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CARBON AND GUM REMOVER

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This invention relates in general to a composition for removing carbon deposited in the combustion area of internal combustion engines. In particular, my composition is especially useful for removing carbon and gums from Diesel engines.

In the operation of internal combustion engines, carbon is often deposited on the piston head, walls of the combustion chamber, rings, and valve heads as a result of various causes. Some carbon is formed from the incomplete combustion of the combustible charge. Carbon is also formed from the lubricating oil which has seeped up to or past the piston rings and is oxidized at the high temperature in the cylinder in the presence of the oxygen of the fuel mixture. At the same time, gums are formed which act as a binder for the carbon particles, which serves to cement them tightly onto the cylinder head, the top of the piston, the rings, and other metal parts defining the combustion space.

Such carbon deposits have long presented a serious problem in the operation and maintenance of gasoline and Diesel engines, being particularly acute in the latter, where the carbon deposits frequently, in a short time, cause sticking of the piston rings to the extent that they fail to seal the combustion chamber from the crankcase. This leads both to loss of power and excessive oil consumption.

Various solvents, such as alcohol and benzol, have been used in attempts to dissolve such deposits. These solvents have been found to have a solvent action on part of the binder holding the carbon encrustation onto the metal parts, but have not been effective in removing a substantial portion of the deposit in a short period of time.

One of the principal objects of this invention is to provide a superior composition which is unusually effective in removing carbon deposits from internal combustion engines.

Another object of the invention is to provide such a composition for removing such carbon which is cheap and has no deleterious effects upon the usual metal parts with which it comes into contact.

Another object is to provide a carbon removing composition that can be easily applied either to the assembled parts of the engine or to the parts after removal from the engine.

Other objects and advantages of the invention will be apparent from the following description.

I have found that a combination of certain solvents and soap has a most remarkable effect

in removing carbon deposits. In particular, soap, alcohol, water, volatile aromatic hydrocarbon, and lubricating oil obtained from petroleum have proven to make a suitable combination. By the application of this mixture to the encrustation, the penetrating and solvent action is such that carbon is quickly loosened and falls off, leaving the metal surface clean.

My invention is most useful in loosening piston rings, which, owing to gum and carbon formation, become "glued" to the pistons upon which they are mounted. The methods by which my composition is most advantageously applied are described in a subsequent portion of this application. By way of example of a carbon remover made according to my invention, the following is given:

		Percent by volume
Edeleanu extract of boiling range 135° C.-195° C.		42.25
Motor lubricating oil obtained from petroleum		30
Lard oil		10
28% NH ₃ solution		.75
Oleic acid		3.5
Water		2.5
Secondary butyl alcohol		11

Instead of using motor lubricating oil obtained from petroleum and lard oil, I may substitute said motor lubricating oil entirely, which will have the same effect, namely, to prevent the quick evaporation of the Edeleanu extract, and to serve as a lubricant when the engine is first started after removal of carbon.

Instead of using ammonia to form a soap with oleic acid, I may substitute sodium hydroxide, potassium hydroxide, or an organic base such as tri-ethanolamine. Instead of oleic acid, I may use stearic acid, palmitic acid, or other fatty acids. The soap assists in penetrating between the carbon particles, and between the carbon encrustation and the metallic surface, thereby assisting the action of the solvent, and also in helping to loosen the carbon deposit from the metal in the form of flakes. Instead of using secondary butyl alcohol, I may use other alcohols, for example, normal butyl, isobutyl, tertiary butyl, isopropyl, ethylene glycol mono butyl ether, or higher molecular weight alcohols. The alcohol serves the purpose of keeping the soap and water in solution in the mixture, and also as a solvent for gums binding the carbon particles. In the case of oil soluble soaps, such as tri-ethanolamine oleate, the alcohol in the com-

position may be dispensed with. The water is desirable to enable the soap to perform its function more effectively. Edeleanu extract is a most valuable solvent for the hydrocarbon gums which are the chief constituent binding the carbon to the metal surface. Instead of using an Edeleanu extract of boiling range of from 135-195° C., I may use a volatile "Edeleanu extract" of lower or higher boiling range, or equally well, purely aromatic hydrocarbons such as benzene, toluene, xylene, or their higher boiling homologues. The advantage of using a relatively high boiling solvent as initially mentioned, e. g., 135-195° C., lies in its high flash point, which provides a safety factor when introducing the product into warm engines, as say, through spark plug openings. "Edeleanu extract" as used herein may be described as a petroleum hydrocarbon fraction obtained by subjecting a hydrocarbon fraction to the low temperature liquid sulphur dioxide treatment invented by Dr. Edeleanu. The extract is separated from the sulphur dioxide by allowing the sulphur dioxide to evaporate, yielding a product having an aromatic content of approximately 40-70% by volume.

