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(54) **ADDITIVES FOR DRAG REDUCING
 POLYMERS**

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 (2013.01)

(58) **Field of Classification Search**

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 See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,758,406 A	9/1973	Malone et al.
4,983,186 A	1/1991	Naiman et al.
2010/0130681 A1	5/2010	Smith et al.

OTHER PUBLICATIONS

Eurasian Patent Office First Official Action (with attached English
 translation) for Application No. 201690851; date unknown; 5 total
 pages.

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(57) **ABSTRACT**

A method of forming a drag reducing polymer formulation.
 The method begins by forming a drag reducing polymer. A
 hydrocarbon additive is then incorporated with the drag
 reducing polymer to form a drag reducing polymer formu-
 lation. The drag reducing polymer formulation is then used
 as a drag reducer in hydrocarbon pipelines.

19 Claims, No Drawings

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ADDITIVES FOR DRAG REDUCING POLYMERS

FIELD OF THE INVENTION

A method of incorporating a hydrocarbon additive to a drag reducing polymer.

BACKGROUND OF THE INVENTION

When fluids are transported by a pipeline, there is typically a drop in fluid pressure due to friction between the wall of the pipeline and the fluid. Due to this pressure drop, for a given pipeline, fluid must be transported with sufficient pressure to achieve the desired throughput. When higher flow rates are desired through the pipeline, more pressure must be applied due to the fact that, as flow rates are increased, the difference in pressure caused by the pressure drop also increases. However, design limitations on pipelines limit the amount of pressure that can be employed. The problems associated with pressure drop are most acute when fluids are transported over long distances. Such pressure drops can result in inefficiencies that increase equipment and operation costs.

To alleviate the problems associated with pressure drop, many in the industry utilize drag reducers in the flowing fluid. When the flow of fluid in a pipeline is turbulent, high molecular weight polymeric drag reducers can be employed to enhance the flow. A drag reducer is a composition capable of substantially reducing friction loss associated with the turbulent flow of a fluid through a pipeline. The role of a drag reducer is to suppress the growth of turbulent eddies, which results in higher flow rate at a constant pumping pressure. Ultra-high molecular weight polymers are known to function well as drag reducers, particularly in hydrocarbon pipelines. In general, drag reduction depends in part upon the molecular weight of the polymer additive and its ability to dissolve in the hydrocarbon under turbulent flow. Effective drag reducers typically have molecular weights in excess of five million or even ten million.

Typically, drag reducers are injected into a pipeline just at the discharge side of a pumping station. A pump capable of surpassing the line pressure of the pipeline is used to inject the drag reducer into the pipeline. It has been shown that additives added to drag reducers can improve the ability of drag reducers to be injected into the pipeline.

There exists a need for an additive to improve the ability of drag reducers to be injected into the pipeline without adversely affecting the formulation of the drag reducer.

BRIEF SUMMARY OF THE DISCLOSURE

The disclosed technology provides a method of forming a drag reducing polymer formulation including forming a drag reducing polymer; and incorporating a hydrocarbon additive with the drag reducing polymer to form the drag reducing polymer formulation in which the drag reducing polymer formulation is used as a drag reducer in hydrocarbon pipelines.

The disclosed technology further provides a method of forming a drag reducing polymer in which the drag reducing polymer is a latex drag reducing polymer.

The disclosed technology further provides a method of forming a drag reducing polymer in which the drag reducing polymer is formed via emulsion polymerization.

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The disclosed technology further provides a method of forming a drag reducing polymer in which the drag reducing polymer is formed via emulsion polymerization.

The disclosed technology further provides a method of forming a drag reducing polymer in which the hydrocarbon additive is selected from heptane, isooctane, kerosene, N-paraffin deplete kerosene, and combinations thereof.

The disclosed technology further provides a method of forming a drag reducing polymer in which the hydrocarbon additive has a distillation temperature less than 275° C.

The disclosed technology further provides a method of forming a drag reducing polymer in which the hydrocarbon pipelines are heavy oil pipelines.

The disclosed technology further provides a method of forming a drag reducing polymer in which the drag reducer suppresses the growth of turbulent eddies in the hydrocarbon pipelines.

The disclosed technology further provides a method of forming a drag reducing polymer in which the drag reducing polymer formulation includes at least about 25,000 repeating units.

The disclosed technology further provides a method of forming a drag reducing polymer in which the drag reducing polymer formulation has a weight average molecular weight of at least 1×10^6 g/mol.

The disclosed technology further provides a method of forming a drag reducing polymer in which from about 3 wt % to about 16 wt % hydrocarbon additive is incorporated into the drag reducer.

The disclosed technology further provides a method of forming a drag reducing polymer in which the hydrocarbon additive comes from a source different than the hydrocarbon pipelines.

The disclosed technology further provides a method of forming a drag reducing polymer in which the addition of the hydrocarbon additive does not affect the stability of the drag reducing polymer.

The disclosed technology further provides a method of forming a drag reducing polymer formulation including forming a latex drag reducing polymer via emulsion polymerization and incorporating from about 3 wt % to about 30 wt % of kerosene additive to the latex drag reducing polymer to form the drag reducing polymer formulation in which the drag reducing polymer formulation use used as a drag reducer in heavy oil pipelines.

The disclosed technology further provides a method of injecting a drag reducing polymer formulation including forming a latex drag reducing polymer via emulsion polymerization, incorporating from about 3 wt % to about 30 wt % of kerosene additive to the latex drag reducing polymer to form the drag reducing polymer formulation, and injecting the drag reducing polymer formulation into a heavy oil pipeline.

The disclosed technology further relates to a method of injecting a drag reducing polymer formulation in which the drag reducer suppresses the growth and turbulent eddies in the heavy oil pipeline.

The disclosed technology further relates to a method of injecting a drag reducing polymer formulation in which the drag reducing polymer formulation comprises at least about 25,000 repeat units.

The disclosed technology further relates to a method of injecting a drag reducing polymer formulation in which the drag reducing polymer formulation has a weight average molecular weight of at least 1×10^6 g/mol.

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The disclosed technology further relates to a method of injecting a drag reducing polymer formulation in which the kerosene additive comes from a source different than the hydrocarbon pipelines.

The disclosed technology further relates to a method of injecting a drag reducing polymer formulation in which the incorporation of kerosene additive does not affect the stability of the latex drag reducing polymer.

The disclosed technology further relates to a method of injecting a drag reducing polymer formulation in which the hydrocarbon additive has a distillation temperature of 300° C. and below.

