

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of:)	Docket No.: 34249US (KDK)
)	
MILLIGAN, Stuart N. et al.)	Group Art Unit No.:
)	
Serial No.: 11/615,539)	Examiner:
)	
Filing Date: December 22, 2006)	Confirmation No.: 1057
)	
Title: DRAG REDUCTION OF)	Customer No.: 46849
ASPHALTENIC CRUDE OILS)	
)	

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

PRELIMINARY AMENDMENT

Please enter the following amendment prior to substantive examination of the above-identified application.

Amendments to the Claims are reflected in the listing of claims that begins on page 2 of this paper.

Remarks begin on page 28 of this paper.

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Original) A method comprising: introducing a drag reducing polymer into a liquid hydrocarbon having an asphaltene content of at least about 3 weight percent and an API gravity of less than about 26° to thereby produce a treated liquid hydrocarbon, wherein said drag reducing polymer comprises at least about 10,000 repeating units, and wherein a plurality of said repeating units comprise a heteroatom.
2. (Original) The method of claim 1, wherein said liquid hydrocarbon has an API gravity in the range of from about 5° to about 25° and an asphaltene content in the range of from about 4 to about 35 weight percent.
3. (Original) The method of claim 1, wherein said liquid hydrocarbon has an API gravity in the range of from 5° to 23° and an asphaltene content in the range of from 5 to 25 weight percent.
4. (Original) The method of claim 1, wherein said liquid hydrocarbon has a sulfur content of at least about 1 weight percent.
5. (Original) The method of claim 1, wherein said liquid hydrocarbon has a nitrogen content of at least about 1,300 ppmw.
6. (Original) The method of claim 1, wherein said liquid hydrocarbon has a metal content in the range of from about 1 to about 2,000 ppmw.

7. (Original) The method of claim 1, wherein said liquid hydrocarbon comprises at least about 15 weight percent of a residuum having a boiling point of at least about 1,050°F, and wherein said liquid hydrocarbon has a Conradson carbon content in the range of from about 3.5 to about 45 weight percent.

8. (Original) The method of claim 1, wherein said liquid hydrocarbon has a sulfur content in the range of from about 1.2 to about 9 weight percent, wherein said liquid hydrocarbon has a nitrogen content of at least about 1,400 ppmw, and wherein said liquid hydrocarbon has a metal content in the range of from about 50 to about 1,500 ppmw.

9. (Original) The method of claim 1, wherein said liquid hydrocarbon is heavy crude oil.

10. (Original) The method of claim 1, wherein said drag reducing polymer comprises perfluoroalkyl groups in an amount in the range of from about 0 to about 1 percent based on the total number of said repeating units.

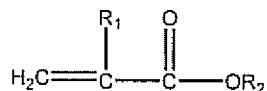
11. (Original) The method of claim 1, wherein at least about 10 percent of said repeating units comprise a heteroatom.

12. (Original) The method of claim 1, wherein said heteroatom comprises an oxygen atom, a nitrogen atom, a sulfur atom, a phosphorous atom, and/or a chlorine atom.

13. (Original) The method of claim 1, wherein said heteroatom has a partial charge.

14. (Original) The method of claim 1, wherein said repeating units comprise the residue of one or more monomers selected from the group consisting of:

(A)



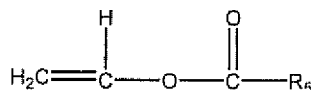
wherein R_1 is H or a C1-C10 alkyl radical, and R_2 is H, a C1-C30 alkyl radical, a C5-C30 substituted or unsubstituted cycloalkyl radical, a C6-C20 substituted or unsubstituted aryl radical, an aryl-substituted C1-C10 alkyl radical, a $-(\text{CH}_2\text{CH}_2\text{O})_x\text{-R}_A$ or $-(\text{CH}_2\text{CH}(\text{CH}_3)\text{O})_x\text{-R}_A$ radical wherein x is in the range of from 1 to 50 and R_A is H, a C1-C30 alkyl radical, or a C6-C30 alkylaryl radical;

(B)



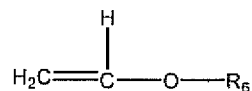
wherein arene is a phenyl, naphthyl, anthracenyl, or phenanthrenyl, R_3 is $\text{CH}=\text{CH}_2$ or $\text{CH}_3\text{-C}=\text{CH}_2$, and R_4 is H, a C1-C30 alkyl radical, a C5-C30 substituted or unsubstituted cycloalkyl radical, Cl , SO_3 , OR_B , or COOR_C , wherein R_B is H, a C1-C30 alkyl radical, a C5-C30 substituted or unsubstituted cycloalkyl radical, a C6-C20 substituted or unsubstituted aryl radical, or an aryl-substituted C1-C10 alkyl radical, and wherein R_C is H, a C1-C30 alkyl radical, a C5-C30 substituted or unsubstituted cycloalkyl radical, a C6-C20 substituted or unsubstituted aryl radical, or an aryl-substituted C1-C10 alkyl radical;

(C)



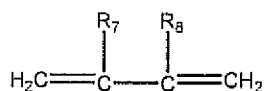
wherein R_5 is H, a C1-C30 alkyl radical, or a C6-C20 substituted or unsubstituted aryl radical;

(D)



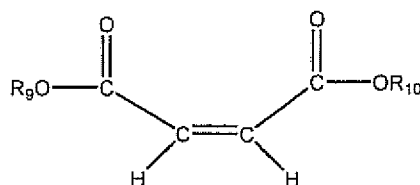
wherein R_6 is H, a C1-C30 alkyl radical, or a C6-C20 substituted or unsubstituted aryl radical;

