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APPLICATION NUMBER: 09/387,476

FILING DATE: September 01, 1999



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UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 C.F.R. § 1.53(b))

Attorney Docket No. **HES990297U1**

First Inventor or Application Identifier **Mohamed Yousef Soliman**

Title **PROACTIVE CONFORMANCE FOR OIL OR GAS WELLS**

Express Mail Label No. **EL402521985US**

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

ADDRESS TO: Assistant Commissioner for Patents
Box Patent Application
Washington, DC 20231

- ☐ * Fee Transmittal Form (e.g., PTO/SB/17)
(Submit an original and a duplicate for fee processing)
- ☒ Specification (Total Pages **14**)
(preferred arrangement set forth below)
 - Descriptive title of the invention
 - Cross References to Related Applications
 - Statement Regarding Fed sponsored R & D
 - Reference to Microfiche Appendix
 - Background of the invention
 - Brief Summary of the invention
 - Brief Description of the Drawings (if filed)
 - Detailed Description
 - Claim(s)
 - Abstract of the Disclosure
- ☒ Drawing(s) (35 U.S.C. 113) (Total Sheets **1**)

- Oath or Declaration (Total Pages **1**)
 - ☒ **not executed**
(original or copy)
 - ☐ Copy from a prior application (37 C.F.R. § 1.63(d))
(for continuation/divisional with Box 16 completed)

- ☐ **DELETION OF INVENTOR(S)**
Signed statement attached deleting
inventor(s) named in the prior application,
see 37 C.F.R. §§ 1.63(d)(2) and 1.33(b).

NOTE FOR INVENTOR: A SMALL ENTITY STATEMENT IS REQUIRED TO PAY SMALL ENTITY FEE. A SMALL ENTITY STATEMENT IS REQUIRED (37 C.F.R. § 1.52). EXCEPT IF ONE CLAIM IN A PRIOR APPLICATION IS RELIED UPON (37 C.F.R. § 1.53).

- ☐ Microfiche Computer Program (Appendix)
- Nucleotide and/or Amino Acid Sequence Submission
(if applicable, all necessary)
 - ☐ Computer Readable Copy
 - ☐ Paper Copy (identical to computer copy)
 - ☐ Statement verifying identity of above copies

ACCOMPANYING APPLICATION PARTS

- ☐ Assignment Papers (cover sheet & document(s))
- ☐ 37 C.F.R. § 3.73(b) Statement of Power of Attorney
(when there is an assignee)
- ☐ English Translation Document (if applicable)
- ☒ Information Disclosure Statement (IDS/PTO-1449) ☒ Copies of IDS
Chapters (1)
- ☐ Preliminary Amendment
- ☒ Return Receipt Postcard (MPEP 503)
(Should be specifically itemized)
- ☐ * Small Entity Statement filed in prior application,
Statement(s) Status still proper and desired
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- ☐ Certified Copy of Priority Document(s)
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- If a CONTINUING APPLICATION, check appropriate box, and supply the requisite information below and in a preliminary amendment:
☐ Continuation ☐ Divisional ☐ Continuation-in-part (CIP) of prior application No. _____

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For CONTINUATION or DIVISIONAL APPL only: The entire disclosure of the prior application, from which an oath or declaration is supplied
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PATENT
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PROACTIVE CONFORMANCE FOR OIL OR GAS WELLS

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BACKGROUND OF THE INVENTION

This invention relates generally to conformance methods for oil or gas wells and particularly to early stage proactive conformance rather than late stage reactive conformance.

10 Liquid and gaseous hydrocarbons are extracted from the earth through wells that penetrate into or through hydrocarbon-bearing formations or reservoirs. Techniques for creating and using such wells are well-known. For a production well, such techniques are used during drilling, completing, and producing phases.

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Drilling pertains to forming a borehole in the earth. Completing pertains to making the hole ready to allow desired hydrocarbons to flow up through it. Producing pertains to controlling and maintaining this flow.

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There can be other fluids in the reservoir. Pertinent examples include water and unwanted gas. Amounts of these unwanted fluids relative to desired hydrocarbons and their locations relative to the reservoir can change over time (for example, by coning or channeling). When this occurs, one response is to provide a conformance treatment. In general, conformance is the management of unwanted water and gas in a well/reservoir.

Conformance treatments have been used near the end of, or otherwise late in, the production phase because that is when the adverse impact of unwanted water or gas has been most noticed (for example, a relatively large amount of water or unwanted gas begins to be produced). Although such late stage, or reactive, conformance treatment can be useful, it may be too late to reverse some

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all detrimental reservoir conditions that may have resulted from the unwanted water or gas flow.

