Patented July 11, 1939 2,165,651

UNITED STATES PATENT OFFICE

2,165,651

MOTOR FUEL

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No Drawing. Application October 12, 1934, Serial No. 748,076

12 Claims. (Cl. 44—9)

This invention relates to motor fuels and has to do particularly with the treatment of anti-knock motor fuels containing an anti-knock reagent by the provision in the fuel of certain reagents which will prevent or retard deterioration in the appearance and quality of the fuel.

It is well known that certain gasolines, particularly those of high anti-knock value, tend to deteriorate in sunlight or on storage unless properly treated to stabilize the same. One source of the instability of some gasolines is thought to be the anti-knock reagent which is often added to gasolines to improve the anti-knock value. For example, it has been found that many gasolines containing tetraethyl lead anti-knock reagent are particularly unstable in sunlight and in a relatively short time become cloudy and even form white deposits in the gasoline bowls or other dispensing or storing equipment. Furthermore, many of the present day gasolines of high anti-knock value contain cracked hydrocarbons in substantial proportions and the presence of such unsaturated hydrocarbons often causes the product to depreciate in anti-knock value and tend to form colored and gummy bodies in sunlight and in storage. Also, certain gasolines have a relatively high sulfur content which often affects adversely the stability of the gasoline in sunlight, particularly in the presence of a lead anti-knock reagent.

An important object of the present invention is to manufacture a gasoline hydrocarbon motor fuel containing an anti-knock reagent of the tetraethyl lead type which is of improved stability.

Another object of the invention is to prevent or retard deterioration in color, gum, or anti-knock value of an anti-knock gasoline motor fuel containing a substantial proportion of unsaturated or cracked hydrocarbons.

A further object of the invention is to treat gasolines of relatively high sulfur content and tending to be unstable in sunlight, particularly when containing a lead anti-knock reagent, to improve the normal stability of such products.

In accordance with the present invention the above and other objects are achieved by incorporating in the fuel certain stabilizing agents as will be fully described hereinafter.

We have found that gasolines containing a lead tetraethyl anti-knock reagent and which tend to become cloudy and eventually to form a white deposit in sunlight may be successfully stabilized by incorporating in the gasoline a small proportion of lecithin.

The following results will show the effect of lecithin on a partially cracked gasoline containing lead tetraethyl or ethyl fluid and known in the trade as "Q" gasoline and which is a grade of gasoline containing not more than 1.5 cc. of ethyl fluid per gallon and having a maximum octane rating of 70. The gasoline was copper color due to the presence of a dye. The tests were made by exposing a control sample and samples containing various quantities of lecithin in glass containers to sunlight and noting the change in cloudiness, color, gum formation and anti-knock value.

	Cloud and deposit formation, time in hours			Color changes		Gum formation mg./100 cc.		Anti-knock value	
	Clear for—	Very cloudy after—	Heavy deposit after—	Orig.	After 2 days	Orig.	After 2 days	Orig.	After 2 days
Control	½	½	3	Copper	Red	6	70	70	67
Control+7.5 lbs. lecithin per 1000 bbls.	1½	2	3	do	do	6	39	70	64
Control+15 lbs. lecithin per 1000 bbls.	2¼	3	3	do	do	4	40	70	65
Control+22.5 lbs. lecithin per 1000 bbls.	2¾	3½	8	do	do	4	26	70	67
Control+37.5 lbs. lecithin per 1000 bbls.	3¼	4	8	do	do	4	55	70	66

It will be observed from the foregoing results that it is possible to stabilize the gasoline so that no cloud formation occurs for various periods of time by the addition of the required quantity of lecithin. Thus, 15 lbs. per 1000 barrels of lecithin will stabilize the gasoline for about 2¼ hours whereas the untreated sample becomes cloudy in about 10 minutes. It will be noted that the lecithin has little effect on the color, gum and anti-knock properties but changes in these properties are generally slower and not so pronounced and therefore in cases where the cloud formation

in the gasoline is of major consideration, the lecithin is a valuable tool for stabilizing the gasoline. It has been found that, in general, lecithin is more effective in inhibiting cloud formation in cracked gasoline than in straight run gasoline. It has also been found that samples of gasoline containing effective amounts of lecithin remain stable in storage for at least three months and when thereafter exposed to sunlight, the samples are substantially as stable as before storage.

It is necessary in some cases, particularly in the treatment of more refractory products, such as those containing large amounts of straight run gasoline, to use more effective stabilizing reagents than lecithin alone and in an effort to find such a material, it was found that a combination of lecithin and a strong gum inhibitor, such as benzyl-aminophenol, pyrogallol, butyryl pyrogallol, alpha and beta naphthol, catechol, triamylamine, etc. would give much better results than lecithin alone. The following table shows the results obtained when adding lecithin in combination with certain inhibitors to a "Q" gasoline consisting largely of straight run gasoline and exposing the same to sunlight in glass containers.

