

PATENT SPECIFICATION

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(54) PROCESS FOR THE PREPARATION OF LUBRICATING OILS

(71) We, SHELL INTERNATIONALE RESEARCH MAATSCHAPPIJ N.V., a company organised under the laws of The Netherlands, of 30 Carel van Bylandtlaan, The Hague, The Netherlands, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to a process for the preparation of lubricating oils with a viscosity index below 90.

Lubricating oils and lubricating oil compositions may be classified on the basis of their viscosity index (VI) as low viscosity index (LVI) oils (VI < 3), medium viscosity index (MVI) oils (VI varying from 30 to 90), high viscosity index (HVI) oils (VI varying from 90 to 120), and very high viscosity index (VHVI) oils (VI > 120). (The viscosity indices mentioned in this specification refer to values as determined by means of the ASTM method D 2270—64).

The VI is a measure of the dependence of the viscosity of a lubricating oil on temperature. The higher the VI of an oil the less sensitive is its viscosity to temperature differences. If lubricating oils are to be used at widely divergent temperatures (e.g. in modern automotive engines) a high VI of the oil is attractive, and hence HVI oils and even VHVI oils are generally used for these purposes.

MVI and LVI oils, whose oxidation stability is, in general, somewhat inferior to that of HVI oils, can be used in all those applications where the viscosity index is not of paramount importance, for example in industrial applications, and in those applications wherein no high demands are made on the oxidation stability of the oil.

For the preparation of HVI oils paraffinic crude oils are used as feedstocks, since it is impossible to prepare lubricating oils with

the desired viscosity index from naphthenic crude oils with the aid of conventional processes, which comprise distillation, deasphalting, extraction and dewaxing.

MVI and LVI oils are usually obtained from naphthenic crude mineral oils, using as processing steps: distillation, extraction (only for MVI oils) and, if desired, a finishing, e.g. an acid treatment or a hydrogen treatment.

In this specification and the accompanying claims the term "paraffinic crude oils" denotes crude mineral oils in which an appreciable amount of paraffins with a melting point over 15°C is present. Hence, distillation and residual fractions of paraffinic crude oils containing these paraffins have relatively high melting points, and removal of paraffins (so-called dewaxing) is needed in order to obtain fuels and lubricating oils which can be used at ambient temperatures or lower.

The term "naphthenic crude oils" in this specification and the accompanying claims denotes crude mineral oils which contain hardly any paraffins with a melting point over 15°C, if at all. Hence, fuels and lubricating oils prepared from naphthenic crude oils do not need dewaxing.

MVI and LVI oils are prepared, in general, by blending vacuum distillate fractions obtained from a naphthenic crude oil; these fractions are designated by a number which is equal to their viscosity in seconds Redwood at 140°F. Examples of fractions are LVI 50, LVI 140, LVI 240, LVI 450, LVI 700 and LVI 1100. If an MVI oil is to be prepared from one or more of these fractions the viscosity index is to be somewhat increased. This can be accomplished by removing part or all of the aromatic compounds of one or more of the fractions to be incorporated into the MVI oil by extraction, which is often carried out with the aid of furfural, sulphur dioxide or phenol as the extracting agent.

[Price 33p]

The cost of the preparation of the LVI distillate fractions increases with viscosity. In particular the preparation of the distillate with the highest viscosity, in general LVI 1100, is cumbersome and costly, since high temperatures and low pressures are needed to distil this fraction. For that reason replacement of distillate fractions with high viscosity obtained from naphthenic crude oils by other components seems attractive. As a matter of fact, this replacement may not impair the properties of the lubricating oil such as stability against oxidation, colour and colour stability to an unattractive level.

In areas where only an HVI lubricating oil plant exists, it would be of special advantage if it were possible to prepare MVI and/or LVI lubricating oils from the HVI feedstock since the transport of fractions originating from a naphthenic crude oil from their production site to the area concerned may be inconvenient and costly. It would in particular be of advantage if it were possible to prepare MVI and LVI lubricating oils from a paraffinic crude oil without impairing the yield of HVI lubricating oil prepared from that feedstock to an appreciable extent.

