ESTOLIDE COMPOSITIONS EXHIBITING HIGH OXIDATIVE STABILITY

CROSS REFERENCE TO RELATED APPLICATIONS

[001] This application claims the benefit under 35 U.S.C. § 119(e) of U.S. Provisional Patent Application No. 61/498,499, filed June 17, 2011, U.S. Provisional Patent Application No. 61/569,046, filed December 9, 2011, and U.S. Provisional Patent Application No. 61/643,072, filed May 4, 2012, which are incorporated herein by reference in their entireties for all purposes.

FIELD

[002] The present disclosure relates to lubricating compositions comprising one or more estolide compounds and exhibiting high oxidation stability, and methods of making the same.

BACKGROUND

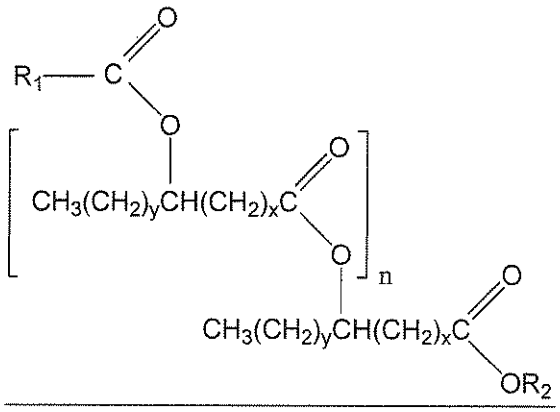
[003] A variety of commercial uses for fatty esters such as triglycerides have been described. When used as a lubricant, for example, fatty esters can provide a biodegradable alternative to petroleum-based lubricants. However, naturally-occurring fatty esters are typically deficient in one or more areas, including hydrolytic stability and/or oxidative stability.

SUMMARY

[004] Described herein are estolide compositions exhibiting high oxidative stability, and methods of making and using the same.

[004a] In a first aspect of the present disclosure, there is provided a composition comprising a combination of an estolide base oil and at least one amine antioxidant, said combination having a time of at least 1000 minutes when tested in a rotating pressurized vessel oxidation test using ASTM Method 2272-11,

wherein the estolide base oil comprises at least one estolide compound selected from compounds of Formula I:



Formula I

wherein

x is, independently for each occurrence, an integer selected from 0 to 20;

y is, independently for each occurrence, an integer selected from 0 to 20;

n is an integer greater than or equal to 0;

R_1 is an optionally substituted alkyl that is saturated or unsaturated, and branched or unbranched; and

R_2 is an optionally substituted alkyl that is saturated or unsaturated, and branched or unbranched,

wherein each fatty acid chain residue of said at least one compound is independently optionally substituted.

[004b] In a second aspect of the present disclosure, there is provided a method of improving the oxidative stability of an estolide base oil, said method comprising

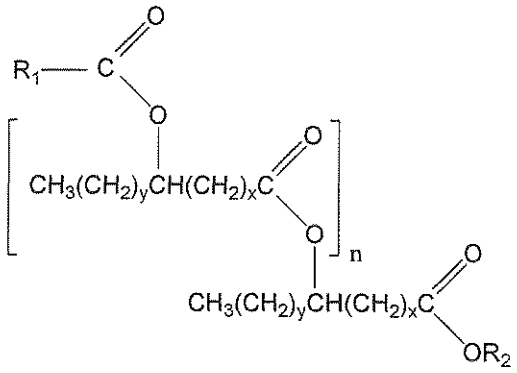
selecting an estolide base oil;

reducing the acid value of the estolide base oil to provide a low-acid estolide base oil; and

combining the low-acid estolide base oil with at least one antioxidant.

wherein the combination of the low-acid estolide base oil and the at least one antioxidant has a time of at least 1000 minutes when tested in a rotating pressurized vessel oxidation test using ASTM Method 2272-11.

[005] In certain embodiments, the composition comprises at least one estolide compound of Formula I:



Formula I