Patented Mar. 27, 1951 2,546,422

UNITED STATES PATENT OFFICE

2,546,422

ORGANIC PHOSPHATES AS WEAR INHIBITORS FOR IRON CARBONYL

Howard Clinton Cross, Columbus, Ohio, assignor, by mesne assignments, to Ethyl Corporation, New York, N. Y., a corporation of Delaware

No Drawing. Application August 5, 1949, Serial No. 108,854

2 Claims. (Cl. 252—386)

1

This invention relates to antiknock mixtures and particularly to a mixture of iron carbonyl and an inhibitor which reduces the engine wear caused by the use of the iron carbonyl.

Ironpentacarbonyl is a good antiknock agent and as such compares favorably with tetraethyllead. It has the economic advantage of being cheap. However, when a fuel containing it is burned in internal combustion engines, it has the disadvantage of causing wear in an engine, particularly wear of the piston rings. The abrasive properties of iron carbonyl decomposition products have effectively prevented its use commercially.

It is therefore an object of this invention to provide a wear inhibitor which substantially reduces such engine wear. I have found that gasoline soluble organic phosphates substantially reduce the engine wear caused by the use of iron carbonyl. It is believed that it is the phosphorus in the phosphate radical which reduces the wear and that the organic radical has little if any effect on the engine wear and serves primarily as a means of getting the phosphate radical into solution in the gasoline, and transplanting it into the combustion chamber of the engine. Therefore, my invention is not limited to the specific organic radicals given herein.

The organic phosphates of my invention correspond to the general formula R_3PO_4 in which R is an organic radical such as an aryl, alkyl, or an alkenyl. Examples of such organic phosphates are as follows: tricresyl phosphate, triphenol phosphate, trivinyl phosphate, tripropenyl phosphate, triethyl phosphate, tripropyl phosphate, and tributyl phosphate.

My invention can be further understood by referring to the following working examples. A quantity of fuel was prepared by blending in a commercial motor gasoline a mixture of 0.312 gram of phosphorus in the form of triethyl phosphate, 3 cubic centimeters of ironpentacarbonyl, all quantities of added materials based on one gallon of fuel. This fuel mixture was burned in a four cycle single cylinder internal combustion engine for 150 hours. The internal diameter of the cylinder and the loss of weight of the piston rings were measured to indicate the resulting wear. In a similar operation keeping all quantities of materials used and engine conditions the same except that no wear inhibitor was used, the same measurements for indicating wear were made. Comparing these two operations as to amount of wear obtained with and without an inhibitor and taking the wear resulting from the use of iron carbonyl alone as 100% the operation using the triethyl phosphate inhibitor resulted in only 32% of the wear obtained for iron carbonyl alone. Thus the addition of a small quantity of the inhibitor of the triethyl phosphate to a fuel

2

containing iron carbonyl reduces the wear by 68% compared of that obtained with the same fuel without the inhibitor. In another operation in place of triethylphosphate, tricresyl phosphate was used, the quantities of all materials being the same as in the above example. Comparing the wear obtained on the test operating on the fuel containing a mixture of tricresyl phosphate and ironpentacarbonyl with the fuel containing ironpentacarbonyl alone, the tricresyl phosphate inhibitor resulted in only 51% of the wear obtained with the iron carbonyl alone. In a similar test substituting trimethyl phosphate for triethyl phosphate substantially the same reduction in wear using the trimethyl phosphate was obtained.

Generally, the amount of iron carbonyl to be used as an antiknock in fuels for engines is between about 1 and 3 cubic centimeters per gallon of fuel. The amount of wear inhibitor used depends on the amount of iron carbonyl used and the inhibitor employed. In all cases the amount of inhibitor used is small and varies between approximately 0.05 to 0.25 gram of phosphorus in the form of the organic phosphate to one cubic centimeter of iron carbonyl.

My wear inhibitors can be used in mixtures containing iron carbonyl and other antiknock materials such as lead antiknock compounds. Also a mixture of iron carbonyl and one of my wear inhibitors can be used as an auxilary antiknock fluid in an engine operating on a leaded gasoline.

I claim:

1. An antiknock mixture consisting essentially of iron carbonyl and a wear inhibitor in an amount sufficient to reduce wear and deposits on engine parts caused by iron pentacarbonyl, said wear inhibitor consisting essentially of from 0.05 to 0.25 gram of phosphorus in the form of an organic phosphate to 1 cubic centimeter of iron pentacarbonyl, said organic phosphate being soluble in gasoline and having the general formula R_3PO_4 in which R is selected from the class consisting of alkyl, aryl, and alkenyl.

2. The product of claim 1 in which the wear inhibitor is triethyl phosphate.

HOWARD CLINTON CROSS.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,940,096	Mueller-Cunradi et al.	Dec. 19, 1933
2,140,627	Hocking	Dec. 20, 1938
2,149,221	Lamping	Feb. 28, 1938
2,291,442	Bass et al.	July 28, 1942