The lubricating oil does not serve as a carbon remover, but rather tends to reduce the activity of the other constituents, and is used primarily in order to ensure that a film of lubricant is left on the parts after cleaning. Where this is not necessary, the lubricant can be omitted from the composition.

As a further example of my invention, I may use a carbon remover of the following composition:

	Percent by volume
Edeleanu extract	41.5
Motor lubricating oil	40
Ammonium oleate	4
Sec. butyl alcohol	12
Water	2.5

The carbon remover may be applied to the carbon deposits either while the engine is assembled or after removal of pistons and other parts. In the former case, it is customary to apply the product to pistons and rings in place when the engines have been shut down. For this purpose one to two ounces of carbon remover are added per cylinder and allowed to remain until the engine is next used, preferably standing over night. The preferred method of placing carbon remover in the engines is through the spark plug openings, or, in the case of Diesel engines, by removing the fuel injectors and pouring through the openings into the cylinders, although pouring directly through the exhaust valve ports can ordinarily be used with a reasonable degree of success. Application of the carbon remover in this manner has been found to soften and loosen carbon in the combustion chamber and on the piston rings which is largely blown out through the exhaust after starting the engine. For particularly large engines, the amount of carbon remover used per cylinder should be increased. When used to prevent sticking of piston rings it is desirable, because of the small clearance between piston rings and their grooves and the

depth of the grooves, which restricts contact between the carbon remover and the carbon deposits, to apply the carbon remover at regular intervals, depending upon the type of engine and the severity of operation. This serves to remove the encrustation before it becomes thick and dense and so prevents piston rings from sticking.

Another method for preventing piston rings from sticking and loosening those that have become stuck, consists in adding carbon remover to the lubricating oil, using preferably about one part of the former to five of the latter. The engine should be run for about eight hours with this mixture in the crankcase, after which it should be drained and replaced with straight lubricating oil.

When cleaning the parts of the engine by hand, they may be placed in a container of the mixture and allowed to soak. The carbon deposit on softening may be wiped off. In cases where the pistons have been removed and the rings have become "glued" to the piston, the latter is placed in a container of the mixture and allowed to soak for a considerable time. When not badly stuck, the rings may readily be loosened in their grooves and removed from the piston. Where the rings are so badly stuck that they are not loosened by the remover, however, the rings may first be removed in parts and the pistons then soaked in the carbon remover, thus softening the carbon and enabling its removal without injury to the pistons, which frequently occurs when the customary scraping tools are used directly on the hard carbon. The mixture may be reused as long as effective. It should be understood that various changes may be made in the constituents and proportions of the composition without departing from the scope of my invention which, generally stated, consists in the matter described and set forth in the appended claims.

I claim as my invention:

1. A composition of matter for the removal of carbon deposits from internal combustion engines comprising by volume approximately 42 parts liquid sulfur dioxide soluble portion of volatile petroleum hydrocarbon oil, 40 parts lubricating oil obtained from petroleum, 4 parts alkali metal soap of oleic acid, 12 parts liquid aliphatic alcohol and 2.5 parts water.

2. A composition of matter for the removal of carbon deposits from internal combustion engines comprising by volume approximately 42 parts liquid sulfur dioxide soluble portion of volatile petroleum hydrocarbon oil, 40 parts lubricating oil obtained from petroleum, 4 parts water soluble oleic acid soap, 12 parts liquid aliphatic alcohol and 2.5 parts water.

3. A composition of matter for the removal of carbon deposits from internal combustion engines comprising by volume approximately 42 parts liquid sulfur dioxide soluble portion of volatile petroleum hydrocarbon, 30 parts lubricating oil obtained from petroleum, 10 parts lard oil, 4 parts water soluble oleic acid soap, 11 parts liquid aliphatic alcohol and 2.5 parts water.

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