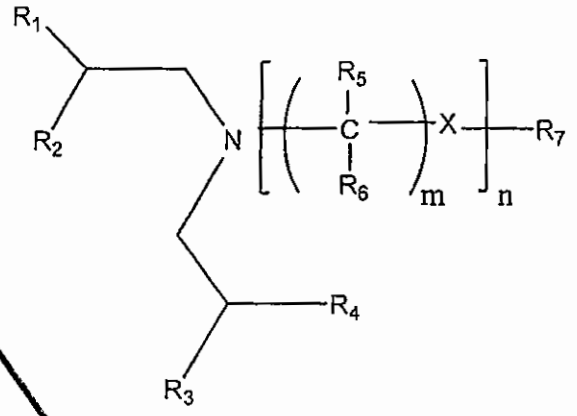
CLAIMS:

1. A lubricating oil composition comprising a major amount of oil of lubricating viscosity and a minor amount of one or more compounds of Formula (I):



(I)

wherein R_1, R_2, R_3 and R_4 are each independently an alkyl or aryl group having 1 to about 12 carbon atoms; R_5 and R_6 are each independently H or an alkyl group having 1 to about 12 carbon atoms; X is O or $N(CH_2CHR_8R_9)$, where R_8 and R_9 are independently alkyl groups having 1 to about 12 carbon atoms; m is 2 to 6; n is 0 to 20; and R_7 is $(CR_5R_6)_nN(CH_2CHR_8R_9)_2$, H or an alkyl group having 1 to about 12 carbon atoms, with the proviso that, when X is $N(CH_2CHR_8R_9)$, R_7 is $(CR_5R_6)_nN(CH_2CHR_8R_9)_2$.

2. A lubricating oil composition, as claimed in claim 1, having a TBN of at least about 6 mg KOH/g, as measured in accordance with ASTM D-2896.

3. A lubricating oil composition, as claimed in claim 2, having a TBN of from about 6 to about 18 mg KOH/g, as measured in accordance with ASTM D-2896.

4. A lubricating oil composition, as claimed in claim 1, having a SASH content of no greater than 1.1 mass %.

5. A lubricating oil composition, as claimed in claim 4, having a SASH content of no greater than 1.0 mass %.

6. A lubricating oil composition, as claimed in claim 5, having a SASH content of no greater than 0.8 mass %.

7. A lubricating oil composition, as claimed in claim 4, wherein at least 10 % of the compositional TBN, as measured in accordance with ASTM D4739, is derived from ashless TBN sources including at least one compound of Formula (I).

8. A lubricating oil composition, as claimed in claim 8, wherein at least 20 % of the compositional TBN, as measured in accordance with ASTM D4739, is derived from at least one compound of Formula (I).

9. A lubricating oil composition, as claimed in claim 1, wherein from about 0.5 to about 4 mg KOH/g of the TBN of the composition, as measured in accordance with ASTM D4739, is derived from a compound of Formula (I).

10. A lubricating oil composition, as claimed in claim 4, having a sulfur content of less than about 0.4 mass, and no greater than 1200 ppm of phosphorus.

11. A lubricating oil composition, as claimed in claim 1, comprising a compound of Formula (I) wherein R_5 and R_6 are H, R_1-R_4, R_8 and R_9 are each alkyl groups, more preferably alkyl groups having 1 to about 6 carbon atoms, X is O, m is 2 to 4, more preferably 2 or 3, most preferably 2, and n is 1 to about 3.

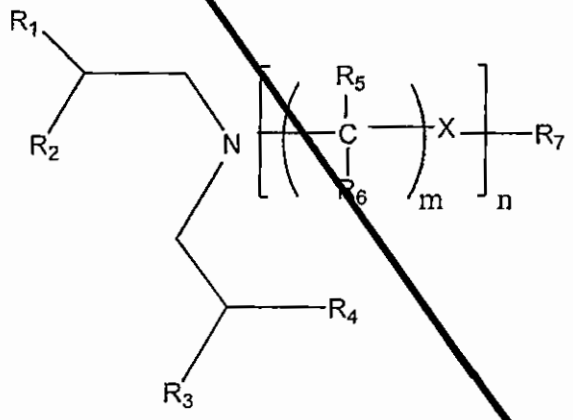
12. A lubricating oil composition, as claimed in claim 11, comprising a compound of Formula (I) wherein R_5 and R_6 are H, R_1-R_4, R_8 and R_9 are each alkyl groups having 1 to about 6 carbon atoms, X is O, m is 2, and n is 1 to about 3.