The disclosed technology further relates to a method of injecting a drag reducing polymer formulation in which from about 3 wt % to about 30 wt % of the hydrocarbon additive is incorporated into the drag reducing polymer.

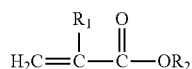
DETAILED DESCRIPTION

Turning now to the detailed description of the preferred arrangement or arrangements of the present invention, it should be understood that the inventive features and concepts may be manifested in other arrangements and that the scope of the invention is not limited to the embodiments described or illustrated. The scope of the invention is intended only to be limited by the scope of the claims that follow.

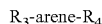
A method of forming a drag reducing polymer formulation. The method begins by forming a drag reducing polymer. A hydrocarbon additive is then incorporated with the drag reducing polymer to form a drag reducing polymer formulation. The drag reducing polymer formulation is then used as a drag reducer in hydrocarbon pipelines.

The drag reducing polymer formed can be any conventionally known drag reducing polymer. Examples of drag reducing polymers that can be used include latex drag reducing polymer and those formed via emulsion polymerization. Hereby incorporated by reference, U.S. Pat. No. 8,022,118 describes various drag reducing polymers that can be used in the present method.

In one embodiment, the drag reducing polymer can comprise a plurality of repeating units of the residues of one or more of the monomers selected from the group consisting of:



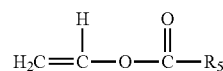
repeating wherein R_1 is H or a C1-C10 alkyl radical, and R_2 is H, a C1-C30 alkyl radical, a C5-C30 substituted or unsubstituted cycloalkyl radical, a C6-C20 substituted or unsubstituted aryl radical, an aryl-substituted C1-C10 alkyl radical, a $-(\text{CH}_2\text{CH}_2\text{O})_x-\text{R}_4$ or $-(\text{CH}_2\text{CH}(\text{CH}_3)\text{O})_x-\text{R}_4$ radical wherein x is in the range of from 1 to 50 and R_4 is H, a C1-C30 alkyl radical, or a C6-C30 alkylaryl radical;



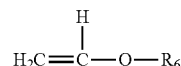
wherein arene is a phenyl, naphthyl, anthracenyl, or phenanthrenyl, R_3 is $\text{CH}=\text{CH}_2$ or $\text{CH}_3-\text{C}=\text{CH}_2$, and R_4 is H, a C1-C30 alkyl radical, a C5-C30 substituted or unsubstituted cycloalkyl radical, Cl, SO_3 , OR_B , or COOR_C , wherein R_B is H, a C1-C30 alkyl radical,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

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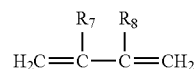
C1-C10 alkyl radical, and wherein R_C is H, a C1-C30 alkyl radical, a C5-C30 substituted or unsubstituted cycloalkyl radical, a C6-C20 substituted or unsubstituted aryl radical, or an aryl-substituted C1-C10 alkyl radical;



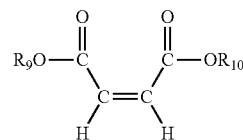
wherein R_5 is H, a C1-C30 alkyl radical, or a C6-C20 substituted or unsubstituted aryl radical;



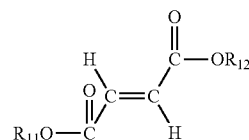
wherein R_6 is H, a C1-C30 alkyl radical, or a C6-C20 substituted or unsubstituted aryl radical;



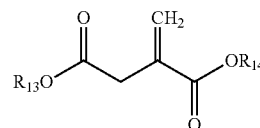
wherein R_7 is H or a C1-C18 alkyl radical, and R_8 is H, a C1-C18 alkyl radical, or Cl;



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;

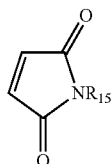


wherein R_{11} and R_{12} are independently H, a C1-C30 alkyl radical, a C6-C20 substituted or unsubstituted aryl radical, a C5-C30 substituted or unsubstituted cycloalkyl radical, or heterocyclic radicals;

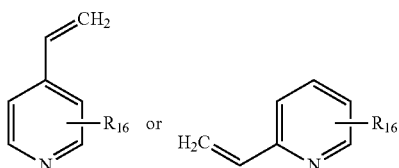
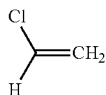


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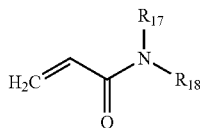
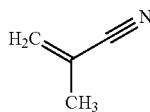
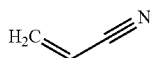
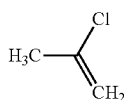
wherein R_{13} and R_{14} are independently H, a C1-C30 alkyl radical, a C6-C20 substituted or unsubstituted aryl radical, a C5-C30 substituted or unsubstituted cycloalkyl radical, or heterocyclic radicals;



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;



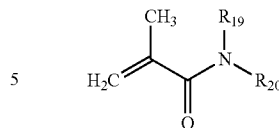
wherein R_{16} is H, a C1-C30 alkyl radical, or a C6-C20 aryl radical;



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; and

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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.

In one embodiment, the drag reducing polymer can comprise 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. In another embodiment, the drag reducing polymer can be a copolymer comprising repeating units of the residues of 2-ethylhexyl methacrylate and the residues of at least one other monomer. In yet another embodiment, the drag reducing polymer can be a copolymer comprising repeating units of the residues of 2-ethylhexyl methacrylate monomers and butyl acrylate monomers. In still another embodiment, the drag reducing polymer can be a homopolymer comprising repeating units of the residues of 2-ethylhexyl methacrylate.

In one embodiment, the drag reducing polymer can comprise the residues of at least one monomer having a heteroatom. As stated above, the term "heteroatom" includes any atom that is not a carbon or hydrogen atom. Specific examples of heteroatoms include, but are not limited to, oxygen, nitrogen, sulfur, phosphorous, and/or chlorine atoms. In one embodiment, the drag reducing polymer can comprise at least about 10 percent, at least about 25 percent, or at least 50 percent of the residues of monomers having at least one heteroatom. Additionally, the heteroatom can have a partial charge. As used herein, the term "partial charge" is defined as an electric charge, either positive or negative, having a value of less than 1.

