United States Patent Office

3,493,509
Patented Feb. 3, 1970

3,493,509

SYNTHETIC LUBRICATING OIL FOR TIMING MECHANISMS

Joseph F. Messina, Havertown, Pa., assignor to the United States of America as represented by the Secretary of the Army

No Drawing. Filed Dec. 4, 1967, Ser. No. 687,436
Int. Cl. C10m 3/20, 1/34
U.S. Cl. 252—51.5 1 Claim

ABSTRACT OF THE DISCLOSURE

A spreading lubricant for use on non-jeweled timers, said lubricant having good viscosity properties at —65° F. and good volatility properties at about +180° F., and consisting essentially of isodecyl pelargonate and diproplyene glycol dipelargonate.

The invention described herein may be manufactured, used, and licensed by or for the Government for governmental purposes without the payment to me of any royalty thereon.

This invention relates to lubricant compositions and more particularly is directed to improved spreading lubricant compositions having desirable viscosity and volatility properties.

Lubricants for instruments such as timing devices, watches, chronometers, and the like, should normally remain in position on the bearing or jewel to which they are applied and should not spread to other parts of the mechanism and thus leave the pivot dry or unlubricated. The lubricant used for such purposes should possess a vanishingly small volatility within the normal operating range of temperature, and a low temperature of solidification, as the instruments must remain effective over a wide temperature range. Since such a lubricant is exposed to air for a long period of time, it should not oxidize, become rancid, nor form gum under ordinary adverse conditions or in the presence of the operating parts to which they are applied, and in general must retain chemical stability over long periods of time. Furthermore, the lubricant should not be corrosive nor become corrosive to the parts with which it may be in contact during the period of use.

Acid-free animal and vegetable oils generally spread rapidly. Among the natural oils, that which is obtained by rendering certain fats from the head of the porpoise has been found to possess many desirable properties and it has found extensive use in the lubrication of watches and fine mechanisms for many years, but suffers disadvantages of non-uniformity, a tendency to become rancid and corrosive, and most important for ordnance item use, is actually solid at —65° F.

The instant invention is unique since it provides a spreading oil for use on timing mechanisms which are devoid of jewels or jeweled bearings.

It is therefore an object of the present invention to provide an oil composition having improved properties.

Another object of the invention is to provide such an oil composition having improved viscosity properties at low temperatures and improved volatility properties at high temperatures.

Other and further objects of the invention will be apparent to those skilled in the art upon studying this disclosure.

In accordance with the present invention, the foregoing

objects, among others, can be attained by the compositions given below:

TABLE I

Compound	Preferred Weight, percent	Approximate Effective range, parts per 100
Isodecyl pelargonate	33.0	25–40
Dipropylene glycol dipelargonate	66.5	60–75
Phenyl-α-naphthylamine	0.5	[1] 0.2–0.8

[1] Added.

The properties of the above oil, when tested in accordance with ASTM D–445–60 yielded the values shown below:

Temp., ° F.:	Centistokes
100	6.4
0	62.9
—40	341
—65	below 1500

The volatility of my inventive lubricant was tested in accordance with ASTM D–972–56 and was subjected to 210° F. for 22 hours with two liters of air per minute passing over the cup in which the lubricant was contained, and a value of 2.6% was obtained.

Evaluation of my inventive lubricant compositions was determined using two pairs of sequential fuze timers for use with a typical ordnance weapon. The pairs were selected from different lots and were disassembled, cleaned, and then lubricated with my oil in accordance with the following illustrative procedure:

(a) Preset one pair of timers for 100 seconds and the other set of timers for 50 seconds.

(b) Soak each of the four preset timers at —65° F. for approximately 12 hours and activate the timers while maintaining the temperature at —55° F. The timers preset for 100 seconds yielded 99.935 and 99.660 seconds whereas the timers preset for 50 seconds yielded 49.881 and 50.064 seconds.

(c) Soak each of the four timers immediately after obtaining the measurements above in a chamber maintained at +125° F. for approximately 3 hours and permit chamber to return to ambient.