(E)



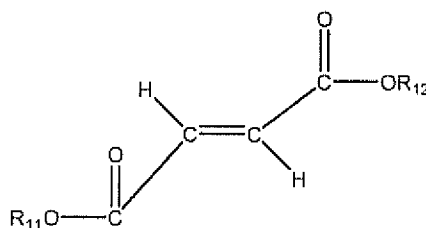
wherein R_7 is H or a C1-C18 alkyl radical, and R_8 is H, a C1-C18 alkyl radical, or Cl;

(F)



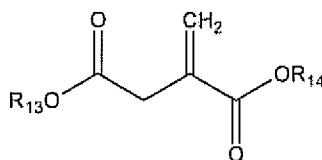
wherein R_9 and R_{10} are independently H, a C1-C30 alkyl radical, a C6-C20 substituted or unsubstituted aryl radical, a C5-C30 substituted or unsubstituted cycloalkyl radical, or heterocyclic radicals;

(G)



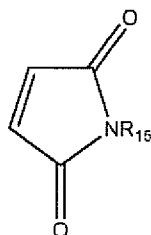
wherein R_{11} and R_{12} are independently H, a C1-C30 alkyl radical, a C6-C20 substituted or unsubstituted aryl radical, a C5-C30 substituted or unsubstituted cycloalkyl radical, or heterocyclic radicals;

(H)



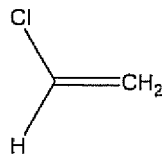
wherein R_{13} and R_{14} are independently H, a C1-C30 alkyl radical, a C6-C20 substituted or unsubstituted aryl radical, a C5-C30 substituted or unsubstituted cycloalkyl radical, or heterocyclic radicals;

(I)



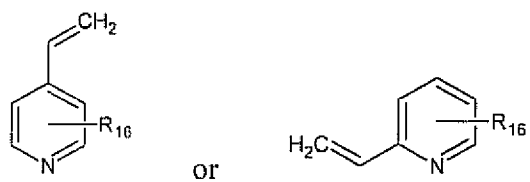
wherein R_{15} is H, a C1-C30 alkyl radical, a C6-C20 substituted or unsubstituted aryl radical, a C5-C30 substituted or unsubstituted cycloalkyl radical, or heterocyclic radicals;

(J)



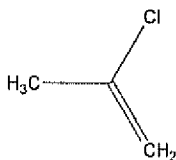
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(K)



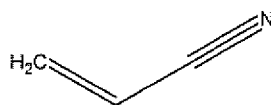
wherein R_{16} is H, a C1-C30 alkyl radical, or a C6-C20 aryl radical;

(L)



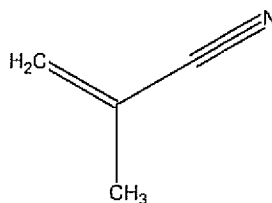
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(M)



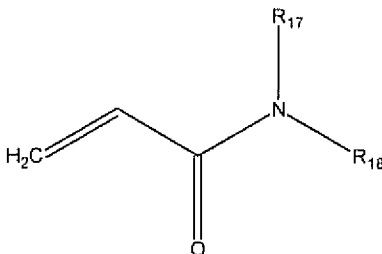
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(N)



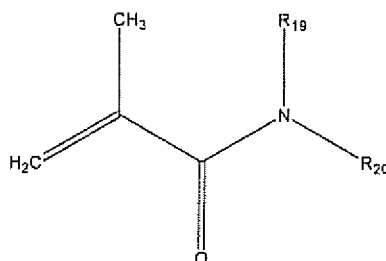
;

(O)



wherein R_{17} and R_{18} are independently H, a C1-C30 alkyl radical, a C6-C20 substituted or unsubstituted aryl radical, a C5-C30 substituted or unsubstituted cycloalkyl radical, or heterocyclic radicals;

(P)



wherein R_{19} and R_{20} are independently H, a C1-C30 alkyl radical, a C6-C20 substituted or unsubstituted aryl radical, a C5-C30 substituted or unsubstituted cycloalkyl radical, or heterocyclic radicals.

15. (Original) The method of claim 1, wherein said drag reducing polymer comprises repeating units of the residues of C4-C20 alkyl, C6-C20 substituted or unsubstituted aryl, or aryl-substituted C1-C10 alkyl ester derivatives of methacrylic acid or acrylic acid.

16. (Original) The method of claim 1, wherein said drag reducing polymer is a homopolymer comprising repeating units of the residues of 2-ethylhexyl methacrylate monomers.

17. (Original) The method of claim 1, wherein said drag reducing polymer comprises the residue of at least one monomer having at least one heteroatom and the residue of at least one monomer having no heteroatoms.

18. (Original) The method of claim 1, wherein said drag reducing polymer is a copolymer comprising repeating units of the residues of 2-ethylhexyl methacrylate monomers and the residues of at least one other monomer.

19. (Original) The method of claim 1, wherein said drag reducing polymer is a copolymer comprising repeating units of the residues of 2-ethylhexyl methacrylate monomers and the residues of butyl acrylate monomers.

20. (Original) The method of claim 1, wherein said treated liquid hydrocarbon comprises in the range of from about 0.1 to about 500 ppmw of said drag reducing polymer.

21. (Original) The method of claim 1, wherein said drag reducing polymer has a solubility parameter of at least about 17.

22. (Original) The method of claim 1, wherein said liquid hydrocarbon has a solubility parameter of at least about 17.

