

CLAIMS

WHAT IS CLAIMED IS

1. A lubricant composition comprising:
one or more base oils of lubricating viscosity;
200 ppm to 2,000 ppm of zinc provided by a zinc dialkyl dithiophosphate compound;
one or more metal-containing detergents providing 1,000 to 5,000 ppm of metal selected from calcium, magnesium and/or sodium and provided from one or more C6 to C30 metal salts of phenates, sulfonates, calixarates, salixarates, salicylates, carboxylic acids, or combinations thereof, wherein the one or more metal containing detergents include an overbased metal salt of a branched polyolefin substituted phenate, sulfonate, and/or salicylate detergent;
no more than 300 ppm of nitrogen provided from one or more nitrogen-containing ashless dispersants; and
0.01 to 3.5 weight percent of a C2 to C3 diol or triol compound or mixture thereof.
2. The lubricant composition of claim 1, wherein the C2 to C3 diol or triol compound is trihydroxypropane, preferably wherein the trihydroxypropane is non-esterified.
3. The lubricant composition of claim 1, wherein the lubricant composition includes 0.01 to 2 weight percent of the C2 to C3 diol or triol compound or mixture thereof.
4. The lubricant composition of any one of claims 1 to 3, wherein the branched polyolefin is derived from a branched alkene having at least 4 carbon atoms and wherein the branched polyolefin has a number average molecular weight of 100 to 800.
5. The lubricant composition of any one of claims 1 to 4, wherein the overbased metal salt of a branched polyolefin substituted phenate, sulfonate, and/or salicylate detergent has a total base number (TBN) of at least 250 mg KOH/g on an oil-free basis as measured pursuant to ASTM D2896.

6. The lubricant composition of any one of claims 1 to 5, wherein the one or more overbased detergents is a branched calcium sulfonate.

7. The lubricant composition of any one of claims 1 to 5, wherein the lubricant composition satisfies the requirements of Caterpillar TO-4 low speed wear and scuffing tests with no more than 100 mg of wear as measured pursuant to ASTM D4998 and a passing load stage of 9 or higher pursuant to CEC L-07 (FZG A/8.3/90).

8. The lubricant composition of claim 7, wherein the lubricating composition exhibits no more than 50 mg of wear as measured pursuant to ASTM D4998 and a passing load stage of 9 or higher pursuant to CEC L-07 (FZG A/8.3/90).

9. The lubricant composition of any one of claims 1 to 8, wherein the nitrogen-containing ashless dispersant is a succinimide dispersant.

10. A method for providing low speed wear and scuffing protection to gears, bearings, and/or clutches according to Caterpillar TO-4 requirements as measured pursuant to ASTM D4998 and CEC L-07 (FZG A/8.3/90), the method comprising:
lubricating the gears, bearings, and/or clutches with a lubricating composition according to any one of claims 1 to 9.

11. A use of the lubricating composition according to any one of claims 1 to 9 as an off-road lubricant composition and/or a heavy-duty lubricant composition.

12. The use of claim 11 in heavy duty and/or off-road driveline or transmission applications, for reducing low speed wear and/or scuffing in off-road driveline or transmission applications.

13. The use of claim 11 or 12 for providing low speed wear and scuffing protection to gears, bearings, and/or clutches according to Caterpillar TO-4 requirements as measured pursuant to ASTM D4998 and CEC L-07 (FZG A/8.3/90).

14. The use of claim 13 for satisfying the requirements of Caterpillar TO-4 low speed wear and scuffing tests with no more than 100 mg or no more than 50 mg of wear as measured pursuant to ASTM D4998 and a passing load stage of 9 or higher pursuant to CEC L-07 (FZG A/8.3/90).