These detrimental results may negatively affect the reservoir ultimate recovery factor.

SUMMARY OF THE INVENTION

The present invention overcomes the above-noted and other shortcomings of the prior art by providing novel and improved proactive conformance. In a particular implementation, such conformance is part of a completion method for a given well. The present invention is used proactively to seek enhancement of production from the beginning of the useful life of the well. The present invention may also be described as preventative in that its early proactive use may avoid reservoir damage that might occur if conformance were left to typical late stage implementation.

A proactive conformance treatment method may be significantly more effective and also more economical to apply than a reactive treatment. This can be by way of, for example, delaying potential water production whereby higher desired hydrocarbon production occurs without risking early water breakthrough. The present invention may lead to higher hydrocarbon production, larger ultimate recovery factor and lower production of unwanted water.

The present invention can be defined as a proactive conformance method for a well, comprising: selecting a well either in a completion phase or early in a production phase of the well; and performing a conformance treatment on the well in the completion phase or early in the production phase. Preferably, the conformance treatment is performed before the well is completed (i.e., sometime during the completion phase between the well having been drilled and the well being placed in production). More specifically within the completion phase, the conformance treatment can be performed after running open hole logging or before setting casing, for example.

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at such latter implementation the present invention provides a method of completing a well comprising: performing a conformance treatment on an open bore of the well; and casing at least a portion of the conformance treated bore.

Another preferred aspect of the present invention is the use of magnetic resonance imaging.

5 With regard to this aspect, the present invention can be defined as a method of completing a well, comprising: using magnetic resonance imaging to analyze the well to determine where unwanted mobile fluid is in a reservoir intersected by the well; and completing the well in response to using magnetic resonance imaging, including treating the well to confine at least part of the unwanted mobile fluid determined to be in the reservoir. In a preferred implementation of the proactive conformance method of the present invention, the method further comprises using magnetic resonance imaging in the well prior to performing the conformance treatment, and performing the conformance treatment in response to using the magnetic resonance imaging.

Therefore, from the foregoing, it is a general object of the present invention to provide novel and improved proactive conformance. Other and further objects, features and advantages of the present invention will be readily apparent to those skilled in the art when the following description of the preferred embodiments is read in conjunction with the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

The drawing depicts a log provided from a magnetic resonance imaging logging tool.

DETAILED DESCRIPTION OF THE INVENTION

20 In the proactive conformance method of the present invention, a well is selected for receiving a conformance treatment. Selection occurs no later than either during the completion phase or early in the production phase of the respective well. As to the latter, selection is preferably

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the well has started producing large amounts of unwanted water or gas. The term "large amounts" is a relative term that may vary from one reservoir to another and may also depend on tolerance of an operator to water production and unwanted gas. This tolerance may depend on the environmental concerns, and how to dispose of water, and may also depend on where the rig is located (e.g., onshore versus off-shore, North Sea operation versus mainland China). The preferred scenario is to perform the proactive conformance treatment before commercial and significant production of hydrocarbon has taken place.

It is more preferred that the well be selected before it has been completed, and it is particularly preferred to do it before the casing has been set to avoid having the casing restrict free access to the formation. If the selection occurs after completion, some of the completion work may have to be redone (e.g., reperforated and sealed using one of the various chemical and/or mechanical techniques such as a cement squeeze treatment). Most preferably, the selection occurs such that considerations pertinent to designing a conformance treatment can be integrated with other completion decisions. For example, pertinent logging information can be obtained.

Selecting a particular well includes determining whether it is a candidate for conformance. This can include, once appropriate reservoir parameters are known, using qualitative analysis, experience, etc. or using a quantitative analysis such as reservoir simulation to predict potential problems and whether conformance might be an appropriate remedy. Reservoir simulation may range in scope from simple analytical solutions to sophisticated multi-well multi-phase numerical simulations. Some of this information, such as the presence of multiple fluids and whether these fluids are mobile, presently may be accurately obtained only through the use of magnetic resonance imaging. Other techniques may give estimates of those values, however, not with the accuracy of

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magnetic resonance imaging and sometimes possibly not even as a meaningful estimate. Non-limiting examples of characteristics indicating candidacy for conformance and thus selectability in the present invention include presence of a water aquifer, presence of a gas cap, presence of a high permeability or "super k" zone, and presence of fractures that would have to be plugged.

5 Diagnostic techniques play an important role in defining the problem and the appropriate solution. In proactive conformance the diagnostic technique defines the potential problem and the appropriate solution.