23. (Original) The method of claim 1, wherein said drag reducing polymer has a solubility parameter within at least about 20 percent of the solubility parameter of said liquid hydrocarbon.

24. (Original) The method of claim 1, wherein said liquid hydrocarbon is a component of a fluid mixture that further comprises a non-hydrocarbon fluid and/or a non-liquid phase, wherein said fluid mixture comprises at least about 50 weight percent of said liquid hydrocarbon.

25. (Original) A method comprising: introducing a drag reducing polymer into a liquid hydrocarbon having an asphaltene content of at least about 3 weight percent and an API gravity of less than about 26° to thereby produce a treated liquid hydrocarbon, wherein said drag reducing polymer includes at least one repeating unit having at least one heteroatom, and wherein the viscosity of said treated liquid hydrocarbon is not less than the viscosity of said liquid hydrocarbon prior to treatment with said drag reducing polymer.

26. (Original) The method of claim 25, wherein said liquid hydrocarbon has an API gravity in the range of from about 5° to about 25° and an asphaltene content in the range of from about 4 to about 35 weight percent.

27. (Original) The method of claim 25, wherein said liquid hydrocarbon has a sulfur content of at least about 1 weight percent.

28. (Original) The method of claim 25, wherein said liquid hydrocarbon has a nitrogen content of at least about 1,300 ppmw.

29. (Original) The method of claim 25, wherein said liquid hydrocarbon has a metal content in the range of from about 1 to about 2,000 ppmw.

30. (Original) The method of claim 25, wherein said liquid hydrocarbon comprises at least about 15 weight percent of a residuum having a boiling point of at least about 1,050°F, and wherein said liquid hydrocarbon has a Conradson carbon content in the range of from about 3.5 to about 45 weight percent.

31. (Original) The method of claim 25, wherein said liquid hydrocarbon has a sulfur content in the range of from about 1.2 to about 9 weight percent, wherein said liquid

hydrocarbon has a nitrogen content of at least about 1,400 ppmw, and wherein said liquid hydrocarbon has a metal content in the range of from about 50 to about 1,500 ppmw.

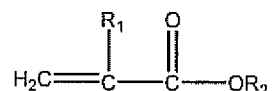
32. (Original) The method of claim 25, wherein said liquid hydrocarbon is heavy crude oil.

33. (Original) The method of claim 25, wherein said drag reducing polymer comprises at least about 10,000 repeating units.

34. (Original) The method of claim 33, wherein at least about 10 percent of said repeating units comprises a heteroatom, wherein said heteroatom comprises an oxygen atom, a nitrogen atom, a sulfur atom, a phosphorus atom, and/or a chlorine atom.

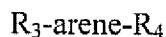
35. (Original) The method of claim 25, wherein said repeating unit comprises the residues of one or more monomers selected from the group consisting of:

(A)



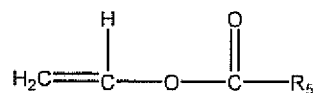
wherein R_1 is H or a C1-C10 alkyl radical, and R_2 is H, a C1-C30 alkyl radical, a C5-C30 substituted or unsubstituted cycloalkyl radical, a C6-C20 substituted or unsubstituted aryl radical, an aryl-substituted C1-C10 alkyl radical, a $-(\text{CH}_2\text{CH}_2\text{O})_x-\text{R}_A$ or $-(\text{CH}_2\text{CH}(\text{CH}_3)\text{O})_x-\text{R}_A$ radical wherein x is in the range of from 1 to 50 and R_A is H, a C1-C30 alkyl radical, or a C6-C30 alkylaryl radical;

(B)



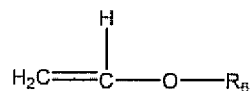
wherein arene is a phenyl, naphthyl, anthracenyl, or phenanthrenyl, R_3 is $\text{CH}=\text{CH}_2$ or $\text{CH}_3\text{-C}=\text{CH}_2$, and R_4 is H, a C1-C30 alkyl radical, a C5-C30 substituted or unsubstituted cycloalkyl radical, Cl, SO_3 , OR_B , or COOR_C , wherein R_B is H, a C1-C30 alkyl radical, a C5-C30 substituted or unsubstituted cycloalkyl radical, a C6-C20 substituted or unsubstituted aryl radical, or an aryl-substituted C1-C10 alkyl radical, and wherein R_C is H, a C1-C30 alkyl radical, a C5-C30 substituted or unsubstituted cycloalkyl radical, a C6-C20 substituted or unsubstituted aryl radical, or an aryl-substituted C1-C10 alkyl radical;

(C)



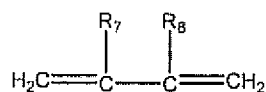
wherein R_5 is H, a C1-C30 alkyl radical, or a C6-C20 substituted or unsubstituted aryl radical;

(D)



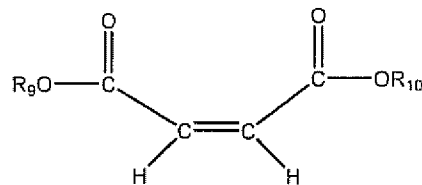
wherein R_6 is H, a C1-C30 alkyl radical, or a C6-C20 substituted or unsubstituted aryl radical;

(E)