The surfactant used in the above-mentioned reaction mixture can include at least one high HLB anionic or nonionic surfactant. The term "HLB number" refers to the hydrophile-lipophile balance of a surfactant in an emulsion. The HLB number is determined by the methods described by W. C. Griffin in *J. Soc. Cosmet. Chem.*, 1, 311 (1949) and *J. Soc. Cosmet. Chem.*, 5, 249 (1954), which are incorporated herein by reference. As used herein, the term "high HLB" shall denote an HLB number of 7 or more. The HLB number of surfactants for use with forming the reaction mixture can be at least about 8, at least about 10, or at least 12.

Exemplary high HLB anionic surfactants include, but are not limited to, high HLB alkyl sulfates, alkyl ether sulfates, dialkyl sulfosuccinates, alkyl phosphates, alkyl aryl sulfonates, and sarcosinates. Suitable examples of commercially available high HLB anionic surfactants include, but are not limited to, sodium lauryl sulfate (available as RHO-DAPON LSB from Rhodia Incorporated, Cranbury, N.J.), dioctyl sodium sulfosuccinate (available as AEROSOL OT from Cytec Industries, Inc., West Paterson, N.J.), 2-ethylhexyl polyphosphate sodium salt (available from Jarchem Industries Inc., Newark, N.J.), sodium dodecylbenzene sulfonate (available as NORFOX 40 from Norman, Fox & Co., Vernon, Calif.), and sodium lauroylsarcosine (available as HAMPOSYL L-30 from Hampshire Chemical Corp., Lexington, Mass.).

Exemplary high HLB nonionic surfactants include, but are not limited to, high HLB sorbitan esters, PEG fatty acid esters, ethoxylated glycerine esters, ethoxylated fatty amines, ethoxylated sorbitan esters, block ethylene oxide/propylene oxide surfactants, alcohol/fatty acid esters, ethoxylated alcohols, ethoxylated fatty acids, alkoxylated castor oils, glycerine esters, linear alcohol ethoxylates, and alkyl phenol ethoxylates. Suitable examples of commercially available high HLB nonionic surfactants include, but are not limited to, nonylphenoxy and octylphenoxy poly(ethyleneoxy) ethanols (available as the IGEAL CA and CO series, respectively from Rhodia, Cranbury, N.J.), C8 to C18 ethoxylated primary alcohols (such as RHODASURF LA-9 from Rhodia Inc., Cranbury, N.J.), C11 to C15 secondary-alcohol ethoxylates (available as the TERGITOL 15-S series, including 15-S-7, 15-S-9, 15-S-12, from Dow Chemical Company, Midland, Mich.), polyoxyethylene sorbitan fatty acid esters (available as the TWEEN series of surfactants from Uniquema, Wilmington, Del.), polyethylene oxide (25) oleyl ether (available as SIPONIC Y-500-70 from Americal Alcolac Chemical Co., Baltimore, Md.), alkylaryl polyether alcohols (available as the TRITON X series, including X-100, X-165, X-305, and X-405, from Dow Chemical Company, Midland, Mich.).

In one embodiment, the initiation system for use in the above-mentioned reaction mixture can be any suitable system for generating free radicals necessary to facilitate emulsion polymerization. Possible initiators include, but are not limited to, persulfates (e.g., ammonium persulfate, sodium persulfate, potassium persulfate), peroxy persulfates, and peroxides (e.g., tert-butyl hydroperoxide) used alone or in combination with one or more reducing components and/or accelerators. Possible reducing components include, but are not limited to, bisulfites, metabisulfites, ascorbic acid, erythorbic acid, and sodium formaldehyde sulfoxylate. Possible accelerators include, but are not limited to, any composition containing a transition metal having two oxidation states such as, for example, ferrous sulfate and ferrous ammonium sulfate. Alternatively, known thermal and radiation initiation techniques can be employed to generate the free radicals. In another embodiment, any polymerization and corresponding initiation or catalytic methods known by those skilled in the art may be used in the present invention. For example, when polymerization is performed by methods such as addition or condensation polymerization, the polymerization can be initiated or catalyzed by methods such as cationic, anionic, or coordination methods.

When water is used to form the above-mentioned reaction mixture, the water can be purified water such as distilled or deionized water. However, the continuous phase of the emulsion can also comprise polar organic liquids or aqueous solutions of polar organic liquids, such as those listed below.

As previously noted, the reaction mixture optionally can include a buffer. The buffer can comprise any known buffer that is compatible with the initiation system such as, for example, carbonate, phosphate, and/or borate buffers.

As previously noted, the reaction mixture optionally can include at least one hydrate inhibitor. The hydrate inhibitor can be a thermodynamic hydrate inhibitor such as, for example, an alcohol and/or a polyol. In one embodiment, the hydrate inhibitor can comprise one or more polyhydric alcohols and/or one or more ethers of polyhydric alcohols. Suitable polyhydric alcohols include, but are not limited to, monoethylene glycol, diethylene glycol, triethylene glycol, monopropylene glycol, and/or dipropylene glycol. Suitable ethers of polyhydric alcohols include, but are not limited to, ethylene glycol monomethyl ether, diethylene glycol

monomethyl ether, propylene glycol monomethyl ether, and dipropylene glycol monomethyl ether.

Generally, the hydrate inhibitor can be any composition that when mixed with distilled water at a 1:1 weight ratio produces a hydrate inhibited liquid mixture having a gas hydrate formation temperature at 2,000 psia that is lower than the gas hydrate formation temperature of distilled water at 2,000 psia by an amount in the range of from about 10 to about 150° F., in the range of from about 20 to about 80° F., or in the range of from 30 to 60° F. For example, monoethylene glycol qualifies as a hydrate inhibitor because the gas hydrate formation temperature of distilled water at 2,000 psia is about 70° F., while the gas hydrate formation temperature of a 1:1 mixture of distilled water and monoethylene glycol at 2,000 psia is about 28° F. Thus, monoethylene glycol lowers the gas hydrate formation temperature of distilled water at 2,000 psia by about 42° F. when added to the distilled water at a 1:1 weight ratio. It should be noted that the gas hydrate formation temperature of a particular liquid may vary depending on the compositional make-up of the natural gas used to determine the gas hydrate formation temperature. Therefore, when gas hydrate formation temperature is used herein to define what constitutes a "hydrate inhibitor," such gas hydrate temperature is presumed to be determined using a natural gas composition containing 92 mole percent methane, 5 mole percent ethane, and 3 mole percent propane.

