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Barbee

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(54) **METHOD AND APPARATUS FOR DROPPING A PUMP DOWN PLUG OR BALL**

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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.

This patent is subject to a terminal disclaimer.

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(52) **U.S. Cl.**

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CPC E21B 33/05; E21B 3/16; E21B 33/068; E21B 34/14; E21B 21/10; E21B 2034/002

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See application file for complete search history.

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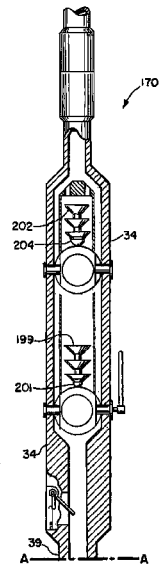
(57) **ABSTRACT**

An improved method and apparatus for dropping a ball, plug or dart during oil and gas well operations (e.g., cementing operations) employs a specially configured valving member with curved and flat portions that alternatively direct fluid flow through a bore or opening in the valving member via an inner channel or around the periphery of the valving member in an outer channel. In one embodiment, the ball(s), dart(s) or plug(s) are contained in a sliding sleeve that shifts position responsive to valve rotation. An optional indicator indicates to a user or operator that a ball or plug has passed a selected one of the valving members.

20 Claims, 29 Drawing Sheets