Patented Aug. 3, 1937

2,088,997

# UNITED STATES PATENT OFFICE

2,088,997

## ANTIKNOCK GASOLINE

Nicolaas Max, Amsterdam, Netherlands, assignor to Shell Development Company, San Francisco, Calif., a corporation of Delaware

No Drawing. Application April 13, 1936, Serial No. 74,195. In the Netherlands April 24, 1935

2 Claims. (Cl. 44—9)

This invention relates to the use of carbonyl hydride derivatives of cobalt and iron in gasoline type fuels to improve their antiknock properties.

It is known that carbonyls of iron, cobalt, nickel and other metals when dissolved in gasoline have the ability of suppressing the latter's tendency to knock. While these carbonyls are quite efficient as antidetonants, their use has been restricted because their solutions in liquid hydrocarbons have proven to be unstable, particularly when exposed to light. Gasolines containing, for instance, cobalt carbonyl develop upon standing a flocculent precipitate of a cobalt compound, and when this gasoline is used in an internal combustion engine, a rapid wear and erosion of the cylinders and valves takes place, due to a formation of hard metallic particles.

I have found that the difficulty of excessive wear can be overcome by using certain oil-soluble derivatives of carbonyl hydrides rather than the carbonyls themselves. The term derivatives of carbonyl hydrides, as herein used, refers to metal salts of the carbonyl hydrides of iron and cobalt, which hydrides appear to have the formulas $H_2Fe(CO)_4$ and $HCo(CO)_4$ respectively. The carbonyl hydrides are so unstable that they decompose within a short period to the respective carbonyls and water. Though relatively unstable, such hydrides can be converted into stable salts.

A typical example of the production of salts of the type herein described is as follows: carbon monoxide, or gases containing carbon monoxide, are contacted under normal or superatmospheric pressure and at normal or elevated temperatures with an aqueous alkaline suspension or a solution of cobalt cyanide. The carbon monoxide reacts with the cobalt cyanide, forming the alkali salt of cobalt carbonyl hydride and in addition alkali carbonate as well as alkali salts of complex compounds of cobalt cyanide. The resulting mixture is slightly acidified and the liberated cobalt carbonyl hydride can be removed by distillation in a stream of an inert gas, such as nitrogen. Instead of using cobalt cyanide as a starting material, certain other cobalt salts such as cobalt thioglycolates, cobalt hexacyanides, cobalt mercaptides and the like, may be reacted with carbon monoxide to produce cobalt carbonyl hydride.

The freshly distilled hydride is introduced into an aqueous solution of mercuric chloride, forming a mercuric cobalt carbonyl of the formula $Hg(Co(CO)_4)_2$ which is then isolated. This compound is soluble in gasoline, forming stable solutions. 0.2% of cobalt in the form of the mercuric cobalt carbonyl dissolved in a standard gasoline, raises the octane number 35 points in comparison with 18½ points due to the same amount of cobalt in the form of the cobalt carbonyl.

Corresponding derivatives of iron carbonyl hydrides are similar in their antiknock properties to those of cobalt compounds.

Besides the mercury salt of iron or cobalt carbonyl hydride, the salts of other polyvalent metals can be used, such as salts of the remaining metals of the second group of the periodic system, for instance the zinc, cadmium and barium salts, as well as thallium and lead salts. Salts of the monovalent metal or metal equivalents, such as the sodium, ammonium and silver salts were found to be as unstable as the free carbonyls themselves.

Engine tests in which fuels containing salts of the carbonyl hydrides have been used, have not revealed excessive wear of cylinders, piston rings and valves, as is frequently found when free carbonyls are used, and no fouling of spark plugs has been evidenced.

I claim as my invention:

1. An antiknock motor fuel comprising gasoline type hydrocarbons and a small amount of the mercuric salt of cobalt carbonyl hydride.

2. An antiknock motor fuel comprising gasoline type hydrocarbons and about .2% of cobalt in the form of mercuric cobalt carbonyl.

NICOLAAS MAX.