Patented Sept. 27, 1938 2,131,139

UNITED STATES PATENT OFFICE

2,131,139

RECLAIMED LUBRICANT

Albert Ernst Ganzert, Chicago, Ill., assignor to Ernest C. Shaw

No Drawing. Application January 31, 1936, Serial No. 61,839

6 Claims. (Cl. 87—9)

This invention relates to reclaimed lubricants and more particularly to a method of removing deleterious material therefrom and improving the lubricating properties thereof.

The reclamation of used lubricants requires the elimination therefrom of foreign materials of a harmful nature, and particularly abrasive substances such as silica, abraded metallic particles, as well as free carbon and other insoluble materials acquired during use.

It is likewise important to alter the acidic content of the oil from a deleterious substance to a compound which shall be beneficial to the lubricant.

By means of the present invention, the insoluble materials in the oil are precipitated or sedimented without the necessity of redistillation, filtration, or centrifusion, and the acid constituents are combined with basic bodies to produce a lubricant of greater value.

A large part of the solid undesirable constituents of used oil exist therein in the form of more or less highly dispersed particles of a colloidal nature, whose electrical charge in general is negative, and which charge enables the particles to maintain their identity to a considerable degree.

The acid contents of the used lubricant are largely of the kind classified as "naphthenic" and are allied to the higher fatty acids. These acids exist in solution in the lubricant.

The acid content of the lubricant may be neutralized and the colloidal suspension of the solids broken to a considerable extent by the addition to the used lubricant of a small amount of an alkali metal aluminate, which reacts with the acids to form neutral salts soluble in or miscible with the lubricant and which act to increase its lubricating properties, and at the same time the resulting aluminum oxide or hydrous oxide acts as a precipitant for itself and the suspended solids.

The precipitating effect may be markedly increased by the addition with the aluminate of a small amount of an inorganic salt of aluminum in order to increase the amount of aluminum oxide or hydrous oxide.

The precipitating effect seems to be due to the fact that most colloids or suspensions including carbon carry a negative charge upon their particles, whereas aluminum oxide or hydrous oxide suspensions carry a positive charge. In the precipitation of a highly stabilized carbon suspension by electrolytes it has been found that the relative amounts required for precipitation were as follows:

LiCl	1400
NaCl	1350
KCl	600
$CaCl_2$	452
$BaCl_2$	30
$AlCl_3$	0.5

Comparatively similar results are obtained, gram molecular weight for gram molecular weight in the use of oppositely charged suspensions in lieu of electrolytes in cases where an electrolyte is either impossible or impractical.

As an example of the effect of the process in improving the lubricating value of lubricants, a badly used winter oil consisting of a mixture of automobile oil crank case drainings obtained from a filling station, the origin and quality of which were unknown but which were presumably of an original S. A. E. viscosity of 20, was processed by the above method at ordinary room temperature, and allowed to rest for seven days for sedimentation. A sample was then decanted and tested in comparison with a high grade unused Pennsylvania oil of S. A. E. 30 viscosity on a Navy (Almen-type) film-strength testing machine with the following results:

Straight unused Pennsylvania S. A. E. 30	Reclaimed used oil mainly S. A. E. 20
Bearings and shaft seized under 7,500 lb. per square inch load.	Bearings and shaft seized under 10,800 lb. load, per square inch.

It is thus clear that notwithstanding the diluents usual to used internal combustion engine lubricants, more especially to such lubricants during winter driving, the reclaimed mixture of heterogeneous oils delivered 44% more resistance to seizure than did the best obtainable unused straight Pennsylvania base lubricant of 50% more viscosity.

A further increase in lubricating value was obtained by adding to the reclaimed oil 0.52% of a halogen derivative of the lower hydrocarbons, carbon dichloride in this case. The reclaimed oil then carried a load on the same machine to seizure at 24,000 pounds per square inch.

When 0.67% of the aluminum-zinc compound described in my copending application, Ser. No. 53,999, filed December 11, 1935, was added, the lubricant carried a load on the same machine to seizure at 50,400 pounds per square inch. This compound comprises a fatty acid salt of aluminum, a fatty acid salt of zinc and an oxide of zinc. A suitable mixture is as follows: To a quantity of aluminum stearate in a hydrocarbon lubricant is added sufficient zinc stearate and zinc oxide in approximately molecular proportions such as will cause an incipient precipitation of the compound from molecular solution into a dispersion such as when it is dissolved in a light benzine will give no floc after several hours rest.