In general, logging that provides reservoir properties (e.g., permeability, porosity, grain size distribution, fluid saturation and irreducible saturation) is useful in the present invention. In a particular implementation, however, especially significant information includes the type and location of reservoir fluids, and specifically, whether the fluids include unwanted mobile water or gas. A tool that can provide this information is a magnetic resonance imaging logging tool such as of a type known in the art (one example is the MRIL tool from Halliburton Energy Services). Accordingly, a particular implementation of the present invention includes using magnetic resonance imaging, preferably during logging in an open bore of the well, to analyze the well to determine where unwanted mobile fluid is in a reservoir intersected by the well. This preferably occurs prior to performing a conformance treatment on the well so that the treatment, when performed, can be performed in response to the use of magnetic resonance imaging.

20 A magnetic resonance imaging logging tool is an open-hole logging tool that operates on known magnetic resonance imaging principles which include obtaining a response from the naturally abundant hydrogen protons in the formation fluids such as water, oil and gas. Information available or obtainable from a magnetic resonance imaging log includes lithology independent total

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porosity, irreducible water saturation (which indicates rock texture), water-cut prediction (when integrated with conventional open-hole logs), permeability (by combining the porosity, free fluid and bound fluid predictions), and fluid (oil, water, or gas) quantification. These properties lead to a better definition of fluid and rock properties, which in turn leads to a better understanding of the reservoir. Thus, using magnetic resonance imaging at the early stage of the present invention may significantly enhance the success of the well completion in general, the conformance treatment in particular, and ultimately the productivity of the well.

Other types of logs useful in analyzing a reservoir include resistivity, gamma ray, neutron density, sonic and caliper logs. When a suite of logs including these, or at least the first three, and a magnetic resonance imaging log are run in the well bore, information about formation layers, water presence and water mobility can be obtained. Magnetic resonance imaging is particularly useful in determining the water presence and mobility.

Magnetic resonance imaging may, also, be used to calculate formation permeability. This formation permeability can be used to create an integrated petrophysical reservoir model such as described by G. W. Gunter et al. in "Early Determination of Reservoir Flow Units Using an Integrated Petrophysical Method," SPE 38679 (1997 Society of Petroleum Engineers Annual Technical Conference and Exhibition, October 5-8, 1997); in that technique, a modified form of Lorenz graph is used to characterize the formation. If used in the present invention, such a graph and reservoir model are created early in the life of the well. These facilitate diagnosis of possible problems with the reservoir and subsequent design of further completion activities (e.g., conformance, selective perforation, cementing, etc.). In the present invention, such diagnosis follows magnetic resonance imaging logging.

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From the foregoing, magnetic resonance imaging logging enables improved accuracy in diagnosis that can be comparable to analyses that use data available only much later in the life of the reservoir.

5 The method of the present invention further comprises performing a conformance treatment on the well in the early stage of the anticipated life of the well. The treatment is preferably to confine at least part of the detected unwanted mobile fluid, and it is performed in response to the results of the magnetic resonance imaging logging when that logging is used (e.g., in response to the types and locations of fluids and the determined reservoir properties obtained using magnetic resonance imaging logging). When this is performed during the completion phase, it is preferably after-running open hole logging as described above and before setting casing in the bore so that the treatment is performed on the open bore of the well in this preferred use of the present invention.

Conformance typically includes pumping in chemicals (e.g., water and polymers that crosslink in the well to form a plugging substance) to reduce or even eliminate unwanted fluid production. This may include plugging a high permeability zone or a fracture that could cause premature water breakthrough, or reducing the relative permeability to water while maintaining the relative permeability to oil. It may also include a complete plugging of a water zone to prevent future and potential water migration in a micro annulus that could form after a cementing treatment. Other applications may include creating a horizontal barrier to prevent vertical migration of unwanted fluids.

20 After the conformance treatment, the well is completed if completion has not already been finished. This can include casing at least a portion of the conformance treated well bore. Further completion work can include perforating, for example, performed conventionally but as designed

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based on the analysis work described above. Such further completion work can be performed as known in the art but as may be designed in accordance with information obtained through preceding steps of the method of the present invention.

As a non-limiting example of a conformance treatment and subsequent completion work,
5 reference is now made to the drawing in which mobile water is identifiable from the magnetic resonance imaging log at the region marked with the reference number 2. This log shows that layers are mostly non-communicating with some containing water and others containing oil, which makes the formation a good candidate for treatment with a relative permeability modifier. The conformance treatment and remainder of the completion phase can be performed in accordance with where the potential water production region is identified. In this example, the relative permeability modifier can be injected at the zone carrying the mobile water to prevent or reduce water movement. Perforating can then be performed such as in the region of 14,250 feet to 14,375 feet. This combination of conformance treatment and perforation retard future water movement.

