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HIGH CAPILLARITY LUBRICATING OIL

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This invention relates to lubricants and is more especially concerned with oil compositions of high capillarity and a consequent ability to penetrate deeply into minute crevices between machine parts and the like.

The principal object of the invention is to provide a lubricant composition which has a degree of capillarity heretofore unobtained, and which accordingly has an ability to work its way into tightly bound machine parts such as rusted machine bolts, for example, more deeply and in a shorter period of time than any of the penetrating oils which are commonly employed.

It is a further object of the invention to provide a composition which not only has ability to carry a film of oil deeply into the minute spaces between opposing machine parts, and particularly those which are intimately joined together by rust and corrosion, but which also has excellent lubricating properties, an ability to soften rust and inhibit further oxidation, and to dissolve binding deposits of tar and gummy residues.

One composition which has been found to be particularly satisfactory in carrying out the foregoing objects was prepared by blending together the following ingredients in the volumetric proportions indicated:

	Percent
White mineral oil, 70–100 S. U. V.	50.
Kerosene	20.5
Secondary butyl alcohol	11.5
Commercial xylol	10.
Tri-n-butyl phosphate	2.5
E. P. agent	0.5
Dibutyl phthalate	5.
Antioxidant	0.1

This product is a water white liquid having a viscosity comparable to that of light spindle oil, which in comparative tests has proven itself capable of carrying a film of lubricant more deeply into minute orifices, as well as of spreading more widely therethrough, and of accomplishing both of these things in a shorter period of time, than of any of the commercial penetrating oils with which I am familiar. The procedure adopted for these comparative tests was to note the degree of penetration into, and the spread across, a fixed capillary space defined by a pair of tightly clamped sheets of glass, within a given period of time. In one set of tests, three pairs of tightly clamped standard microscope slides, each measuring one inch by three inches, were mounted in vertical position resting upon their short sides to define three fixed capillaries of comparable

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size. A drop of the foregoing composition was placed upon the upper edge of one of the pairs, while comparable drops of two widely known and highly reputed commercial penetrating oils were placed on each of the other pairs. At the end of thirty minutes it was found that the example composition had penetrated to the bottom, and spread across substantially the entire face of the test set-up. The next best oil had managed to penetrate no more than three-quarters of the length of its slide, and had not spread therethrough to any very appreciable extent. In fact, at the end of a 24-hour period neither of the commercial oils had managed to penetrate to the bottom of the test orifices, nor achieved a full spread across the face of the slides. In order to assure comparability of results, the test was repeated three times, so that each oil was tried upon each of the three pairs of slides. The results achieved by the repeated tests were substantially identical with those mentioned above, for in each case it was found that my composition penetrated through the slides and spread over them within about a 30-minute period, while neither of the other oils was able to penetrate so far or to spread so widely. The results of these laboratory tests have been fully confirmed in actual practice, where it has been demonstrated that my oil composition will penetrate even the most tightly bound and heavily rusted machine bolts within an incredibly short period of time, that it softens and loosens oxide scale, and deposits a film of lubricant of such character as to enable the bolt to be easily separated from its nut. In other instances it has been found that the oil has a marked ability to cut through deposits of tar and gum and to loosen machine parts which are thus bound together, in cases where commercial penetrating oils have proven substantially worthless.

The exact nature of the penetrating action is not fully known. It is believed, however, that the secondary butyl alcohol and tri-n-butyl phosphate act primarily as wetting agents, and serve to carry the white oil and kerosene into the capillary space, while the xylol acts primarily as a tar and gum solvent. The three last ingredients are added primarily to reinforce the properties of the foregoing major ingredients. Thus, the extreme pressure agent serves to increase the load carrying capacity of the lubricating oil, and accordingly enables the use of a light bodied oil without any sacrifice of lubricating value. In this connection I have found that almost any of the standard extreme pressure agents such as Po-

lane, Santolube, and the like will work satisfactorily. These example E. P. agents are commercially available products of Patent Chemicals Company and Monsanto Chemical Company, respectively. The first, "Polane," is in the nature of an ester of fatty acid or chlorinated fatty acid ester such as ethyl laurate of chlormethyl stearate. "Santolube" may be described as a metallic derivative of an alkylated carboxylic acid containing compounds of tin and sulphur, that is to say, a sulphurized tin salt of an alkyl phenol carboxylic acid. The dibutyl phthalate serves primarily as an anti-rusting agent which, together with the antioxidant, tends to protect the parts from further corrosion, once they have been subjected to the action of my composition. In that composition, anthranalic acid forms the antioxidant, although other agents which are well known for this purpose may be substituted where desired.

The use of white mineral oil as a lubricant is preferred because of its high degree of purity and because it lends to the final product an attractive clear, water-white color. It will be appreciated, however, that any other suitable lubricant may be substituted for the white oil without in any way lessening the ultimate value of the product. The kerosene ingredient is likewise subject to substitution by No. 2 furnace oil, Stoddard solvent, or the like, its primary character being that of a petroleum solvent.

The example composition represents a preferred form of the invention which has proven itself of wide utility as a general purpose penetrating oil. It will be apparent, however, that one or more of the addition agents may be omitted in those cases in which its function can be dispensed with. Thus a composition of the first five ingredients listed, in which the percentages stated become parts by volume, has substantially the same penetrating characteristics as the example composition, and is a better high capillary lubricant than any prior composition which I have encountered. It has also been found that the proportions of these major ingredients may be varied within limits to provide a large number of penetrating oil compositions having properties adapted to the needs of special cases. Thus the lubricating oil may represent from forty to sixty per cent by volume of the entire composition, the kerosene or other petroleum solvent, of which several possible substitutes have been indicated, may be varied between fifteen and thirty per cent, the secondary butyl alcohol between ten and fifteen per cent, the commercial xylol may run from five to fifteen per cent, while the tri-n-butyl phosphate should be held to from two to three per cent. The addition agents account for approximately six per cent of the entire composition, and

the exact amount used will depend in part upon the nature of the agent in question. Where those agents are the ones identified herein, the percentages employed should be held very close to the limits stated in the example composition.

Having described my invention in general terms, and illustrated it by way of specific example, what I claim as new is:

1. A lubricating oil composition comprising from about forty to sixty per cent of a light bodied mineral lubricating oil, from about fifteen to thirty per cent of a petroleum solvent selected from the group consisting of kerosene, No. 2 furnace oil and Stoddard solvent, from about ten to fifteen per cent of secondary butyl alcohol, from about five to fifteen per cent of commercial xylol, and from about two to about three per cent of tri-n-butyl phosphate.

2. A lubricating oil composition consisting of about fifty parts of white mineral lubricating oil, about twenty parts of kerosene, about eleven parts of secondary butyl alcohol, about ten parts of commercial xylol, and about two parts of tri-n-butyl phosphate, all of said parts being by volume.

3. A lubricating oil composition consisting essentially of from about forty to sixty per cent of a light bodied mineral lubricating oil, from about fifteen to thirty per cent of kerosene, from about ten to fifteen per cent of secondary butyl alcohol, from about five to fifteen per cent of commercial xylol, about 5% of dibutyl-phthalate and from about two to three per cent of tri-n-butyl phosphate, said percentages being by volume.

4. A lubricating oil composition consisting essentially of about fifty per cent of a white mineral lubricating oil, about twenty and one-half per cent of kerosene, about eleven and one-half per cent of secondary butyl alcohol, about ten per cent of commercial xylol, about two and one-half per cent of tri-n-butyl phosphate, and about five per cent of dibutyl phthalate.

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