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LUBRICATING COMPOUND MANUFACTURE

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It is known to make up lubricants of mineral oil and lead soap. However, the lead soap as heretofore available is not properly soluble in the mineral oil such as to result in the particularly desired character of product and action. In accordance with the present invention though, peculiar compounds may be attained, which involve remarkable solubility of lead compounds in lubricating oils, and afford an especially durable and tenacious lubricating film capable of withstanding extreme pressure operation.

To the accomplishment of the foregoing and related ends, the invention, then, comprises the features hereinafter fully described, and particularly pointed out in the claims, the following description setting forth in detail certain illustrative embodiments of the invention, these being indicative, however, of but a few of the various ways in which the principle of the invention may be employed.

In proceeding in accordance with the invention, a lubricating oil, as for instance a petroleum lubricating oil of 305 seconds at 100° F. to 50 seconds viscosity at 210° F. is compounded with a material prepared as more particularly described hereinafter. The petroleum oil may be of any desired source, in accordance with particular conditions and duty in view.

The material compounded with or incorporated in the lubricating oil is prepared from petroleum hydrocarbons of 300–550° F. boiling point, or in general a hydrocarbon portion or cut whose molecular weight approximately corresponds to the number of carbon atoms in the oxidation acid material which is to be produced. In general, for lubricants having a petroleum base stock as afore-indicated, a rather narrow hydrocarbon fraction of lower boiling range than gas oil, and for example 350–550° F. is particularly desirable, and such distillate fraction may be segregated from petroleum which is suitably paraffinic or at least sufficiently predominantly paraffinic or saturated in character, as notably for instance such petroleums as those from Pennsylvania, Michigan, etc. In some instances, even closer distillate cuts may be employed, as for instance 400 to 500° F. B. P. The segregated cut or fraction of hydrocarbons as indicated, is now subjected to oxidation action, such as by heating and agitating and submitting to the action of oxygen or more commonly air, blown into the liquid under controlled conditions. In general the pressure may be 60 to 140 pounds per square inch and the operating temperature 290–340° F. Compressed air fed at around 75 to 125 pounds per square inch is particularly advantageous. The reaction being exothermic, the temperature is carefully controlled in the desired reaction range, suitably controlled jackets or coils being employed. Vapors from the reaction zone may be condensed and water be separated out and oil be returned to the reaction zone. The air feed may be at the rate of 2 to 100 cubic feet per hour per gallon of oil being treated, and preferably about 27 cubic feet per hour per gallon, and usually not over 40. Advantageously, although not indispensable, the reaction may be carried on in the presence of a catalyst, for instance a manganese salt of a high molecular weight acid, as manganese stearate, manganese naphthenate, or manganese soaps of the acids herein manufactured etc. On obtaining a suitable acid number, 5–25, and in general about 10, the reaction liquid is saponified, the acid being combined with a suitable base. While in some instances a lead compound, as litharge, or a reactive compound such as lead acetate, may be brought into reaction with the acid to the production of a lead salt of the formed oxidation acid, it is generally preferable to first neutralize the reaction liquid from the oxidation operation with an alkaline solution, such as caustic soda solution of 2.5 N. concentration or higher. A concentration of 4 N. is especially advantageous. Desirably distillation with steam is applied to eliminate unsaponified material. The alkali reaction product or soap thus formed is next acidified to release the oxidation acid, and the temperature in this operation may desirably be controlled to below 125° F. For the acidifying, concentrated sulphuric acid, or the light acids produced in the oxidation process may be applied if the latter are not desired for other uses. After acidification and agitation, the material is allowed to settle. The oxidation acid forms a layer and then the acid itself is distilled. The purified petroleum acid is then reacted with a lead compound, as for instance by warming with litharge. Or where desired, the purified petroleum acid may be further treated by neutralizing with caustic soda to form a sodium salt and this may then be reacted with a lead salt, as for instance lead acetate, in double decomposition to form the lead salt of the petroleum oxidation acid.

The lead salt of the oxidation acid is now incorporated in the lubricating oil, in amounts of 0.10 to 10.0 per cent, as desired.

As a further refinement, sulphur, or chlorine, may be incorporated. In instances where desired, sulphur may be combined with the min-

eral oil or fatty oil as for example, by adding elemental sulphur in amount of 0.5 to 10.0 per cent and heating, as for instance by adding 3 per cent of sulphur to a petroleum lubricating oil on the order of 300 red oil. The sulphur or chlorine may be combined directly with the synthetic acid in the first instance, where desired, as for example by adding 0.5 to 15.0 per cent of sulphur to the synthetic acid, and heating, or by passing chlorine into the acid. Sulphur monochloride may similarly be reacted upon the synthetic acid, or upon a fatty oil. In some cases both sulphur and chlorine may be reacted upon the acid. The sulphurized or chlorinated synthetic acids may be incorporated in the lubricating oil in amounts of 0.1% to 10.0%. The load-carrying property of lubricants involving synthetic acids in accordance with our invention, is remarkable. For instance, whereas a lubricating oil such as 300 red oil, tested on a Cornell testing machine showed load carrying ability only up to 1000 pounds, and torque in.-lb. failure at 30, the compound lubricants showed results as follows:

	Amount added to the 300 red oil (in percent)	Cornell machine test	
		Load, lbs.	Torque, in.-lb.
Lead salt of sulphurized synthetic acid.	6.0	3250	50 failure.
Lead salt of synthetic acid in sulphurized 300 red oil (6% of the former in 300 red oil containing 3% of sulphur).	6.0	2750	57 failure.
Synthetic acid treated with S_2Cl_2.	1.0	3750	50 failure.
Lead salt of chlorinated synthetic acid.	1.0	2250	55 failure.

Other modes of applying the principle of the invention may be employed, change being made as regards the details described, provided the features stated in any of the following claims, or the equivalent of such, be employed.

We therefore particularly point out and distinctly claim as our invention:

1. A lubricating compound, comprising an oil of lubricating viscosity having an incorporated sulphur compound and a lead salt consisting of a salt whose acid component is an oxidation acid of oxidation of petroleum hydrocarbons of 350–550° F. B. P.

2. A lubricating compound, comprising an oil of lubricating viscosity having an incorporated sulphur compound and a lead salt whose acid component is a substituted oxidation acid of oxidation of petroleum hydrocarbons of 350–550° F. B. P., the substituent being from the group of adjacent elements sulphur and chlorine.

3. A lubricating composition, comprising an oil of lubricating viscosity having an incorporated sulphurized oil and a lead salt whose acid component is a sulphurized and chlorinated oxidation acid of oxidation of petroleum hydrocarbons of 350–550° F. B. P.

4. A lubricating composition, comprising an oil of lubricating viscosity having an incorporated lead salt whose acid component is a sulphurized and chlorinated oxidation acid of oxidation of petroleum hydrocarbons of 350–550° F. B. P.

5. A lubricating composition, comprising an oil of lubricating viscosity having an incorporated sulphurized oil and a lead salt whose acid component is a sulphurized oxidation acid of petroleum hydrocarbons of 350–550° F. B. P.

6. A lubricating composition, comprising an oil of lubricating viscosity having an incorporated sulphurized oil and a lead salt whose acid component is a chlorinated oxidation acid of petroleum hydrocarbons of 350–550° F. B. P.

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