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LUBRICATING COMPOSITION

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The present invention relates, as indicated, to lubrication and more particularly to a lubricating composition characterized by being capable of withstanding extreme unit pressures between the bearing surfaces which the same is called upon to lubricate, without the disadvantages of instability and gum-forming tendencies which characterize similar lubricating compositions now commonly available.

This application is a continuation in part of co-pending application Serial No. 193,960, filed March 4, 1938, and Serial No. 737,070, filed July 26, 1934.

By "extreme pressures," as referred to above, is meant pressures of or in excess of 10,000 pounds per square inch, such pressures now being commonly encountered in hypoid gears, bearings, contact surfaces of cylinders and piston rings in internal combustion engines, and many other points. Such pressures tend to cause the rupture of the continuous "thick film" of lubricant which separates bearing surfaces under more moderate conditions. A region of "thin-film" lubrication results which is also sometimes described as "boundary" lubrication.

It is a principal object of this invention, therefore, to provide a method of lubricating and a lubricating composition which will operate under conditions of extreme pressure to prevent seizure between the relatively moving metallic surfaces and which may be so employed without danger of deleterious effect upon the parts lubricated.

Other objects of this invention will appear as the description proceeds.

To the accomplishment of the foregoing and related ends, said invention, then, consists of the means hereinafter fully described and particularly pointed out in the claims; the following description setting forth in detail certain approved combinations of ingredients embodying my invention, such disclosed means constituting, however, but certain of various forms in which the principle of the invention may be used.

Broadly stated, this invention comprises a method of lubricating and a lubricating composition wherein a minor proportion of dibenzyl disulphide is employed in conjunction with a hydrocarbon oil.

While for certain specialized uses the dibenzyl disulphide may be employed as the sole lubricant this invention contemplates that in general it will be employed as an addition agent to mineral lubricating oils in amounts ranging from about .2% to about 4% by weight, based on the amount of mineral oil. Larger amounts

may be still more advantageous, up to about 10% or more, but the proportion added is usually limited to small percentages by the limit of solubility in the particular oil and from about 1% to about 3% will be found to be a highly desirable proportion for general use. The final product should contain at least .2% of the addition agent in order that it may exhibit sufficient extreme pressure properties to be commercially feasible. Where the lubricating composition is maintained at a high temperature relatively larger proportions of the addition agent may be employed and, conversely, where low operating temperatures are to be encountered usually only such amounts of the addition agent should be incorporated in the oil as will remain in solution under conditions of use.

While the oil base is referred to above as a mineral lubricating oil it is to be understood that any other suitable hydrocarbon lubricating oil, whether naturally occurring or synthetic, may be employed as the oil base.

It is also within the contemplation of this invention to provide the addition agent in the form of a concentrate in a suitable oil, said oil containing rather large percentages of the addition agent. Such concentrates are employed for future blending with a lubricating oil in the proportions desired for the particular conditions of use.

Dibenzyl disulphide is a particularly satisfactory addition agent to mineral oils because, in addition to its effectiveness, it is relatively chemically inactive at ordinary temperatures and under ordinary pressures but under conditions of extreme pressure it will react with the relatively moving metallic surfaces to form an anti-fluxing film and prevent seizure and scoring of said surfaces.

When still greater resistance to extreme pressure conditions is desired than that afforded by the addition agent of this invention alone it may often be found advantageous to employ a small amount of a separate organic halogen compound which will cooperate with the addition agent of this invention to increase the film strength of the lubricant (as indicated on the Almen machine) to a degree greater than the sum of the effects of either addition agent when used alone.

The following is one example of a lubricating composition of this type:

	Per cent
Refined mineral oil (SAE 90 gear oil).....	90
Chlorinated paraffin wax.....	7.5
Dibenzyl disulphide.....	2.5

The next table gives the results of tests on the Almen machine showing increase in breaking load and demonstrating that the increase when both the dibenzyl disulphide and the separate organic halogen compound are employed is much more than would be expected, i. e., more than merely cumulative, and therefore that the two addition agents cooperate to produce the desired effect.

Percent of dibenzyl disulphide	Percent of chlorinated diphenyl ether	Increase in break-down load
0	1	6
0	2	8
3	0	4
3	1½	24

It will be seen from the above table that improvement is obtained more than twice as great as would be expected when the two addition agents are employed together. As a result it is on many occasions possible to employ amounts of dibenzyl disulphide in the lower part of the range above given and even down to as little as about 0.1% where otherwise much larger amounts would be needed.

While the lubricating compositions which have been described herein as illustrating one embodiment of the invention have been generally referred to as "oils," i. e., liquids, this invention is, however, also especially applicable to the solid and semi-solid types of lubricants commonly referred to in the trade as greases, bodied oils, etc., and which may contain soaps such as sodium, calcium, lead and aluminum naphthenates, stearamides and oleates.

While mineral oil generally is the principal ingredient of the lubricant, it is not essential that

it be the only ingredient other than the addition agent, provided that there be no additional ingredient which is incompatible with such addition agent. It is within the contemplation of this invention to include, if necessary or desirable, such other addition agents as are commonly added to improve the viscosity index or cold test of the lubricant and a lubricating composition according to this invention which also has a separate oiliness increasing agent has been found to be especially effective.

Other modes of applying the principle of my invention may be employed instead of the one explained, change being made as regards the composition and method disclosed, provided the ingredients or steps stated by any of the following claims or the equivalent of such stated ingredients or steps be employed.

I therefore particularly point out and distinctly claim as my invention:

1. An extreme pressure lubricating composition comprising a major proportion of a lubricating oil the film strength of which has been substantially increased by the inclusion therein of a minor proportion of dibenzyl disulphide and a separate organic halogen compound.

2. An extreme pressure lubricating composition comprising a major proportion of a lubricating oil the film strength of which has been substantially increased by the inclusion therein of a small amount of dibenzyl disulphide and a separate organic halogen compound.

3. An extreme pressure lubricating composition comprising a major proportion of a lubricating oil the film strength of which has been substantially increased by the inclusion therein of an organic halogen compound and on the order of about 0.1% of dibenzyl disulphide.

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