above 1000, more preferably above 2500, even more preferably above 5000.

[0030] According to a preferred embodiment of the present invention, the composition comprises less than 0.5 wt.%, preferably less than 0.1 wt.%, more preferably less than 0.05 wt.% of a VI improver, based on the total weight of the composition, most preferably no VI improver at all.

[0031] Furthermore it is preferred that the composition comprises less than 0.3 wt.%, preferably less than 0.1 wt.% of a pour point depressant, based on the total weight of the composition, more preferably no pour point depressant at all.

[0032] According to an especially preferred embodiment of the lubricating composition according to the present invention, the composition has a shear loss of less than 5%, preferably less than 2%, more preferably less than 1%, most preferably less than 0.5% as evaluated in a 20 hours KRL test according to CEC-L-45-A-99. The CEC L-45-A-99 measures the viscosity shear stability of transmission lubricants (on a Taper Roller Bearing Rig, which is also referred to with the German abbreviation "KLR").

[0033] The lubricating composition according to the present invention further comprises one or more additives such as anti-oxidants, anti-wear additives, (preferably ashless) dispersants, detergents, extreme-pressure additives, friction modifiers, metal deactivators, corrosion inhibitors, demulsifiers, anti-foam agents, seal compatibility agents and additive diluent base oils, etc.

[0034] As the person skilled in the art is familiar with the above and other additives, these are not further discussed here in detail. Specific examples of such additives are described in for example Kirk-Othmer Encyclopedia of Chemical Technology, third edition, volume 14, pages 477-526. Also specific reference is made to the above-mationed EP-A-1 553 158, the teaching of which is hereby incorporated by reference.

[0035] The lubricating compositions of the present invention may be conveniently prepared by admixing the one or more additives with the base oil(s).

[0036] The above-mentioned additives are typically present in an amount in the range of from 0.01 to 35.0 wt.%, based on the total weight of the lubricating composition, preferably in an amount in the range of from 0.05 to 25.0 wt.%, more preferably from 1.0 to 20.0 wt.%, based on the total weight of the lubricating composition.

[0037] In another aspect, the present invention provides the use of a lubricating composition according to the present invention, in particular as a transmission fluid, in order to improve one or more of shear stability (in particular according to CEC-L-45-A-99) and fuel economy. A favourable shear stability results in a limited shear loss (decrease in the kinematic viscosity at 100°C (determined by ASTM D445). Typically, the shear loss for the compositions according to the present invention will be less than 5%, preferably less than 2%, more preferably less than 1.5%, even more preferably less than 1% or even less than 0.5%. Most preferably, no shear loss will be measured within the reproducibility of the viscosity measurement by ASTM D445.

[0038] The present invention is described below with reference to the following Examples, which are not intended to limit the scope of the present invention in any way.

Examples

Lubricating Oil Compositions

[0039] Various transmission fluids for possible use in an automatic transmission, a dual clutch transmission, a transfer case, a power-steering system, a hydraulic system, etc., were formulated.

[0040] Tables 1 and 2 indicate the compositions and properties of the fully formulated transmission fluid formulations (Examples 1-5 and Comparative Examples 1-13) that were tested; the amounts of the components are given in wt.%, based on the total weight of the fully formulated formulations.

[0041] All tested transmission fluid formulations contained a combination of a base oil (or base oil mixture), an additive package (which additive package was the same in all tested compositions) and an anti-foam agent. Comparative Examples 12 and 13 also contained a VI improver.

[0042] The "Additive package" was a special performance package for transmission fluids and contained a combination of performance additives including a friction modifier, an anti-oxidant, an anti-rust agent, an anti-wear agent, a dispersant, and a detergent.

[0043] "VI improver 1" and "VI improver 2" were conventional VI improvers, commercially available from e.g. Evonik RohMax Additives GmbH (Darmstadt, Germany) (under the trade designation "Viscoplex 12-410" and "Viscoplex 0-050", respectively).

[0044] "Base oil 1" was a Fischer-Tropsch derived base oil ("GTL 4") having a kinematic viscosity at 100°C (ASTM D445) of approx. 4 cSt (1 cSt corresponds to 1 mm^2s^{-1}).

[0045] "Base oil 2" was a Fischer-Tropsch derived base oil ("GTL 5") having a kinematic viscosity at 100°C (ASTM D445) of approx. 5 cSt.