13. A lubricating oil composition, as claimed in claim 1, comprising a compound of Formula (I) having a TBN of at least about 50 mg KOH/g, as measured in accordance with ASTM D-4739.

14. A lubricating oil composition, as claimed in claim 13, comprising a compound of Formula (I) having a TBN of no greater than about 300 mg KOH/g, as measured in accordance with ASTM D-4739.

15. A concentrate for the preparation of a lubricating oil composition, as claimed in claim 1, said concentrate comprising from about 2.5 to about 30 mass % of one or more compounds of Formula (I); about 10 to about 40 mass % of a nitrogen-containing dispersant; about 2 to about 20 mass % of an aminic antioxidant, a phenolic antioxidant, a molybdenum compound, or a mixture thereof; about 5 to 40 mass % of a detergent; and from about 2 to about 20 mass % of a metal dihydrocarbyl dithiophosphate.

16. A method of increasing the TBN of a lubricating oil composition without concurrently increasing the SASH content, which method comprises adding to said lubricating oil composition one or more compounds of Formula (I):

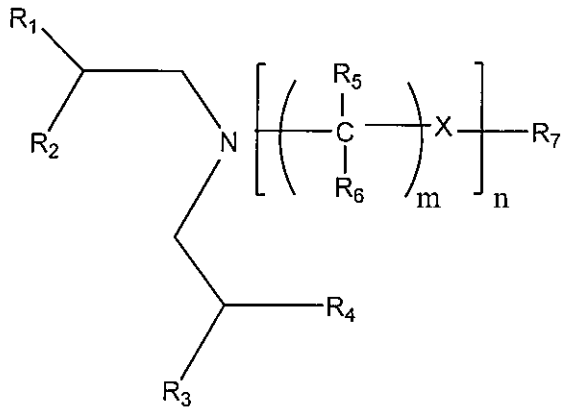


(I)

wherein R_1, R_2, R_3 and R_4 are each independently an alkyl or aryl group having 1 to about 12 carbon atoms; R_5 and R_6 are each independently H or an alkyl group having 1 to about 12 carbon atoms; X is O or $N(CH_2CHR_8R_9)$, where R_8 and R_9 are independently alkyl groups having 1 to about 12 carbon atoms; m is 2 to 6; n is 0 to 20; and R_7 is $(CR_5R_6)_nN(CH_2CHR_8R_9)_2$, H or an alkyl group having 1 to about 12 carbon atoms, with the proviso that, when X is $N(CH_2CHR_8R_9)$, R_7 is $(CR_5R_6)_nN(CH_2CHR_8R_9)_2$.

CLAIMS:

1. A lubricating oil composition comprising a major amount of oil of lubricating viscosity and a minor amount of one or more compounds of Formula (I):



(I)

wherein R_1, R_2, R_3 and R_4 are each independently an alkyl or aryl group having 1 to about 12 carbon atoms; R_5 and R_6 are each independently H or an alkyl group having 1 to about 12 carbon atoms; X is O or $N(CH_2CHR_8R_9)$, where R_8 and R_9 are independently alkyl groups having 1 to about 12 carbon atoms; m is 2 to 6; n is 0 to 20; and R_7 is $(CR_5R_6)_nN(CH_2CHR_8R_9)_2$, H or an alkyl group having 1 to about 12 carbon atoms, with the proviso that, when X is $N(CH_2CHR_8R_9)$, R_7 is $(CR_5R_6)_nN(CH_2CHR_8R_9)_2$ wherein the lubricating oil has a total base number (TBN) of at least about 6 mg KOH/g, as measured in accordance with ASTM D-2896.

2. A lubricating oil composition, as claimed in claim 1, having a TBN of from about 6 to about 18 mg KOH/g, as measured in accordance with ASTM D-2896.

