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STABILIZATION OF MOTOR FUELS

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16 Claims. (Cl. 44—9)

This invention relates to the stabilization of motor fuels and more particularly to stabilization of cracked gasolines and the like.

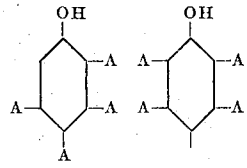
Motor fuels, particularly gasolines as ordinarily produced, are complicated mixtures comprising many constituents. Some of these constituents comprise unsaturated and aromatic hydrocarbons and other compounds which normally tend to form gummy, resinous, insoluble or non-volatile products upon storage and/or exposure to light, heat and the atmosphere. This is particularly true of cracked gasolines. However, straight-run gasolines often contain substituents of this type. Also, unsaturated hydrocarbons are often added to straight-run gasolines. These gummy, resinous, insoluble and non-volatile products are highly objectionable in motor fuels. The formation of these objectionable products, together with their disadvantages, is well recognized by those skilled in the art and many expedients have been resorted to to obviate the difficulties introduced thereby.

It has been proposed to treat such motor fuels with substances such as sulfuric acid, fuller's earth and the like to remove these gum forming constituents. Such treatment has not proved to be satisfactory for the reason that the anti-knock value of a motor fuel so treated is appreciably lowered.

It has also been proposed to add various substances to motor fuels of this type to prevent the formation of these gummy products. The compounds added to motor fuels for this purpose are generally designated gum inhibitors. The gum inhibitors heretofore employed have not proved to be entirely satisfactory as some of them tend to discolor the motor fuel and some of them are readily removed by water when the motor fuel is brought into contact with water. Such contact with water causes loss of inhibitor and reduction in the stability of the motor fuel. It has been found to be almost impossible to keep motor fuel permanently out of contact with water, in commercial practice.

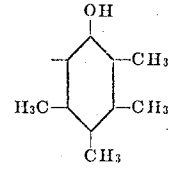
An object of the present invention is to provide new gum inhibitors for motor fuels. A further object is to provide gum inhibitors which are insoluble in water and have no tendency to discolor the motor fuel in which they are incorporated. Still further objects are to provide motor fuels and particularly cracked gasolines which do not tend to form gum on storage or on subjection to the action of light, heat and the atmosphere, which motor fuels are cheaper to manufacture and have a higher anti-knock value. Other objects are to provide new compositions of matter and to advance the art. Still other objects will appear hereinafter.

These objects may be accomplished in accordance with our invention which comprises incorporating in motor fuels, particularly cracked gasolines and the like, a 2:3:4:5 tetra alkyl-1-hydroxy benzene or a 2:3:5:6 tetra alkyl-1-hydroxy benzene which compounds have the following respective formulæ:

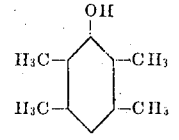


in which A represents an alkyl group. Among the compounds which we have found to be particularly satisfactory for our purposes are the following:

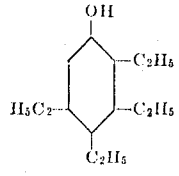
2:3:4:5-tetramethyl-1-hydroxy benzene



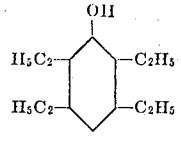
2:3:5:6-tetramethyl-1-hydroxy benzene



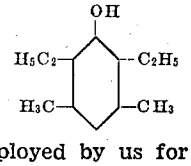
2:3:4:5-tetraethyl-1-hydroxy benzene



2:3:5:6-tetraethyl-1-hydroxy benzene



3:5-dimethyl-2:6-diethyl-1-hydroxy benzene



The test, employed by us for evaluating the effectiveness of the members of our class of compounds as stabilizers or gum inhibitors, is the well known accelerated oxygen test. This test comprises heating 25 cc. of the motor fuel, cracked gasoline, motor benzol or the like, having incor-

porated therein a small amount of the gum inhibitor at 100° C. in an atmosphere of oxygen for a period of from 3 to 5 hours. The gum formed is measured by evaporating the motor fuel, after the oxygen test, from a porcelain dish in a steam oven. The extent of gum formation during the accelerated oxygen test is a measure of the stability and gumming tendency of the fuel during long time storage.

In order to more fully illustrate our invention and the advantageous results to be obtained thereby the following example is given:

Example 1

A freshly distilled cracked gasoline containing 0.005% of 2:3:4:5-tetra methyl-1-hydroxy-benzene for each 25 cc. of the gasoline was subjected to the accelerated oxygen test for 3¾ hours. The amount of gum formed for each 25 cc. was 23 mg. An equal portion of the same gasoline containing no inhibitor, subjected to the same test at the same time, gave 171 mg. of gum for each 25 cc. of the gasoline.