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20 Other conformance treatments and completion techniques can of course be used. These typically are chemical, mechanical, or a combination of the two. Particular non-limiting examples include cement squeezes and spots, tool applications, polymer chemical systems, colloidal dispersed systems, sodium silicate chemical systems, foam cementing, in-situ polymerizing polyacrylamides, in-situ polymerizing acrylates, preformed and in-situ formed relative permeability modifiers, plug-backs with cement-sand mixtures-hydromites-etc., and other solution materials or techniques.

Once the well is completed, commercial production from the well can be initiated; therefore, the invention can be defined also to include initiating commercial production from the

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5 well only after performing the conformance treatment. By so performing the conformance treatment at an early stage, subsequent detrimental fluid flows may be prevented or delayed in such a manner as to improve production of desired hydrocarbons from the beginning of commercial production and to delay premature decline of production due to unwanted water or gas flow, for example.

As a result of the present invention, potential water production can be delayed such that higher hydrocarbon production can be obtained without risking early water breakthrough. Another result may be significant reduction of potential unwanted water and gas movement in well bore micro-annuli. The use of magnetic resonance imaging can facilitate the design of proactive conformance treatments, such as by identifying zones capable of producing water-free hydrocarbons, by identifying types and locations of formation fluids, and by identifying volumes of free fluids (water and hydrocarbons). Use of the present invention can also enhance achieving success with traditional treatments, both technically and commercially.

In the foregoing, the specific selection and use of particular diagnostic tools, the analysis of resulting data, the design of specific conformance treatments, and the further completion of a well and production from the well can individually be performed as known in the art.

Thus, the present invention is well adapted to carry out the objects and attain the ends and advantages mentioned above as well as those inherent therein. While preferred embodiments of the invention have been described for the purpose of this disclosure, changes in the construction and arrangement of parts and the performance of steps can be made by those skilled in the art, which changes are encompassed within the spirit of this invention as defined by the appended claims.

What is claimed is:

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1. A method of completing a well, comprising:
performing a conformance treatment on an open bore of the well; and
casing at least a portion of the conformance treated bore.
2. A method as defined in claim 1, further comprising logging in the open bore with
5 a magnetic resonance imaging tool prior to performing the conformance treatment.
3. A method of completing a well, comprising:
using magnetic resonance imaging to analyze the well to determine where
unwanted mobile fluid is in a reservoir intersected by the well; and
completing the well in response to using magnetic resonance imaging, including
treating the well to confine at least part of the unwanted mobile fluid
determined to be in the reservoir.
4. A method as defined in claim 3, wherein using magnetic resonance imaging to
analyze the well to determine where unwanted mobile fluid is in the reservoir includes
determining where unwanted mobile water or gas is.
5. A proactive conformance method for a well, comprising:
performing a conformance treatment in the well; and
completing the well after performing the conformance treatment.
6. A method as defined in claim 5, further comprising logging in the well with a
magnetic resonance imaging tool prior to performing the conformance treatment.

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7. A proactive conformance method for a well, comprising:
selecting a well either in a completion phase or early in a production phase of the
well; and
performing a conformance treatment on the well in the completion phase or early
in the production phase.

8. A method as defined in claim 7, further comprising using magnetic resonance
imaging in the well prior to performing the conformance treatment, and performing the
conformance treatment in response to using the magnetic resonance imaging.

9. A proactive conformance method for a well, comprising:
selecting a well before completion; and
performing a conformance treatment on the selected uncompleted well.

10. A method as defined in claim 9, further comprising using magnetic resonance
imaging in the well prior to performing the conformance treatment, and performing the
conformance treatment in response to using the magnetic resonance imaging.

11. A proactive conformance method for a well, comprising:
selecting a well before setting casing in the well; and
performing a conformance treatment on the selected well before setting casing in
the well.

12. A method as defined in claim 11, further comprising using magnetic resonance
imaging in the well prior to performing the conformance treatment, and performing the
conformance treatment in response to using the magnetic resonance imaging.

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13. A proactive conformance method for a well, comprising:
selecting a well in which open hole logging has been performed in the well; and
performing a conformance treatment on the selected well before completing the well.

- 5 14. A method as defined in claim 13, wherein the open hole logging includes using magnetic resonance imaging in the well and further wherein the conformance treatment is performed in response to the magnetic resonance imaging from the open hole logging.

