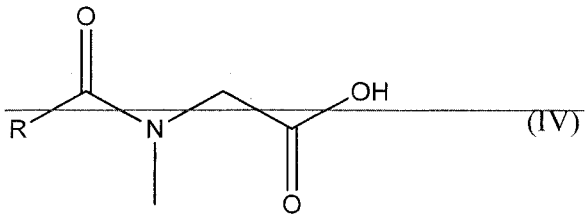
WHAT IS CLAIMED IS:

1. An engine oil composition comprising ~~a major amount~~greater than 50 wt.% of a base oil selected from a Group II, Group III, Group IV and Group V base oil and mixtures thereof, wherein the base oils of Group II and Group III have at least 90% saturates, and ~~a minor amount of~~ an additive package, wherein the additive package comprises:

(A) a friction modifier component selected from~~:~~

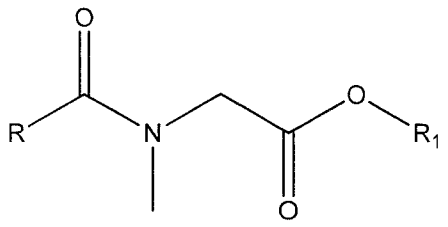
~~(a) one or more a reaction products of an alcohol with a compound of the formula IV:~~



(IV)

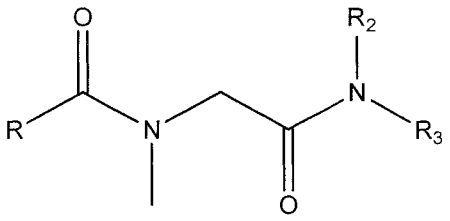
~~wherein R is a linear or branched, saturated, unsaturated, or partially saturated hydrocarbyl group having about 8 to about 22 carbon atoms; and~~

~~(b)~~ one or more compounds of the Formulae ~~II~~I-III:



(I)

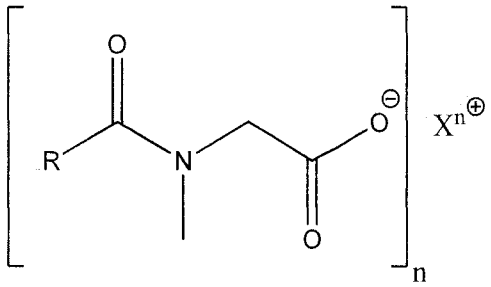
wherein R is a linear or branched, saturated, unsaturated, or partially saturated hydrocarbyl having 8 to 22 carbon atoms and R_1 is hydrogen, a hydrocarbyl having from 1 to 8 carbon atoms, or a C_1-C_8 hydrocarbyl group containing one or more heteroatoms;



(II)

wherein R is a linear or branched, saturated, unsaturated, or partially saturated hydrocarbyl having ~~about~~ 8 to ~~about~~ 22 carbon atoms and R_2 and R_3 are independently

selected from hydrogen, C_1-C_{18} hydrocarbyl groups, and C_1-C_{18} hydrocarbyl groups containing one or more heteroatoms;



(III)

wherein R is a linear or branched, saturated, unsaturated, or partially saturated hydrocarbyl having ~~about~~ 8 to ~~about~~ 22 carbon atoms; and X is an alkali metal, alkaline earth metal, or ammonium cation and n is the valence of cation X; and

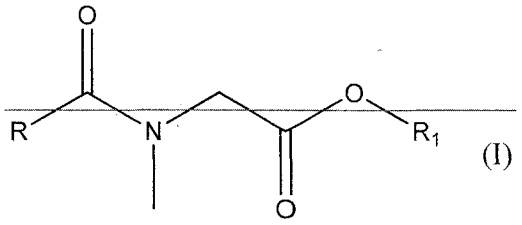
(B) at least one metal dialkyl dithio phosphate salt; and

wherein the engine oil composition is adapted for use as an engine oil, the engine oil composition has a phosphorus content of 50-1000 ppm and the engine oil composition contains 0.1 to 2.0 wt.% of the friction modifier component, based on a total weight of the composition, and when the friction modifier component is a compound of the formula (III), the engine oil composition comprises a major amount of a base oil having at least 90% saturates and being selected from a Group II, Group III and Group IV base oil and mixtures thereof.