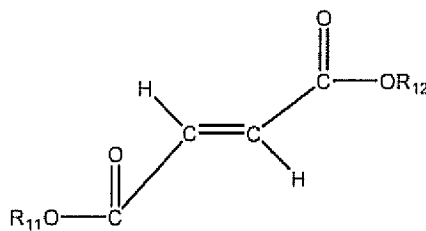
wherein R_7 is H or a C1-C18 alkyl radical, and R_8 is H, a C1-C18 alkyl radical, or Cl;

(F)



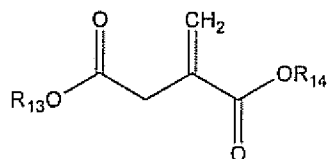
wherein R₉ and R₁₀ are independently H, a C1-C30 alkyl radical, a C6-C20 substituted or unsubstituted aryl radical, a C5-C30 substituted or unsubstituted cycloalkyl radical, or heterocyclic radicals;

(G)



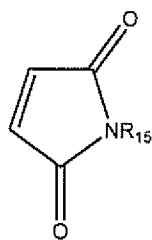
wherein R₁₁ and R₁₂ are independently H, a C1-C30 alkyl radical, a C6-C20 substituted or unsubstituted aryl radical, a C5-C30 substituted or unsubstituted cycloalkyl radical, or heterocyclic radicals;

(H)



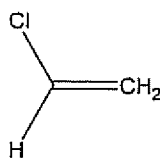
wherein R_{13} and R_{14} are independently H, a C1-C30 alkyl radical, a C6-C20 substituted or unsubstituted aryl radical, a C5-C30 substituted or unsubstituted cycloalkyl radical, or heterocyclic radicals;

(I)



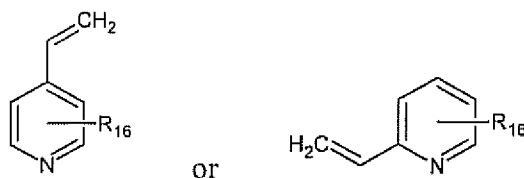
wherein R_{15} is H, a C1-C30 alkyl radical, a C6-C20 substituted or unsubstituted aryl radical, a C5-C30 substituted or unsubstituted cycloalkyl radical, or heterocyclic radicals;

(J)



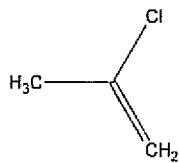
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(K)



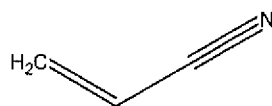
wherein R_{16} is H, a C1-C30 alkyl radical, or a C6-C20 aryl radical;

(L)



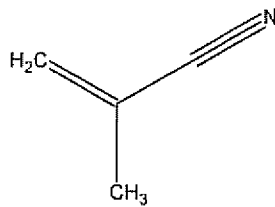
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(M)



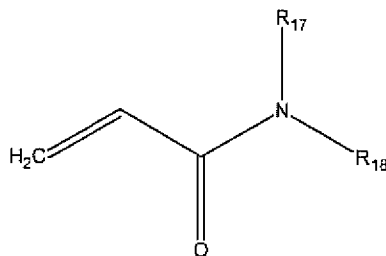
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(N)



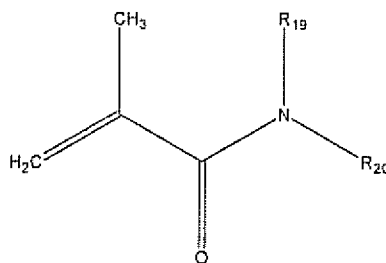
;

(O)



wherein R_{17} and R_{18} are independently H, a C1-C30 alkyl radical, a C6-C20 substituted or unsubstituted aryl radical, a C5-C30 substituted or unsubstituted cycloalkyl radical, or heterocyclic radicals;

(P)



wherein R_{19} and R_{20} are independently H, a C1-C30 alkyl radical, a C6-C20 substituted or unsubstituted aryl radical, a C5-C30 substituted or unsubstituted cycloalkyl radical, or heterocyclic radicals.

36. (Original) The method of claim 25, wherein said drag reducing polymer comprises repeating units of the residues of C4-C20 alkyl, C6-C20 substituted or unsubstituted aryl, or aryl-substituted C1-C10 alkyl ester derivatives of methacrylic acid or acrylic acid.

37. (Original) The method of claim 25, wherein said drag reducing polymer is a homopolymer comprising repeating units of the residues of 2-ethylhexyl methacrylate monomers.

38. (Original) The method of claim 25, wherein said drag reducing polymer is a copolymer comprising repeating units of the residues of 2-ethylhexyl methacrylate monomers and the residues of at least one other monomer.

39. (Original) The method of claim 25, wherein said drag reducing polymer is a copolymer comprising repeating units of the residues of 2-ethylhexyl methacrylate monomers and the residues of butyl acrylate monomers.

40. (Original) The method of claim 25, wherein said treated liquid hydrocarbon comprises in the range of from about 0.1 to about 500 ppmw of said drag reducing polymer.

41. (Original) The method of claim 25, wherein said drag reducing polymer has a solubility parameter within at least about 20 percent of the solubility parameter of said liquid hydrocarbon.

42. (Original) The method of claim 25, wherein said liquid hydrocarbon is a component of a fluid mixture that further comprises an non-hydrocarbon fluid and/or a non-liquid phase, wherein said fluid mixture comprises at least about 50 weight percent of said liquid hydrocarbon.

