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LUBRICATING OIL

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This invention relates to a lubricating oil and particularly to a motor oil adapted for lubrication of the bearings and cylinders of internal combustion engines, such as automotive engines, airplane engines, Diesel engines, and the like.

In our co-pending application Serial No. 223,527, filed August 6, 1938, Patent No. 2,221,162 issued November 12, 1940, there is disclosed and claimed the addition to a motor oil of this type of a small proportion of a phosphatide or phospho lipine, such as lecithin, to reduce or inhibit bearing corrosion and lacquer formation while affording other advantages, together with a small proportion of an emulsion preventing agent capable of improving the emulsion test of the oil in the presence of the phosphatide. The type of lecithin most commonly available on the market is a commercial soybean lecithin, such as the product known as "Lipoidol" which consists essentially of about equal proportions of lecithin and cephalin with a smaller proportion of soybean oil, and perhaps a very small proportion of materials which may have been added to improve the viscosity such as stearic acid. The soybean oil portion may contain certain unsaturated hydroxy compounds. Other types of bleached commercial soybean lecithins are known commercially, such as "Coloidol BT" which is commercial soybean lecithin bleached with hydrogen peroxide and benzoyl peroxide and containing some benzoic acid from the bleaching operation, and the product known as "Coloidol HX" which is commercial soybean lecithin bleached with hydrogen peroxide.

As set forth in our mentioned application, the phosphatide additive is particularly effective in connection with highly solvent refined lubricating oils, such as modern motor oils which have been refined with a solvent having high selectivity between naphthenic and paraffinic constituents of the oil, such as furfural, beta-beta-dichlorethyl ether, nitrobenzene, phenol, cresylic acid, chlorphenol and the like. The modern development of internal combustion engines with extremely small clearances between piston and cylinder wall has given rise to the problem of so-called varnish or lacquer formation. This lacquer generally appears as a yellowish or reddish brown film which deposits upon the metal surfaces, piston rings and cylinder walls during operation of the engine over extended periods of time. In the newest engines having extremely small clearances and high compression, this problem is so severe as to frequently result in seizure of the pistons when the motor is stopped and allowed to cool. The phosphatide additive is highly effective in preventing the formation of this lacquer deposit.

Further, the modern development of the highly solvent refined motor oils together with the modern development of the new type bearings including the connecting rod and main bearings of internal combustion engines, which has involved a departure from the old babbitt bearings and has given rise to new alloy bearings of the type of cadmium-silver and copper-lead has also presented the industry with the problem of bearing corrosion. The phosphatide compound is also effective for reducing or minimizing this bearing corrosion. In fact, this type of compound is probably the best anti-corrosive agent thus far developed, and is the only material known which possesses the combined function of minimizing bearing corrosion and preventing lacquer formation.

As set forth in our mentioned application, the addition of the phosphatide additive selected from the heretofore available commercial soybean lecithins, or obtained in purified form from these commercial lecithins, is found to increase the emulsion difficulties of the lubricating oil when that oil comes in contact with water or salt water, as determined by the U. S. Government Method No. 320.12 as found on pages 76 et seq. of Appendix 6 "Lubricants and Liquid Fuels" issued by the Navy Department August 1, 1928, with specifications set forth on page 7 of Naval Engineering Bulletin 31 "Lubricating Oil" published by the U. S. Government Printing Office in 1937. In our said prior application, this was overcome by incorporating along with the phosphatide a small amount of an emulsion preventing agent of the character of an oil soluble material which hydrolyzes in the presence of water to give an alkaline reaction, such as soaps of the alkali or alkaline earth metals, or quaternary organic ammonium soaps.

We have now discovered that a phosphatide compound or lecithin can be prepared which possesses the desirable properties of minimizing bearing corrosion and preventing lacquer formation and which at the same time is free from objectionable emulsifying tendencies, such that when the additive is added to a mineral lubricating oil in the proportion range employed for purposes of this invention, that oil will meet the above referred to U. S. Navy specifications for emulsion tests without the addition of an emulsion preventing agent. Briefly these specifications require that an emulsion of lighter lubri-

cating oil, having a Saybolt-Universal viscosity at 210° F. of less than 55 seconds, with water at 130° F., or with a 1% NaCl solution at 130° F. or with a normal NaOH solution at 130° F., shall break in less than thirty minutes; and that an emulsion of the heavier lubricating oils, having a Saybolt-Universal viscosity at 210° F. in excess of 55 seconds, with water at 180° F., or with a 1% NaCl solution at 180° F., shall break in less than sixty minutes.

As opposed to the commercial soybean lecithins which are found to possess the objectionable emulsifying properties, we have discovered that a phosphatide or lecithin material obtained from the brain and spinal column of animals, such as cattle, constitutes in itself a satisfactory material for purposes of the present invention, and the compounded oil prepared therewith possesses satisfactory emulsion tests. This phosphatide material is a dark brown sticky plastic, which is soft and oily in appearance, having an unctuous feeling when rubbed between the fingers, and having a pronounced odor of dried blood or dried ground flesh. This material contains about 70% of lecithin and 30% of other nitrogenous material. In addition to a minor proportion of cephalin, this material apparently contains some cholesterol and similar fat-like material and other materials of a protein nature which inherently give a reverse emulsifying effect to that of the phosphatides. The presence of the softening or greasy constituents in this material is found of distinct benefit in connection with the emulsifying properties, as is evident from the fact that a sample of lecithin from the same source which had been reduced, probably by steam distillation, to a hard wax-like material does not possess the desired non-emulsifying properties. Thus the material contemplated by our invention is a crude or practical lecithin obtained from animal origin consisting essentially of phosphatide compounds but also containing a minor or small proportion of naturally occurring impurities which have a reverse emulsifying effect from that of the phosphatide and which counteract the emulsifying tendencies of the latter. As an example of a suitable material for purposes of our invention, we may mention the practical lecithin which is sold as Chemical P–683 by the Eastman Kodak Company, and which possesses the soft unctuous properties specified above.