In forming the reaction mixture, the monomer, water, the at least one surfactant, and optionally the hydrate inhibitor, can be combined under a substantially oxygen-free atmosphere that is maintained at less than about 1,000 ppmw oxygen or less than about 100 ppmw oxygen. The oxygen-free atmosphere can be maintained by continuously purging the reaction vessel with an inert gas such as nitrogen and/or argon. The temperature of the system can be kept at a level from the freezing point of the continuous phase up to about 60° C., in the range of from about 0 to about 45° C., or in the range of from 0 to 30° C. The system pressure can be maintained in the range of from about 5 to about 100 psia, in the range of from about 10 to about 25 psia, or about atmospheric pressure. However, higher pressures up to about 300 psia can be necessary to polymerize certain monomers, such as diolefins.

Next, a buffer can be added, if required, followed by addition of the initiation system, either all at once or over time. The polymerization reaction is carried out for a sufficient amount of time to achieve at least about 90 percent conversion by weight of the monomers. Typically, this time period is in the range of from between about 1 to about 10 hours, or in the range of from 3 to 5 hours. During polymerization, the reaction mixture can be continuously agitated.

The following table sets forth approximate broad and narrow ranges for the amounts of the ingredients present in the reaction mixture.

Ingredient	Broad Range	Narrow Range
Monomer (wt. % of reaction mixture)	10-60%	30-50%
Water (wt. % of reaction mixture)	20-80%	50-70%
Surfactant (wt. % of reaction mixture)	0.1-10%	0.25-6%
Initiation system		
Monomer:Initiator (molar ratio)	1×10^3 :1- 5×10^6 :1 5×10^3 :1- 2×10^6 :1	

-continued

Ingredient	Broad Range	Narrow Range
Monomer:Reducing Comp. (molar ratio)	$1 \times 10^3:1-5 \times 10^6:1$	$1 \times 10^4:1-2 \times 10^6:1$
Accelerator:Initiator (molar ratio)	0.001:1-10:1	0.005:1-1:1
Buffer	0 to amount necessary to reach pH of initiation (initiator dependent, typically between about 6.5-10)	
Optional hydrate inhibitor	If present, the hydrate inhibitor can have a hydrate inhibitor-to-water weight ratio from about 1:10 to about 10:1, about 1:5 to about 5:1, or 2:3 to 3:2.	

The emulsion polymerization reaction yields a latex composition comprising a dispersed phase of solid particles and a liquid continuous phase. The latex can be a stable colloidal dispersion comprising a dispersed phase of high molecular weight polymer particles and a continuous phase comprising water. The colloidal particles can comprise in the range of from about 10 to about 60 percent by weight of the latex, or in the range of from 40 to 50 percent by weight of the latex. The continuous phase can comprise water, the high HLB surfactant, the hydrate inhibitor (if present), and buffer as needed. Water can be present in the range of from about 20 to about 80 percent by weight of the latex, or in the range of from about 40 to about 60 percent by weight of the latex. The high HLB surfactant can comprise in the range of from about 0.1 to about 10 percent by weight of the latex, or in the range of from 0.25 to 6 percent by weight of the latex. As noted in the table above, the buffer can be present in an amount necessary to reach the pH required for initiation of the polymerization reaction and is initiator dependent. Typically, the pH required to initiate a reaction is in the range of from 6.5 to 10.

When a hydrate inhibitor is employed in the reaction mixture, it can be present in the resulting latex in an amount that yields a hydrate inhibitor-to-water weight ratio in the range of from about 1:10 to about 10:1, in the range of from about 1:5 to about 5:1, or in the range of from 2:3 to 3:2. Alternatively, all or part of the hydrate inhibitor can be added to the latex after polymerization to provide the desired amount of hydrate inhibitor in the continuous phase of the latex.

In one embodiment 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, at least about 2×10^6 g/mol, or at least 5×10^6 g/mol. The 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. At least about 95 percent by weight of the colloidal particles can be larger than about 10 nm and smaller than about 500 nm. At least about 95 percent by weight of the particles can be larger than about 25 nm and smaller than about 250 nm. The continuous phase can have a pH in the range of from about 4 to about 10, or in the range of from about 6 to about 8, and contains few if any multi-valent cations.

In one embodiment, the drag reducing polymer can comprise at least about 10,000, at least about 25,000, or at least 50,000 repeating units selected from the residues of the above mentioned monomers. In one embodiment, the drag reducing polymer can comprise less than 1 branched unit per each monomer residue repeating unit. Additionally, the drag reducing polymer can comprise less than 1 linking group per each monomer residue repeating unit. Furthermore, the drag

reducing polymer can exhibit little or no branching or crosslinking. Also, the drag reducing polymer can comprise perfluoroalkyl groups in an amount in the range of from about 0 to about 1 percent based on the total number of monomer residue repeating units in the drag reducing polymer

The hydrocarbon additive added after the formation of the drag reducing polymer can be any conventionally known hydrocarbon additive. In one embodiment the hydrocarbon additive can be chosen from hydrocarbons such as heptane, isooctane, kerosene, N-Paraffin depleted kerosene, and combinations thereof. In an alternate embodiment the hydrocarbon additive comes from a source different than the hydrocarbon pipelines. Any known amount of hydrocarbon additive can be added to the drag reducing polymer as long as it does not affect the stability of the drag reducing polymer. In one embodiment from about 3 wt % to about 16 wt % hydrocarbon additive is incorporated with the drag reducer. In one embodiment, from about 3 wt % to about 30 wt % hydrocarbon additive is incorporated with the drag reducer.

In an alternate embodiment the hydrocarbon additive can have a distillation temperature of around 300° C. and below. In other embodiments the distillation temperature can be around 275° C. and below, 250° C. and below, 258° C. and below, 225° C. and below, 200° C. and below, 175° C. and below, 150° C. and below, 126° C. and below or even 100° C. and below.

The following examples of certain embodiments of the invention are given. Each example is provided by way of explanation of the invention, one of many embodiments of the invention, and the following examples should not be read to limit, or define, the scope of the invention.

Sample Preparation

Hydrocarbon additives were post-added at various levels to pre-made drag reducer formulations. The resulting samples were rolled to ensure uniform distribution before testing.

LMI Pump Test

Milton Roy LMI B7 series pumps were also used to screen the pumping performance of product formulations in the lab. Approximately 1 Liter of sample was added to a container equipped with a feed and return port and recirculated continuously via the pump at a rate of approximately 180 g/min. After a period of time, depending on the testing protocol, the pump was stopped and the clear acrylic pump head was removed. The inside surface of the head and the diaphragm were lightly rinsed with water to remove residual latex prior to collecting any adhered film that had formed. The film was collected in a tared tin and allowed to dry at ambient conditions for 24 h prior to weighing.

