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(12) **United States Patent**  
**Almaguer**

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(54) **TECHNIQUES FOR HYDRAULIC FRACTURING COMBINING ORIENTED PERFORATING AND LOW VISCOSITY FLUIDS**

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(73) Assignee: **Schlumberger Technology Corporation**, Sugar Land, TX (US)

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(\* ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

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(21) Appl. No.: **09/614,304**

(22) Filed: **Jul. 12, 2000**

**Related U.S. Application Data**

(60) Provisional application No. 60/145,000, filed on Jul. 22, 1999.

(51) **Int. Cl.**<sup>7</sup> ..... **E21B 43/26**

(52) **U.S. Cl.** ..... **166/308; 166/297**

(58) **Field of Search** ..... 166/308, 297, 166/298, 300, 55

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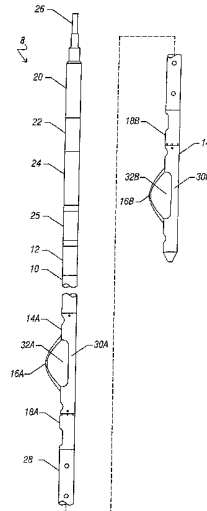
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(57) **ABSTRACT**

The present invention relates to novel methods to stimulate a hydrocarbon-bearing formation; in particular, techniques are disclosed for shooting perforations aligned with the direction of probable fracture propagation; this is followed by fracturing using a low viscosity fluid, preferably a viscoelastic surfactant-based fluid; the combination yields surprising results with respect to optimized fracture efficiency (i.e., ideal height, and half-length more closely approaches the true fracture length due to superior clean up properties of the fluids).

**20 Claims, 5 Drawing Sheets**



**BAKER HUGHES, A GE COMPANY, LLC AND BAKER HUGHES OILFIELD OPERATIONS LLC**  
Exhibit 1136  
**BAKER HUGHES, A GE COMPANY, LLC AND BAKER HUGHES OILFIELD OPERATIONS LLC v. PACKERS PLUS ENERGY SERVICES, INC.**  
IPR2016-01506