The aim set for such an MVI and/or LVI lubricating oil to be prepared from an HVI lubricating oil feedstock is that their viscosimetric and oxidative properties are comparable to those of MVI and/or LVI lubricating oils prepared entirely from naphthenic crude mineral oil as feedstock.

There has now been found an oil fraction, originating from a paraffinic crude oil, which is very suitable to be used as a component with high viscosity for the preparation of LVI and MVI lubricating oils. This oil fraction is very attractive for use in LVI and MVI lubricating oils based partly on components derived from a naphthenic crude oil, as well as in LVI and MVI lubricating oils entirely derived from a paraffinic crude oil.

The preparation of HVI lubricating base oils is normally carried out as follows. A paraffinic crude mineral oil is separated, by means of distillation under atmospheric pressure, into a number of distillate fractions and a residual fraction (the so-called long residue). The residual fraction is then subjected to a distillation under reduced pressure to separate it into fractions, for example, into three vacuum distillate fractions and one residual fraction (the so-called short residue).

The vacuum distillate fractions obtained can be classified according to their viscosities; as an example may be mentioned that a distillation yields three vacuum distillate fractions: a fraction with a viscosity between about 10 and 15 cSt at

140°F (spindle oil waxy distillate), a fraction with a viscosity between about 25 and 35 cSt at 140°F (light machine oil waxy distillate) and a fraction with a viscosity between about 50 and 70 cSt at 140°F (medium machine oil waxy distillate).

The fractions obtained by distillation under reduced pressure are normally subjected to a number of refining processes. These refining processes comprise removal of at least part of the aromatics and the paraffins (the wax) contained in the oil. As far as the residual fraction is concerned, removal of the asphalt is required as well. Asphalt is undesirable in lubricating oils and also interferes in subsequent refining processes. The processes for the removal of asphalt, aromatics and paraffins are hereinafter referred to as deasphalting, aromatics extraction and dewaxing.

Deasphalting, which in the preparation of a lubricating base oil from a residual fraction normally precedes the aromatics extraction and the dewaxing, is usually carried out with the aid of propane as deasphalting solvent.

Aromatics extraction—which is often carried out with the aid of furfural, sulphur dioxide or phenol as the extracting agent—serves to increase the viscosity index and to improve the colour and colour stability and the oxidation stability of the fractions. The aromatic extracts are by-products of HVI lubricating oil manufacture and are of low value. In general they are used as fuel components.

Dewaxing serves to decrease the pour point of the fractions and thus to make them suitable for use as lubricating oils at temperatures below ambient temperature. Dewaxing is in general carried out after aromatics extraction.

As the aromatic extracts discussed above generally have a low VI, their viscosity properties make them suitable for use as components of MVI and LVI oils. However, in general the aromatic extracts have poor resistance to oxidation and a poor colour and colour stability. For these reasons they are not used as lubricating oils.

It has now been found that a specific aromatic extract, viz. the aromatic extract of a deasphalted short residue, has good resistance against oxidation and can be used as a high-viscosity component of LVI and MVI oils.

It has also been found that aromatic extracts from distillate fractions of a crude oil which have been treated with hydrogen in the presence of a hydrogenation catalyst have increased resistance against oxidation and improved colour and colour stability, and are suitable for use as components with lower viscosity of LVI and MVI oils, which

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contain the said aromatic extract of a deasphalted short residue as a high viscosity component.

5 Accordingly, the invention provides a process for the preparation of lubricating oils with a viscosity index below 90 which comprises blending of

(a) an aromatic extract of a deasphalted short residue of a paraffinic crude oil in an amount of at least 1 %w of the total lubricating oil, and

(b) a hydrofinished aromatic extract of a vacuum distillate fraction of a crude oil, and/or

15 (c) a vacuum distillate fraction of a naphthenic crude oil.