43. (Original) A method for reducing pressure drop associated with the turbulent flow of heavy crude oil through a pipeline, wherein said heavy crude oil has an API gravity of less than about 26° and an asphaltene content of at least about 5 weight percent, said method comprising:

- (a) introducing a drag reducing polymer into said heavy crude oil, wherein said drag reducing polymer comprises at least about 25,000 repeating units; and
- (b) flowing the resulting treated crude oil through said pipeline, wherein the viscosity of said treated crude oil is not less than the viscosity of said heavy crude oil prior to treatment with said drag reducing polymer.

44. (Original) The method of claim 43, wherein said heavy crude oil has a sulfur content of at least about 1 weight percent.

45. (Original) The method of claim 43, wherein said heavy crude oil has a nitrogen content of at least about 1,300 ppmw.

46. (Original) The method of claim 43, wherein said heavy crude oil has a metal content in the range of from about 1 to about 2,000 ppmw.

47. (Original) The method of claim 43, wherein said drag reducing polymer comprises at least about 50,000 repeating units.

48. (Original) The method of claim 43, wherein said repeating units comprise the residues of one or more monomers selected from the group consisting of 2-ethylhexyl methacrylate, styrene or its derivatives, butadiene or its derivatives, acrylates, methacrylates, and combinations thereof.

49. (Original) The method of claim 43, wherein said repeating units comprise the residues of one or more monomers selected from the group consisting of 2-ethylhexyl methacrylate and butyl acrylate.

50. (Original) The method of claim 43, wherein said heavy crude oil is a component of a fluid mixture that further comprises water and/or a natural gas, wherein said fluid mixture comprises at least about 50 weight percent of said heavy crude oil.

51. (Original) A method comprising: introducing a drag reducing polymer into a liquid hydrocarbon having an asphaltene content of at least about 3 weight percent and an API gravity of less than about 26° to thereby produce a treated liquid hydrocarbon, wherein said drag reducing polymer comprises at least about 10,000 repeating units, and wherein said drag reducing polymer has a solubility parameter of at least about 17.

52. (Original) The method of claim 51, wherein said drag reducing polymer has a solubility parameter in the range of from about 17.5 to about 23.

53. (Original) The method of claim 51, wherein said liquid hydrocarbon has a solubility parameter in the range of from about 17.1 to about 24.

54. (Original) The method of claim 51, wherein said liquid hydrocarbon has a solubility parameter within at least about 20 percent of the solubility parameter of said drag reducing polymer.

55. (Original) The method of claim 51, wherein said liquid hydrocarbon has a solubility parameter within at least 4 MPa^{1/2} of the solubility parameter of said drag reducing polymer.

56. (Original) The method of claim 51, wherein said liquid hydrocarbon has a sulfur content of at least about 1 weight percent.

57. (Original) The method of claim 51, wherein said liquid hydrocarbon has a nitrogen content of at least about 1,300 ppmw.

58. (Original) The method of claim 51, wherein said liquid hydrocarbon has a metal content in the range of from about 1 to about 2,000 ppmw.

59. (Original) The method of claim 51, wherein said liquid hydrocarbon comprises at least about 15 weight percent of a residuum having a boiling point of at least about 1,050°F, and wherein said liquid hydrocarbon has a Conradson carbon content in the range of from about 3.5 to about 45 weight percent.

60. (Original) The method of claim 51, wherein said liquid hydrocarbon is heavy crude oil.

61. (Original) The method of claim 51, wherein said drag reducing polymer comprises repeating units of the residues of C4-C20 alkyl, C6-C20 substituted or unsubstituted aryl, or aryl-substituted C1-C10 alkyl ester derivatives of methacrylic acid or acrylic acid.

62. (Original) The method of claim 51, wherein said drag reducing polymer is a copolymer comprising repeating units of the residues of 2-ethylhexyl methacrylate monomers and the residues of at least one other monomer.

63. (Original) A method comprising: introducing a drag reducing polymer into a liquid hydrocarbon having an asphaltene content of at least about 3 weight percent and an API gravity of less than about 26° to thereby produce a treated liquid hydrocarbon, wherein said drag reducing polymer comprises at least about 10,000 repeating units, and wherein said drag reducing polymer has a solubility parameter within at least about 20 percent of the solubility parameter of said liquid hydrocarbon.

64. (Original) The method of claim 63, wherein said drag reducing polymer has a solubility parameter within at least about 18 percent of the solubility parameter of said liquid hydrocarbon.

65. (Original) The method of claim 63, wherein said drag reducing polymer has a solubility parameter in the range of from about 17.5 to about 23.

66. (Original) The method of claim 63, wherein said liquid hydrocarbon has a solubility parameter in the range of from about 17.1 to about 24.

67. (Original) The method of claim 63, wherein said drag reducing polymer has a solubility parameter within at least 4 MPa^{1/2} of the solubility parameter of said liquid hydrocarbon.

68. (Original) The method of claim 63, wherein said liquid hydrocarbon has a sulfur content of at least about 1 weight percent.

69. (Original) The method of claim 63, wherein said liquid hydrocarbon has a nitrogen content of at least about 1,300 ppmw.

70. (Original) The method of claim 63, wherein said liquid hydrocarbon has a metal content in the range of from about 1 to about 2,000 ppmw.

71. (Original) The method of claim 63, wherein said liquid hydrocarbon comprises at least about 15 weight percent of a residuum having a boiling point of at least about 1,050°F, and wherein said liquid hydrocarbon has a Conradson carbon content in the range of from about 3.5 to about 45 weight percent.

72. (Original) The method of claim 63, wherein said liquid hydrocarbon is heavy crude oil.

73. (Original) The method of claim 63, wherein said repeating units comprise the residue of one or more monomers selected from the group consisting of 2-ethylhexyl methacrylate, styrene or its derivatives, butadiene or its derivatives, acrylates, methacrylates, and combinations thereof.