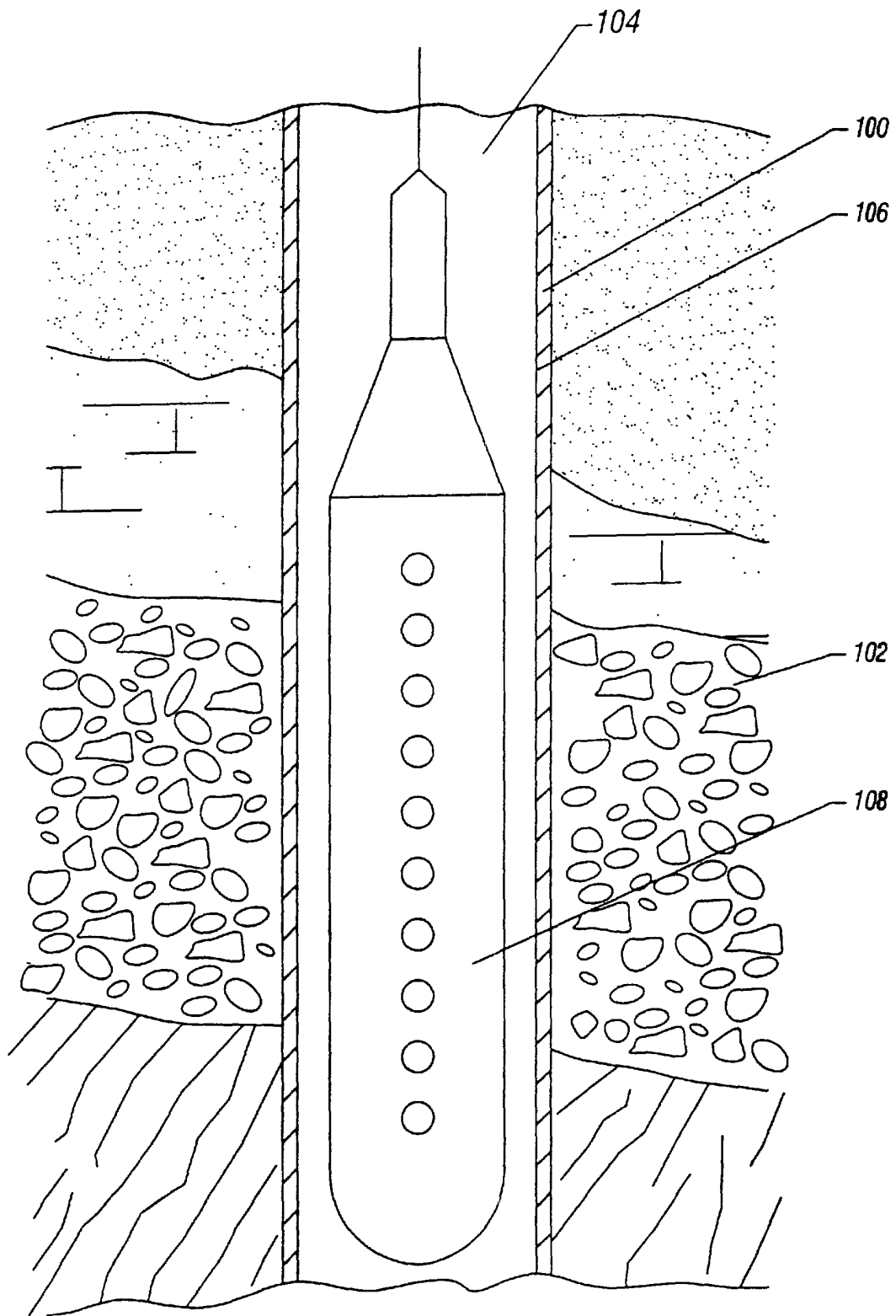