Hydrofinishing within the purview of this specification and the accompanying claims stands for a treatment of oil fractions with hydrogen in the presence of a catalyst which consists of one or more of the metals molybdenum, chromium, tungsten, vanadium, platinum, nickel, copper, iron and cobalt or their oxides and/or sulphides, either unsupported or supported on a suitable catalyst carrier, such as alumina or silica. Particularly advantageous catalysts are the iron transition metals (iron, cobalt and nickel) and the Group-VIB metals (chromium, molybdenum and tungsten), especially combinations of metals from each of these groups, for instance cobalt and molybdenum, nickel and tungsten, and nickel and molybdenum supported on alumina. The catalyst may also contain promoters, such as compounds containing phosphorus, fluorine or borium.

The average catalyst bed temperatures at which hydrofinishing is carried out range from 275—400°C, in particular from 300—370°C. The total pressures range from 50—200 atm and the space velocities from 0.1—2 kg feed per 1 catalyst per hour, in particular from 0.5—1 kg/l/h.

45 Lubricating oil compositions containing at least 10 %w of the aromatic extract mentioned under (a) are preferred in view of the oxidative properties of this extract. By blending appropriate amounts of an aromatic extract of a deasphalted short residue of a paraffinic crude oil and one or more of the fractions mentioned under (b) and (c) a broad scale of LVI and MVI oils with desired viscosities can be obtained.

55 The hydrofinished aromatic extract of a spindle oil waxy distillate is preferred as component mentioned under (b) since it has the lowest viscosity of the hydrofinished aromatic extracts of vacuum distillate fractions of a crude mineral oil, and accordingly allows the largest amounts of the aromatic extract of a deasphalted residue as mentioned under (a) to be incorporated into a lubricating oil of the desired viscosity.

65 Although the aromatic extracts of a

vacuum distillate fraction as mentioned under (b) may be derived from a naphthenic crude oil, it is preferred that they are prepared from a paraffinic crude oil because in that case they can be prepared from the same crude mineral oil (and hence at the same refinery) as the aromatic extract of a deasphalted short residue as mentioned under (a).

The distillate fractions of a naphthenic crude oil mentioned under (c) may be refined e.g. by a clay and/or an acid and/or a hydrofinishing treatment before they are blended with the aromatic extract mentioned under (a).

As discussed above the resistance against oxidation of the aromatic extract of a deasphalted short residue mentioned under (a) is good. The colour and colour stability of blends containing the component mentioned under (a) may leave to be desired for certain applications. For that reason the said aromatic extract is preferably hydrofinished in cases wherein it is to be used in applications where requirements for colour and colour stability are set.

If the aromatic extract of a deasphalted short residue mentioned under (a) is hydrofinished, blending of this hydrofinished extract with the hydrofinished extract mentioned under (b) gives the opportunity to prepare blends of any required viscosity at any moment. For this reason blending of these hydrofinished aromatic extracts is more attractive than blending the unhydrofinished aromatic extracts followed by hydrofinishing of the mixture.

It is preferred that either a hydrofinished aromatic extract of a vacuum distillate fraction of a crude mineral oil as mentioned under (b) or a vacuum distillate fraction of a naphthenic crude oil as mentioned under (c) is used in the process of the present invention.

LVI and MVI oils are in general classified by their viscosity, e.g. seconds Redwood I at 140°F, or for automotive purposes by the so-called SAE classification, each class having a viscosity at 210°F within a specified range. Examples of widely used lubricating oils are those classified in the SAE—30, SAE—40, SAE—50 and SAE—60 classes.

It is to be understood that mixtures of aromatic extracts of a deasphalted short residue of a paraffinic crude oil as mentioned under (a) may be used; the components of such a mixture may be derived from the same or from different paraffinic crude oils.