15. A proactive conformance method for a well, comprising:
determining types and locations of fluids in a reservoir intersected by the well and
determining reservoir properties of the reservoir;
performing a conformance treatment on the well in response to the determined types and locations of fluids in the reservoir and the determined reservoir properties; and
completing the well after performing the conformance treatment.

16. A method as defined in claim 15, wherein determining types and locations of fluids and reservoir properties includes using magnetic resonance imaging to detect mobile water in the reservoir.

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17. A proactive conformance method for a well, comprising:

determining types and locations of fluids in a reservoir intersected by the well;

determining reservoir properties of the reservoir;

performing a conformance treatment on the well in response to the determined

5 types and locations of fluids in the reservoir and the determined reservoir properties; and

initiating commercial production from the well only after performing the

conformance treatment.

18. A method as defined in claim 17, wherein determining types and locations of

fluids includes using magnetic resonance imaging to detect mobile water in the reservoir.

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ABSTRACT OF THE DISCLOSURE

A proactive conformance method for a well includes selecting a well either in a completion phase or early in a production phase of the well and performing a conformance treatment on the well in the completion phase or early in the production phase. The conformance treatment preferably is performed before the well is completed (i.e., sometime during the completion phase between the well having been drilled and the well being placed in production), such as after running open hole logging or before setting casing. Another preferred aspect is the use of magnetic resonance imaging, such as using magnetic resonance imaging to analyze the well to determine where unwanted mobile fluid is in a reservoir intersected by the well. Such a well is completed in response to using the magnetic resonance imaging, including treating the well to confine at least part of the unwanted mobile fluid determined to be in the reservoir.

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DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION (37 CFR 1.63)	Attorney Docket Number	HES99029711		
	First Named Inventor	Mohamed Yousef		
	COMPLETE IF KNOWN			
	Application Number	/ Unknown		
	Filing Date	Concurrently Herewith		
	Group Art Unit	Unknown		
☐ Declaration Submitted with Initial Filing	OR	☐ Declaration Submitted after Initial Filing (surcharge (37 CFR 1.16 (e)) required)	Examiner Name	Unknown

As a below named inventor, I hereby declare that:

My residence, post office address, and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

PROACTIVE CONFORMANCE FOR OIL OR GAS WELLS

the specification of which

☒ is attached hereto

OR

☐ was filed on (MM/DD/YYYY) as United States Application Number or PCT International Application Number and was amended on (MM/DD/YYYY) (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56.

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				YES	NO
			☐	☐	☐
			☐	☐	☐
			☐	☐	☐
			☐	☐	☐

☐ Additional foreign application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto.

I hereby claim the benefit under 35 U.S.C. 119(e) of any United States provisional application(s) filed below.

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I hereby claim the benefit under 35 U.S.C. 120 of any United States application(s), or 356(c) of any PCT International application designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C. 112, I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56 which became available between the filing date of the prior application and the national or PCT International filing date of this application.

U.S. Parent Application or PCT Parent Number	Parent Filing Date (MM/DD/YYYY)	Parent Patent Number (if applicable)

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OR

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☐ Additional registered practitioners named on supplemental Registered Practitioner Information sheet PTO/SB/02C attached hereto.

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Name of Sole or First Inventor:	☐ A petition has been filed for this unsigned inventor				
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Inventor's Signature				Date	
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				Country	U.S.A.

☒ Additional inventors are being named on the 2 supplemental Additional Inventor(s) sheet(s) PTO/SB/02A attached hereto

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DECLARATION

ADDITIONAL INVENTOR(S)
Supplemental Sheet
Page 3 of 4

Name of Additional Joint Inventor, if any:		☐ A petition has been filed for this unsigned inventor					
Given Name (first and middle (if any))				Family Name or Surname			
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Inventor's Signature						Date	
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Post Office Address							
City	Odessa	State	TX	ZIP	79761	Country	U.S.A.
Name of Additional Joint Inventor, if any:		☐ A petition has been filed for this unsigned inventor					
Given Name (first and middle (if any))				Family Name or Surname			
Steve				Reister			
Inventor's Signature						Date	
Residence: City	Houston	State	TX	Country	U.S.A.	Citizenship	
Post Office Address	8707 Woodlight Drive						
Post Office Address							
City	Houston	State	TX	ZIP	77083	Country	U.S.A.
Name of Additional Joint Inventor, if any:		☐ A petition has been filed for this unsigned inventor					
Given Name (first and middle (if any))				Family Name or Surname			
Michael H.				Johnson			
Inventor's Signature						Date	
Residence: City	Flower Mound	State	TX	Country	U.S.A.	Citizenship	
Post Office Address	3600 Barbor Creek Lane						
Post Office Address							
City	Flower Mound	State	TX	ZIP	75028	Country	U.S.A.