[0046] These GTL 4 and GTL 5 base oils meet Group III requirements and may be conveniently manufactured by or

similar to the process described in e.g. WO-A-02/070631, the teaching of which is hereby incorporated by reference.

[0047] "Base oil 3" and "Base oil 4" were commercially available Group II base oils. Base oils 3 and 4 are commercially available from e.g. Neste Oil B.V (Beringen, Belgium) (under the trade designation "Nexbase 3020", and "Nexbase 3030", respectively).

[0048] "Base oil 5" was a commercially available Group III base oil. Base oil 5 is commercially available from e.g. Neste Oil B.V (Beringen, Belgium) (under the trade designation "Nexbase 3043").

[0049] "Base oil 6" and "Base oil 7" were commercially available Group II base oils. Base oils 6 and 7 are commercially available from e.g. SK Energy (Ulsan, South Korea) (under the trade designation "Yubase 3", and "Yubase 3L", respectively).

[0050] "Base oil 8" was a commercially available Group III base oil. Base oil 8 is commercially available from e.g. SK Energy (Ulsan, South Korea) (under the trade designation "Yubase 4").

[0051] "Base oil 9" was a commercially available Group II base oil. Base oil 9 is commercially available from e.g. S-Oil Corporation (Onsan, South Korea) (under the trade designation "S-Oil Ultra 3").

[0052] "Base oil 10" was a commercially available Group III base oil. Base oil 10 is commercially available from e.g. S-Oil Corporation (Onsan, South Korea) (under the trade designation "S-Oil Ultra 4").

[0053] "Base oil 11" and "Base oil 12" were commercially available Group III base oils. Base oil 11 is commercially available from e.g. Petro-Canada (Canada) (under the trade designation "VHVI4"), and Base oil 12 is commercially available from e.g. Shell (under the trade designation "XHVI4.0").

[0054] The compositions of Examples 1-5 and Comparative Examples 1-13 were obtained by mixing the base oils with the additive package using conventional lubricant blending procedures.

Table 1

Component [wt.%]	Examples 1	Example 2	Example 3	Example 4	Example 5
Base oil 1 (Group III, GTL)	93.1	70.1	73.6	53.6	68.1
Base oil 2 (Group III, GTL)	-	23.0	19.5	39.5	-
Base oil 4 (Group II)	-	-	-	-	25.0
Additive package 1	6.85	6.85	6.85	6.85	6.85
VI improver	-	-	-	-	-
Anti-foam agent	Remainder	Remainder	Remainder	Remainder	Remainder
TOTAL	100	100	100	100	100
Kinematic Viscosity at 40°C[1] [cSt] V [cSt]	18.79	20.84	20.51	22.53	17.30
Kinematic viscosity at 100°C[1] [cSt]	4.25	4.56	4.51	4.83	3.98
Brookfield viscosity at -40°C[2] [mPas]	5290	5289	6630	7495	5970
I[3]	134	137	136	141	129
Kinematic viscosity at 100°C[4] of base oil	3.85	4.17	4.12	4.43	3.62
Shear Loss[5] [%]	n.d.	-0.2	n.d.	-0.3	n.d.

[1]According to ASTM D 445
[2]According to DIN 51398
[3]According to ASTM D2270
[4]According to ASTM D 445, determined for base oil or base oil mixture
[5]According to CEC-L-45-A-99, after 20 hours KRL test for viscosity at 100°C.
n.d. = not determined