Furthermore several hydrofinished aromatic extracts of different distillate fractions as mentioned under (b) or mixtures thereof may be blended in. It is also possible to use hydrofinished aromatic extracts of vacuum distillate fractions of different

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crude oils or mixtures of crude oils.

In the process according to the invention two or more vacuum distillate fractions of a naphthenic crude oil as mentioned under (c) or mixtures thereof may be incorporated into the lubricating oils according to the invention.

In case the LVI and MVI lubricating oils obtained according to the invention have a pour point (which is the lowest temperature observed in a standard laboratory test (ASTM D97) at which the oil still flows) which is too high for the application envisaged, the oil may be dewaxed. Since dewaxing of these types of oils is costly and cumbersome, it is preferred to incorporate, during or after the blending, a suitable pour point depressant to decrease the pour point to an acceptable value. Pour point depressants are well-known, and as examples of the types of compounds which may be used may be mentioned condensation products of chlorinated wax and naphthalene, condensation products of phenol and chlorinated wax, and polymeric pour point depressants, such as polymers of esters of acrylic or methacrylic acid. Very suitable pour point depressants consist of copolymers of ethylene and an olefinically unsaturated aliphatic monomer containing from 3 to 5 carbon atoms, such as copolymers of ethylene and unsaturated esters, e.g. copolymers of ethylene and vinyl acetate. Preference is also given to polymers containing unbranched aliphatic hydrocarbon side chains with at least 16 carbon atoms, in particular polymers of unsaturated esters, such as polymers of alkylacrylates or alkylmethacrylates in which the alkyl chains are unbranched and contain 16—22 carbon atoms, and copolymers of these esters with vinylpyridines, e.g. 4-vinylpyridine. Particularly suitable are polymers of alkylacrylates with unbranched alkyl chains containing 18 or 20 carbon atoms with a number average molecular weight between 10,000 and 100,000.

The amount of pour point depressant incorporated into the LVI and MVI lubricating oils prepared according to the invention may vary between wide limits. Amounts between 0.01 and 1 %w are preferred.

The pour point depressants may be added as such during blending, or they may be dissolved in one or more of the components mentioned under (a), (b) and (c) to be blended. Preferably the pour point depressants are incorporated into the LVI and MVI oils after blending of the aromatic extract of a deasphalted short residue mentioned under (a) and the hydrofinished extract of a vacuum distillate fraction mentioned under (b) and/or the vacuum dis-

tillate fraction of a naphthenic crude oil mentioned under (c).

Into the LVI and MVI lubricating oils prepared according to the process of the invention may be incorporated during or after blending of the components mentioned under (a), (b) and (c) compounds which are capable of imparting desired properties to the LVI and MVI lubricating oils. As examples may be mentioned (besides the pour point depressants discussed) antioxidants (e.g. phenolic antioxidants) and/or detergents (e.g. calcium petroleum sulphonates, calcium alkylsalicylates, polyamines containing a hydrocarbon chain with at least 50 carbon atoms, such as polyisobutenyl-tetraethylene pentamine, reaction products of a polyamine (e.g. tetraethylene pentamine) and an alkylsuccinic anhydride in which the alkyl group contains at least 50 carbon atoms) and/or EP additives, such as zinc dialkyldithiophosphates.

The blends obtained according to the invention may be used in many applications, e.g. as automotive lubricating oils, as gear oils, as axle oils, in greases, in concrete mould oils, in rubber processing and extender oils, in cutting oils, in printing inks, for batching of fibres, and as moulding oils in the foundry industry.

EXAMPLE I.