TABLE 1

Five hour LMI pump test results of drag reducer with hydrocarbon additives.		
Additive	Test duration (h)	Mass on diaphragm (g)
Toluene (8%)	5	0.000
Kerosene (12%)	5	0.0109
1-decene (8%)	5	0.027
1-decene (4%)	5	0.149
No additive	5	0.292
No additive	5	0.121

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TABLE 2

Three hour LMI pump test results of drag reducer with hydrocarbon additives.		
Additive	Test duration (h)	Mass on diaphragm (g)
Heptane (12%)	3	0.000
Isooctane (12%)	3	0.000
Kerosene (12%)	3	0.000
Molex Raffinate (12%)	3	0.001
Hexane (6%)	3	0.024
Kerosene (6%)	3	.0421
Isooctane (6%)	3	0.043
Kerosene (10%)	3	0.061
No additive	3	0.0768
No additive	3	0.08
No Additive	3	0.0973

In closing, it should be noted that the discussion of any reference is not an admission that it is prior art to the present invention, especially any reference that may have a publication date after the priority date of this application. At the same time, each and every claim below is hereby incorporated into this detailed description or specification as an additional embodiment of the present invention.

Although the systems and processes described herein have been described in detail, it should be understood that various changes, substitutions, and alterations can be made without departing from the spirit and scope of the invention as defined by the following claims. Those skilled in the art may be able to study the preferred embodiments and identify other ways to practice the invention that are not exactly as described herein. It is the intent of the inventors that variations and equivalents of the invention are within the scope of the claims while the description, abstract and drawings are not to be used to limit the scope of the invention. The invention is specifically intended to be as broad as the claims below and their equivalents.

The invention claimed is:

1. A method of forming a drag reducing polymer formulation comprising:

forming a drag reducing polymer; and

incorporating a hydrocarbon additive with the drag reducing polymer to form the drag reducing polymer formulation;

wherein from about 3 wt % to about 30 wt % hydrocarbon additive is incorporated with the drag reducing polymer.

2. The method of claim 1, wherein the drag reducing polymer is a latex drag reducing polymer.

3. The method of claim 1, wherein the drag reducing polymer is formed via emulsion polymerization.

4. The method of claim 1, wherein the hydrocarbon additive is selected from the group consisting of: heptane, isooctane, kerosene, N-Paraffin depleted kerosene, and combinations thereof.

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5. The method of claim 1, wherein the hydrocarbon additive has a distillation temperature less than 275° C.

6. The method of claim 1, wherein the drag reducing polymer suppresses the growth of turbulent eddies in hydrocarbon pipelines.

7. The method of claim 1, wherein the drag reducing polymer comprises at least about 25,000 repeating units.

8. The method of claim 1, wherein the drag reducing polymer has a weight average molecular weight of at least 1×10^6 g/mol.

9. The method of claim 1, wherein from about 3 wt % to about 16 wt % hydrocarbon additive is incorporated with the drag reducing polymer.

10. The method of claim 6, wherein the hydrocarbon additive comes from a source different than the hydrocarbon pipelines.

11. The method of claim 1, wherein the incorporation of the hydrocarbon additive does not affect the stability of the drag reducing polymer.

12. A method of forming a drag reducing polymer formulation consisting essentially of:

forming a latex drag reducing polymer via emulsion polymerization; and

incorporating from about 3 wt % to about 30 wt % of kerosene additive to the latex drag reducing polymer to form the drag reducing polymer formulation.

13. A method of injecting a drag reducing polymer formulation consisting essentially of:

forming a latex drag reducing polymer via emulsion polymerization;

incorporating from about 3 wt % to about 30 wt % of kerosene additive to the latex drag reducing polymer to form the drag reducing polymer formulation; and

injecting the drag reducing polymer formulation into a heavy oil pipeline.

14. The method of claim 13, wherein the latex drag reducing polymer suppresses the growth of turbulent eddies in the heavy oil pipeline.

15. The method of claim 13, wherein the latex drag reducing polymer comprises at least about 25,000 repeating units.

16. The method of claim 13, wherein the latex drag reducing polymer has a weight average molecular weight of at least 1×10^6 g/mol.

17. The method of claim 13, wherein the kerosene additive comes from a source different than the hydrocarbon pipelines.

18. The method of claim 13, wherein the incorporation of kerosene additive does not affect the stability of the latex drag reducing polymer.

19. The method of claim 1, wherein the hydrocarbon additive has a distillation temperature of 300° C. and below.

* * * * *

REIVINDICACIONES

1. Un método para conformar una formulación de polímero reductor del rozamiento que comprende:

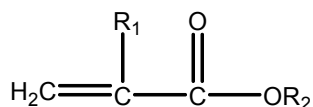
5 formar un polímero reductor del rozamiento; e
 incorporar un aditivo de hidrocarburo al polímero reductor del rozamiento para formar la formulación de polímero reductor del rozamiento, donde de 3% en peso hasta de 30% en peso de aditivo de hidrocarburo es incorporado con el polímero reductor de rozamiento, y donde el aditivo de hidrocarburo se
10 selecciona entre el grupo que consiste en heptano, isooctano, queroseno, queroseno con N-parafina agotada, y combinaciones de los mismos.

2. El método de la reivindicación 1, donde el polímero reductor del rozamiento es un polímero reductor del rozamiento de látex.

3. El método de la reivindicación 1, donde el polímero reductor del rozamiento se forma mediante polimerización en emulsión.