As a specific example of the invention, to one gallon of used lubricant was added a mixture consisting approximately of 55% water, 41% sodium aluminate and 4% aluminum chloride an-

hydrous, sufficient of this mixture was added to the oil so that the excess of sodium aluminate over the aluminum chloride would be sufficient to neutralize the acidity of the lubricant. For example, 6 grams of sodium aluminate, .5 gram anhydrous aluminum chloride and 8 cc. of water were agitated for one hour with one gallon of used lubricant and the lubricant allowed to rest for seven days at room temperature. At the end of this period the lubricant was sufficiently clear to permit reading newsprint through a considerable depth thereof, whereas the same lubricant untreated remained opaque to newsprint.

It is to be understood that the flexibility of the process is such that varying proportions of the reactants may be used to meet varying requirements. The principle involved being to have sufficient alkali aluminate present to neutralize the lubricant's acidity and where the acidity is insufficient to produce sufficient aluminum oxide or hydrous oxide to satisfactorily precipitate the suspended solids, to increase the amount of the latter body by the addition of an excess of aluminate and reacting upon this excess by an inorganic salt of aluminum to produce more of the aluminum oxide or hydrous oxide whereby both products of the latter reaction serve to increase the precipitating effect upon the suspended solids.

In practice other and also higher valent base alkali aluminates than sodium may be advantageously used both from the standpoint of their greater precipitation values and also the superior lubricating value of high molecular weight fatty acid like salts as disclosed in my copending petition Serial No. 53,999, filed December 11, 1935, and also other salts of aluminum than its chloride.

Heat will substantially accelerate the processes of chemical reaction and sedimentation and at the same time tend to remove the more volatile diluents.

The foregoing detailed description has been given for clearness of understanding only, and no unnecessary limitations should be understood therefrom, but the appended claims should be construed as broadly as permissible in view of the prior art.

I claim:

1. The method of reclaiming used lubricants containing self-generated acids and colloidal impurities which comprises incorporating with the lubricant an alkali metal salt of an acid of aluminum to neutralize the said acids and form the hydroxide of the amphoteric metal, and thereafter separating from the lubricant the colloidal impurities and the hydroxide, allowing the salts formed in the neutralization to remain in the lubricant.

2. The method of reclaiming used lubricants containing self-generated acids and colloidal impurities which comprises incorporating with the lubricant an alkali metal aluminate in excess of the amount necessary to neutralize said acids and a small proportion of aluminum chloride, to form salts of said acids and aluminum hydroxide, and thereafter separating from the lubricant the precipitated colloidal impurities and aluminum hydroxide, allowing the salts formed in the neutralization to remain in the lubricant.

3. The method of reclaiming used lubricants containing self-generated acids and colloidal impurities which comprises incorporating with the lubricant sodium aluminate in excess of the amount necessary to neutralize the said acids and a small proportion of alumium chloride, to form salts of said acids and aluminum hydroxide, and thereafter separating from the lubricant the precipitated colloidal impurities and aluminum hydroxide, allowing the salts formed in the neutralization to remain in the lubricant.

4. The method of reclaiming used lubricants containing self-generated acids and colloidal impurities which comprises incorporating with the lubricant sodium aluminate to neutralize the said acids and form aluminum hydroxide, retaining the lubricant in a quiescent state to permit sedimentation, and thereafter separating from the lubricant the sediment including the colloidal impurities and the aluminum hydroxide, allowing the salts formed in the neutralization to remain in the lubricant.

5. The method of reclaiming used lubricants containing self-generated acids and colloidal impurities which comprises incorporating with the lubricant an alkali metal aluminate and a halogen substitution derivative of the lower hydrocarbon alkyls, and thereafter separating from the lubricant the precipitated colloidal impurities and aluminum hydroxide, allowing the salts formed in the neutralization to remain in the lubricant with the halogen substitution derivative.

6. The method of reclaiming used lubricants containing self-generated acids and colloidal impurities which comprises incorporating with the lubricant approximately 0.2% sodium aluminate, 0.02% aluminum chloride and 0.5% carbon dichloride, and thereafter separating from the lubricant the sediment including the colloidal impurities and the aluminum hydroxide, allowing the salts formed in the neutralization to remain in the lubricant with the carbon dichloride.

ALBERT ERNST GANZERT.