The long residue from a paraffinic crude oil originating from the Middle East was vacuum-distilled to yield three distillate fractions, viz. a spindle oil waxy distillate (viscosity 10.2 cSt at 140°F), a light machine oil waxy distillate (viscosity 29.5 cSt at 140°F) and a medium machine oil waxy distillate (viscosity 56.2 cSt at 140°F). The residue of the vacuum distillation was deasphalted with the aid of propane and the deasphalted oil obtained was extracted with the aid of furfural. The furfural extract obtained is further on in the Examples referred to as DAO extract. The DAO extract was hydrofinished by leading it over a catalyst containing nickel, molybdenum and phosphorus or alumina as a support, in the presence of hydrogen at a temperature of 340—360°C, a space velocity of 0.3—0.5 kg/l catalyst/h and a total pressure of 130—140 atm. The product obtained after removal of volatile components is further on referred to as hydrofinished DAO extract. The DAO extract and the hydrofinished DAO extract were used as component a) of oil compositions prepared according to the process of the invention.

The spindle oil waxy distillate mentioned above was extracted with the aid of furfural, and the extract was hydrofinished under the conditions mentioned above. The product so obtained (after removal of volatile com-

- pounds) is further on referred to as hydrofinished spindle oil extract; it is used as component b) of oil compositions prepared according to the process of the invention. 35
- The long residue of a naphthenic crude oil originating from South America was vacuum-distilled to yield several fractions. A fraction with a viscosity at 140°F of 170 sec. Redwood I (an LVI 170 oil) was isolated and treated with sulphuric acid. The oil so obtained had a viscosity of 140 sec. Redwood I at 140°F and is further on designated as LVI 140 oil; it is used as component c) in the preparation of oil compositions according to the process of the invention. Another fraction of the distillate was hydrofinished and yielded an oil with a viscosity of 50 sec. Redwood and is further on designated as LVI 50 oil; it is used as component c). 40
- Several oil compositions in the SAE 20, 30, 40, 50, 60 and 70 classes were prepared by blending a component a) with component b) or component c). From these compositions were determined the viscosity at 210°F, the viscosity index (by means of ASTM method D 2270—64), the pour point by means of ASTM method D 97). The pour point of several compositions was also determined after incorporation of 0.1% of a 45
- pour point depressant. As pour point depressants were used a polyer of C₁₈-alkylacrylate with a number average molecular weight of 25,000 (additive A) and a commercial copolymer of ethylene and vinylacetate (additive B). 50
- The oxidative properties of the blends were determined with the aid of a method according to which, for 24 hours and at 130°C, 15 l air per hour was passed through a sample of the oil, which contained copper and iron wires. At the end of each experiment the sludge content of the oil after 20-fold dilution with n-heptane was determined, and the results expressed as a weight percentage thereof. 55
- The results of the determinations are compiled in Tables I—V; in these tables also comparative figures for conventional LVI and MVI oil are in some instances recorded. 60
- It can be seen that the oil compositions prepared according to the process of the invention (experiments 3, 4, 5, 6, 7, 9, 10, 11, 12, 13, 17, 18, 19, 20 and 22—29) have viscosity and oxidative properties not much different from oils prepared from naphthenic crude oils entirely (experiments 14, 15, 16)); the former can replace the conventional LVI and MVI oils in many applications.

Table I.

Exp. No.	1	2	3	4	5	6	7
SAE class			20	30	40	50	60
DAO extract p.b.w.	100		38	45	60	65	75
Hydrofinished spindle oil extract pbw		100	62	55	40	35	25
Viscosity at 210°F, cSt	63.5	4.25	8.0	11.6	17.2	19.7	26.7
Viscosity index		-40	25	31	32	32	34
Pour point, °C		-7		4	10	10	13
Pour point after addition of 0.1% additive A, °C			-15	-12	-7	-4	-1
Pour point after addition of 0.1% additive B, °C				-12	-4	-4	-1
Sludge in oxidation test, %w	0.3	2.6	2.8	2.7	2.0	1.7	1.2

Table II.