Table 2

Component [wt.%]	Comp. Ex. 1	Comp. Ex. 2	Comp. Ex. 3	Comp. Ex. 4	Comp. Ex. 5	Comp. Ex. 6	Comp. Ex. 7	Comp. Ex. 8	Comp. Ex. 9
Base oil 3 (Group II)	93.1	-	-	-	-	-	-	-	-
Base oil 4 (Group II)	-	93.1	44.0	-	-	-	-	-	-
Base oil 5 (Group III)	-	-	49.1	93.1	-	-	-	-	-
Base oil 6 (Group II)	-	-	-	-	-	93.1	44.0	-	-
Base oil 7 (Group II)	-	-	-	-	93.1	-	-	-	-
Base oil 8 (Group III)	-	-	-	-	-	-	49.1	-	-
Base oil 9 (Group II)	-	-	-	-	-	-	-	93.1	-
Base oil 10 (Group III)	-	-	-	-	-	-	-	-	93.1
Base oil 11 (Group III)	-	-	-	-	-	-	-	-	-
Base oil 12 (Group III)	-	-	-	-	-	-	-	-	-
Additive package	6.85	6.85	6.85	6.85	6.85	6.85	6.85	6.85	6.85
VI improver 1	-	-	-	-	-	-	-	-	-
VI improver 2	-	-	-	-	-	-	-	-	-
Anti-foam agent	Remainder	Remainder	Remainder	Remainder	Remainder	Remainder	Remainder	Remainder	Remainder
TOTAL	100	100	100	100	100	100	100	100	100
Kinematic viscosity at 40°C[1] [cSt]	8.94	13.89	17.91	22.60	13.81	14.41	17.72	14.38	22.64
Kinematic viscosity at 100°C[1] [cSt]	2.51	3.36	4.01	4.70	3.32	3.45	4.01	3.49	4.74
Brookfield viscosity at -40°C[2] [mPas]	1475	6960	> 1000000	> 1000000	3150	6110	> 1000000	53070	> 1000000
VI[3]	107	115	123	128	111	115	126	122	132
Kinematic viscosity at 100°C[4] of base oil [cSt]	2.20	2.99	3.63	4.26	2.97	3.06	3.63	3.11	4.30
Shear Loss[5] [%]	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.

[1]According to ASTM D 445
[2]According to DIN 51398
[3]According to ASTM D2270
[4]According to ASTM D 445, determined for base oil or base oil mixture
[5]According to CEC-L-45-A-99, after 20 hours KRL test for viscosity at 100°C
n.d. = not determined

Table 2 (continued)

Component [wt.%]	Comp. Ex. 10	Comp. Ex. 11	Comp. Ex. 12	Comp. Ex. 13
Base oil 3 (Group II)	-	-	-	-
Base oil 4 (Group II)	-	-	67.4	-
Base oil 5 (Group III)	-	-	24.7	89.6
Base oil 6 (Group II)	-	-	-	-
Base oil 7 (Group II)	-	-	-	-
Base oil 8 (Group III)	-	-	-	-
Base oil 9 (Group II)	-	-	-	-
Base oil 10 (Group III)	-	-	-	-
Base oil 11 (Group III)	93.1	-	-	-
Base oil 12 (Group III)	-	93.1	-	-
Additive package	6.85	6.85	6.85	6.85
VI improver 1	-	-	1.0	-
VI improver 2	-	-	-	3.5
Anti-foam agent	Remainder	Remainder	Remainder	Remainder
TOTAL	100	100	100	100
Kinematic viscosity at 40°C[1] [cSt]	23.73	19.38	17.16	16.60
Kinematic viscosity at 100°C[1] [cSt]	4.87	4.46	4.02	3.95
Brookfield viscosity at -40°C[2] [mPas]	> 1000000	> 1000000	4839	5460
VI[3]	130	147	136	138
Kinematic viscosity at 100°C[4] of base oil [cSt]	4.42	4.0	3.28	2.99
Shear Loss[5] [%]	n.d.	n.d.	3.51	1.01

Discussion

[0055] As can be learned from Table 1, it has been surprisingly found according to the present invention that it is possible to formulate a transmission fluid which does not contain a VI improver (and/or a pour point depressant) but still meets the stringent conditions of a kinematic viscosity at 100°C of at least 3.6 cSt and a Brookfield Viscosity at -40°C of less than 10,000 mPas.

[0056] As can be seen from Table 2, none of the Comparative Examples 1-11 - which contained the same additive package as the formulation of Examples 1-5 but instead of a Fischer-Tropsch derived base oil mineral Group II and/or Group III base oils - met the above severe requirements without the use of a VI improver (or a VI improver that is added for the purpose of a pour point depressant).

[0057] Comparative Examples 12 and 13, to which a VI improver was added, met the above requirements of kinematic viscosity at 100°C and Brookfield Viscosity at -40°C, but resulted in an undesired level of shear loss. To the contrary, as can be seen from Table 1, Example 2 and Example 4 show a very good shear stability; no shear loss was found at all. Although no shear loss data was generated for Examples 1, 3 and 5, similar good values are expected.

