United States Patent Office 3,143,513 Patented Aug. 4, 1964

3,143,513

LUBRICANT COMPOSITION

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No Drawing. Filed Feb. 20, 1961, Ser. No. 90,197
Claims priority, application Great Britain Feb. 26, 1960
4 Claims. (Cl. 252—51.5)

The present invention relates to a lubricating oil composition containing a mixture of two additives which synergistically lower the pour point of the lubricating oil.

It is known that particular polymeric oil-soluble additives may lower the pour point of lubricating oils, such additives may also have other properties such as viscosity index (V.I.) improving and detergent properties. The applicants have discovered that if a copolymer of polyethylene with an ester of vinyl alcohol and a C_1–C_4 monocarboxylic acid is employed in lubricating oils in conjunction with the oil-soluble polymers or copolymers as hereinafter defined there is an unexpected improvement in the pour point of the lubricating oil.

The present invention therefore comprises an improved lubricating oil composition containing an oil-soluble polymer or copolymer derived from at least one unsaturated compound having at least one ester group, as hereinafter defined, together with an oil-soluble copolymer of polyethylene with an ester of vinyl alcohol and a C_1–C_4 monocarboxylic acid.

The lubricating oils employed as the base oils may be of mineral origin or synthetic lubricating oils such as synthetic ester lubricants.

The oil-soluble polymer is hereby defined as a homopolymer of an unsaturated ester, or a copolymer of the unsaturated ester or esters with one or more copolymerisable compounds, such comonomers preferably containing polar groups selected from halogen-containing, nitrogen-containing, sulfur-containing, ester, carboxylic acid, anhydride or hydroxyl groups.

A representative list of unsaturated polymers and copolymers as hereinbefore defined is given below. This list is not intended to be an exhaustive list of types of polymers that may be employed in the composition of the present invention but merely illustrative.

Homopolymers.—Polymers of acrylic acid esters and methacrylic acid esters.

Two component copolymers.—Copolymers of vinyl acetate and fumaric acid esters, of vinyl acetate or acrylic acid esters with styrene, of cinnamic acid esters with acrylic or methacrylic acid esters, acrylic acid esters with maleic anhydride, of vinyl acetate with aconitic acid esters, different esters of fumaric acid that is, esters which have alkyl groups of different chain lengths, of nitriles or amides of unsaturated monobasic acids with methacrylic acid esters with nitriles of amides of unsaturated dibasic acids, of C_8–C_{18} alcohol esters of unsaturated acids or esters of unsaturated alcohols with C_3–C_8 organic acids such as vinyl acetate with butyrolactams such as N-vinyl pyrrolidone, of vinyl esters and/or esters of unsaturated dicarboxylic acids with unsaturated urethanes, unsaturated ureas, N-vinyl-n-alkyl amides of aliphatic carboxylic acids, N-vinyl pyrazolones, N-vinyl morpholines, N-vinyl imidazolines, N-vinyl sultams or N-vinyl cyclic imides.

Three component copolymers.—Copolymers of fumaric acid esters and vinyl acetate with maleic anhydride, partial esters of maleic acid or maleic hydrazide, or butyrolactams such as N-vinyl pyrrolidone.

Four component copolymers.—Copolymers of a mixture of two different fumaric acid esters and vinyl acetate with maleic anhydride, or partial esters of maleic acid or butyrolactams such as N-vinyl pyrrolidone.

The copolymer of polyethylene with an ester of vinyl alcohol and a C_1–C_4 monocarboxylic acid is preferably derived from 2–30% by weight of the vinyl ester, particularly from 4–15% by weight of the vinyl ester.

The oil-soluble polyethylene copolymer may be added to the lubricating oil in the form of oil concentrates, the copolymer being present at concentrations of from 25% to 50% by weight in the concentrate.

When polyethylene is employed in the polyethylene copolymer used in the compositions of the present invention the polyethylene may be obtained by polymerising ethylene until the desired average molecular weight range is obtained; or by the degradation of high molecular weight polyethylene until the desired average molecular weight range is obtained. As used in this specification the average molecular weight was determined by the cryoscopic method. A preferred molecular weight range for polyethylene is from 800 to 6,000, a range of from 800 to 2,000 being particularly preferred.

