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CARBON REMOVER AND METHOD OF
USING THE SAMEHyym E. Buc, Roselle, and Raphael Rosen, Cran-
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ment Company, a corporation of DelawareNo Drawing. Application May 3, 1932,
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18 Claims. (Cl. 87-5)

This invention relates to improvements in liquid compositions for removing or loosening carbon deposits, and to methods of using such compositions. The improved carbon remover comprises basic organic compounds.

An object of the invention is to produce a powerful and efficient carbon remover, yet one which is substantially non-corrosive in its action on the metal parts with which it comes in contact.

The invention includes the use as carbon removers of chemical compounds of the "onium" base type. By this term is meant organic bases in which organic radicals are connected to the elements to which the OH radical of the base is attached but to which no H atoms are attached. These onium bases have relatively high dissociation constants of the order of those of the alkali hydroxides.

Tetramethyl ammonium hydroxide is one of these onium bases which has proved successful; a 10% solution in water was used. Other examples are:

Tetraethyl ammonium hydroxide
Tetraethanol ammonium hydroxide
Diethyl-monomethyl sulfonium hydroxide
Trimethyl tin hydroxide. (This may be called trimethyl stannonium hydroxide.)
Triphenyl tin hydroxide

These onium bases may be used in solution in water, alcohol, or any other suitable solvent, and may be applied to the carbon coated parts such as pistons, rings, valves, and other parts of an internal combustion engine, in any suitable manner so that the liquid will be allowed to remain in contact with the carbon deposit a sufficient length of time to allow it to act upon the deposit. For example, an internal combustion engine is first allowed to cool slightly after running and then the carbon remover may be injected into the cylinders directly through the spark plug openings or into the intake manifold for discharge into the cylinders. After standing for a time (several hours or preferably over night), the carbon is flaked loose from the metal, and is then either burned during operation of the motor, or washed down into the crank case by oil seepage or blown out through the exhaust. The carbon remover may also be added directly into the crank case periodically to remove carbon on the inner surfaces of the crank case and the under side of the pistons.

The temperature at which these onium bases are used is not material other than that they cannot be used at temperatures higher than

those at which they decompose or tend to escape too rapidly in the vapor state. They will work in the cold but they will work better warm so the preferred practice is to use them at as high a temperature as practical. Vaporization may be permitted when suitable vapor recovery means are provided, or vaporization may be retarded by operating under pressure. As these onium bases have decomposition and vaporization temperatures covering a wide range, it is possible to select a suitable one according to the temperature at which it is desired to use it for removing carbon.

Although the exact mechanism of the action or reactions involved in the use of this onium base carbon remover is not well understood, it is believed that it attacks the acidic gummy binder which causes the carbon deposit to adhere to the parts of an internal combustion engine for example, and as a result loosens the deposit in such a way as to free stuck piston rings, valves, etc.

A typical formula is R_n-X-OH in which R_n are organic radicals (not necessarily the same), and X is one of the various onium base elements, such as nitrogen, arsenic, phosphorus, sulphur, iodine and various metals, for example, tin, bismuth, antimony and other elements capable of forming onium compounds. In general, any of the elements in the right hand columns of the 4th, 5th and 6th groups of the periodic table are capable of forming such onium compounds. The subscript "n" represents one less than the valence of X . Thus the compounds used in the present invention will be usually either tertiary or quaternary hydroxides depending upon the valence of the onium base element.

The substituted radicals to be combined with the onium base element may be any organic radicals and may comprise either the same or different members in the same series, as methyl, ethyl, etc., or in different series, as alkyl, aryl, alcohols, or mixed or substituted groups. Also tertiary heterocyclic onium base compounds are suitable, for example, those of the pyridin type having a nitrogen atom in the ring, and the homologs of such compounds. The chief requirement is that all hydrogen atoms originally connected directly with the onium base element should be completely substituted by organic radicals.

The use of onium bases has been suggested above for removing carbon in internal combustion engines but they may also be used for cleaning other carbon coated parts, such as spark-plugs, gas burners, stoves, etc. Small parts such as spark-plugs, etc have been treated satisfactorily by immersing directly in the carbon remover so-

lution. They are preferably then removed, or the solution drawn off, and a blast of air turned on to sweep off the loosened carbon. The solution may be re-used so long as effective.

5 The specific embodiments of the invention described are subject to various changes and it is intended to claim all novelty inherent in the invention as far as the prior art permits.

We claim:

- 10 1. A carbon remover comprising a basic organic compound of the onium base type.
2. A carbon remover comprising a basic onium organic compound having a plurality of mono-valent organic radicals containing at least one
- 15 carbon atom and an OH radical linked to a nitrogen atom.
3. A carbon remover comprising a basic organic compound of the onium base type in which the onium base element is a part of a cyclic structure.
- 20 4. A carbon remover comprising a basic onium organic compound having a plurality of mono-valent organic radicals containing at least one carbon atom and an OH radical linked to an inorganic element capable of forming onium compounds.
- 25 5. A carbon remover comprising a basic onium organic compound having a high dissociation constant of the order of that of the alkali hydroxides and having only atoms other than hydrogen linked by means of single bonds to the element to which the OH radical is attached.
- 30 6. A carbon remover comprising an onium base compound of one of the elements in the right hand column of the 4th, 5th and 6th groups of the periodic table.
7. A carbon remover comprising a basic onium organic compound having a plurality of mono-valent organic radicals containing at least one
- 40 carbon atom and also an OH radical attached to one of the elements in the right hand column of the 4th, 5th and 6th groups of the periodic table.
8. A carbon remover comprising substituted
- 45 ammonium hydroxide in which the hydrogen

atoms originally linked to the nitrogen are replaced by organic radicals.

9. A carbon remover comprising tetramethyl ammonium hydroxide.

10. A carbon remover comprising trimethyl tin hydroxide.

11. A carbon remover comprising diethylmonomethyl sulfonium hydroxide.

12. A carbon remover comprising a compound having the typical formula R_n-X-OH in which 1 R_n are mono-valent organic radicals and X is an element in the right hand column of the 4th, 5th and 6th groups of the periodic table.

13. Method of cleaning articles coated with adherent carbon deposits, comprising contacting the 1 articles with a solution of an onium organic base in a suitable solvent for said onium compound and removing the loosened carbon.

14. Method of loosening carbon deposits in an internal combustion engine, which comprises in- 20 jecting into said internal combustion engine a composition comprising a basic organic compound of the onium base type.

15. Method of cleaning surfaces coated with adherent carbon deposits, which comprises con- 25 tacting said surfaces with a solution comprising an aqueous solvent and a basic onium organic compound of an inorganic element capable of forming onium compounds to which a plurality of mono-valent organic radicals containing at least 30 one carbon atom and a hydroxyl radical are attached.

16. A carbon remover comprising a basic organic compound of the onium base type dissolved 35 in a suitable solvent for said onium compound.

17. A carbon remover comprising a basic organic compound of the onium base type dissolved in a suitable solvent of the class consisting of water and alcohol.

18. A carbon remover comprising a water solu- 40 tion of about 10% strength of a basic organic compound of the onium base type.

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