[0058] Thus, as the compositions according to the present invention do not need the presence - or at least a substantial lower amount - of a VI improver, the shear stability of the composition is improved. In applications where the fluid is

pumped, this improved shear stability reduces or even eliminates the need to overcompensate shear losses by higher capacity pumps, consequently reducing costs and weight what eventually contributes to fuel economy.

[0059] Also, in view of the low kinematic viscosity and low Brookfield viscosity of the compositions according to the present invention, desirable fuel economy properties can be obtained with respect to start-up and pumping at low temperatures as well as operating conditions at elevated temperatures.

[0060] The above indicates that the compositions according to the present invention exhibit not only improved shear stability properties, but at the same time desirable fuel economy properties, especially when compared with a similar lubricating composition using a Group II and/or Group III mineral oil.

[0061] Also it was found that the compositions according to the present invention resulted in desirable flashpoint properties (according to DIN ISO 2592) and Noack volatility values (according to CEC-L-40-93B).

Claims

1. A lubricating composition comprising a base oil and one or more additives, wherein the base oil comprises a Fischer-Tropsch derived base oil and wherein the lubricating composition has:

   - a kinematic viscosity at 100°C (according to ASTM D 445) of at least 3.6 cSt;
   - a Brookfield Viscosity at -40°C (according to DIN 51398) of less than 10,000 mPas; and
   wherein the composition comprises less than 1.0 wt.% of a VI improver, based on the total weight of the composition.

2. Lubricating composition according to claim 1, wherein the base oil meets the requirements of a Group II or Group III base oil, preferably of a Group III base oil.

3. Lubricating composition according to claim 1 or 2, wherein the VI improver has a molecular weight of at least 300 average molecular weight (as determined by Gel Permeation Chromatography, in particular according to DIN 55672-1) and is selected from the group consisting of a polyisoalkylene component olefin copolymers, polyalkyl-methacrylates, styrene-maleic esters and a combination thereof.

4. Lubricating composition according to any one of claims 1 to 3, wherein the composition has a kinematic viscosity at 100°C (according to ASTM D 445) of at least 3.7, preferably at least 3.9, more preferably at least 4.1, even more preferably at least 4.2, most preferably at least 4.5 cSt.

5. Lubricating composition according to any one of claims 1 to 4, wherein the composition has a Brookfield Viscosity at -40°C of below 9000 mPas, preferably below 8000 mPas, more preferably below 7000 mPas, even more preferably below 6000 mPas.

6. Lubricating composition according to any one of claims 1 to 5, wherein the base oil has a kinematic viscosity at 100°C (according to ASTM D 445) of at least 3.0 cSt, more preferably at least 3.5, more preferably at least 4.0 cSt.

7. Lubricating composition according any one of claims 1 to 6, wherein the composition comprises less than 0.5 wt. %, preferably less than 0.1 wt.%, more preferably less than 0.05 wt.% of a VI improver, based on the total weight of the composition, most preferably no VI improver at all.

8. Lubricating composition according any one of claims 1 to 7, wherein the composition comprises less than 0.3 wt. %, preferably less than 0.1 of a pour point depressant, based on the total weight of the composition, more preferably no pour point depressant at all.

9. Lubricating composition according any one of claims 1 to 8, wherein the base oil contains more than 50 wt.%, preferably more than 60 wt.%, more preferably more than 70 wt.%, even more preferably more than 80 wt.%, most preferably more than 90 wt.% Fischer-Tropsch derived base oil.

10. Lubricating composition according any one of claims 1 to 9, wherein the composition comprises less than 20 wt.% of a Group IV base oil, preferably less than 10, more preferably less than 5, even more preferably less than 3, especially preferred less than 2, even more preferred less than 1 and most preferred 0 wt.% of a Group IV base oil.

11. Lubricating composition according to any one of claims 1 to 10, wherein the composition has a shear loss of less

than 5%, preferably less than 2%, more preferably less than 1.0%, most preferably less than 0.5%, as evaluated in a 20 hours KRL test according to CEC-L-45-A-99.

12. Use of a lubricating composition according to any one of claims 1 to 11, in particular as a transmission fluid, in order to improve one or more of shear stability (in particular according to CEC-L-45-A-99) and fuel economy properties.

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EUROPEAN SEARCH REPORT

Application Number
EP 09 15 2596

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	22 June 2009	Bertrand, Samuel

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