	Cloud and deposit formation, time in hours			Color changes		Gum formation mg./100 cc.		Anti-knock value	
	Clear for—	Very cloudy after—	Heavy deposit after—	Orig.	After 8 hrs.	Orig.	After 8 hrs.	Orig.	After 8 hrs.
Control No. 1	½	¾	4	Copper	Salmon	14	53	70	68
Control No. 1+15 lbs. lecithin+5 lbs. benzyl-aminophenol+10 gals. cresylic acid per 1,000 bbls.	+8			do	No change.	14	50	69	69
Control No. 2	¾	1½	4	do	Salmon	8	58	67	66
Control No. 2+15 lbs. lecithin+5 lbs. benzyl-aminophenol+10 gals. cresylic acid per 1,000 bbls.	+8			do	No change.	16	33	67	66
Control No. 2+15 lbs. lecithin+7.5 lbs. benzyl-aminophenol +17 gals. cresylic acid per 1,000 bbls.	+8			do	do	10	30	67	66
Control No. 2+15 lbs. lecithin+7.5 lbs. pyrogallol+17 gals. cresylic acid per 1,000 bbls.	+8			do	do	11	24	66	66
Control No. 2+15 lbs. lecithin+5 lbs. benzyl-aminophenol+10 gals. petroleum phenols per 1,000 bbls.	+8			do	do	14	34	67	66
Control No. 2+15 lbs. lecithin+5 lbs. pyrogallol+10 gals. petroleum phenols per 1,000 bbls.	+8			do	do	16	32	66	66

	Cloud and deposit formation, time in hours		
	Clear for—	Very cloudy after—	Heavy deposit after—
Control	¾	2	5
Control+15 lbs. lecithin per 1000 bbls.	2½	4	5
Control+15 lbs. lecithin+7.5 lbs. butyrl pyrogallol per 1000 bbls.	4¾	6	7
Control+15 lbs. lecithin+3 gals. petroleum phenols per 1000 bbls.	6¾	9	24
Control+15 lbs. lecithin+7.5 lbs. benzyl-aminophenol per 1000 bbls.	24		

The combination of lecithin and a strong gum inhibitor is very effective in preventing cloud formation and in certain types of gasolines which are more difficultly stabilized against cloud formation such a combination has a valuable application. It has been found, however, that in the case of those inhibitors giving best results, such as benzyl-aminophenol and pyrogallol, the color is not always satisfactory and even a substantial impairment in color may occur whereby the gasoline becomes brown after a considerable time. In the case of the phenols, however, the color was less impaired and the phenols may even cause a bleaching effect when added to samples which were of poor color.

It has now been found that by combining both the strong inhibitor and phenols with lecithin to form a mixture of a strong inhibitor, phenols, and lecithin, a very desirable combination is obtained which not only prevents cloud formation, but also retards the deterioration in color, gum and anti-knock properties. The following results show the effect of using a mixture of lecithin, a strong gum inhibitor and petroleum phenols or cresylic acid in two samples of unstable "Q" grades of gasoline.

While the present invention is directed chiefly to stabilizing gasolines containing an anti-knock reagent against discoloration and formation of a cloud or deposit in sunlight, nevertheless it will be observed that some beneficial stabilizing effect on the gum and anti-knock properties may also be obtained. The particular gasolines herein treated were particularly unstable with respect to cloud and deposit formation and relatively stable as to gum and anti-knock properties over periods of the extent of the present tests, but in the case of gasolines which are more unstable as to gum and anti-knock properties or over more extended periods of storage, the present inhibitors may show greater value in stabilizing the gum and anti-knock properties than the above results indicate.

The present invention is advantageous for treating gasolines of high sulfur content such as those from South Texas and New Mexico crudes. In the refining of such gasolines wherein the naphtha from which the gasoline is derived is acid treated and rerun it is often advantageous to sweeten before steam distillation or both before and after steam distillation; however, even after such treatments the sulfur content may be about 0.075 to 0.10 per cent. Such gasolines containing anti-knock reagents are often quite unstable and the present invention provides a particularly valuable method of treating these products, although gasolines of lower sulfur content may be advantageously treated.

The combinations of lecithin, a strong gum inhibitor and cresylic acid have been found to be commercially valuable stabilizing reagents. Such a combination is very effective and each of the components appears to have certain advantages. Thus, the lecithin tends to retard decomposition of the anti-knock reagent and eliminate cloudi-

ness and formation of deposits. The gum inhibitor tends to augment the stabilizing effect of the lecithin and also to perform a valuable inhibiting action with respect to color, gum and anti-knock deterioration. The cresylic acid or petroleum phenols act as a mutual solvent and may replace acetone which is often used for this purpose. The cresylic acid also exerts considerable stabilizing effect on the color and facilitates the mixing of the inhibitor and gasoline to be treated.

