

UNITED STATES PATENT OFFICE

2,297,114

TREATMENT OF GASOLINES

Ralph B. Thompson, Chicago, Ill., assignor to
Universal Oil Products Company, Chicago, Ill.,
a corporation of Delaware

No Drawing. Application June 24, 1940,
Serial No. 342,125

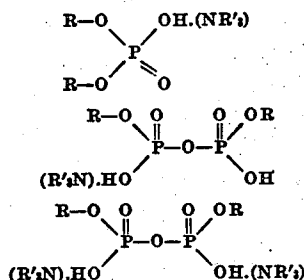
23 Claims. (Cl. 44-69)

This invention relates to a method for preventing the deterioration of gasolines when exposed to sunlight. More particularly it relates to preventing depreciation of gasolines containing tetraethyl lead when exposed to light.

Due to the fact that motor fuels are often dispensed from pumps having glass bowls in which the gasoline is contained and which may be exposed to sunlight for indefinite periods of time, it becomes necessary to treat certain gasolines to prevent depreciation of color and other properties such as antiknock value of the gasolines so exposed. Many motor fuels tend to become hazy or cloudy upon exposure to sunlight and this is particularly true of gasolines containing tetraethyl lead which has been added to improve the octane number of the motor fuel. The use of certain compounds, particularly alkyl amines, to prevent such cloudiness in gasolines containing no tetraethyl lead has been practiced. These compounds alone, however, are not particularly effective in preventing haze formation in leaded gasolines. The present invention relates to a method for preventing such haze formation together with the consequent loss in antiknock value, resulting from prolonged exposure to sunlight.

In one specific embodiment the present invention comprises a method for preventing haze formation in motor fuel by adding thereto a relatively minor amount of an alkyl amine salt of an organic ester of an acid of phosphorus.

Several types of such salts may exist and these may be represented by the following structural formulae:



R in the above formulae represents an organic group such as an alkyl group, or in some cases an aromatic group. The various groups need not be the same in all cases. The group designated (NR'₃) represents an alkylamine. These may include mono-, di- or trialkylamines. In cases where di- or triamines are used, the alkyl

groups do not necessarily contain the same number of carbon atoms.

Representative compounds of this invention are listed in the example given. The amine salts should not be limited to the amines shown therein, since a wide variety of alkylamines may be used. The various compounds are not necessarily exactly equivalent in their action and should not be so interpreted.

The quantity of the amine salt of the organic phosphate which is necessary to protect the gasoline against haze formation is usually within the limits of approximately 0.005-0.05% by weight of the gasoline, although larger or smaller amounts may be necessary in certain instances. The compounds of the invention are readily soluble in gasoline and may be added directly thereto or may be first dissolved in a portion of the gasoline to form a concentrated solution which may then be injected into the gasoline as desired. The compounds are added to the gasoline after other forms of treatment such as acid-treating, sweetening, clay treating, etc., have been carried out and the gasoline is ready to be stored prior to use. These compounds are effective in gasolines containing no tetra-ethyl lead and prevent color depreciation and haze formation therein. Their greatest utility is, however, in gasolines containing added tetraethyl lead, since exposure to strong light of such gasolines without the compounds of this invention being added, leads to haze formation and consequent depreciation in antiknock rating which can readily be prevented by the addition of the above disclosed haze inhibitors.

The following example is given to illustrate the usefulness and practicability of the present invention but should not be construed as limiting it to the exact compounds or conditions shown therein. The compounds disclosed are merely representative of a large number of possible haze inhibitors coming within the classification described.

The tests shown were carried out in Pennsylvania straight-run and cracked gasolines containing 3 cc. of tetraethyl lead per gallon and to which 0.05% of the indicated salts had been added. The gasoline was then exposed in four-ounce fused quartz bottles to the light of a carbon arc lamp. The samples were examined at intervals of about two minutes and the length of time at which the appearance of haze was first noted was recorded. The carbon arc lamp test is comparable to tests in natural sunlight with the exception that the amount of ultraviolet radiation is greatly concentrated so that the arc

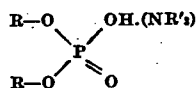
test is much more accelerated than a test carried out in natural sunlight. Thus a gasoline which develops haze after 15 minutes exposure to the arc lamp may be good for several hours exposure in natural sunlight. The following table indicates the effectiveness of the various compounds of this invention compared with the gasolines containing no added compound.

