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KETONES IN AVIATION GASOLINE

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This invention relates to new and useful motor fuels. More particularly it relates to aromatic-amine-containing gasolines in which are incorporated minor amounts of certain ketones. In one of its preferred embodiments, the invention comprises an aviation gasoline containing minor amounts of aniline or an alkyl aniline plus minor amounts of a methyl propyl ketone or a methyl isobutyl ketone.

The use of aromatic amines as anti-knock agents in gasoline has long been known. However, their employment in the place in which they are now most needed, high octane aviation gasoline, has met with various difficulties. Aromatic amines, as a class, are sparingly soluble in gasoline, particularly at relatively low temperature. This is especially true for aviation gasoline of low aromatic content. As a result, aromatic amines tend to separate from gasolines and this difficulty is greatly increased by the low temperatures at which modern airplanes are required to operate.

It has been proposed to employ alcohols or low molecular weight ketones as blending agents to keep the aromatic amines in solution in the gasoline. However, these have proved unsatisfactory for a number of reasons. The alcohols and lower ketones are very water soluble and tend not only to leave the gasoline and enter the water phase when water comes in contact with the gasoline (as when gasoline is stored over water), but they also will take up significant amounts of water from the environment and incorporate it into the gasoline. The latter is particularly objectionable in an aviation fuel since the water may crystallize out of the gasoline and form ice in the carburetor when operating at high altitudes. Also alcohol, in addition to the disadvantage ensuing from appreciable amounts of water contained in its commercially available form, has a relatively poor anti-knock value when used in a gasoline containing lead. Of the ketones hitherto suggested, none, when present in small amount, satisfactorily prevents the above-described difficulties when a gasoline is lowered to the temperature required for aviation fuel.

Accordingly, it is an object of this invention to produce a gasoline containing a concentration of aromatic amines of appreciable anti-knock value, which gasoline remains stable at low temperatures. Another purpose is the production of an aviation gasoline containing an amount of aniline of substantial anti-knock value, which gasoline does not exhibit phase separation at low temperatures.

The gasolines of the invention comprise predominantly light hydrocarbon distillates boiling within gasoline boiling range, and contain about 0.25%–10% of aniline or an alkyl derivative thereof, plus a small amount of an asymmetrical aliphatic ketone having five or six carbon atoms. The total number of carbon atoms in the alkyl radicals of suitable alkyl anilines should not exceed 6, and the alkyl radical or radicals may be attached to the nitrogen atoms and/or to the nucleus of the monocyclic aromatic compound.

Of the five and six carbon atom ketones, those containing a tertiary carbon atom—i e. having a branched chain—are preferred. Specific ketones employed in accordance with this invention are methyl- and ethyl n-propyl and -isopropyl ketones, methyl n-butyl, -isobutyl and -tertiary butyl ketones. These ketones may be employed individually or in combination with each other. Amounts between about 0.5% and 10%, preferably 1–5%, are in general adequate to stabilize gasoline containing the aromatic amines although larger or smaller quantities of ketone may be used. As a rule the amounts of the ketones should be sufficient to prevent phase separation down to temperatures of at least —70° F. The minimum amount which will accomplish this varies considerably, depending not only on the amount of aromatic amines contained in the gasoline, but also on the nature both of the particular amines and of the gasolines, as well as the presence of other ingredients which may act as mutual solvents. Such gasoline may also contain up to about 6 cc. of commercial tetra-alkyl lead per gallon.

Among the many aromatic amines which may be incorporated individually or together in a gasoline type motor fuel, mention may be made of the following: aniline, N-mono- and di-methyl aniline, corresponding ethyl and higher alkyl anilines (which may also be alkylated on the nucleus), toluidines, xylidines, mono-, di-, and tri-methyl and higher alkylated anilines (which may also be alkylated on the N atom), cumidines, pseudo cumidine, cymidine, etc. Similarly, mixtures of aromatic amines such as are produced by the nitration and reduction of a suitable aromatic petroleum fraction such as is described in U. S. Patents 1,844,362 and 2,252,099, may be employed.

Since aniline ($C_6H_5NH_2$) is the least gasoline-soluble of the aromatic amines which possess a good anti-knock value, the invention will be illustrated with reference to aniline in aviation gasoline. Government specifications require that

an aviation fuel remain solution-stable to a temperature of −76° F. At this temperature less than 0.25% aniline will remain in solution in average aviation gasolines in the absence of a blending agent.

The effect of two ketones of this invention in maintaining 0.5% aniline in solution in a 100 octane number aviation gasoline containing approximately 3% aromatics is as follows:

Additive	Separation temperature
	°F.
None	−20
1% methyl n-propyl ketone	−58
3% methyl n-propyl ketone	−94
3% methyl isobutyl ketone	−83

In general, 3–10% of my ketones will adequately stabilize an aviation gasoline containing 0.25–1% aniline in the substantial absence of other aromatic constituents.

I claim as my invention:

1. A motor fuel consisting essentially of a gasoline in which is dissolved .25 to 10% of a mononuclear aromatic amine having a total number of carbon atoms less than 7 in attached alkyl radicals and between .5 and 5% of an asymmetric ketone selected from the group consisting of the five and six carbon atom di-alkyl ketones.

2. The fuel of claim 1 in which the ketone contains one tertiary carbon atom.

3. The fuel of claim 1 in which the ketone is methyl n-propyl ketone.

4. The fuel of claim 1 in which the ketone is methyl isobutyl ketone.

5. The fuel of claim 1 in which the aromatic amine is xylidine.

6. An aviation gasoline containing about 0.25–1% aniline and between about 3 and 5% of an asymmetric ketone selected from the group consisting of the five and six carbon atom di-alkyl ketones.

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