2. The engine oil composition of claim 1, wherein the additive package comprises at least one ~~reaction~~

~~product of an alcohol with a~~ compound of the formula ~~IV~~I.

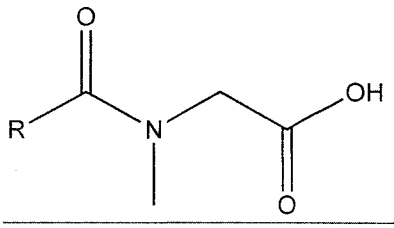
3. ~~The engine oil of claim 2, wherein the one or more reaction products of an alcohol with a compound of the formula IV comprise one or more compounds of the formula I:~~



(I)

~~wherein R is a linear or branched, saturated, unsaturated, or partially saturated hydrocarbyl having about 8 to about 22 carbon atoms and R_1 is hydrogen, a hydrocarbyl having from about 1 to about 8 carbon atoms, or a C_1-C_8 hydrocarbyl group containing one or more heteroatoms~~An engine oil composition comprising greater than 50 wt.% of base oil selected from a Group II, Group III, Group IV and Group V base oil and mixtures thereof, wherein the base oils of Group II and Group III have at least 90% saturates, and an additive package, wherein the additive package comprises:

(A) a friction modifier component selected from one or more ester reaction products of an alcohol with a compound of the formula IV:



(IV)

wherein R is a linear or branched, saturated, unsaturated, or partially saturated hydrocarbyl group having 8 to 22 carbon atoms; and

(B) at least one metal dialkyl dithio phosphate salt; and

wherein the engine oil composition is adapted for use as an engine oil, the engine oil composition has a phosphorus content of 50-1000 ppm and the engine oil composition contains 0.1 to 2.0 wt.% of the friction modifier component, based on a total weight of the composition.

4. The engine oil composition of claim 1, wherein the additive package comprises one or more compounds of the formula II.

5. The engine oil composition of claim 1, wherein the additive package comprises at least one salt of the formula III.

6. The engine oil composition of claim 1, wherein the additive package comprises at least two different compounds independently selected from the ~~reaction products of an alcohol with one or more compounds of the formula IV and~~ compounds of the formulae ~~HI~~-III.

7. The engine oil composition of ~~any one of claims 3 and 6~~claim 1, wherein R_1 is hydrocarbyl group having from ~~about~~ 1 to ~~about~~ 8 carbon atoms.

8. The engine oil composition of ~~any one of claims 3 and 6~~claim 1, wherein R_1 is a hydrocarbyl group containing a C_1-C_8 hydrocarbyl group containing one or more heteroatoms.

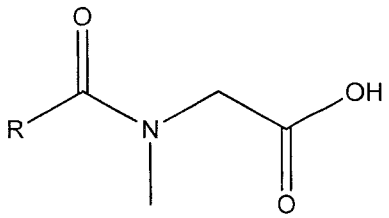
9. The engine oil composition of any one of claims 4 and 6, wherein R_2 and R_3 are independently selected from hydrogen, C_1-C_{18} hydrocarbyl groups, and C_1-C_{18} hydrocarbyl groups containing one or more heteroatoms.

10. The engine oil composition of any one of claims 4 and 6, wherein R_2 and R_3 are independently selected from hydrogen and C_4-C_8 hydrocarbyl groups.

11. The engine oil composition of any one of claims 5 and 6, wherein the one or more compounds of the formula III are salts of one or more cations selected from sodium, lithium, potassium, calcium, magnesium, and an amine.