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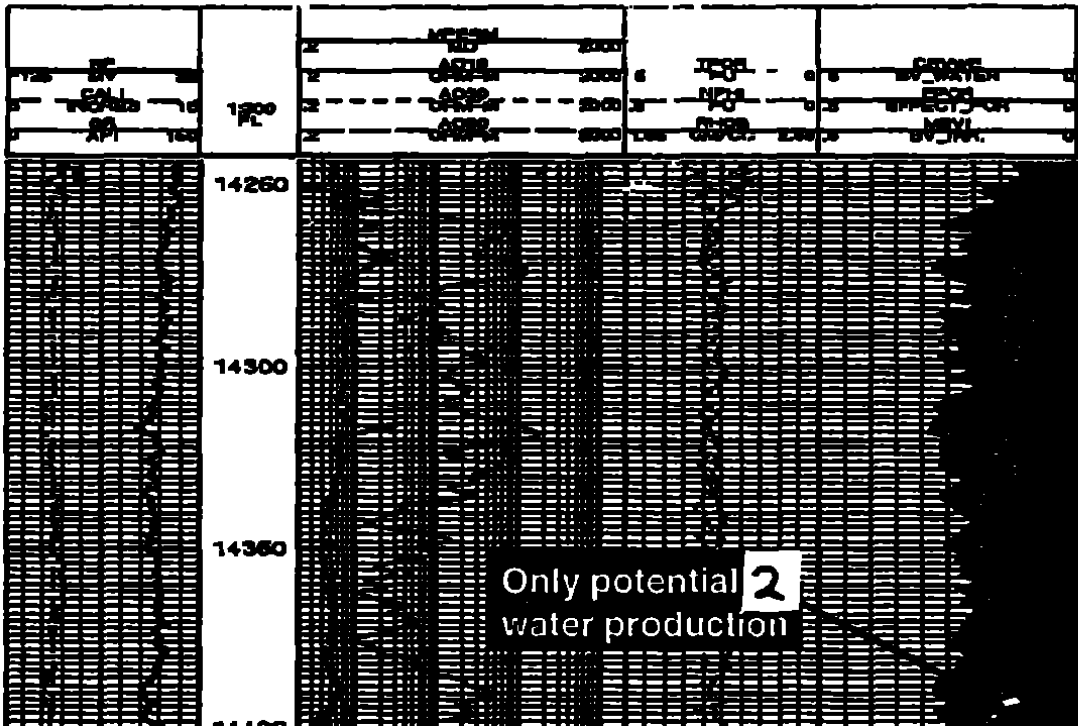
DECLARATION

ADDITIONAL INVENTOR(S)
Supplemental Sheet
Page 4 of 4

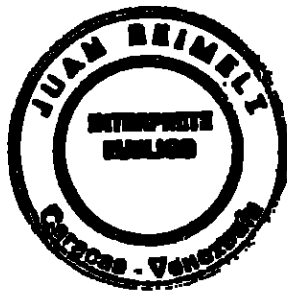
Name of Additional Joint Inventor, if any:		☐ A petition has been filed for this unsigned inventor					
Given Name (first and middle (if any))		Family Name or Surname					
Lloyd E.		East, Jr.					
Inventor's Signature						Date	
Residence: City	Duncan	State	OK	Country	U.S.A.	Citizenship	
Post Office Address	1305 Normandy Road						
Post Office Address							
City	Duncan	State	OK	ZIP	73533	Country	U.S.A.
Name of Additional Joint Inventor, if any:		☐ A petition has been filed for this unsigned inventor					
Given Name (first and middle (if any))		Family Name or Surname					
Don M.		Everett					
Inventor's Signature						Date	
Residence: City	Houston	State	TX	Country	U.S.A.	Citizenship	
Post Office Address	8315 E. Copperlakes Drive						
Post Office Address							
City	Houston	State	TX	ZIP	77095	Country	U.S.A.
Name of Additional Joint Inventor, if any:		☐ A petition has been filed for this unsigned inventor					
Given Name (first and middle (if any))		Family Name or Surname					
Inventor's Signature						Date	
Residence: City		State		Country		Citizenship	
Post Office Address							
Post Office Address							
City		State		ZIP		Country	

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Yo, Juan Reimelt, quien suscribe, mayor de edad, de este domicilio, titular de la Cédula de Identidad No. V-11.938.252, Intérprete Público de la República de Venezuela en el idioma inglés, según consta de la Gaceta Oficial No 30.675, de fecha 23 de abril de 1975 y Título registrado en la Oficina Principal de Registro Público del Distrito Federal, bajo el No 93, folio 55, Tomo Segundo y en el Juzgado Primero de Primera Instancia en lo Civil, bajo el No 61, folio 115, letra "R", certifico que el anexo documento que me fue presentado para su traducción, vertido fielmente al castellano, dice textualmente así:

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Oficina de Patentes y Marcas de Fábrica de los Estados Unidos.