74. (Original) The method of claim 63, wherein said drag reducing polymer comprises repeating units of the residues of C4-C20 alkyl, C6-C20 substituted or unsubstituted aryl, or aryl-substituted C1-C10 alkyl ester derivatives of methacrylic acid or acrylic acid.

75. (Original) The method of claim 63, wherein said drag reducing polymer is a copolymer comprising repeating units of the residues of 2-ethylhexyl methacrylate monomers and the residues of at least one other monomer.

76. (New) A drag reducing composition comprising: a continuous phase and a plurality of drag reducing polymer particles dispersed in said continuous phase, wherein at least a portion of said polymer particles are copolymers comprising residues of 2-ethylhexyl methacrylate monomers and residues of n-butyl acrylate monomers.

77. (New) The composition of claim 76, wherein said copolymers comprise residues of 2-ethylhexyl methacrylate and residues of n-butyl acrylate in a weight ratio of about 4:1 2-ethylhexyl methacrylate-to-n-butyl acrylate.

78. (New) The composition of claim 76, wherein said drag reducing composition comprises said polymer particles in an amount in the range of from about 10 to about 60 weight percent based on the total weight of said drag reducing composition.

79. (New) The composition of claim 76, wherein said polymer particles have a weight average molecular weight of at least 1×10^6 g/mol.

80. (New) The composition of claim 76, wherein said polymer particles have an average particle size in the range of from about 10 to about 500 nm.

81. (New) The composition of claim 76, wherein said polymer particles have a solubility parameter in the range of from about 17.5 to about 23 MPa^{1/2}.

82. (New) The composition of claim 76, wherein said continuous phase comprises water and/or polar organic liquids, wherein substantially all of said polymeric particles are copolymers of 2-ethylhexyl methacrylate and n-butyl acrylate.

83. (New) A method comprising: introducing a drag reducing composition into a liquid hydrocarbon having an asphaltene content of at least 3 weight percent and an API gravity of less than 26° to thereby produce a treated liquid hydrocarbon, wherein said drag reducing composition comprises a continuous phase and a plurality of drag reducing polymer particles dispersed in said continuous phase, wherein at least a portion of said polymer particles are copolymers comprising residues of 2-ethylhexyl methacrylate monomers and residues of n-butyl acrylate monomers.

84. (New) The method of claim 83, wherein said polymer particles comprise residues of 2-ethylhexyl methacrylate and residues of n-butyl acrylate in a weight ratio of about 4:1 2-ethylhexyl methacrylate-to-n-butyl acrylate.

85. (New) The method of claim 83, wherein said drag reducing composition comprises said polymer particles in an amount in the range of from about 10 to about 60 weight percent based on the total weight of said drag reducing composition.

86. (New) The method of claim 83, wherein said polymer particles have a weight average molecular weight of at least 1×10^6 g/mol.

87. (New) The method of claim 83, wherein said polymer particles have an average particle size in the range of from about 10 to about 500 nm.

88. (New) The method of claim 83, wherein said polymer particles have a solubility parameter in the range of from about 17.5 to about $23 \text{ MPa}^{1/2}$.

89. (New) The method of claim 83, wherein said liquid hydrocarbon has an API gravity in the range of from about 5° to about 25° and an asphaltene content in the range of from about 4 to about 35 weight percent.

90. (New) The method of claim 83, wherein said liquid hydrocarbon has a sulfur content of at least 1 weight percent, wherein said liquid hydrocarbon has a nitrogen content of at least 1,300 ppmw, wherein said liquid hydrocarbon has a metal content in the range of from about 1 to about 2,000 ppmw.

91. (New) The method of claim 83, wherein said liquid hydrocarbon comprises at least 15 weight percent of a residuum having a boiling point of at least 1,050°F, and wherein said liquid hydrocarbon has a Conradson carbon content in the range of from about 3.5 to about 45 weight percent.

92. (New) The method of claim 83, wherein said liquid hydrocarbon is heavy crude oil.

REMARKS

Claims 1-75 were originally presented and claims 76-92 have been added herein so that claims 1-92 are currently pending. Claims 1, 25, 43, 51, 63, 76, and 83 are in independent form.

The subject matter of new claims 76-92 is fully described in the specification of the present application. The following paragraphs provide an explanation of where support can be found in the specification as filed for each new claim.

Independent claim 76 recites the limitation of “[a] drag reducing composition comprising: a continuous phase and a plurality of drag reducing polymer particles dispersed in said continuous phase” Support for this limitation can be found in the specification of the present application at page 6, lines 28-30, which states that “the drag reducing polymer can be in the form of a latex drag reducer comprising a high molecular weight polymer dispersed in an aqueous continuous phase.” Further support can be found in the specification at page 16, lines 3-5, which states that “[t]he latex can be a stable colloidal dispersion comprising a dispersed phase of high molecular weight polymer particles and a continuous phase comprising water.”

Independent claim 76 recites the limitation “wherein at least a portion of said polymer particles are copolymers comprising residues of 2-ethylhexyl methacrylate monomers and residues of n-butyl acrylate monomers.” Support for this limitation can be found in the specification at page 12, lines 6-8, which states that “the drag reducing polymer can be a copolymer comprising repeating units of the residues of 2-ethylhexyl methacrylate monomers and butyl acrylate monomers.” Additional support for this limitation can be found in Example 1 of the specification at page 21, lines 2-5, which states that “[p]reparation of Polymer B was performed in the same manner as the preparation of Polymer A above, with the following exception: the monomer charged to the reactor was an 80/20 weight percent blend of 2-ethylhexyl methacrylate and n-butyl acrylate” (emphasis added).

