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Fripp et al.

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(54) **VALVE AND POSITION CONTROL USING
MAGNETORHEOLOGICAL FLUIDS**

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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 465 days.

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Examination Report for UK application No. GB0303599.5.

(52) **U.S. Cl.** **166/66.5**; 251/129.06

(Continued)

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166/66.6, 66.7, 135, 334.1; 137/909; 251/129.06,
251/129.08

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Assistant Examiner—Daniel P Stephenson
(74) *Attorney, Agent, or Firm*—Marlin R. Smith

See application file for complete search history.

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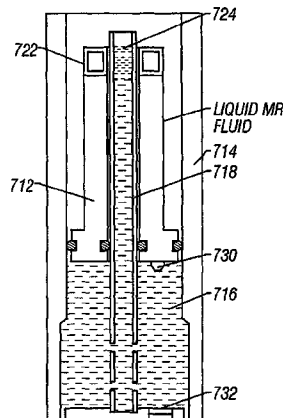
(57) **ABSTRACT**

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Magnetorheological fluids, which solidify in response to a magnetic field, offer the ability to simplify many of the valves and control systems used downhole in the search for and production of oil and gas. They lessen the need for moving parts, provide solid-state valves, and can provide a differential movement of fluid through the valves by varying the strength of the magnetic field. Combinations of permanent and electro-magnets can improve safety by providing valves that fail, when power is lost, in either an open or closed position, depending on design. A number of examples are given.

27 Claims, 14 Drawing Sheets



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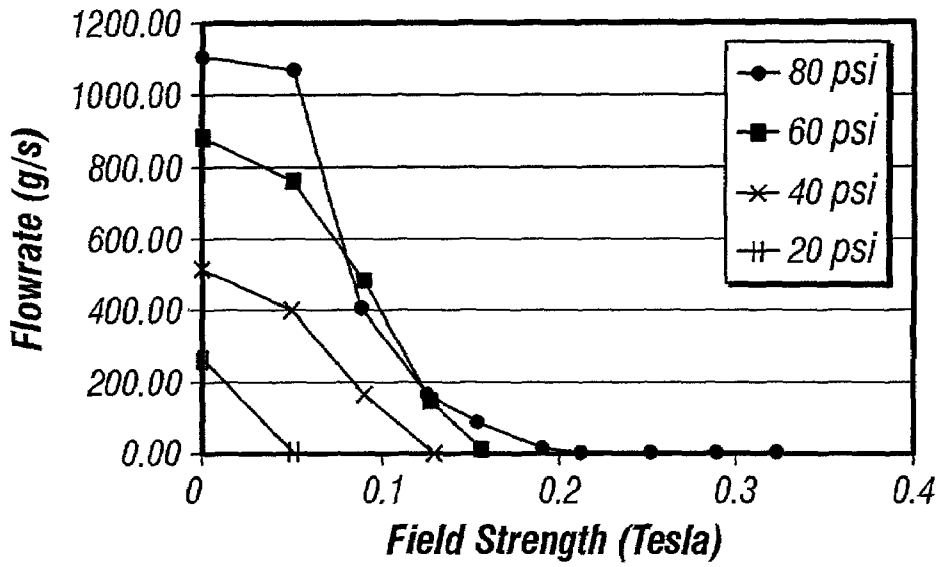


