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LUBRICATING OIL

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7 Claims. (Cl. 87-9)

This application is a continuation of my co-pending application Serial No. 711,912, filed February 19, 1934.

This invention relates to high quality lubricating oils and specifically comprises such products as new compositions of matter. Design of mechanical devices is calling for higher loads on rubbing surfaces. The best quality straight hydrocarbon lubricants are deficient in load carrying capacities, which justifies the introduction of lubricants having higher film strength or greater load carrying capacities.

One object of my invention is to improve the film strength of hydrocarbon lubricants so they may be used with safety under conditions which cause breaking down of straight hydrocarbon lubricants due to excessive load. By practicing my invention the film strength of lubricants may be greatly improved in an economical manner.

In general, my invention comprises the halogenation of high boiling point hydrocarbon waxes and like saturated hydrocarbons of high molecular weight and adding such halogenated products to mineral lubricating oils. This product in my invention is added to hydrocarbon oils in varying quantities to improve the film strength, the exact quantity used depending upon the quality and initial film strength of the original hydrocarbon lubricant and the film strength desired in the blended product.

To prove the efficiency of my invention I have used the Timken film strength testing machine which has been developed and described by the Timken Roller Bearing Company. This machine allows rupture of the film of lubricating oil under conditions simulating operating conditions. The large scale laboratory equipment is designed to keep operating conditions constant, with the exception of increasing load and to measure the pressure or load at which the lubricant breaks down. With several sets of identical rubbing surfaces, it is possible to test lubricants under identical conditions and to determine the relative film strength of each. These relative film strengths are converted into pounds per square inch on the rubbing surfaces, which gives comparable load carrying capacities of any two or more lubricants under comparison. The following examples of my invention are given to show embodiments thereof, but it is to be understood that my invention is not to be limited thereto, except in so far as pointed out in the claims.

Petroleum hydrocarbon wax with a melting point of between 50° F. and 150° F. is suitable for use in my invention. In the present exam-

ples, wax with a melting point of 130° F. was chlorinated by direct chlorination and substitution to a melting point of about 60° F. The thus prepared chlorinated wax can be freed of all excess chlorine and/or hydrogen chloride by either steaming and air-blowing or by washing with alkali. In the instant example, lime was used. The reduction in cold test represents approximately 30% of chlorine by weight in the chlorinated wax. Methods of purification of the chlorinated wax other than steaming and air-blowing and alkali washing have been employed and found satisfactory and are within the ambit of my invention. Low pressure or vacuum distillation of the chlorinated product is another satisfactory means of purification. Using solvents for the chlorinated wax and giving the solvents either alkali or water washes has proved quite satisfactory. Those skilled in the art are familiar with the many other methods used for purifying such compounds.

The chlorinated wax prepared as above described was added to a good quality hydrocarbon lubricant of S. A. E. 40 classification. To indicate the quality of the original hydrocarbon lubricant, I tested it on a Timken testing machine and found that it showed a Timken film strength of 11 pounds weight, which represents a load of 7,000 pounds per square inch for rupture conditions. To another sample of this same mineral oil lubricant, I added 1% of the chlorinated paraffin wax and obtained a Timken film strength of 15.3 pounds weight, which represents a load of 9,250 pounds.

To another sample of the previously mentioned hydrocarbon lubricant I added 5% of the chlorinated wax purified by washing with lime water at relatively low temperatures to remove the excessive free chlorine or hydrogen chloride. Upon testing the product containing the 5% halogenated wax, I found that it had a Timken film strength of 30.5 pounds weight, which is equivalent to 18,500 pounds per square inch film strength.

To still another sample of the previously mentioned hydrocarbon lubricant, I added 2% of chlorinated wax which had been purified by ordinary steaming for two hours to remove the excessive free chlorine and/or hydrogen chloride present. When testing this sample containing the 2% of steam purified chlorinated wax, I found that the blend had a Timken film strength of 39.0 pound weight, which is approximately 23,500 pounds per square inch film strength.