Dependent claim 77 recites the limitation “wherein said copolymers comprise residues of 2-ethylhexyl methacrylate and residues of n-butyl acrylate in a weight ratio of about 4:1 2-ethylhexyl methacrylate-to-n-butyl acrylate.” Support for this limitation can be found in

Example 1 of the specification at page 21, lines 2-5, which states that “[p]reparation of Polymer B was performed in the same manner as the preparation of Polymer A above, with the following exception: the monomer charged to the reactor was an *80/20 weight percent blend* of 2-ethylhexyl methacrylate and n-butyl acrylate” (emphasis added).

Dependent claim 78 recites the limitation “wherein said drag reducing composition comprises said polymer particles in an amount in the range of from about 10 to about 60 weight percent based on the total weight of said drag reducing composition.” Support for this limitation can be found in the specification at page 16, lines 5-6, which states that “[t]he colloidal particles can comprise in the range of from *about 10 to about 60 percent* by weight of the latex” (emphasis added).

Dependent claim 79 recites the limitation “wherein said polymer particles have a weight average molecular weight of at least 1×10^6 g/mol.” Support for this limitation can be found in the specification at page 17, lines 7-9, which states that “the drag reducing polymer of the dispersed phase of the latex can have a *weight average molecular weight (M_w) of at least about 1×10^6 g/mol*” (emphasis added).

Dependent claim 80 recites the limitation “wherein said polymer particles have an average particle size in the range of from about 10 to about 500 nm.” Support for this limitation can be found in the specification at page 17, lines 9-12, which states that “[t]he colloidal particles of drag reducing polymer can have a mean particle size of less than about 10 microns, less than about 1,000 nm (1 micron), *in the range of from about 10 to about 500 nm*, or in the range of from 50 to 250 nm” (emphasis added).

Dependent claim 81 recites the limitation “wherein said polymer particles have a solubility parameter in the range of from about 17.5 to about $23 \text{ MPa}^{1/2}$.” Support for this limitation can be found in the specification at page 19, lines 7-10, which states that “the drag reducing polymer can have a solubility parameter, as determined according to the above equations, of at least about $17 \text{ MPa}^{1/2}$, in the range of from about 17.1 to about $24 \text{ MPa}^{1/2}$, *or in the range of from 17.5 to $23 \text{ MPa}^{1/2}$* ” (emphasis added).

Dependent claim 82 recites the limitation “wherein said continuous phase comprises

water and/or polar organic liquids, wherein substantially all of said polymeric particles are copolymers of 2-ethylhexyl methacrylate and n-butyl acrylate.” Support for this limitation can be found in the specification at page 7, lines 1-3, which states that “[t]he continuous phase generally comprises at least one component selected from the group consisting of water, polar organic liquids, and mixtures thereof.”

Independent claim 83 recites the limitation of “introducing a drag reducing composition into a liquid hydrocarbon having an asphaltene content of at least 3 weight percent and an API gravity of less than 26° to thereby produce a treated liquid hydrocarbon” Support for this limitation can be found in the specification of the present invention at page 2, lines 8-11, which states that “[i]n one embodiment of the present invention, there is provided a method comprising: introducing a drag reducing polymer into a liquid hydrocarbon having an asphaltene content of at least about 3 weight percent and an API gravity of less than about 26° to thereby produce a treated liquid hydrocarbon.”

Independent claim 83 recites the limitation “wherein said drag reducing composition comprises a continuous phase and a plurality of drag reducing polymer particles dispersed in said continuous phase” Support for this limitation can be found in the specification of the present application at page 6, lines 28-30, which states that “the drag reducing polymer can be in the form of a latex drag reducer comprising a high molecular weight polymer dispersed in an aqueous continuous phase.” Further support can be found in the specification at page 16, lines 3-5, which states that “[t]he latex can be a stable colloidal dispersion comprising a dispersed phase of high molecular weight polymer particles and a continuous phase comprising water.”

Independent claim 83 recites the limitation “wherein at least a portion of said polymer particles are copolymers comprising residues of 2-ethylhexyl methacrylate monomers and residues of n-butyl acrylate monomers.” Support for this limitation can be found in the specification at page 12, lines 6-8, which states that “the drag reducing polymer can be a copolymer comprising repeating units of the residues of 2-ethylhexyl methacrylate monomers and butyl acrylate monomers.” Additional support for this limitation can be found in Example 1 of the specification at page 21, lines 2-5, which states that “[p]reparation of Polymer B was

performed in the same manner as the preparation of Polymer A above, with the following exception: the monomer charged to the reactor was an 80/20 weight percent blend of 2-ethylhexyl methacrylate and n-butyl acrylate” (emphasis added).

Dependent claim 84 recites the limitation “wherein said polymer particles comprise residues of 2-ethylhexyl methacrylate and residues of n-butyl acrylate in a weight ratio of about 4:1 2-ethylhexyl methacrylate-to-n-butyl acrylate.” Support for this limitation can be found in Example 1 of the specification at page 21, lines 2-5, which states that “[p]reparation of Polymer B was performed in the same manner as the preparation of Polymer A above, with the following exception: the monomer charged to the reactor was an *80/20 weight percent blend* of 2-ethylhexyl methacrylate and n-butyl acrylate” (emphasis added).