Inhibitor	Haze time, min. in Pa. crkd. gasoline	Haze time, min. in Pa. St. Run gasoline
Di-tolyl phosphate-octyl amine	12	19
Di-i-amyl phosphate-octyl amine	22	23
Octyl acid pyrophosphate-octyl amine, normal salt	20	31
Octyl acid pyrophosphate-octyl amine, acid salt	28	16
i-Amyl octyl phosphate-octyl amine	28	19
i-Amyl acid pyrophosphate-octyl amine, normal salt	25	53
i-Amyl acid pyrophosphate-octyl amine, acid salt	32	20
n-Butyl-i-amyl phosphate-octyl amine	31	33
Di-tolyl phosphate-octadecyl amine	17	21
Di-i-amyl phosphate-octadecyl amine	24	>60
Octyl acid pyrophosphate-octadecyl amine, normal salt	21	>60
Octyl acid pyrophosphate-octadecyl amine, acid salt	48	20
i-Amyl octyl phosphate-octadecyl amine	25	52
i-Amyl acid pyrophosphate-octadecyl amine, normal salt	39	>68
i-Amyl acid pyrophosphate-octadecyl amine, acid salt	>60	22
n-Butyl-i-amyl phosphate-octadecyl amine	>60	68
Di-tolyl phosphate-dioctyl amine	12	21
Di-i-amyl phosphate-dioctyl amine	54	34
Octyl acid pyrophosphate-dioctyl amine, normal salt	>60	35
Octyl acid pyrophosphate-dioctyl amine, acid salt	>60	19
i-Amyl octyl phosphate-dioctyl amine	>60	21
i-Amyl acid pyrophosphate-dioctyl amine, normal salt	>60	39
i-Amyl acid pyrophosphate-dioctyl amine, acid salt	>60	32
n-Butyl-i-amyl phosphate-dioctyl amine	>60	24
Di-tolyl phosphate-triamylamine	28	40
Di-i-amyl phosphate-triamylamine	28	40
Octyl acid pyrophosphate-triamylamine, normal salt	>60	45
Octyl acid pyrophosphate-triamylamine, acid salt	>60	58
i-Amyl octyl phosphate-triamylamine	58	41
i-Amyl acid pyrophosphate-triamylamine, normal salt	41	36
i-Amyl acid pyrophosphate-triamylamine, acid salt	36	12
n-Butyl-i-amyl phosphate-triamylamine	12	16
Blank	9	50

I claim as my invention:

1. A process for preventing color depreciation of gasolines exposed to light which comprises adding thereto a relatively minor amount of an alkylamine salt of an organic phosphate, the organic component of said phosphate being a hydrocarbon radical consisting of carbon and hydrogen.

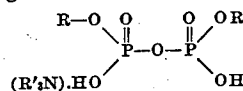
2. A process for preventing color depreciation in gasolines upon exposure to sunlight which comprises adding thereto an amine salt of an organic ester of an acid of phosphorus having the following general structure:



wherein R is an organic radical and (NR'₃) is an alkylamine.

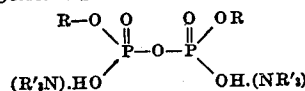
3. A process for preventing color depreciation in gasolines upon exposure to sunlight which comprises adding thereto an amine salt of an

organic ester of an acid of phosphorus having the following general structure:



wherein R is an organic radical and (R'₃N) is an alkylamine.

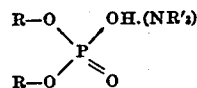
4. A process for preventing color depreciation in gasolines upon exposure to sunlight which comprises adding thereto an amine salt of an organic ester of an acid of phosphorus having the following general structure:



wherein R is an organic radical and (R'₃N) and (NR'₃) are alkylamines.

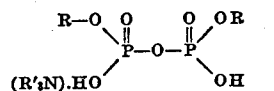
5. A process for preventing haze formation in gasolines containing tetraethyl lead when said gasolines are exposed to sunlight which comprises adding to said gasolines an amine salt of an organic phosphate, the organic component of said phosphate being a hydrocarbon radical consisting of carbon and hydrogen.

