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LIQUID CLEANING COMPOSITION

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The invention relates to the cleaning of metal surfaces, and is particularly concerned with liquid cleaner compositions for removing sludge deposits from the interior parts of internal combustion engines.

Under ordinary operating conditions of an internal combustion engine there is usually formed in the crank case, on the surfaces of the combustion chamber, and on other interior working parts, a precipitate or deposit commonly referred to as sludge. This sludge is formed in large part of decomposition products of oil and fuel used in the engine, and may be composed of heavy hydrocarbons, asphaltenes, gums, fine carbon, road dirt and other solid deposits. The sludge accumulates on, and becomes tightly bound to, the piston head and rings, the valve stems and the bearings, and in sufficiently large amounts it may markedly interfere with satisfactory engine operation. The removal of this sludge occasionally is, therefore, desirable, and while efforts have been made to accomplish this by means of various types and kinds of solvent cleaners, the matter of satisfactorily cleaning engines in a quick and easy manner remains a difficult and important problem.

It is an object of this invention to provide improved metal cleaner compositions, adapted more effectively, more readily, and more conveniently to remove sludge deposits from internal combustion engines.

The new cleaner is composed of a plurality of components, in controlled volume proportions to produce a homogeneous liquid mixture of exceptionally rapid and effective cleaning action. As the essential loosening and dissolving agent for the sludge deposits, one or more organic solvents are used in an amount comprising at least 50% by volume of the total mixture. Water in an amount from about 4% to 25% of the whole, and oil in quantities preferably not exceeding about 30% by volume are mixed with the solvent, and a coupling agent is then added to produce a stable and homogeneous liquid composition. A detergent may also be included, but by preference the coupling agent selected is one which also will exert a detergent action.

Suitable solvents for this cleaner may be selected from organic ethers and esters, and the best results have been obtained with mixtures of two or more solvents. The heterogeneous nature of the sludge deposit appears to account for the fact that a single solvent does not usually dissolve or loosen the deposit as well as a mixture of two or more of them. Carboxylic acid esters

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of glycol monoalkyl ethers are good solvent components, and the cleansing action of these compounds can be further improved by mixing them with an aliphatic ether compound. Especially effective among the latter solvents are the monoether derivatives of alkylene glycols. The most suitable proportions of each solvent in these mixtures can be readily determined by test, but the total solvent quantity in the cleaner should preferably be from about 50% to 80% by volume.

Water in the cleaner formula substantially aids in loosening tightly bound sludge, and causes flaking off of lacquer-type deposits, which might not otherwise be attacked by the solvent. At least 4% water is necessary to improve the cleaner performance, and it preferably should not exceed 25% by volume. The purpose of an oil addition is to afford lubricating properties, and prevent rusting of the metal surfaces after cleaning. Ordinary mineral lubricating oils are satisfactory for this use, and the oil proportions preferably vary from about 15% to 25% by volume.

A coupling agent is necessary to render the oil-water-solvent mixture homogeneous, and thereby insure proper functioning of the cleaner both as initially formulated and after storage in containers. Some of the solvents above mentioned may in themselves assist in coupling of the completed mixture, but a further additive specifically for this purpose is usually desirable. Many compounds are available which may be suitable in their homogenizing effect, among which amine soaps are preferred, since these compounds also have certain detergent action, and thus further improve the solvent efficiency. Morpholine soaps, such as morpholine oleate and morpholine ricinoleate have proved especially effective as coupling and detergency agents. A fatty acid, such as oleic acid, may also be added in addition to the amine soap, if desired, and may aid in softening the lacquer-like hard deposits on valve stems, piston heads and rings. The amine soap proportions are generally between about 5% and 20% by volume, and the fatty acid, if used, preferably should not exceed about 10%.

A complete cleaner formula representative of the invention, which has proven particularly effective in the cleaning of automobile engines, is shown in the following table:

	Per cent by volume
Mineral lubricating oil S. A. E. 20	18
Water	18
Ethylene glycol monobutyl ether	4
Ethylene glycol monoethyl ether acetate	32
Morpholine oleate	19
Oleic acid	9

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In the manner of use and application of these cleaner compositions, no restrictions are intended by the present disclosure, but a distinct advantage lies in the ease and convenience with which satisfactory cleaning can be effected. With an engine still in running order, a cleaning treatment may consist in slowly adding a pint or so of the sludge remover through the carburetor air intake while operating at a speed just sufficient to prevent stalling. In this process the cleaner is carried directly into the combustion chambers and is later expelled through the exhaust manifold. Thus, the valves, pistons, piston rings and combustion chambers are exposed to the cleaner, and the very small quantities of the cleaner which may pass the piston rings into the crank case, are not sufficient to cause any deleterious action on, or dilution of, the crank case oil.

Where the sludging is very severe and the most effective cleaning action is desired, the treatment above can be augmented by crank case cleaning. This is accomplished by draining the crank case and refilling it to normal level with the concentrated cleaner formula before starting addition of cleaner to the carburetor. At the conclusion of the carburetor treatment, the crank case is again drained, and may be flushed with light oil. This combination treatment effects excellent cleaning of the crank case, inner engine surfaces, bearings and oil passages, as well as all parts of the combustion chambers. In case of complete engine seizure by heavy sludge, introduction of the cleaner into the spark plug holes, followed by a period of soaking, is usually effective in loosening the deposits. Where overhauling or dismantling of the engine is necessary, the cleaner composition can, of course, be used in the ordinary way, and will be found rapidly effective in cleaning all metal surfaces.

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In the particular liquid mixtures proposed, consideration has also been given to factors such as toxicity and odor, flash point, corrosiveness, and attack on gasket materials. These formulae are satisfactory in such respects, having no odor that is obnoxious, and being entirely safe to handle under the ordinary precautions used in handling common solvents. They are not irritating to the skin, and they do not readily corrode metals or attack gasket material.

It will be understood, however, that the specific cleaner formula given is merely representative, and that numerous modifications in the various components, and their proportions, may be made with the advantages described. Such modifications are intended to be included within the broader scope of the invention. This application is a continuation-in-part of my copending application Serial No. 438,077, filed April 8, 1942.

I claim:

1. A cleaning composition for removing sludge from internal combustion engines consisting of a homogeneous liquid mixture of a solvent composed of ethylene glycol monoethyl ether acetate and ethylene glycol monobutyl ether, in appreciable component proportions and in a total amount of about 50% to 80% by volume; a lubricating oil in an amount from about 15% to 25%; about 4% to 25% of water; about 5% to 20% of morpholine oleate; and not more than about 10% oleic acid.

2. A cleaning composition for removing sludge from internal combustion engines comprising a homogeneous liquid mixture, in proportion by volume of about 32% ethylene glycol monoethyl ether acetate, about 18% ethylene glycol monobutyl ether, about 18% mineral lubricating oil, about 4% water, about 19% morpholine oleate, and about 9% oleic acid.

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