4. El método de la reivindicación 1, donde la formulación de polímero reductor del rozamiento comprende 25.000 unidades de repetición de los
20 residuos de un monómero seleccionados de grupo que consiste de:

(A)



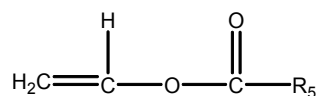
25 repeticiones donde R_1 es H o un radical alquilo C1-C10, y R_2 es H, un radical alquilo C1-C30, un radical cicloalquilo C5-C30 sustituido o no sustituido, un radical arilo C6-C20 sustituido o no sustituido, un radical alquilo C1-C10 sustituido con arilo, un radical $-(\text{CH}_2\text{CH}_2\text{O})_x-\text{R}_A$ o un radical $-(\text{CH}_2\text{CH}(\text{CH}_3)\text{O})_x-\text{R}_A$ donde x está en el intervalo de 1 a 50 y R_A es H, un radical alquilo C1-C30, o un radical alquilarilo C6-C30;

(B)



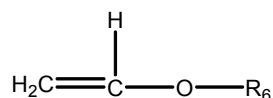
donde areno es un fenilo, naftilo, antraceniilo, o fenantrenilo, R_3 es $\text{CH}=\text{CH}_2$ o $\text{CH}_3\text{-C}=\text{CH}_2$, y R_4 es H, un radical alquilo C1-C30, un radical cicloalquilo C5- C30 sustituido o no sustituido, Cl, SO_3 , OR_B , o COOR_C , donde R_B es H, un radical alquilo C1-C30, un radical cicloalquilo C5-C30 sustituido o no sustituido, un radical arilo C6-C20 sustituido o no sustituido, o un radical alquilo C1-C10 sustituido con arilo, y donde R_C es H, un radical alquilo C1-C30, un radical cicloalquilo C5-C30 sustituido o no sustituido, un radical arilo C6-C20 sustituido o no sustituido, o un radical alquilo C1-C10 sustituido con arilo;

(C)



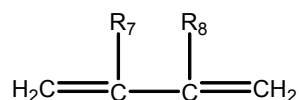
donde R_5 es H, un radical alquilo C1-C30, o un radical arilo C6-C20 sustituido o no sustituido;

(D)



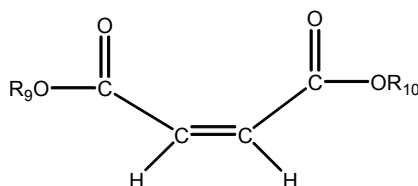
donde R_6 es H, un radical alquilo C1-C30, o un radical arilo C6-C20 sustituido o no sustituido;

(E)



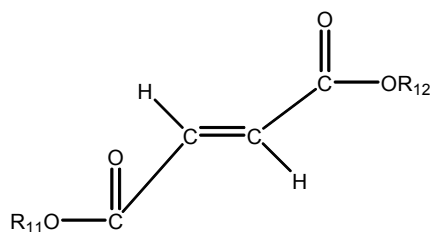
donde R_7 es H o un radical alquilo C1-C18, y R_8 es H, un radical alquilo C1-C18, o Cl;

(F)



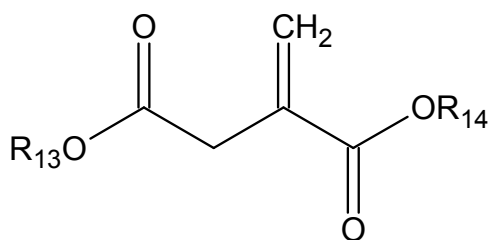
donde R_9 y R_{10} son independientemente H, un radical alquilo C1-C30, un radical arilo C6-C20 sustituido o no sustituido, un radical cicloalquilo C5-C30 sustituido o no sustituido, o radicales heterocíclicos;

(G)



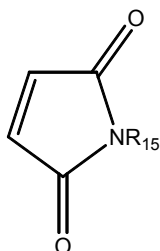
donde R_{11} y R_{12} son independientemente H, un radical alquilo C1-C30, un radical arilo C6-C20 sustituido o no sustituido, un radical cicloalquilo C5-C30 sustituido o no sustituido, o radicales heterocíclicos;

(H)



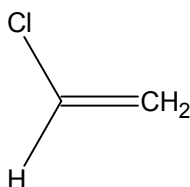
donde R_{13} y R_{14} son independientemente H, un radical alquilo C1-C30, un radical arilo C6-C20 sustituido o no sustituido, un radical cicloalquilo C5-C30 sustituido o no sustituido, o radicales heterocíclicos;

(I)

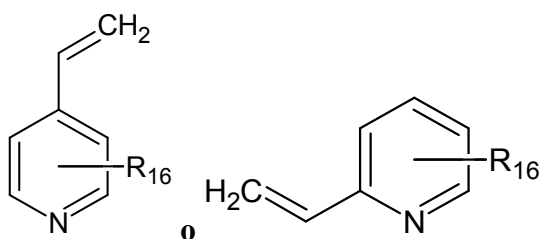


donde R_{15} es H, un radical alquilo C1-C30, un radical arilo C6-C20 sustituido o no sustituido, un radical cicloalquilo C5-C30 sustituido o no sustituido, o radicales heterocíclicos;

(J)

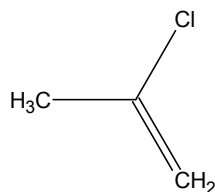


(K)

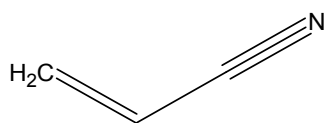


donde R16 es H, un radical alquilo C1-C30, o un radical arilo C6-C20;

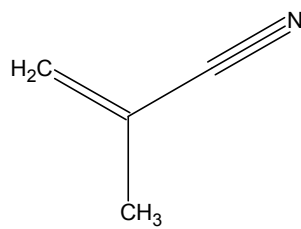
(L)



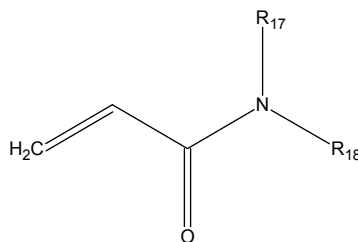
(M)



(N)

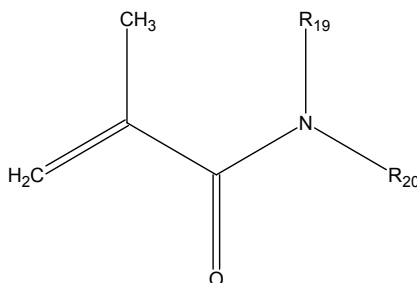


(O)



- 5 donde R_{17} y R_{18} son independientemente H, un radical alquilo C1-C30, un radical arilo C6-C20 sustituido o no sustituido, un radical cicloalquilo C5-C30 sustituido o no sustituido, o radicales heterocíclicos; y

(P)



donde R_{19} y R_{20} son independientemente H, un radical alquilo C1-C30, un radical arilo C6-C20 sustituido o no sustituido, un radical cicloalquilo C5-C30 sustituido o no sustituido, o radicales heterocíclicos.

5. El método de la reivindicación 1, donde el polímero reductor del rozamiento tiene un peso molecular promedio en peso de 1×10^6 g/mol.