11 de septiembre del año 2000.

La presente es para certificar que el texto adjunto es copia verídica de los registros de la Oficina de Patente de los Estados Unidos de América y de la solicitud de patente tal como identificada mas abajo la cual cumplió con todos los requisitos para que le sea otorgado una fecha de consignación conforme 35 USC 111.

Solicitud No. 09/387,476.

Fecha de consignación: 1 de septiembre de 1999.

Por autorización del Comisionado de Patentes y Marcas de Fábrica (fdo): W. Montgomery, Funcionario de Certificaciones.

Hay sello oficial en papel oro.

Apostilla

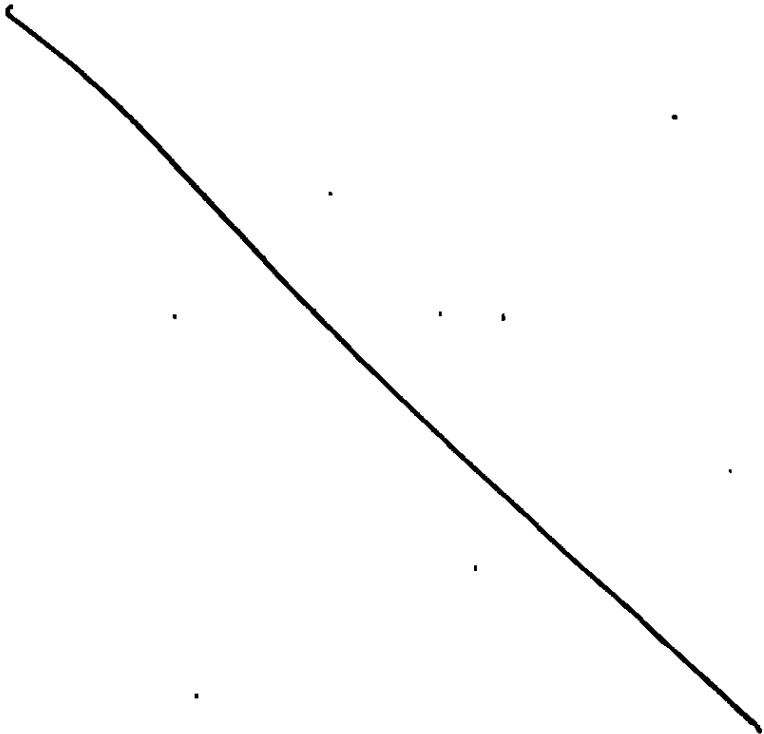
País: Estados Unidos de América

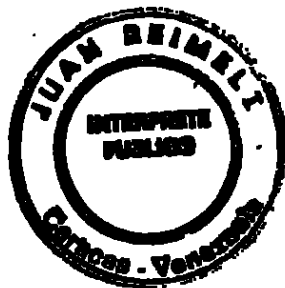
El presente documento público fue firmado por W. Montgomery, actuando aquí en su carácter de Funcionario de Certificaciones y lleva el sello de la Oficina de Patentes y Marcas de Fábrica.

Certificado en Washington, D.C., hoy día 27 de septiembre del año 2000, por el Funcionario Adjunto de Autenticaciones, Departamento de Estado de los Estados Unidos de América, bajo el No. 00047545-3.

(fdo): Denitra T. Hawkins.

Hay sello oficial correspondiente.





REIVINDICACIONES:

1. Un método para terminar un pozo, el cual comprende:
llevar a cabo un tratamiento conformador en una perforación abierta del pozo; y
revestir por lo menos una porción de la perforación sometida al tratamiento conformador.
2. Un método conforme definido en la reivindicación 1, el cual comprende además hacer una diagraña de la perforación abierta con una herramienta de representación por resonancia magnética antes de llevar a cabo el tratamiento conformador.
3. Un método para terminar un pozo, el cual comprende:
usar representación por resonancia magnética para analizar el pozo para determinar en dónde se encuentra líquido móvil indeseado en un yacimiento intersectado por el pozo; y
terminar el pozo en respuesta al uso de la representación por resonancia magnética, incluyendo el tratamiento del pozo para confinar por lo menos una parte del líquido móvil indeseado cuya presencia en el pozo ha sido determinada.
4. Un método conforme reivindicación 3, en el cual el uso de la representación por resonancia magnética para analizar el pozo para determinar en dónde se encuentra el líquido móvil indeseado en el yacimiento incluye determinar en dónde se encuentra el agua o gas móvil.
5. Un método conformador proactivo para un pozo, el cual comprende:

llevar a cabo un método conformador del pozo; y
terminar el pozo después de llevar a cabo el tratamiento conformador.