(d) Remove the timers from the chamber and rewind and seal them.

(e) Soak the four rewound and sealed timers in a chamber for ten days, the chamber being maintained at approximately 185 to 195° F., and then activate at 189° F. The timers preset for 100 seconds yielded 100.039 and 99.735 seconds, whereas the timers preset for 50 seconds yielded 49.957 and 50.001 seconds.

(f) Return the timers to ambient temperature.

(g) Rewind and seal timers once again.

(h) Soak each of the timers from (g) above at —65° F. for twelve hours and activate them at this temperature. The timers preset for 100 seconds yielded 100.820 seconds and a dud, whereas 51.28 and 50.588 seconds were obtained on the timers preset for 50 seconds.

(i) Immediately following the timing test described in (h) above, soak timers in chamber at +125° F. for approximately 3 hours and permit chamber to return to ambient.

(j) With only the fuze cover removed and no further disassembly thereof, my oil was applied to the pallet uprights and the escapement lever.

(k) Rewind and seal the timers once again.

(l) Soak the timers for 10 hours at —65° F. and

activate at −65° F. The timers preset for 100 seconds yielded 100.071 and 100.456 seconds, whereas the timers preset for 50 seconds yielded 50.325 and 50.088 seconds.

(m) Immediately following the timing test described in (l) above, soak the timers in a chamber at +125° F. for approximately 3 hours and permit chamber to return to ambient.

(n) Soak the timers for 10 days at +160° F. and then activate at this temperature. The timers preset at 100 seconds yielded 100.120 and 100.026 seconds, whereas the timers preset at 50 seconds yielded 50.066 and 50.018 seconds.

(o) Return the timers to ambient.

(p) Rewind and seal the timers once again.

(q) Soak the timers at −65° F. for ten hours and activate at −65° F. The timers preset for 100 seconds yielded 101.943 and 101.848 seconds, whereas the timers preset for 50 seconds yielded 50.250 and 50.572 seconds.

(r) Immediately following timing test described in (q) above, soak the timers in chamber at +125° F. for approximately 3 hours and permit the chamber to return to ambient.

A brief summary of the results are presented in Table III below:

TABLE III.—LUBRICANT OIL DATA

	Entire Fuze First Cleaned and Oiled	Fuze Rewound	Fuze Rewound	Fuze Rewound and Escapement Reoiled	Fuze Rewound	Fuze Rewound
Soak time	16 hours	10 days	16 hours	16 hours	10 days	8 hours.
Temperature, ° F	−65	+189	−65	−65	+610	65.
Fuze:						
No. 1—Preset at 100 sec	99.935 sec	100.039 sec	100.820 sec	100.071 sec	100.120 sec	101.943 sec.
No. 2—Preset at 100 sec	99.660 sec	99.735 sec	Dud	100.436 sec	100.026 sec	101.848 sec.
No. 3—Pre et at 50 sec	49.881 sec	49.957 sec	51.280 sec	50.325 sec	50.066 sec	50.250 sec.
No. 4—Preset at 50 sec	50.064 sec	50.001 sec	50.588 sec	50.088 sec	50.018 sec	50.572 sec.

It is apparent from the foregoing description and tabulated data that I have provided spreading type lubricating compositions suitable for use in non-jeweled timers, and especially in fuze mechanisms for ordnance applications, wherein the mechanism may be and often is subjected to temperature extremes, the viscosity and volatility of said composition at these temperature extremes being almost completely unaffected thereby.

I claim:

1. A lubricant composition for use with non-jeweled timing mechanisms such as fuzes, said composition consisting of about 33 weight percent isodecyl pelargonate, about 66.5 weight percent dipropylene glycol dipelargonate, and about 0.5 weight percent phenyl-α-naphthylamine, said composition having a viscosity below 1500 centistokes at −65° F. and a volatility of about 2.6%.

References Cited

UNITED STATES PATENTS

3,297,574 1/1967 MacPhail et al. ..... 252—56

DANIEL E. WYMAN, Primary Examiner

W. J. SHINE, Assistant Examiner

U.S. Cl. X.R.

252—56