The concentration of the inhibitor required to produce a given stabilizing effect will vary widely with the nature and concentration of the unsaturated constituents of the motor fuel and will generally vary in proportion with the molecular weight of the inhibitor. In general, however, the amount of inhibitor required will be substantially less than 0.1% of the motor fuel by weight.

The gum inhibitors of our invention have many advantages over those heretofore employed as they possess a greater degree of effectiveness than any heretofore known. They have no tendency to discolor the motor fuel and are insoluble in water.

This application is a continuation in part of our co-pending application 472,187, filed July 31, 1930, now Patent 1,945,521.

While we have specifically disclosed the preferred compounds containing only methyl and ethyl groups, alkyl groups containing longer carbon chains such as the propyl and butyl groups may be employed, if desired. Other compounds will be readily apparent to those skilled in the art without departing from the spirit of our invention. Accordingly, our invention is to be limited solely by the appended claims construed as broadly as is permissible in view of the prior art.

We claim:

1. Motor fuel comprising cracked hydrocarbon spirits normally tending to form gum having incorporated therein, in an amount sufficient to inhibit the formation of gum, a member of the group consisting of 2:3:4:5-tetra-alkyl-1-hydroxy and 2:3:5:6-tetra-alkyl-1-hydroxy benzenes.

2. Motor fuel comprising cracked hydrocarbon spirits normally tending to form gum having incorporated therein, in an amount sufficient to inhibit the formation of gum, 2:3:5:6-tetra-methyl-1-hydroxy benzene.

3. Motor fuel comprising cracked hydrocarbon spirits normally tending to form gum having incorporated therein, in an amount sufficient to inhibit the formation of gum, 2:3:4:5-tetra-alkyl-1-hydroxy benzene.

4. Motor fuel comprising cracked hydrocarbon spirits normally tending to form gum having incorporated therein, in an amount sufficient to inhibit the formation of gum, 2:3:4:5-tetra-methyl-1-hydroxy benzene.

5. Cracked gasoline normally tending to form gum having incorporated therein, in an amount not exceeding about 0.1%, a member of the group consisting of 2:3:4:5-tetra-alkyl-1-hydroxy and 2:3:5:6-tetra-alkyl-1-hydroxy benzenes to materially reduce the formation of gum by said cracked gasoline.

6. Cracked gasoline normally tending to form gum having incorporated therein, in an amount sufficient to inhibit the formation of gum, 2:3:5:6-tetra-methyl-1-hydroxy benzene.

7. Cracked gasoline normally tending to form gum having incorporated therein, in an amount sufficient to inhibit the formation of gum, a 2:3:4:5-tetra-alkyl-1-hydroxy benzene.

8. Cracked gasoline normally tending to form gum having incorporated therein, in an amount sufficient to inhibit the formation of gum, 2:3:4:5-tetra-methyl-1-hydroxy benzene.

9. The process of stabilizing cracked gasoline which normally tends to deteriorate on storage which process comprises adding to the gasoline 2:3:5:6-tetra-methyl-1-hydroxy benzene in an amount sufficient to inhibit such deterioration.

10. The process of stabilizing cracked gasoline which normally tends to deteriorate on storage which process comprises adding to the gasoline a 2:3:4:5-tetra-alkyl-1-hydroxy benzene in an amount sufficient to inhibit such deterioration.

11. The process of stabilizing cracked gasoline which normally tends to deteriorate on storage which process comprises adding to the gasoline 2:3:4:5-tetra-methyl-1-hydroxy benzene in an amount sufficient to inhibit such deterioration.

12. Motor benzol normally tending to form gum having incorporated therein, in an amount not exceeding 0.1% to inhibit the formation of gum, a member of the group consisting of 2:3:4:5-tetra-alkyl-1-hydroxy and 2:3:5:6-tetra-alkyl-1-hydroxy benzenes.

13. Motor benzol normally tending to form gum having incorporated therein, in an amount sufficient to inhibit the formation of gum, 2:3:5:6-tetra-methyl-1-hydroxy benzene.

14. Motor benzol normally tending to form gum having incorporated therein, in an amount sufficient to inhibit the formation of gum, a 2:3:4:5-tetra-alkyl-1-hydroxy benzene.

15. Motor benzol normally tending to form gum having incorporated therein, in an amount sufficient to inhibit the formation of gum, 2:3:4:5-tetra-methyl-1-hydroxy benzene.

16. The process of preserving cracked hydrocarbon distillates which normally tend to deteriorate on storage and develop gum which comprises incorporating therein a member of the group consisting of 2:3:4:5-tetra-alkyl-1-hydroxy and 2:3:5:6-tetra-alkyl-1-hydroxy benzenes in amounts not exceeding about 0.1% to inhibit such deterioration and gum formation.

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