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AGENTS SUITABLE FOR IMPROVING
LUBRICANTS

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12 Claims. (Cl. 252—56)

The present invention relates to new agents suitable for the improvement of lubricants, more particularly of lubricating oils, and to a method for producing these agents.

We have found that improving agents for lubricants of high efficiency are obtained by acting on fatty acids which contain one or more double linkages and/or hydroxyl groups, or on esters of the said fatty acids, more particularly their glycerides, as for example drying or semi-drying animal or vegetable oils, with boron halides at temperatures of at least 50° C. and, if so desired, decomposing the resulting thickened oils with selective solvents. By adding the products thus obtained to lubricants, more particularly to lubricating oils, they improve the properties of the latter, for example by raising the viscosity, improving the temperature-viscosity curves, lowering the pour point, reducing the formation of sludge and diminishing the tendency to form pitch.

Among the drying or semi-drying vegetable oils soy bean oil, cottonseed oil, castor oil, rape oil and linseed oil and among the animal oils whale oil and neat's-foot oil may be mentioned, by way of example, as starting materials. The fatty acids contained in the said oils, as well as synthetic acids and acid esters having a similar nature may also be employed as starting materials. It is preferred to employ as initial materials such fatty oils as are known to belong to the class of non-drying or semi-drying oils (cf. Holde, Kohlenwasserstofföle und Fette, 6th ed., page 598 et seq.) or the fatty acids which are found in oils of the said classes.

The initial materials may be polymerized in an undiluted condition or also in admixture with diluents or solvents, as for example benzene, illuminating oil or carbon tetrachloride. Among the boron halides boron fluoride which may be used in the gaseous state or in the form of its addition or complex compounds, for example with glacial acetic acid or with ethers, or also in admixture with suitable solvents, as for example nitrobenzene or phenol, is particularly suitable. The treatment is performed at a temperature of at least 50° C., but preferably at a higher temperature which, however, as a rule should not exceed 160° C., the boron fluoride for example being slowly passed in the gaseous state into the oil, while stirring, until the necessary amount has been absorbed.

The resulting products, when added to lubricants, for example lubricating oils, improve the

temperature-viscosity curve and increase the viscosity thereof. They also often possess the property of lowering the pour point of lubricating oils, which undesirably high pour point is usually caused by the presence of paraffin wax in said oils, but for this purpose it is often necessary to add the polymerization products in large amounts and under certain circumstances no lowering of the pour point may take place at all. However, it is often undesirable to add to the lubricating oils large amounts of products containing oxygen, because other undesirable properties may be thereby imparted to the oils.

We have further found that the polymerization products obtained as aforescribed may be improved by treating them with selective solvents, whereby two fractions are obtained, one of which has a high molecular weight and a high efficiency for lowering the pour point, while the other having a lower molecular weight has only slight activity in this respect. The efficiency of the high molecular portion depends on the selective dissolving power of the solvent applied, on its amount, on the temperature and kind of the treatment. As suitable selective solvents for this purpose we may mention by way of example alcohols, ketones, phenols, esters, aldehydes, chlorhydrins, ethers and chlorinated ethers, compounds containing nitrogen, as for example nitrobenzene, aniline and nitriles, also liquid sulphurous acid, hydrocarbons having a low boiling point, as for example propane and butane, or preferably mixtures of several selective solvents.

The high molecular fractions of the polymerization products have a consistency ranging from viscous to plastic and a from yellow to brown color. They are usually difficultly soluble or insoluble in the said selective solvents. For the improvement of their color they may be treated with bleaching earths. On the other hand, their molecular weight may be increased still further by subjecting them to another treatment with selective solvents or with boron fluoride.

When adding the said high molecular fractions of the polymerization products to lubricating oils by fractions of one per cent or by a few per cent, they are capable of lowering the pour point thereof considerably. The degree of lowering of the pour point depends on the initial oil, on the method of preparation and on the nature of the lubricating oil to be improved. Another beneficial action of the additions on lubricating oils resides in their capacity of rendering the oils more stable to oxidation which in turn results

for example in a reduced tendency towards the formation of asphalts.

The fractions soluble in the selective solvents either are unchanged initial materials or oils having undergone only slight polymerization; they may be treated anew with boron fluoride and thus converted into high molecular products of high efficiency.