Exp. No.	8	2	9	10	11	12	13
SAE Class			20	30	40	50	60
Hydrofinished DAO extract, pbw	100		38	57	70	80	86
Hydrofinished spindle oil extract, pbw		100	62	43	30	20	14
Viscosity at 210°F, cSt	35	4.25	8.0	12.6	16.7	21.0	25.0
Viscosity index	44	-40		43	43	41	45
Pour point, °C		-7		13	16	16	17
Pour point after addition of 0.1% additive A, °C				-9	-7	-7	-4
Pour point after addition of 0.1% additive B, °C				-9	-7	-7	-4
Sludge oxidation test, %w	0	2.6	1.7	1.2	0.9	0.6	0.5

Table III.

Exp. No.	1	14	15	16	17	18
SAE Class		20	50	60	50	60
DAO extract pbw	100				50	62
LVI 140 oil, pbw		100			50	38
LVI—450, based on naphthenic feedstock entirely			100			
LVI—650, based on naphthenic feedstock entirely				100		
Viscosity at 210°F, cSt	63.5	8.12	18.7	25.0	20.5	26.3
Viscosity index		-6	4	-16	9	14
Pour Point, °C		-22			+3	+8
Pour point after addition of 0.1%, additive A, °C					-5	-1
Sludge in oxidation test, %w	0.3	1.5	0.8	2.0		1.1

Table IV.

Exp. No.	8	14	19	20
SAE class			50	60
Hydrofinished DAO extract, pbw	100		64	80
LVI 140 oil, pbw		100	36	20
Viscosity at 210°F, cSt	35.0	8.12	20.0	25.5
Viscosity index	44	-6	15	
Pour point, °C		-22	+5	+10
Pour point after addition of 0.1% additive A, °C			-8	-5
Sludge in oxidation test, %w	0	1.5	0.7	0.1

Table V.

Exp. No.	1	8	21	22	23	24	25	26	27	28	29
SAE class					20	40	70		20	30	50
DAO extract, pbw	100			20	40	60	80				
Hydrofinished DAO extract, pbw		100						20	40	60	80
LVI—50 oil, pbw			100	80	60	40	20	80	60	40	20
Viscosity at 210°F, cSt	63.5	35	3.69	5.59	8.86	15.60	29.8	5.29	7.96	12.4	20.2
Viscosity index		44	7	42	44	35	24	41	43	44	24
Pour point, °C				-31	-17	-2	+8	-27	-13	-2	+10
Pour point after addition of 0.1% additive A, °C											
Pour point after addition of 0.1% additive B, °C											
Sludge in oxidation test, %w	0.3	0	0.7	1.6	2.0	1.6	0.7	1.0	1.0	0.5	0.1

WHAT WE CLAIM IS:—

1. A process for the preparation of lubricating oils with a viscosity index below 90 which comprises blending of
 - (a) an aromatic extract of a deasphalted short residue of a paraffinic crude oil in an amount of at least 1 %w of the total lubricating oil, and
 - (b) a hydrofinished aromatic extract of a vacuum distillate fraction of a crude mineral oil, and/or
 - (c) a vacuum distillate fraction of a naphthenic crude oil.
2. A process according to claim 1 in which at least 10 %w of the total lubricating oil is an aromatic extract of a deasphalted short residue of a paraffinic crude oil.
3. A process according to claim 1 or 2 in which the crude mineral oil mentioned under (b) is a paraffinic crude oil.
4. A process according to any one of claims 1—3, in which the vacuum distillate fraction of a crude mineral oil mentioned under (b) is a spindle oil waxy distillate.
5. A process according to any one of the preceding claims in which the vacuum distillate fraction mentioned under (c) has been refined by a clay and/or an acid and/or a hydrofinishing treatment.
6. A process according to any one of the preceding claims in which either a hydrofinished aromatic extract of a vacuum

Table V.