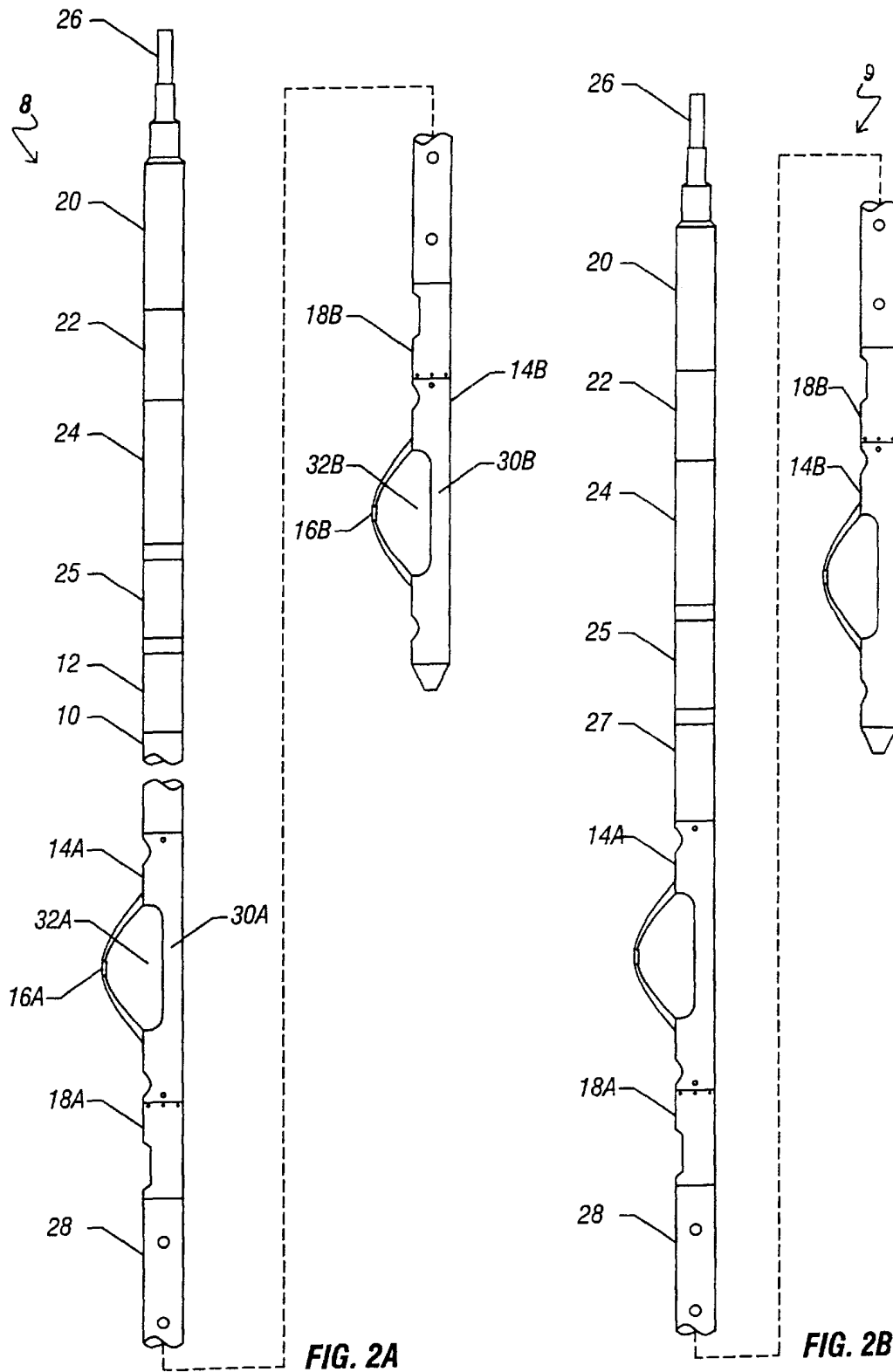