6. A process for preventing haze formation in sunlight of gasolines containing tetraethyl lead which comprises adding thereto an alkylamine salt of an organic ester of an acid of phosphorus having the following general structure:



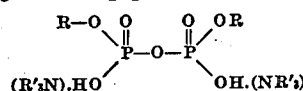
wherein R is an alkyl group and (NR'₃) is an alkylamine.

7. A process for preventing haze formation in sunlight of gasolines containing tetraethyl lead which comprises adding thereto an alkylamine salt of an organic ester of an acid of phosphorus having the following general structure:



wherein R is an alkyl group and (NR'₃) is an alkylamine.

8. A process for preventing haze formation in sunlight of gasolines containing tetraethyl lead which comprises adding thereto an alkylamine salt of an organic ester of an acid of phosphorus having the following general structure:



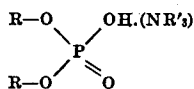
wherein R is an alkyl group and (R'₃N) and (NR'₃) are alkylamines.

9. An inhibitor for preventing haze formation in gasolines exposed to sunlight comprising essentially an alkylamine salt of an organic phosphate, the organic component of said phosphate being a hydrocarbon radical consisting of carbon and hydrogen.

10. An inhibitor useful for preventing haze formation in sunlight of gasolines containing tetraethyl lead comprising essentially an alkylamine salt of an organic phosphate, the organic component of said phosphate being a hydrocarbon radical consisting of carbon and hydrogen.

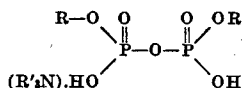
11. An inhibitor useful for preventing haze formation in sunlight of gasolines containing

tetraethyl lead which comprises essentially an amine salt of an organic phosphate having the general structure:



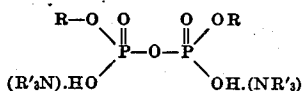
wherein R is an alkyl group and (NR'₃) is an alkylamine.

12. An inhibitor useful for preventing haze formation in sunlight of gasolines containing tetraethyl lead which comprises essentially an amine salt of an organic ester of an acid of phosphorus having the general structure:



wherein R is an alkyl group and (R'₃N) is an alkylamine.

13. An inhibitor useful for preventing haze formation in sunlight of gasolines containing tetraethyl lead which comprises essentially an amine salt of an organic ester of an acid of phosphorus having the general structure:



wherein R is an alkyl group and (R'₃N) and (NR'₃) are alkylamines.

14. The process of claim 1 wherein the compound is added in concentration within the limits of approximately 0.005 to 0.05% by weight of the gasoline.

15. A method for stabilizing gasoline normally tending to form haze upon exposure to sunlight,

which comprises adding to the gasoline an alkylamine salt of an organic phosphate in sufficient amount to substantially prevent haze formation in the gasoline, the organic component of said phosphate being a hydrocarbon radical consisting of carbon and hydrogen.

16. Motor fuel comprising gasoline normally tending to form haze on exposure to sunlight and an alkylamine salt of an organic phosphate in sufficient amount to substantially prevent haze formation in the gasoline, the organic component of said phosphate being a hydrocarbon radical consisting of carbon and hydrogen.

17. Gasoline containing a minor quantity of lead tetraethyl which normally tends to decompose in storage, and as a stabilizer therefor, a small quantity of an alkyl amine salt of an alkyl pyrophosphoric acid ester.

18. The method as defined in claim 15 further characterized in that said organic phosphate is an ester of pyrophosphoric acid.

19. The method as defined in claim 15 further characterized in that said hydrocarbon radical is an alkyl group.

20. The method as defined in claim 15 further characterized in that said hydrocarbon radical is an aryl group.

21. Motor fuel as defined in claim 16 further characterized in that said organic phosphate is an ester of pyrophosphoric acid.

22. Motor fuel as defined in claim 16 further characterized in that said hydrocarbon radical is an alkyl group.

23. Motor fuel as defined in claim 16 further characterized in that said hydrocarbon radical is an aryl group.

RALPH B. THOMPSON.