In practicing the invention it is advantageous to dissolve the lecithin and gum inhibitor in the cresylic acid to form a stabilizer reagent and then add this reagent in the required amount to the gasoline to be treated. The resulting mixture is ordinarily a liquid consisting of a solution of the lecithin and inhibitor dissolved in the cresylic acid. Such a mixture is easily handled and readily commingled with the gasoline.

In case it is desired to add the anti-knock reagent and the stabilizer to the gasoline at the same time, we have found that a convenient and valuable reagent may be prepared by mixing the two reagents together. Accordingly, we may combine the reagents described above, consisting of lecithin, lecithin and a gum inhibitor, or lecithin, a gum inhibitor and cresylic acid, with the lead tetraethyl anti-knock reagent or ethyl fluid in the proportions desired to be added to the gasoline. Such a reagent is not only convenient to handle but also the stabilizer reagent has a beneficial effect on the anti-knock reagent whereby the latter is stabilized against decomposition. We have found that the anti-knock reagent so treated will keep for extended periods of time without decomposition or deposition of precipitates.

While we have obtained best results with petroleum phenols or phenols recovered from waste alkali liquors from treating cracked distillates, however, where petroleum phenols are not available, we may use other types of commercial mixtures of phenols, such as cresylic acid, creosote oil, carbolic oil, etc.

The petroleum phenols referred to above are the phenolic bodies occurring in varying amounts in most cracked petroleum distillates. These phenols may be extracted from the distillate by a caustic alkali or carbonate solution from which the phenols may be recovered by partial or complete acidification and separation therefrom of the resulting phenol layer. In the ordinary course of refinery operation, these phenols are extracted from the cracked distillates by the refining reagents, such as caustic alkali wash or doctor reagents. The phenols may be conveniently recovered from such refinery liquors by blowing with flue gas or other means of effecting neutralization sufficient to liberate the phenols. It is usually advantageous to redistill the phenols to separate high boiling bodies such as tar and asphalt. It is also sometimes desirable to fractionate the phenols and use only the more desirable fractions for the purposes of the present invention.

We have given examples of stabilizing agents which we have found useful but we do not wish to be limited to the specific amounts of materials recited. One skilled in the art will obviously vary the amounts and proportions of the ingredients to give optimum results.

We claim:

1. A stable antiknock motor fuel comprising gasoline and tetraethyl lead, said motor fuel normally tending to deteriorate in sunlight and containing small amounts of lecithin and an aromatic ring compound substituted with one or more groups of the class of amino and hydroxy, whereby such deterioration is substantially retarded.

2. A composition according to claim 1 in which the aromatic ring compound is alpha-naphthol.

3. A composition according to claim 1 in which the aromatic ring compound is benzyl-aminophenol.

4. A composition according to claim 1 in which the aromatic ring compound is pyrogallol.

5. A stable antiknock motor fuel comprising gasoline and tetraethyl lead, said motor fuel normally tending to deteriorate in sunlight and containing small amounts of lecithin, cresylic acid and an aromatic compound substituted with one or more groups of the class of amino and hydroxy, whereby such deterioration is substantially retarded.

6. The method of stabilizing, against deterioration in sunlight, an antiknock motor fuel comprising gasoline and tetraethyl lead, which comprises incorporating in the motor fuel small amounts of lecithin and an aromatic hydroxy compound substituted with one or more groups of the class of amino and hydroxy.

7. The method of stabilizing, against deterioration in sunlight, an antiknock motor fuel comprising gasoline and tetraethyl lead, which comprises incorporating in the motor fuel small amounts of lecithin, cresylic acid and an aromatic ring compound substituted with one or more groups of the class of amino and hydroxy.

8. A stable anti-knock motor fuel comprising gasoline and lead tetraethyl, said motor fuel normally tending to deteriorate in sunlight, stabilized by containing small amounts of lecithin and a compound selected from the group consisting of aromatic amino and aromatic hydroxy compounds.

9. A stable anti-knock motor fuel comprising gasoline and lead tetraethyl, said motor fuel normally tending to deteriorate in sunlight, stabilized by containing small amounts of lecithin and alpha naphthol.

10. A stable anti-knock motor fuel comprising gasoline and lead tetraethyl, said motor fuel normally tending to deteriorate in sunlight, stabilized by containing small amounts of lecithin and benzyl aminophenol.

11. The method of stabilizing, against deterioration in sunlight, an antiknock motor fuel comprising gasoline and tetraethyl lead, which comprises adding to the fuel small amounts of lecithin and alphanaphthol.

12. The method of stabilizing, against deterioration in sunlight, an antiknock motor fuel comprising gasoline and tetraethyl lead, which comprises adding to the fuel small amounts of lecithin and benzyl aminophenol.

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