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(54) Title: WELLBORE CEMENTING COMPOSITIONS AND METHODS OF MAKING AND USING SAME

(57) Abstract: A method of cementing a wellbore comprising preparing a wellbore cementing composition comprising a cementitious material and a modified biopolymer additive wherein the modified biopolymer additive is the reaction product of a process comprising contacting a biopolymer and an organic carbonate to form a reaction mixture and subjecting the reaction mixture to a temperature of from about 100 °F (38 °C) to about 250 °F (121 °C) and placing the wellbore cementing fluid in the wellbore. A method of cementing a wellbore comprising contacting a modified biopolymer additive with a cementitious slurry to produce a wellbore cementing composition having an initial viscosity, \( V_0 \); placing the wellbore cementing composition to a desired depth in a subterranean formation wherein the wellbore cementing composition has a transitional viscosity, \( V_T \), during placement in the subterranean formation and a final viscosity, \( V_F \), at the desired depth wherein \( V_F > V_T > V_0 \); and allowing the wellbore cementing composition to set.
Date of publication of the international search report:

20 December 2012
**A. CLASSIFICATION OF SUBJECT MATTER**

INV. C09K8/467 C09K8/487 C04B24/38 C04B28/02

ADD.

According to International Patent Classification (IPC) or to both national classification and IPC:

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols):

C09K C04B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched:

Electronic database consulted during the international search (name of data base and, where practicable, search terms used):

EPO-Internal

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

<table>
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<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
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<td>A</td>
<td>DE 195 15 477 AI (BUNA SOW LEUNA 0LEF/INVERB GMBH [DE]) 31 October 1996 (1996-10-31) claims</td>
<td>1-21</td>
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Further documents are listed in the continuation of Box C. See patent family annex.

- Special categories of cited documents:
  - **A** document defining the general state of the art which is not considered to be of particular relevance.
  - **E** earlier application or patent but published on or after the international filing date.
  - **L** document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified).
  - **O** document referring to an oral disclosure, use, exhibition or other means.
  - **P** document published prior to the international filing date but later than the priority date claimed.
  - **T** later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention.
  - **X** document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone.
  - **Y** document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
  - **Z** document member of the same patent family.

**Date of the actual completion of the international search**

26 January 2012

**Date of mailing of the international search report**

17/10/2012

**Name and mailing address of the ISA**

European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk

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**Authorized officer**

Zimpfer, Emmanuel

Form PCT/ISA/210 (second sheet) (April 2005)
This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.: because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.: because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.: because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☑ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-21

Remark on Protest
☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☒ No protest accompanied the payment of additional search fees.
This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-21

   method of cementing a wellbore comprising preparing a wellbore cementing composition comprising a cementitious material and a modified biopolymer additive wherein the modified biopolymer additive is the reaction product of a process comprising contacting a biopolymer and an organic carbonate, or wellbore cementing composition comprising a cementitious material and a modified biopolymer additive wherein the modified biopolymer additive is the reaction product of a process comprising contacting a biopolymer and an organic carbonate.

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2. Claim: 22

   A method of cementing a wellbore comprising contacting a modified biopolymer additive with a cementitious slurry to produce a wellbore cementing composition having an initial viscosity, v₀; placing the wellbore cementing composition to a desired depth in a subterranean formation wherein the wellbore cementing composition has a transitional viscosity, vₜ, during placement in the subterranean formation and a final viscosity, Vᶠ, at the desired depth wherein Vᶠ > vₜ > v₀; and allowing the wellbore cementing composition to set.

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