From the above examples it is noted that I

have more than trebled the load carrying capacity of a good quality hydrocarbon lubricant in a very economical manner.

It is also noted that the degree of film strength improvement may be varied by various methods of purification of the halogenated wax.

In the above examples, quantities of halogenated wax varying between 1 and 5% were added to hydrocarbon lubricants. Greater quantities than 5% may be required for poor quality hydrocarbon lubricants or if greater film strength than shown above is desired. Quantities as high as 20% or more may be employed, the exact amount depending upon the desired results and the variable factors, which will be appreciated by those skilled in the art. Quantities as low as 0.1% give slight film strength improvement.

The degree of halogenation to be used may be varied over wide limits. In the above example 30% of halogen was added to the wax to reduce the cold test to 60° F. More or less halogen may be employed. The degree of halogenation influences the amount of product to be used in the final lubricant. As little as 5% of chlorine by weight may be added to the paraffin wax and quantities as great as 50% or more may be employed, depending upon the condition. The other halogens may be employed within the scope of my invention. It is difficult to handle fluorine and bromine and iodine are very expensive. Therefore, these latter members of the halogen family would not be preferred over chlorine which is perfectly satisfactory and much cheaper.

Many methods of halogenation of wax are known, any of which may be employed in my invention. It should be understood that this invention does not contemplate covering any halogenation process.

The term "wax" which I have used in my specification and in my claims is used broadly to include the high molecular weight hydrocarbons of more or less waxy nature obtainable from petroleum. Hydrocarbons of 15 carbon atoms or more and their isomeric compounds are included within my term "wax". For example, the relatively light hydrocarbon waxy material which is removed from crude oil, after the removal of gasoline and kerosene, may be used satisfactorily in my invention. I can also use the high molecular weight, high melting point petrolatum-like material resulting from the de-waxing of heavy lubricating oil stocks very satisfactorily.

The product of my invention may be efficiently added to any of the hydrocarbon lubricants of whatever classification, including the high and low viscosity lubricants, blends of the two, hydrogenated lubricants, synthetic lubricants, and the like.

It will be understood that certain features, sub-combinations and operations are of utility and may be employed without reference to other features and sub-combinations. This is contemplated by and is within the scope of my claims. It is further obvious that various changes may be made in details, within the scope of my claims, without departing from the spirit of my invention. It is, therefore, to be understood that my invention is not to be limited to the specific details described.

Other modes of applying the principle of my invention may be employed instead of the one explained, change being made as regards the materials employed, provided the ingredients stated by any of the following claims or the equivalent of such stated ingredients be employed.

I, therefore, particularly point out and distinctly claim as my invention:—

1. A lubricating composition comprising a mineral lubricating oil and a minor amount, based on the amount of such mineral oil, of halogenated petroleum wax.

2. A lubricating composition comprising a mineral lubricating oil and from an effective amount up to 20%, based on the amount of mineral oil, of halogenated petroleum wax.

3. A lubricating composition comprising a mineral lubricating oil and from 0.1% to about 20%, based on the amount of mineral oil, of halogenated petroleum wax.

4. A lubricating composition comprising a mineral lubricating oil and from about 1% to about 5%, based on the amount of mineral oil, of halogenated petroleum wax.

5. A lubricating composition comprising a mineral lubricating oil and from an effective amount to about 20%, based on the amount of mineral oil, of halogenated petroleum wax, which, before halogenation, has a melting point of from about 50° F. to about 150° F.

6. A lubricating composition comprising a mineral lubricating oil and from an effective amount to about 20%, based on the amount of mineral oil, of halogenated petroleum wax, which, before halogenation, has a melting point of about 130° F.

7. A liquid lubricating composition which is essentially a mineral lubricating oil and which contains from about 0.1% to about 20%, based on the amount of mineral oil, of halogenated paraffin wax, which wax, before halogenation, has a melting point of from about 50° F. to about 150° F.

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