6. Un método conforme definido en la reivindicación 5, el cual comprende además hacer una diagrafla del pozo con una herramienta de representación por resonancia magnética antes de llevar a cabo el tratamiento conformador.

7. Un método conformador proactivo para un pozo, el cual comprende:

seleccionar un pozo en fase de terminación o en una fase de producción temprana del pozo; y

realizar un tratamiento conformador del pozo en fase de terminación o en fase de producción temprana.

8. Un método conforme definido en la reivindicación 7, el cual comprende además el uso de representación por resonancia magnética en el pozo antes de llevar a cabo el tratamiento conformador, y llevar a cabo el tratamiento conformador en respuesta al uso de la representación por resonancia magnética.

9. Un método conformador proactivo para un pozo, el cual comprende:

seleccionar un pozo antes de la terminación; y

llevar a cabo un tratamiento conformador del pozo inacabado.



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10. Un método conforme definido en la reivindicación 9, el cual comprende además el uso de la representación por resonancia magnética antes de llevar a cabo el tratamiento conformador, y llevar a cabo el tratamiento conformador en respuesta a la representación por resonancia magnética.

11. Un método conformador proactivo para un pozo, el cual comprende:

seleccionar un pozo antes de colocar el revestimiento en el pozo; y

llevar a cabo un tratamiento conformador del pozo seleccionado antes de colocar el revestimiento en el pozo.

12. Un método conforme definido en la reivindicación 11, el cual comprende además el uso de representación por resonancia magnética en el pozo antes de llevar a cabo el tratamiento conformador, y llevar a cabo el tratamiento conformador en respuesta al uso de la representación por resonancia magnética.

13. Un método conformador proactivo para un pozo, el cual comprende:

seleccionar un pozo en el cual ha sido llevado a cabo una diagraña de la perforación abierta del pozo; y

llevar a cabo un tratamiento conformador del pozo seleccionado antes de terminar el pozo.

14. Un método conforme definido en la reivindicación 13, en el cual la diagraña de la perforación abierta incluye el

uso de representación por resonancia magnética en el pozo y en donde el tratamiento conformador se lleva a cabo en respuesta a la representación por resonancia magnética de la diagraña de la perforación abierta.

15. Un método conformador proactivo para un pozo, el cual comprende:

determinar tipos y ubicaciones de líquidos en un yacimiento intersectado por el pozo y determinar las propiedades de yacimiento del yacimiento;

llevar a cabo un tratamiento conformador de un pozo en respuesta a tipos y ubicaciones determinadas de líquidos en el yacimiento y a las propiedades determinadas del yacimiento; y

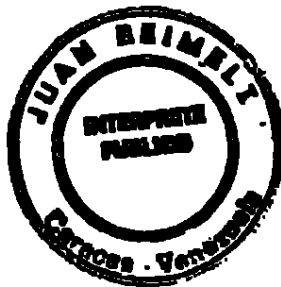
terminar el pozo después de llevar a cabo el tratamiento conformador.

16. Un método conforme definido en la reivindicación 15, en el cual la determinación de tipos y ubicaciones de los líquidos y propiedades del yacimiento incluye el uso de representación por resonancia magnética para detectar agua móvil en el yacimiento.

17. Un método conformador proactivo para un pozo, el cual comprende:

determinar tipos y ubicaciones de líquidos en un yacimiento intersectado por el pozo y determinar las propiedades de yacimiento del yacimiento;

llevar a cabo un tratamiento conformador del pozo en



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respuesta a los tipos y ubicaciones determinadas de líquidos en el yacimiento y las propiedades determinadas del yacimiento; e

iniciar la producción comercial del pozo después de llevar a cabo el tratamiento conformador.

18. Un método conforme definido en la reivindicación 17, en el cual la determinación de los tipos y las ubicaciones de los líquidos incluye el uso de representación por resonancia magnética para detectar agua móvil en el yacimiento.

Es traducción fiel del anexo documento que hago a solicitud de parte interesada, EN FE de lo cual firmo y sello la presente, hoy día cuatro de octubre del año dos mil.



Juan Reimelt
Intérprete Público

