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LUBRICANTS

John M. Musselman, South Euclid, and Herman P. Lankelma, Shaker Heights, Ohio, assignors to The Standard Oil Company, Cleveland, Ohio, a corporation of Ohio

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This invention relates to lubricants, and more particularly lubricants which are subject to severe usage conditions and in high temperature; and it is among the objects of the invention to provide lubricants having greater stability and resistance against change and having greater film strength than characteristic of usual petroleum lubricants.

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.

We have found that by reacting phosphorus pentasulphide with naphthenic acids, products result which have peculiar utilities, as pointed out more in detail hereinafter.

The reaction between the naphthenic acids and the phosphorus pentasulphide is carried out at elevated temperatures, sufficient for the reaction, these being generally about 100 to 200° C., depending somewhat upon the particular materials, and usually a reaction time of one-half to an hour or somewhat more is sufficient. The materials may be taken in calculated or molecular proportions. A final excess of phosphorus pentasulphide may however be easily eliminated by filtering off. For instance thus, 220 parts by weight of naphthenic acid may be reacted with 110 parts of phosphorus pentasulphide at a temperature of 125° C. for 60 minutes, after which the reaction product is filtered.

The reaction product may be incorporated in an oil of lubricating viscosity, as for instance oils of 40 to 3000 viscosity Saybolt Universal at 100° F., and the amounts may be for instance 0.05—5 per cent.

With particular further advantage, the reaction product as foregoing, may be further reacted with a base, which may be an amine, ammonia or oxides or hydroxides of metals, for example aluminum, lead, tin, etc. The amines are especially desirable. Illustrative thereof are diamylamine, monoamylamine, butylamine, triamylamine, octylamine, tributylamine, dicyclohexylamine, quinoline, dimethylamine, dipropylamine, quinaldine, pyridine, brucine, quinine, or other amine of aliphatic, cycloparaffin or heterocyclic type, of commercially suitable availability and cost. This reaction occurs readily at temperatures in the range of 20° C. to 100° C. These products or salts may be incorporated in the oil. The amounts may be for instance 0.1 to 10 per cent.

As an example: To a lubricating oil of 350 viscosity S. U. at 100° F., there is incorporated 1 per cent of the product formed by reacting naphthenic acid with phosphorus pentasulphide and reacting the product thereof with brucine.

As another example: With a similar oil there is incorporated 1 per cent of the product of the reaction of naphthenic acid and phosphorus pentasulphide reacted in turn with monoamylamine.

These lubricants show surprising results in operation. Thus, whereas a commercially high grade S. A. E. 20 lubricating oil run in a standard test engine for a standard period of 20 hours continuous, showed a viscosity increase of 198, an optical density increase of 1,922, and acid number 2.50, and piston rating 8 (on a scale of 10, 10 being the extreme condition of carbon accumulation and wear occurring with ordinary lubricating oils), a like oil compounded with the reaction product of phosphorus pentasulphide and naphthenic acid reacted in turn with brucine, showed a viscosity increase of 60, an optical density increase of 1,599, an acid number 0.56, and piston rating zero (which means that the piston, on disassembling the engine, was entirely clean). Again, as another illustration, such an oil compounded with one per cent of the lead salt of reaction product of phosphorus pentasulphide and naphthenic acid gave a Timken test of 50,000# per sq. in. at 800 R. P. M., whereas the test of the same oil without the salt was 17,500# per sq. in. at 800 R. P. M.

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 lubricant comprising an oil of lubricating viscosity and a small amount of the reaction product of phosphorus pentasulphide and naphthenic acid, and brucine.

2. A lubricant comprising an oil of lubricating viscosity and a small amount of the reaction product of phosphorus pentasulphide and naphthenic acid, and a reactive amine.

3. A lubricant comprising an oil of lubricating viscosity and a small amount of the reaction product of phosphorus pentasulphide on naphthenic acid, and a reactive base.

JOHN M. MUSSELMAN.
HERMAN P. LANKELMA.