6. El método de la reivindicación 1, donde de 3% en peso a 16% en peso de aditivo de hidrocarburo se incorporan al polímero reductor de rozamiento.

7. El método de la reivindicación 1, donde el aditivo de hidrocarburo es seleccionado del grupo que consiste de: isooctano, queroseno, queroseno con N-parafina agotada, y combinaciones de los mismos.

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ABOGADOS

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José Luis SALAZAR LOPEZ

Director Nuevas Creaciones

SUPERINTENDENCIA DE INDUSTRIA Y COMERCIO

E. S. D.

REF.	Expediente No.:	16-142295
	Patente de Invención:	“METODO PARA CONFORMAR UN ADITIVO DE HIDROCARBURO INCORPORADO CON UN POLIMERO REDUCTOR DEL ROZAMIENTO DE LATEX”
	PCT:	PCT/US2014/065897
	Solicitante:	LIQUID POWER SPECIALTY PRODUCTS INC.

RESPUESTA A REQUERIMIENTO OFICIO NO.11928 NOTIFICADO EL 5 DE OCTUBRE DE 2018
VENCIMIENTO: 18 DE FEBRERO DE 2019

HUMBERTO RUBIO CAMACHO, mayor de edad, domiciliado en Bogotá, D.C., identificado con la cédula de ciudadanía número 17.192.062 de Bogotá, abogado en ejercicio, portador de la Tarjeta Profesional No.50.007 expedida por el Consejo Superior de la Judicatura, actuando en carácter de Apoderado de la Sociedad **LIQUID POWER SPECIALTY PRODUCTS INC.**, domiciliada en One Briarlake Plaza, 2000 West Sam Houston Parkway South, Suite 320, Houston, Texas 77042, Estados Unidos de América; debidamente reconocido por su Despacho; encontrándome dentro del término legal para dar contestación al auto proferido por su Despacho mediante Oficio No.11928 notificado el 5 de octubre de 2009, me permito:

Manifiestar:

I. En el informe oficial emitido sobre la presente solicitud, se han emitido las objeciones que a continuación se resumen:

1. De la solicitud de patente

Título

El título es demasiado amplio por la expresión “FORMULACION DE POLIMERO REDUCTOR DEL ROZAMIENTO” ya que abarca múltiples composiciones, se sugiere incorporar los componentes presentes.

Reivindicaciones (Art 30 D 486, Art 22 PCT)

- El capítulo reivindicatorio no se encuentra debidamente soportado en la descripción puesto que en las realizaciones preferidas hace referencia al método que emplea los componentes mencionados en la tabla 1.

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- Se sugiere restringir la solicitud a una razonable cantidad de acuerdo a los componentes.
- El solicitante debe definir específicamente la materia y el alcance de la invención a través de las características técnicas esenciales que estén soportadas en la descripción.
- Las reivindicaciones 1, 3, 9, no son claras porque mencionan un método, pero en este no se definen características como condiciones específicas en que debieran realizarse las etapas: “formar un polímero”. Se sugiere definir la invención por sus características esenciales.
- La reivindicación independiente 9 se encuentra contenida en la reivindicación independiente 1, y en las reivindicaciones dependientes 2 a 4. Se sugiere eliminar la reivindicación 9.
- Las reivindicaciones 5, 10, no deberían caracterizar el aditivo de hidrocarburo solamente por sus parámetros, como su temperatura de destilación, si es posible definirlo de otra manera como su nombre químico específico. Se sugiere definirlo por sus características esenciales, estructurales o funcionales.
- Las reivindicaciones 8 y 11 reclaman la misma materia. Se sugiere eliminar la reivindicación 11.
- La reivindicación 6 no es concisa porque las definiciones de los sustituyentes de los monómeros son géneros funcionales que da pie para múltiples polímeros que no encuentran soporte en la descripción. Se sugiere restringir la solicitud a una razonable generalización del tipo de compuestos.
- Las reivindicaciones 1, 3, no son concisas, ya que los términos: “polímero reductor del rozamiento”, “aditivo de hidrocarburo”, “reductor del rozamiento”; no especifican un compuesto específico por su nombre químico o fórmula, sino por la función o actividad que desempeñan.
- La reivindicación 6 emplea el término: “uno o más”, que es impreciso, por lo cual no permite distinguir la invención del estado de la técnica.

2. Determinación del Estado de la Técnica

El estado de la técnica se determinó con base en la fecha de presentación de la solicitud internacional: noviembre 17 de 2014, y se encontraron los siguientes documentos que anticipan el objeto de esta solicitud:

Ítem	Documento	Título	Fecha de Publicación
D2	US2010130681	“Hydrate inhibited latex flow improver”	27/Mayo/2010

D5	US2006144595	“Remote delivery of latex drag-reducing agent”	06/Julio/2006
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**3. Examen de Patentabilidad
Novedad (Art 16 D486)**

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La reivindicación 1 consiste en: “Un método para conformar una formulación de polímero reductor del rozamiento que comprende.” (No. 16142295 del 08 de mayo de 2018).

El documento D2 se considera el estado de la técnica más cercano a la invención definida en la reivindicación 1 porque divulga un método para formar una composición para reducir la resistencia.

Asimismo, los documentos divulgan las características de las reivindicaciones dependientes reivindicación 2, 3, 4, 5, 10, 6,7, 8 y 11, 1-8, 10-11.

El documento D2 se considera el estado de la técnica más cercano a la invención definida en la reivindicación 9 porque divulga un método para formar una composición para reducir la pérdida de presión por fricción.

La reivindicación 9 cumple el requisito de novedad (Art. 16), pero no cumple con el requisito de nivel inventivo (Art. 18).