Polyethylene as prepared by the known techniques consists of straight chain polymers and branched chain polymers, the applicants have discovered that it is particularly desirable to use polyethylene which contains branched chain polymers. We have found that suitable polyethylene copolymers have a molecular weight from 1,200 to 1,400, dropping point from 195 to 210° F., viscosity from 5 to 8.8 stokes at 210° F., and penetration at 77° F. of 8 to 12 mm./10. A particularly preferred polyethylene copolymer has a molecular weight of 1,300, dropping point of 204° F., viscosity of 7.34 stokes at 210° F., and penetration at 77° F. of 10 mm./10.

It is preferred that the lubricating oil compositions of the present invention, when containing polyethylene copolymer, contain from 0.003 to 0.3 weight percent of the oil-soluble polyethylene copolymer, a range of 0.05 to 0.1 weight percent of the polyethylene copolymer being particularly preferred.

Example 1

A paraffinic mineral lubricating oil of Middle East origin having a V.I. of 113 was employed as the base oil, a 40% oil solution a copolymer of *n* C_9–C_{10} alkyl fumarate acid esters and *n* C_{12}–C_{18} alkyl fumarate acid diester, vinyl acetate and maleic anhydride being the polymeric additive, the polyethylene copolymer being derived from polyethylene and 8% of vinyl acetate and having a molecular weight of 1300. The pour points of the lubricating oil alone and with the additives singly and in combination, are given below.

	Pour point, ° F.
Base oil	+15
Base oil+6.25% by wt. of the oil-solution of the polymeric additive	−5
Base oil+0.1% by wt. of polyethylene copolymer	+15
Base oil+6.25% by wt. of the oil-solution of the polymeric additive, and 0.1% by wt. polyethylene copolymer	−15

Example 2

A copolymer containing N-vinyl pyrrolidone instead of maleic anhydride as in the previous example was employed, the other polymer constituents remaining the same, the base oil and polyethylene copolymer being the same as in Example 1.

	Pour point, ° F.
Base oil	+15
Base oil+6.25% by wt. of the oil-solution of the polymeric additive	0
Base oil+0.1% by wt. of polyethylene copolymer	+15
Base oil+6.25% by wt. of the oil-solution of polymeric additive, and 0.1% by wt. polyethylene copolymer	−15

In all the above examples the pour points were determined by the method described in I.P. 15/55 "Cloud and Pour Point Test."

It will be seen in the examples that an unexpected drop in the pour point of the base oil is obtained when employing the two additives together in accordance with the present invention as compared to the pour points when the additives are used singly.

Conventional lubricating oil additives such as antioxidants, extreme-pressure additives, detergent additives and viscosity index improving additives may also be added to the lubricating oil compositions of the present invention.

What is claimed is:

1. A lubricating composition comprising a major proportion of a mineral lubricating oil and a minor amount, sufficient to depress the pour point of said oil, of a mineral lubricating oil pour point depressant which is an oil-soluble copolymer of (1) ester of fumaric acid and C_8 to C_{18} alcohol, (2) vinyl acetate, and (3) a material selected from the group consisting of maleic anhydride and N-vinyl pyrollidone; and an amount within the range of 0.003 to 0.3 wt. percent sufficient to further depress the pour point of said composition of an oil-soluble synergistically-acting copolymer of 70 to 98 wt. percent of polyethylene having a molecular weight of from 800 to 6000 and 30 to 2 wt. percent of an ester of vinyl alcohol and a C_1 to C_4 monocarboxylic acid.

2. A composition according to claim 1, wherein said wt. percent of said oil-soluble synergistically-acting copolymer is within the range of 0.05 to 0.1 wt. percent, said molecular weight of said synergistically-acting copolymer is from 1200 to 1400, and said ester of vinyl alcohol and a C_1 to C_4 monocarboxylic acid is vinyl acetate.

3. A composition according to claim 2, wherein said material is maleic anhydride.

4. A composition according to claim 2, wherein said material is N-vinyl pyrollidone.

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