3. A lubricating oil composition, as claimed in claim 1, having a SASH content of no greater than 1.1 mass %.

4. A lubricating oil composition, as claimed in claim 3, having a SASH content of no greater than 1.0 mass %.

5. A lubricating oil composition, as claimed in claim 4, having a SASH content

of no greater than 0.8 mass %.

6. A lubricating oil composition, as claimed in claim 3, wherein at least 10 % of the compositional TBN, as measured in accordance with ASTM D4739, is derived from ashless TBN sources including at least one compound of Formula (I).

7. A lubricating oil composition, as claimed in claim 6, wherein at least 20 % of the compositional TBN, as measured in accordance with ASTM D4739, is derived from at least one compound of Formula (I).

8. A lubricating oil composition, as claimed in claim 1, wherein from about 0.5 to about 4 mg KOH/g of the TBN of the composition, as measured in accordance with ASTM D4739, is derived from a compound of Formula (I).

9. A lubricating oil composition, as claimed in claim 3, having a sulfur content of less than about 0.4 mass, and no greater than 1200 ppm of phosphorus.

10. A lubricating oil composition, as claimed in claim 1, comprising a compound of Formula (I) wherein R_5 and R_6 are H, R_1-R_4, R_8 and R_9 are each alkyl groups, more preferably alkyl groups having 1 to about 6 carbon atoms, X is O, m is 2 to 4, more preferably 2 or 3, most preferably 2, and n is 1 to about 3.

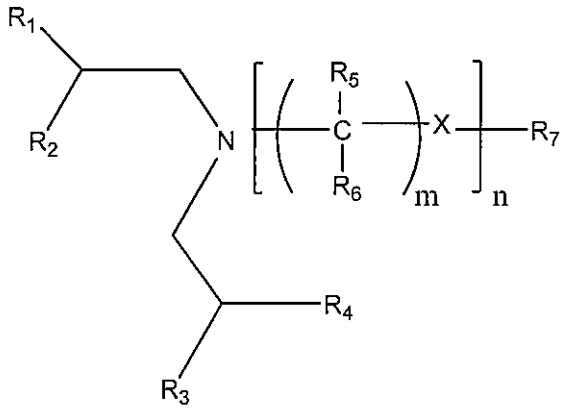
11. A lubricating oil composition, as claimed in claim 10, comprising a compound of Formula (I) wherein R_5 and R_6 are H, R_1-R_4, R_8 and R_9 are each alkyl groups having 1 to about 6 carbon atoms, X is O, m is 2, and n is 1 to about 3.

12. A lubricating oil composition, as claimed in claim 1, comprising a compound of Formula (I) having a TBN of at least about 50 mg KOH/g, as measured in accordance with ASTM D-4739.

13. A lubricating oil composition, as claimed in claim 12, comprising a compound of Formula (I) having a TBN of no greater than about 300 mg KOH/g, as measured in accordance with ASTM D-4739.

14. A concentrate for the preparation of a lubricating oil composition, as claimed in claim 1, said concentrate comprising from about 2.5 to about 30 mass % of one or more compounds of Formula (I); about 10 to about 40 mass % of a nitrogen-containing dispersant; about 2 to about 20 mass % of an aminic antioxidant, a phenolic antioxidant, a molybdenum compound, or a mixture thereof; about 5 to 40 mass % of a detergent; and from about 2 to about 20 mass % of a metal dihydrocarbyl dithiophosphate.

15. A method of increasing the TBN of a lubricating oil composition without concurrently increasing the SASH content, which method comprises adding to said lubricating oil composition one or more compounds of Formula (I):



(I)

wherein R_1, R_2, R_3 and R_4 are each independently an alkyl or aryl group having 1 to about 12 carbon atoms; R_5 and R_6 are each independently H or an alkyl group having 1 to about 12 carbon atoms; X is O or $N(CH_2CHR_8R_9)$, where R_8 and R_9 are independently alkyl groups having 1 to about 12 carbon atoms; m is 2 to 6; n is 0 to 20; and R_7 is $(CR_5R_6)_nN(CH_2CHR_8R_9)_2$, H or an alkyl group having 1 to about 12 carbon atoms, with the proviso that, when X is $N(CH_2CHR_8R_9)$, R_7 is $(CR_5R_6)_nN(CH_2CHR_8R_9)_2$.