4. Conclusión

Los requisitos de Patentabilidad de la presente solicitud están afectados así:

Ítem	Documento	Reivindicaciones afectadas	Requisito que afecta
D2	US2010130681	1 a 11	Nivel Inventivo
D5	US2006144595	1 a 11	Nivel inventivo

II. En contestación a las objeciones anteriores, y para dar respuesta al requerimiento como resultado del examen de patentabilidad efectuado en la presente solicitud, nos permitimos manifestar y anexar:

1. De la Solicitud de Patente

Título

Para definir en forma breve y precisa el objeto de la invención y estar acorde con la descripción y reivindicación, se ha modificado el título de la presente solicitud, así:

“METODO PARA CONFORMAR UN ADITIVO DE
HIDROCARBURO INCORPORADO CON UN POLIMERO
REDUCTOR DEL ROZAMIENTO DE LATEX”

Reivindicaciones (Art. 30 D 486)

- Con el objeto de superar las objeciones contenidas en el informe del examen de patentabilidad, se adjunta un nuevo pliego de reivindicaciones (1-7), todas las cuales están sustentadas en el contenido de la solicitud internacional PCT originalmente presentada, y por lo tanto es permitido según el artículo 34 de la Decisión 486. Advirtiéndole que el capítulo reivindicatorio modificado no incluye materia nueva. Se ha enmendado el capítulo reivindicatorio subsanando las objeciones de la examinadora, describiendo de forma clara las reivindicaciones, todo de acuerdo con el capítulo descriptivo presentado junto con la solicitud inicial. Modificaciones que no contienen ninguna ampliación.

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- Se han realizado las siguientes modificaciones al capítulo reivindicatorio para subsanar las objeciones, las cuales se detallan así:

Reivindicación 4: Se incorporó en la reivindicación 1 para definir los aditivos de hidrocarburo. La modificación se encuentra respaldada en la Tabla 2 de la patente conferida en Estados Unidos. Las características esenciales son el aditivo de hidrocarburos que logra reducir la acumulación de masa en el diafragma. Por lo tanto, la reivindicación independiente 1 define claramente la invención y está respaldada en el capítulo descriptivo.

Reivindicaciones 4, 5 y 9-11 se han cancelado para subsanar las objeciones

Reivindicación 4 (anterior 6), se ha modificado para que incluya “un monómero”.

Descripción (Art 28 D486)

En cuanto a las objeciones de la examinadora sobre la descripción que no divulga la invención de manera suficientemente completa, el solicitante se permite manifestar que está en total desacuerdo con dicha opinión teniendo en cuenta que la tabla que se muestra en la descripción pagina 12, renglón 20-35 muestra el proceso de formación de los polímeros reductores del rozamiento. Una persona experta en la técnica entendería cómo preparar el polímero reductor de la resistencia en base a la especificación.

Teniendo en cuenta lo expuesto anteriormente y el nuevo pliego reivindicatorio y los argumentos expuestos, consideramos que las nuevas reivindicaciones definen la materia que se desea proteger, son claras, concisas y debidamente sustentadas en la descripción original y no son anticipadas ni obviamente derivadas del estado de la técnica, conforme lo establece el Art. 14, 20, 16 y 30 de la Decisión 486.

Dado que los cambios propuestos son una limitación del capítulo reivindicatorio, dichas modificaciones se ajustan a los parámetros establecidos en el artículo 34 de la Decisión 486, pues las enmiendas efectuadas no amplían el alcance de la divulgación original.

2. Determinación del Estado de la Técnica

Examen de patentabilidad (Art 14 D486)

Nivel Inventivo (Art 18 D496)

La examinadora considera que la presente solicitud se ve afectada por los siguientes documentos:

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D2 US2010130681

D5 US2006148928

Al respecto debemos manifestar lo siguiente:

El solicitante respetuosamente no esta de acuerdo con la examinadora, teniendo en cuenta que la examinadora admite que D2 no enseña que el aditivo de hidrocarburo se incorpore de 3% en peso a aproximadamente 30% en peso y se basa en D5 para remediar las deficiencias de D2. D5 enseña un solvente adecuado para usar en la formación de un reductor de rozamiento de látex modificado, y la cantidad de solvente puede variar de aproximadamente 15-25% en peso (ver párrafo [0062]). Sin embargo, la tarea técnica de la presente solicitud es reducir la cantidad de película formada en la bomba de inyección. La Tabla 2 de la correspondiente patente emitida en los Estados Unidos (**ver adjunto**) muestra que los DRAs con los aditivos de hidrocarburos tienen menos masa en el diafragma en comparación con los DRAs sin aditivos de hidrocarburos. D5 no enseña que los DRAs tengan de 3% en peso a 30% en peso de aditivos hidrocarbonados (heptano, isooctano, queroseno, queroseno con N-parafina agotada y combinaciones de los mismos) que tienen el beneficio de una reducción de la acumulación de masa en el diafragma de la bomba de inyección. Por lo tanto, D2 y D5 solos o en combinación, no enseñan el método como se describe en la reivindicación 1 y las reivindicaciones dependientes de ello. Cabe concluir que las nuevas reivindicaciones no sólo definen materia novedosa sino también materia que no resulta evidente para una persona versada en la materia y, en consecuencia, también implican una actividad inventiva.

Teniendo en cuenta lo expuesto y el nuevo pliego reivindicatorio, consideramos que las nuevas reivindicaciones definen la materia que se desea proteger, son claras, concisas y debidamente sustentadas en la descripción original y no son anticipadas ni obviamente derivadas del estado de la técnica, conforme lo establece el Art. 14, 16 y 30 de la Decisión 486.

Habiendo atendido cabalmente las objeciones presentadas por ese despacho, atentamente solicitamos se realice el segundo estudio de fondo de la solicitud y si la examinadora considera que subsisten razones para objetar la presente invención, rogamos expedir otro examen de fondo con los debidos motivos y razones que sustenten su objeción con el fin de que nuestro mandante tenga la posibilidad de exponer sus argumentos con base en la interpretación de los artículos 45 y subsiguientes de la Decisión 486.

HUMBERTO RUBIO & CIA.

ABOGADOS

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Solicitud No. 16-142295

Respuesta Acción Oficial Art 45

Enero 31, 2019

III. Anexo:

- a) Nuevo capítulo reivindicatorio (1~7).
- b) Documento emitido por Estados Unidos relacionado con la concesión de la patente 9939113.

IV. Petición:

Conforme a lo anterior, una vez atendidos y completados los requisitos conforme lo establece el artículo 14, 16, 18 y 30 de la Decisión 486, y al tener en cuenta el nuevo capítulo reivindicatorio, solicito muy respetuosamente a su Despacho, continuar el trámite de rigor, se realice el segundo examen de patentabilidad y se emita una nuevo oficio si la examinadora lo considera, o de lo contrario solicito sea otorgado el privilegio de invención o de ser el caso se hagan las correspondientes observaciones con el ánimo de hacer lo pertinente dentro del presente trámite.

Atentamente,



HUMBERTO RUBIO CAMACHO

C.C. 17'192.062 de Bogotá

T.P. 50.007 de Consejo Superior de la Judicatura.

COD. 4134