Dependent claim 85 recites the limitation “wherein said drag reducing composition comprises said polymer particles in an amount in the range of from about 10 to about 60 weight percent based on the total weight of said drag reducing composition.” Support for this limitation can be found in the specification at page 16, lines 5-6, which states that “[t]he colloidal particles can comprise in the range of from *about 10 to about 60 percent* by weight of the latex” (emphasis added).

Dependent claim 86 recites the limitation “wherein said polymer particles have a weight average molecular weight of at least 1×10^6 g/mol.” Support for this limitation can be found in the specification at page 17, lines 7-9, which states that “the drag reducing polymer of the dispersed phase of the latex can have a *weight average molecular weight (M_w) of at least about 1×10^6 g/mol*” (emphasis added).

Dependent claim 87 recites the limitation “wherein said polymer particles have an average particle size in the range of from about 10 to about 500 nm.” Support for this limitation can be found in the specification at page 17, lines 9-12, which states that “[t]he colloidal particles of drag reducing polymer can have a mean particle size of less than about 10 microns, less than about 1,000 nm (1 micron), *in the range of from about 10 to about 500 nm*, or in the range of from 50 to 250 nm” (emphasis added).

Dependent claim 88 recites the limitation “wherein said polymer particles have a

solubility parameter in the range of from about 17.5 to about 23 MPa^{1/2}.” Support for this limitation can be found in the specification at page 19, lines 7-10, which states that “the drag reducing polymer can have a solubility parameter, as determined according to the above equations, of at least about 17 MPa^{1/2}, in the range of from about 17.1 to about 24 MPa^{1/2}, *or in the range of from 17.5 to 23 MPa^{1/2}*” (emphasis added).

Dependent claim 89 recites the limitation “wherein said liquid hydrocarbon has an API gravity in the range of from about 5° to about 25°” Support for this limitation can be found in the specification at page 5, lines 26-28, which states that “the liquid hydrocarbon can have an API gravity of less than about 26°, *in the range of from about 5° to about 25°*, or in the range of from 5° to 23°” (emphasis added).

Dependent claim 89 recites the limitation “wherein said liquid hydrocarbon has . . . an asphaltene content in the range of from about 4 to about 35 weight percent.” Support for this limitation can be found at page 3, lines 8-10, which states that “the liquid hydrocarbon can comprise asphaltene compounds in an amount of at least about 3 weight percent, *in the range of from about 4 to about 35 weight percent*, or in the range of from 5 to 25 weight percent” (emphasis added).

Dependent claim 90 recites the limitation “wherein said liquid hydrocarbon has a sulfur content of at least 1 weight percent” Support for this limitation can be found in the specification at page 4, lines 15-16, which states that “the liquid hydrocarbon can comprise sulfur in an amount of at least about 1 weight percent.”

Dependent claim 90 recites the limitation “wherein said liquid hydrocarbon has a nitrogen content of at least 1,300 ppmw” Support for this limitation can be found in the specification at page 4, lines 18-19, which states that “the liquid hydrocarbon can comprise nitrogen in an amount of at least about 1,300 parts per million by weight.”

Dependent claim 90 recites the limitation “wherein said liquid hydrocarbon has a metal content in the range of from about 1 to about 2,000 ppmw.” Support for this limitation can be found in the specification at page 4, lines 22-25, which states “In one embodiment, the liquid hydrocarbon can comprise metals in an amount of at least about 1 ppmw, *in the range of from*

about 1 to about 2,000 ppmw, in the range of from about 50 to about 1,500 ppmw, or in the range of from 100 to 1,000 ppmw” (emphasis added).

Dependent claim 91 recites the limitation “wherein said liquid hydrocarbon comprises at least 15 weight percent of a residuum having a boiling point of at least 1,050°F” Support for this limitation can be found in the specification at page 5, lines 6-9, which states that “the liquid hydrocarbon can comprise at least about 10 weight percent, *at least about 15 weight percent*, or in the range of from 20 to 60 weight percent *of a residuum having an initial boiling point of at least about 1,050°F*” (emphasis added).

Dependent claim 91 recites the limitation “wherein said liquid hydrocarbon has a conradson carbon content in the range of from about 3.5 to about 45 weight percent.” Support for this limitation can be found in the specification at page 5, lines 13-16, which states that “the liquid hydrocarbon can comprise conradson carbon in an amount of at least about 1 weight percent, in the range of from about 2 to about 50 weight percent, *in the range of from about 3.5 to 45 weight percent*, or in the range of from 5 to 40 weight percent” (emphasis added).

Dependent claim 92 recites the limitation “wherein said liquid hydrocarbon is heavy crude oil.” Support for this limitation can be found in the specification at page 4, lines 1-2, which states that “[i]n one embodiment, the liquid hydrocarbon can be a heavy crude oil.”

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Amendment dated March 10, 2008
Preliminary Amendment

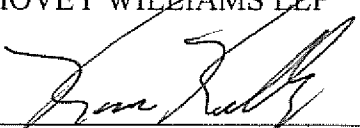
In view of the foregoing, Applicants submit that added claims 76-92 are fully supported by the specification of the application. Further, all of claims 1-92 are believed to be in patentable form. Action on the merits is respectfully requested.

In accordance with 37 C.F.R. §§ 1.16(h) and 1.16(i), a check in the amount of \$1,270 is enclosed for the 17 additional claims, 2 of which are independent. The Commissioner is hereby authorized to charge any additional fees associated with this communication or credit any overpayment to Deposit Account No. 19-0522.

Respectfully submitted,

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