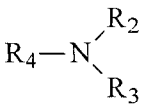
12. ~~A lubricating~~An engine oil composition comprising ~~a major amount~~greater than 50 wt.% of base oil selected from a Group II, Group III, Group IV and Group V base oil and mixtures thereof, wherein the base oils of Group II and Group III have at least 90% saturates, and ~~a minor amount of~~ an additive package, wherein the additive package comprises:

(A) a friction modifier component selected from one or more amide reaction products of a compound of the formula IV:



(IV)

wherein R is a linear or branched, saturated, unsaturated, or partially saturated hydrocarbyl group having ~~about~~ 8 to ~~about~~ 22 carbon atoms, and an amine of the formula V:



(V)

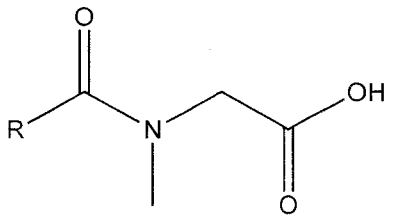
wherein R_2, R_3, and R_4 are independently selected from hydrogen, C_1-C_{18} hydrocarbyl groups, and hydrocarbons containing C_3-C_{12} hydrocarbyl groups and one or more heteroatoms; and

(B) at least one metal dialkyl dithio phosphate salt; and

wherein the engine oil composition is adapted for use as an engine oil, the engine oil composition has a phosphorus content of 50-1000 ppm and the engine oil composition contains 0.1 to 2.0 wt.% of the friction modifier component, based on a total weight of the composition.

13. ~~A lubricating~~An engine oil composition comprising ~~a major amount~~greater than 50 wt.% of a base oil selected from a Group II, Group III and Group IV base oil and mixtures thereof, wherein the base oils of Group II and Group III have at least 90% saturates, and ~~a minor amount of~~ an additive package, wherein the additive package comprises:

(A) a friction modifier component selected from one or more salts that are reaction products of one or more compounds of the formula IV:



(IV)

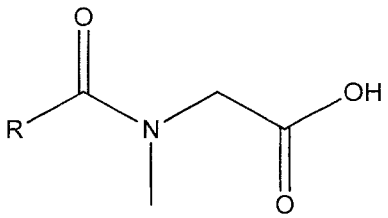
wherein R is a linear or branched, saturated, unsaturated, or partially saturated hydrocarbyl group having ~~about~~ 8 to ~~about~~ 22 carbon atoms, and an alkali metal hydroxide, and alkaline earth metal hydroxide, an alkali metal oxide, an alkaline earth metal hydroxide, ammonia, an amine or mixtures thereof; and

(B) at least one metal dialkyl dithio phosphate salt; and

wherein the engine oil composition is adapted for use as an engine oil, the engine oil composition has a phosphorus content of 50-1000 ppm and the engine oil composition contains 0.1 to 2.0 wt.% of the friction modifier component, based on a total weight of the composition.

14. ~~A lubricating~~ An engine oil composition comprising ~~a major amount~~ greater than 50 wt.% of a base oil selected from a Group II, Group III, Group IV and Group V base oil and mixtures thereof, wherein the base oils of Group II and Group III have at least 90% saturates, and ~~a minor amount of~~ an additive package, wherein the additive package comprises:

(A) a friction modifier component selected from one or more ester or amide reaction products of one or more compounds of the formula IV:



(IV)

wherein R is a linear or branched, saturated, unsaturated, or partially saturated hydrocarbyl group having ~~about~~ 8 to ~~about~~ 22 carbon atoms, and one or more amine alcohol(s); and

(B) at least one metal dialkyl dithio phosphate salt; and

wherein the engine oil composition is adapted for use as an engine oil, the engine oil composition has a phosphorus content of 50-1000 ppm and the engine oil composition contains 0.1 to 2.0 wt.% of the friction modifier component, based on a total weight of the composition.

15. The engine oil composition of any one of claims 1-~~11~~ 14~~or the lubricating oil of any one of claims 12-14~~, wherein R has from ~~about~~ 10 to ~~about~~ 20 carbon atoms.

16. The engine oil composition of any one of claims 1-~~11~~ 14~~or the lubricating oil of any one of claims 12-14~~, wherein R has from ~~about~~ 12 to ~~about~~ 18 carbon atoms.

17. The engine oil composition of any one of claims 1-~~11 and 15~~-16~~ or the lubricating oil of any one of claims 12-16~~, wherein the additive package further comprises at least one additive selected from the group consisting of antioxidants, antifoam agents, molybdenum-containing compounds, titanium-containing compounds, phosphorus-containing compounds, viscosity index improvers, pour point depressants, and diluent oils.