FIG. 1

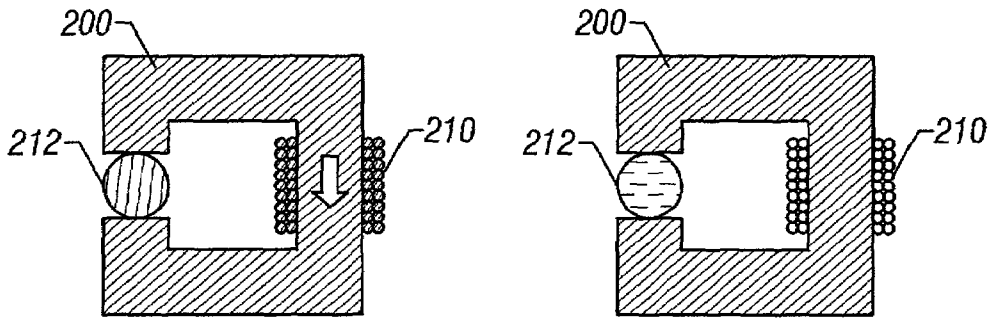


FIG. 2A

FIG. 2B

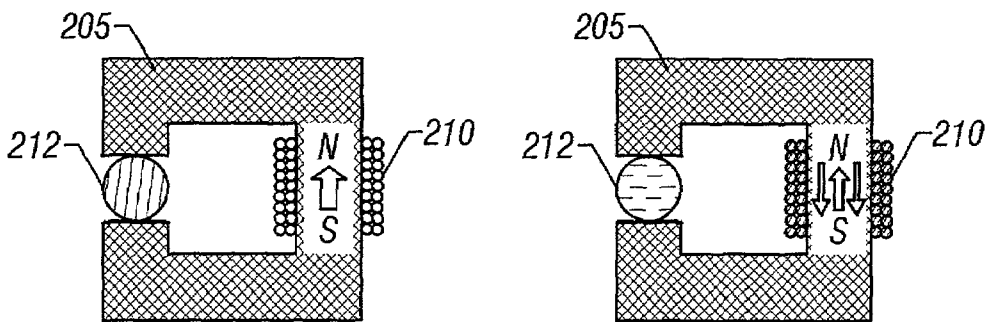


FIG. 2C

FIG. 2D

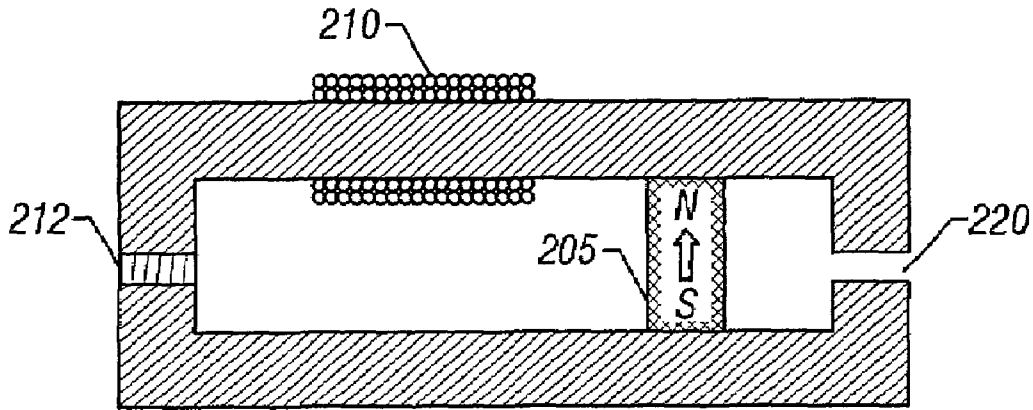


FIG. 2E

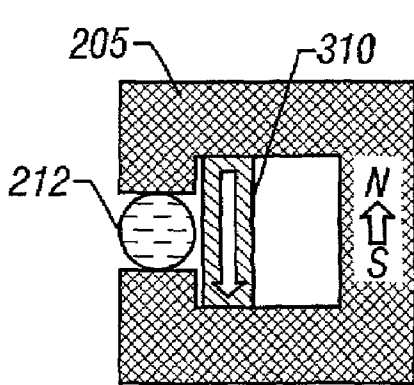


FIG. 3A

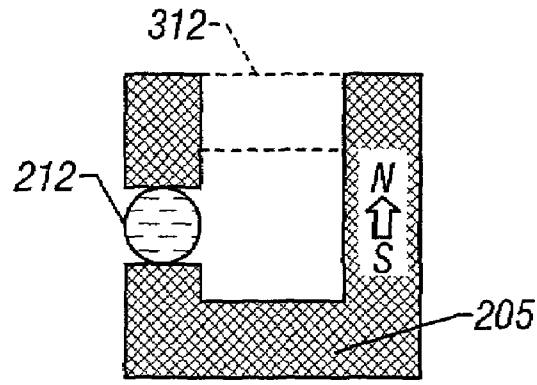


FIG. 3B

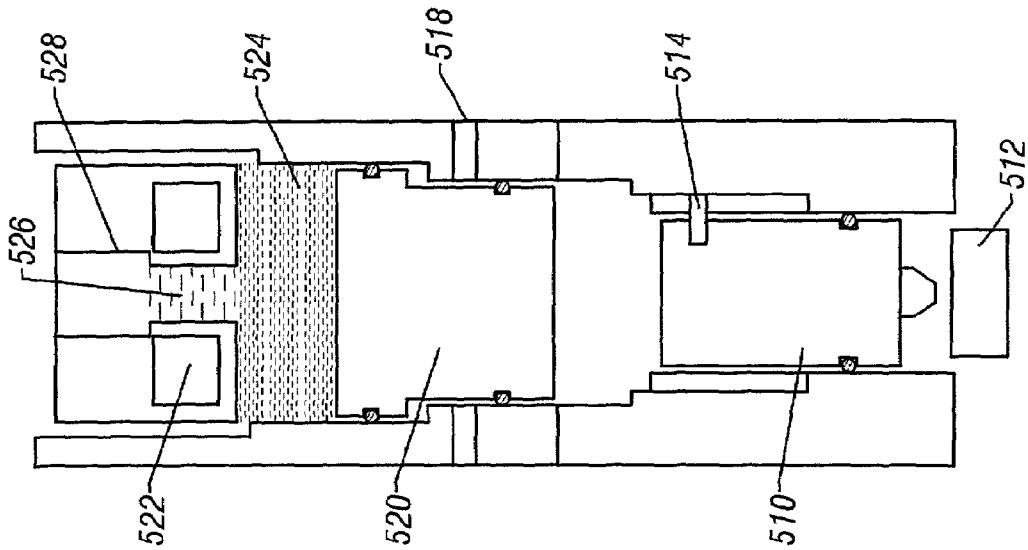


FIG. 5

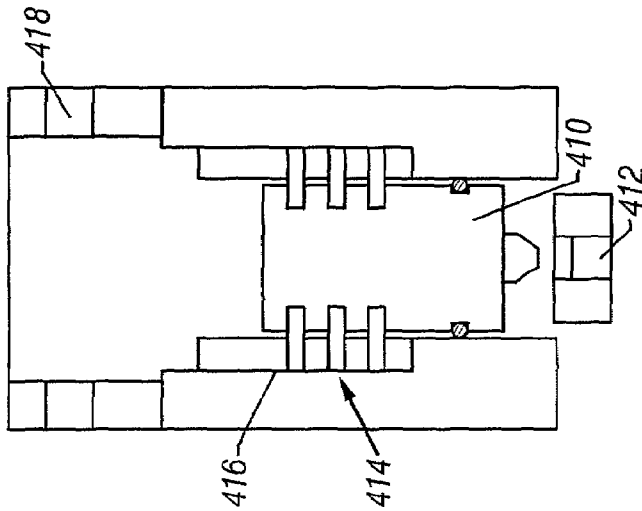


FIG. 4
(Prior Art)

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