FIG. 1



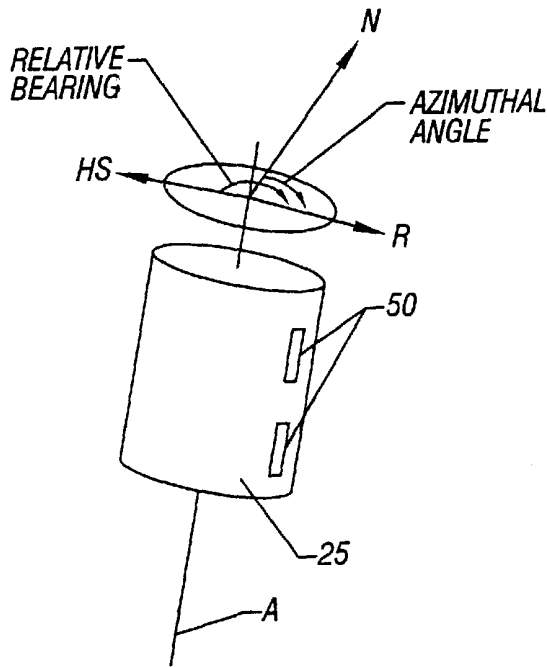


FIG. 7

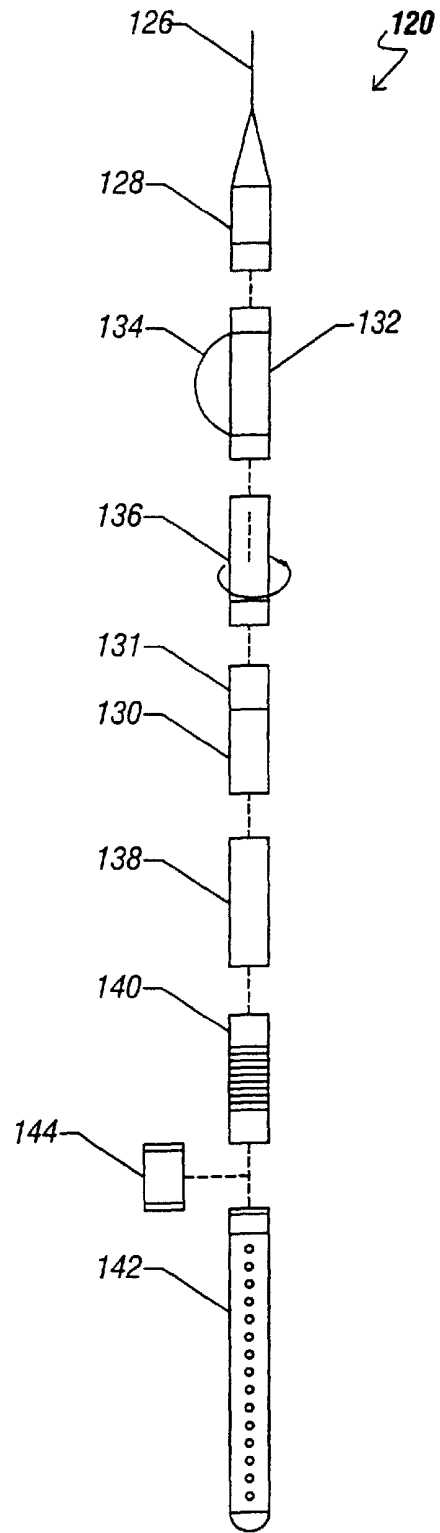


FIG. 3

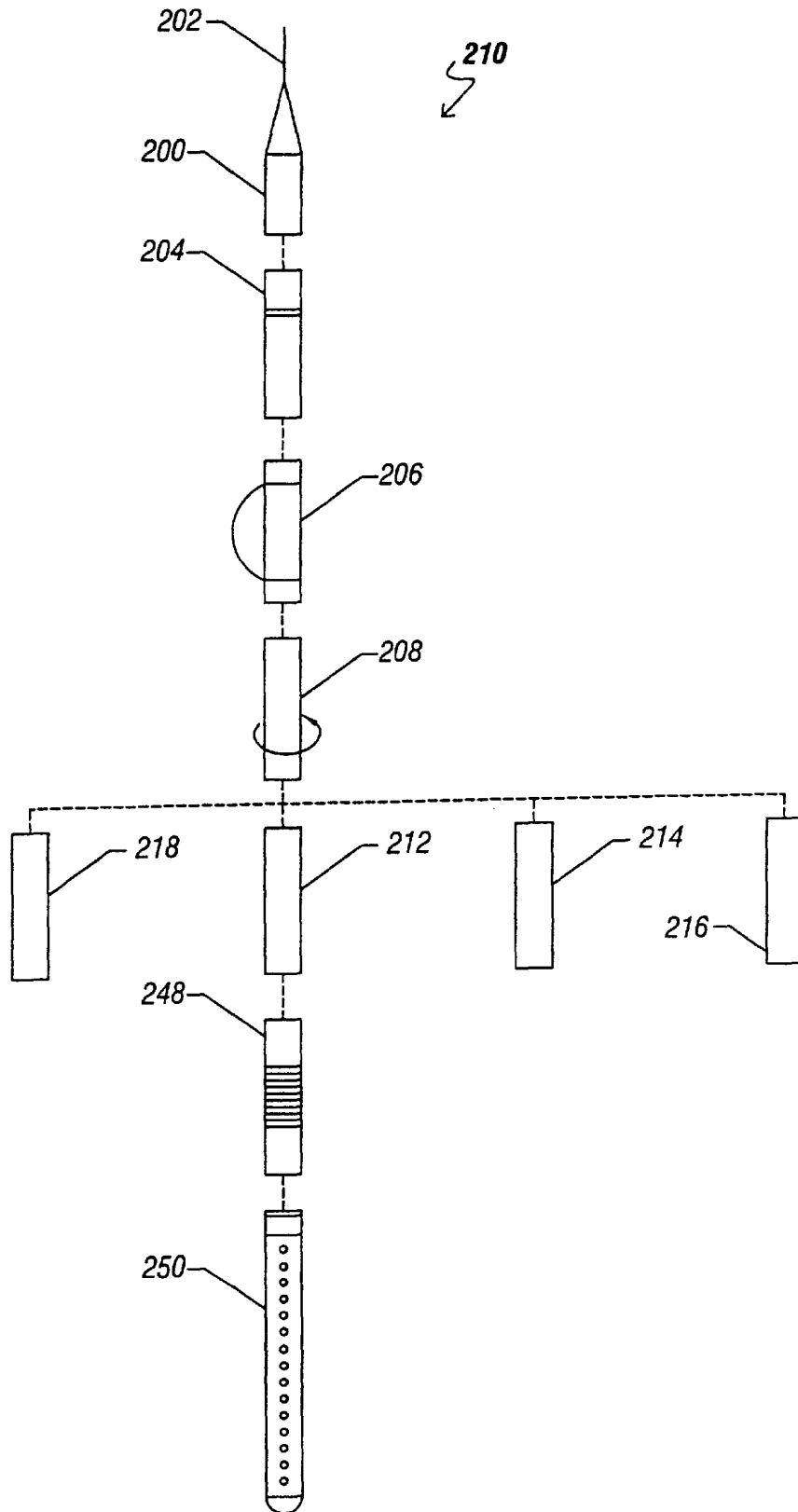


FIG. 4

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