18. The engine oil composition of any one of claims 1-~~11 and 15~~-17~~ or the lubricating oil of any one of claims 12-17~~, comprising at least two metal dialkyl dithio phosphate salts.

19. The engine oil composition of any one of claims 1-~~11 and 15~~-18 ~~or the lubricating oil of any one of claims 12-18~~, wherein the metal of the metal dialkyl dithio phosphate salt is selected from the group consisting of alkali metals, alkaline earth metals, aluminum, lead, tin, molybdenum, manganese, nickel, copper, titanium and zinc.

20. The engine oil composition of any one of claims 1-~~11 and 15~~-19 ~~or the lubricating oil of any one of claims 12-19~~, wherein the alkyl groups on the metal dialkyl dithio phosphate salts contain from 1 to 18 carbon atoms.

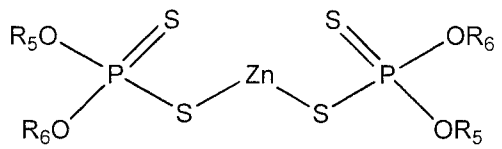
21. The engine oil composition of any one of claims 1-~~11 and 15~~-19 ~~or the lubricating oil of any one of claims 12-19~~, wherein the alkyl groups of the at least one metal dialkyl dithio phosphate salt are independently selected from ethyl, n-propyl, i-propyl, n-butyl, i-butyl, sec-butyl, amyl, n-hexyl, i-hexyl, n-octyl, decyl, dodecyl, octadecyl, 2-ethylhexyl, phenyl, butylphenyl, cyclohexyl, methylcyclopentyl, propenyl, and butenyl.

22. The engine oil composition of any one of claims 1-~~11 and 15~~-21 ~~or the lubricating oil of any one of claims 12-21~~, wherein 100 mole percent of the alkyl groups of the at least one metal dialkyl dithio phosphate salt are derived from primary alcohols.

23. The engine oil composition of any one of claims 1-~~11 and 15~~-21 ~~or the lubricating oil of any one of claims 12-21~~, wherein 100 mole percent of the alkyl groups of the at least one metal dialkyl dithio phosphate salt are derived from secondary alcohols.

24. The engine oil composition of any one of claims 1-~~11 and 15~~-21 ~~or the lubricating oil of any one of claims 12-21~~, wherein the alkyl groups of the at least one metal dialkyl dithio phosphate salt comprise a mixture of alkyl groups derived from both primary and secondary alcohols.

25. The engine oil composition of any one of claims 1-~~11 and 15~~-18 ~~or the lubricating oil of any one of claims 12-18~~, wherein the at least one metal dialkyl dithio phosphate salt comprises at least one zinc dialkyl dithio phosphate represented by the following formula:



wherein R_5 and R_6 may be the same or different hydrocarbyl moieties containing from 1 to 18 carbon atoms.

26. A method for ~~improving~~ reducing thin film and boundary layer friction in an engine comprising the step of lubricating the engine with the engine oil composition as claimed in any one of claims 1-~~11 and 15-25 or the lubricating oil of any one of claims 12-~~25.

27. The method as claimed in claim 26, wherein the ~~improved~~ reduced thin film and boundary layer friction is determined relative to a same composition in the absence of the one or more friction modifier components.

28. A method for ~~improving~~ reducing boundary layer friction in an engine, comprising the step of lubricating the engine with the engine oil composition as claimed in any one of claims 1-~~11 and 15-25 or the lubricating oil of any one of claims 12-~~25.

29. The method as claimed in claim 28, wherein the ~~improved~~ reduced boundary layer friction is determined relative to a same composition in the absence of the one or more friction modifier components.

30. A method for ~~improving~~ reducing thin film friction in an engine, comprising the step of lubricating the engine with the engine oil composition as claimed in any one of claims 1-~~11 and 15-25 or the lubricating oil of any one of claims 12-~~25.

31. The method as claimed in claim 30, wherein the ~~improved~~ reduced thin film friction is determined relative to a same composition in the absence of the one or more friction modifier components.