Exp. No.	1	8	21	22	23	24	25	26	27	28	29
SAE class					20	40	70		20	30	50
DAO extract, pbw	100			20	40	60	80				
Hydrofinished DAO extract, pbw		100						20	40	60	80
LVI—50 oil, pbw			100	80	60	40	20	80	60	40	20
Viscosity at 210°F, cSt	63.5	35	3.69	5.59	8.86	15.60	29.8	5.29	7.96	12.4	20.2
Viscosity index		44	7	42	44	35	24	41	43	44	24
Pour point, °C				-31	-17	-2	+8	-27	-13	-2	+10
Pour point after addition of 0.1% additive A, °C						-12	-1		-25	-18	-10
Pour point after addition of 0.1% additive B, °C						-13	-3		-26	-19	-10
Sludge in oxidation test, %w	0.3	0	0.7	1.6	2.0	1.6	0.7	1.0	1.0	0.5	0.1

WHAT WE CLAIM IS:—

1. A process for the preparation of lubricating oils with a viscosity index below 90 which comprises blending of
 - (a) an aromatic extract of a deasphalted short residue of a paraffinic crude oil in an amount of at least 1 %w of the total lubricating oil, and
 - (b) a hydrofinished aromatic extract of a vacuum distillate fraction of a crude mineral oil, and/or
 - (c) a vacuum distillate fraction of a naphthenic crude oil.
2. A process according to claim 1 in which at least 10 %w of the total lubricating oil is an aromatic extract of a deasphalted

short residue of a paraffinic crude oil.

3. A process according to claim 1 or 2 in which the crude mineral oil mentioned under (b) is a paraffinic crude oil.

4. A process according to any one of claims 1—3, in which the vacuum distillate fraction of a crude mineral oil mentioned under (b) is a spindle oil waxy distillate.

5. A process according to any one of the preceding claims in which the vacuum distillate fraction mentioned under (c) has been refined by a clay and/or an acid and/or a hydrofinishing treatment.

6. A process according to any one of the preceding claims in which either a hydrofinished aromatic extract of a vacuum



- distillate fraction of a crude mineral oil as mentioned under (b) or a vacuum distillate fraction of a naphthenic crude oil as mentioned under (c), is used.
- 5 7. A process according to any one of the preceding claims in which the aromatic extract of a deasphalted residue of a paraffinic crude oil as mentioned under (a) has been hydrofinished.
- 10 8. A process according to any one of the preceding claims in which during or after blending a pour point depressant is incorporated in the blend, or a pour point depressant is dissolved in one or more of the components (a), (b) and (c) to be blended.
- 15 9. A process according to claim 8 in which the pour point depressant is incorporated after blending of the aromatic extract of a deasphalted short residue as mentioned under (a) and the hydrofinished aromatic extract of a vacuum distillate fraction as mentioned under (b) and/or a vacuum distillate fraction of a naphthenic crude oil as mentioned under (c).
- 20 10. A process according to claim 8 or 9, in which the pour point depressant is a copolymer of ethylene and an olefinically unsaturated aliphatic monomer containing from 3 to 5 carbon atoms.
- 25 11. A process according to claim 10, in which the pour point depressant is a copolymer of ethylene and vinyl acetate.
- 30 12. A process according to claim 8 or 9 in which the pour point depressant is a polymer containing unbranched aliphatic hydrocarbon side chains with at least 16 carbon atoms.
- 35 13. A process according to claim 12, in which the pour point depressant is a polymer of alkylacrylates or alkylmethacrylates in which the unbranched alkyl chains contain 16—22 carbon atoms.
- 40 14. A process according to claim 13, in which the pour point depressant is a polymer of alkylacrylates with unbranched alkyl chains containing 18 or 20 carbon atoms, with a number average molecular weight between 10,000 and 100,000.
- 45 15. A process according to any one of claims 8 to 14 in which the amount of pour point depressant is between 0.01 and 1 %w.
- 50 16. A process according to any one of the preceding claims in which during or after blending an antioxidant and/or a detergent and/or an EP additive is, or are, incorporated in the blend.
- 55 17. A process according to claim 1, substantially as described with special reference to the Examples.
- 60 18. Lubricating oils with a viscosity index below 90, whenever obtained by the process of any one of the preceding claims.

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