The following examples serve to illustrate how the present invention may be carried out in practice, but the invention is not restricted thereto.

Example 1

Soy bean oil having a viscosity of 1.72° E. at 99° C. is heated to 130° C. in a stirring vessel and 2.8 per cent by weight of boron fluoride are led within 30 minutes, stirring being then continued for additional 30 minutes at 130° C. After removing the boron fluoride by washing out with water or an alcoholic solution of caustic alkali, a product is obtained which has a viscosity of 9.5° E. at 100° C. and which on addition in an amount of 20 per cent by weight lowers the pour point of a lubricating oil (having a specific gravity of 0.906 at 20° C. and a viscosity of 1.85° E. at 99° C.) from -8° to -17° C.

By extracting the polymerization product at 80° C. with 2 parts by weight of amyl alcohol an insoluble residue results which, when added in an amount of 2 per cent by weight, lowers the pour point of the said lubricating oil to -28° C.

Example 2

4 per cent by weight of boron fluoride are led at 130° C. within 6 hours into cottonseed oil having a viscosity of 1.8° E. at 99° C. The reaction product is diluted with benzine and washed with water until neutral. After distilling off the solvent, a plastic mass is obtained which has a viscosity of 17.8° E. at 99° C. By adding 5 per cent by weight of the said product to the same lubricating oil as described in Example 1 the pour point thereof is lowered to -28° C.

After extracting the polymerization product by means of 3 parts by volume of amyl alcohol, 2 per cent by weight of the fraction insoluble in the amyl alcohol lower the pour point of the lubricating oil to -27° C.; after repeating the extraction 1 per cent and 0.5 per cent by weight, respectively, of the insoluble fraction lower the pour point of the lubricating oil to -33° and to -32° C., respectively.

This application is a continuation in part of our copending application Ser. No. 60,638 filed January 24, 1936.

What we claim is:

1. A composition of matter essentially comprising a lubricating oil having an undesirably high pour point and a polymerization product which has been obtained by treating soy bean oil at a temperature of about 130° C. for about one hour with about 2.8% by weight of boron fluoride until

that amount of boron fluoride has been absorbed which is necessary to produce polymers which are soluble in said lubricating oil and capable of materially depressing the pour point of that lubricating oil when dissolved therein.

2. A composition of matter essentially comprising a lubricating oil having an undesirably high pour point and a polymerization product which has been obtained by treating cotton seed oil at a temperature of about 130° C. for about 6 hours with about 4% by weight of boron fluoride until that amount of boron fluoride has been absorbed which is necessary to produce polymers which are soluble in said lubricating oil and capable of materially depressing the pour point of that lubricating oil when dissolved therein.

3. A composition as claimed in claim 1 in which the polymerization product prior to being incorporated with the lubricating oil has been treated with a selective solvent to recover a high-molecular fraction of said product.

4. A composition as claimed in claim 1 in which the undesirably high pour point of the lubricating oil is due to the presence of paraffin wax.

5. A composition as claimed in claim 1 in which the polymerization product is present in a minor proportion, as compared with the lubricating oil.

6. A composition as claimed in claim 1 in which the polymerization product is present in an amount not exceeding 5 per cent.

7. A composition as claimed in claim 1 in which the polymerization product has been obtained by carrying out the treatment with boron fluoride in the presence of a diluent selected from the group consisting of benzine, illuminating oil and carbon tetrachloride.

8. A composition as claimed in claim 2 in which the polymerization product prior to being incorporated with the lubricating oil has been treated with a selective solvent to recover a high-molecular fraction of said product.

9. A composition as claimed in claim 2 in which the undesirably high pour point of the lubricating oil is due to the presence of paraffin wax.

10. A composition as claimed in claim 2 in which the polymerization product is present in a minor proportion, as compared with the lubricating oil.

11. A composition as claimed in claim 2 in which the polymerization product is present in an amount not exceeding 5 per cent.

12. A composition as claimed in claim 2 in which the polymerization product has been obtained by carrying out the treatment with boron fluoride in the presence of a diluent selected from the group consisting of benzine, illuminating oil and carbon tetrachloride.

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