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2,790,768

LUBRICANT COMPOSITION

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3 Claims. (Cl. 252—32.7)

This invention relates to improvements in petroleum compounds, and more particularly to raising the flash and fire points of mineral lubricating oils.

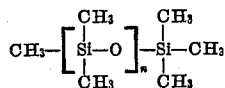
It has been observed that mineral hydrocarbon oils, ordinarily of reasonably high flash and fire points capable of passing government or industrial specifications, are materially reduced in such flash and fire points as much as 15° F. or more by the addition of some types of additives. Among additives having this undesirable effect are basic alkaline earth metal (particularly calcium and barium) mahogany sulfonates of petroleum. Others are zinc and barium hydrocarbon dithiophosphates such as zinc and barium alkyl dithiophosphate; e. g. zinc hexyl-dithiophosphate; and zinc and barium cycloaliphatic dithiophosphates, for example zinc and barium salts of methyl cyclohexanol-P₂S₅ reaction product.

Such additives are usually prepared as concentrates in relatively light fractions of hydrocarbon oils such as light mineral oil, and the resultant concentrate added to the petroleum compound. The reason for the consequent lowering of the original flash and fire points is not understood, but in any case the net result is highly undesirable and may result in an oil that is otherwise excellent for a specific purpose being rejected because of too low a flash or fire point.

An object of this invention is to maintain the flash and fire points of such petroleum compounds despite any lowering effect of the additive and even to raise these points in some cases.

Another object of the invention is the provision of a petroleum product containing an additive or additives tending to lower the fire and flash points thereof, in combination with a compound substantially effective to offset the lowering effect of the additive.

I have discovered that the lowering of the fire and flash points of mineral oils, as caused by additives referred to above, can be substantially overcome by the incorporation of relatively small amounts of a liquid dimethyl silicone polymer having the following formula:



in which *n* is 1 or more. In most cases it is believed that the product contains a number of such polymers of different chain lengths and perhaps different chain types. Viscosities of 100 centistokes or higher at 25° C. are suitable, for example 100 cs., 1,000 cs. and 100,000 cs.

Good results in raising flash and fire points by 15° F. or more have been obtained with amounts of the silicone up to 2.5 p. p. m. Above this figure the flash and fire points do not increase commensurately with the additional silicone, thus indicating the criticality of 2.5 p. p. m.

Example I

As an example of the unusual properties of such dimethyl silicone in raising the flash and fire points of

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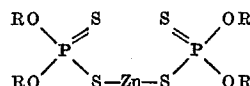
petroleum compounds, an additive consisting essentially of 3 parts by weight of calcium mahogany sulfonate (as a detergent), and 1 part by weight of the zinc cycloaliphatic dithiophosphate produced as the zinc salt of the reaction product of P₂S₅ with methyl cyclohexanol (as an antioxidant and anti-corrosive agent) was found, when added in the amount of 4% by weight, to lower both the flash and fire points of a light base mineral oil by 15° F. In other cases, the same additive lowered the flash points of different oils anywhere from 25° F. to 40° F. In one case of a heavy mineral oil, 4% of the additive was found to reduce the flash point 60° F. and the fire point 10° F. By the incorporation of only small amounts of dimethyl silicone in these oils, the entire loss in flash and fire points was recovered in most cases, and in some cases there was an appreciable gain over the flash and fire points of the oils prior to the addition of the additive.

Specifically, 752 pounds of a mineral oil having a flash point of about 475° F., COC, was compounded with 34 pounds of the above additive (4.5% by weight based on the oil), after which its flash point was only 430° F., COC. The addition of 2.5 p. p. m. of 100 cs. dimethyl silicone raised the flash point to 490° F., COC.

The inclusion of 5 p. p. m. of the same silicone gave no further improvement in flash point, which remained at 490° F., thus showing that 2.5 p. p. m. is a critical upper limit.

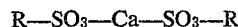
The dimethyl silicone was prepared as a kerosine concentrate, sufficient kerosine being added to 10 grams of the silicone fluid to bring the total volume up to 100 milliliters. The silicone fluid added to the kerosine had a viscosity of 100 cs. at 25° C., a specific gravity of 0.9733, and a silicon content of approximately 35.7% by weight.

The zinc salt was prepared in accordance with the principles described in U. S. Patent 2,540,084, and had the following structural formula:



wherein R=methyl cyclohexyl radical.

The calcium mahogany sulfonate had the following structural formula:



wherein the structure of the R groups is uncertain since the product is obtained by sulfonation of heterogeneous petroleum fractions.

All flash and fire tests were made according to ASTM-D92-46 otherwise known as U. S. Government method 110.33, the tests also being called the Cleveland Open Cup (COC) tests.

This application is a continuation-in-part of my application Serial No. 25,511, filed May 6, 1948, now abandoned, and my application Serial No. 292,978, filed June 11, 1952, now abandoned.

I claim:

1. A composition of matter consisting essentially of a mineral lubricating oil, 4 to 4.5% by weight based on said oil of a mixture of an alkaline earth metal mahogany sulfonate and a dithiophosphate selected from the group consisting of zinc and barium hexyl and methyl cyclohexyl dithiophosphates, said mixture acting to lower the flash point of said mineral lubricating oil alone by at least 15° F., and an amount up to 2.5 p. p. m. of a liquid dimethyl silicone polymer effective to raise the flash point of said mineral lubricating oil containing said mixture by at least 15° F.

2. A composition of matter consisting essentially of a

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mineral lubricating oil, 4 to 4.5% by weight based on said oil of a mixture of calcium mahogany sulfonate and zinc hydrocarbon dithiophosphate made as the zinc salt of the reaction product of P_2S_5 with methyl cyclohexanol, said mixture acting to lower the flash point of said mineral lubricating oil alone by at least $15^\circ F.$, and an amount up to 2.5 p. p. m. of a liquid dimethyl silicone polymer effective to raise the flash point of said mineral lubricating oil containing said mixture by at least $15^\circ F.$

3. A composition of matter consisting essentially of about 752 parts by weight of a mineral lubricating oil, about 34 parts by weight of a mixture of 3 parts by weight of calcium mahogany sulfonate and 1 part by weight of

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zinc hydrocarbon dithiophosphate made as the zinc salt of the reaction product of P_2S_5 with methyl cyclohexanol, said mixture acting to lower the flash point of said mineral lubricating oil alone by at least $15^\circ F.$, and an amount up to 2.5 p. p. m. of a liquid dimethyl silicone polymer effective to raise the flash point of said mineral lubricating oil containing said mixture by at least $15^\circ F.$

References Cited in the file of this patent

UNITED STATES PATENTS

2,375,007	Larsen et al. _____	May 1, 1945
2,469,003	Rocchini _____	May 3, 1949