It is also contemplated in accordance with our invention that a purified phosphatide, such as purified lecithin, cephalin or sphengomyelin can be modified by the addition thereto in a small proportion of the order of 10% or less of naturally occurring cholesterol or other fatty material or protein material extracted from animal tissues, to produce a satisfactory additive for lubricating oil meeting the emulsion tests specified above.

The phosphatide material is added to the motor oil in a critical proportion range of 0.01–2.0%. It is found that these percentages are critical in securing the desired improvement with respect to inhibiting bearing corrosion and lacquer formation and without affecting other desirable properties of the oil. In the case of motor oils adapted for automotive use, a range of 0.01 to 0.25% appears most satisfactory, with about 0.1% preferred. Somewhat higher percentages may be employed in Diesel lubricating oil or airplane oil where it is desired to improve materially the ring sticking properties of the oil in addition to obtaining the benefits of inhibiting bearing corrosion and lacquer formation. A very satisfactory method for adding the phosphatide compound to the mineral lubricating oil is to first form a concentrate, such as a 50% solution of the phosphatide material in a S. A. E. 30 oil or other lubricating oil within the motor oil viscosity range, and then add the concentrate to the mineral lubricating oil in an amount sufficient to give the desired percentage of phosphatide compound therein. By motor oil viscosity range is meant a lubricating oil having a Saybolt viscosity in excess of 100 at 100° F. and generally in excess of 150 at 100° F., and embracing the motor oils falling within the S. A. E. 10 to 60 grades as well as certain heavier motor oils adapted for special use in heavy duty truck or bus engines at higher atmospheric temperatures, and having a viscosity range varying from about 90 seconds at 130° F. up to about 150 seconds at 210° F. Saybolt Universal, as shown on page 444 of the 1936 edition of the S. A. E. Handbook.

As illustrative of the effectiveness of the phosphatide material of animal origin of the present invention in meeting the desired emulsion test of lubricating oils containing this material as an additive, in comparison with the use of phosphatide materials or lecithins of soybean origin, the following data are given:

Water emulsion test

Material added to oil	Coloidol BT	Eastman P–683 of soft grade
Concentration of material.....percent..	0.1	0.1
Cc. oil separated:		
15 minutes	32	0
30 minutes	34	40
45 minutes	35	40
60 minutes	36	40
Cc. water separated:		
15 minutes	18	36
30 minutes	19	40
45 minutes	21	40
60 minutes	32	40
Cc. actual emulsion:		
15 minutes	30	44
30 minutes	27	0
45 minutes	24	0
60 minutes	22	0

Reference oil was furfural refined dewaxed Mid-Continent distillate S. A. E. 30 grade.

In addition to affording an economical advantage over the use of two additives to accomplish the purpose of our present invention by the use of a single additive, we are also enabled to obviate certain difficulties or objections which may be encountered due to the presence of small proportions of soap in a motor oil of this character.

Obviously many modifications and variations of the invention as hereinbefore set forth may be made without departing from the spirit and scope thereof, and therefore only such limitations should be imposed as are indicated in the appended claims.

We claim:

1. A motor oil for lubricating the bearings and cylinders of an internal combustion engine comprising a mineral lubricating oil within the motor oil viscosity range having a Saybolt viscosity varying from about 90 at 130° F. to about 150 at 210° F., containing 0.01–2.0% of a phosphatide material of animal origin and of such characteristics as to inhibit bearing corrosion and lacquer formation, said phosphatide material containing a proportion of animal fat-like material having a reverse emulsifying effect to that of the phos-

phatide and which is effective to produce a compounded oil meeting the United States Navy specifications for emulsion test as herein specified.

2. A motor oil according to claim 1 in which the phosphatide material is obtained from brain and spinal column of cattle.

3. A motor oil according to claim 1 in which the phosphatide material contains a sufficient proportion of cholesterol to render the phosphatide material soft and unctuous.

4. A motor oil according to claim 1 in which the phosphatide material is a practical lecithin derived from the brain and spinal column of cattle and contains a major proportion of phosphatide compound and a small proportion of retained protein matter and cholesterol or other fat-like material.

5. A motor oil for lubricating the bearings and cylinders of an internal combustion engine comprising a mineral lubricating oil within the motor oil viscosity range having a Saybolt viscosity varying from about 90 at 130° F. to about 150 at 210° F., containing 0.01–2.0% of a phosphatide compound, the latter containing a minor proportion of the order of less than 10% of a fatty material of the character of cholesterol derived from animal tissue, the resultant compounded oil meeting the United States Navy specifications for emulsion tests as herein specified without the addition of a further emulsion preventing agent.

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