United States Patent [19]

Becker

[11] **3,716,426**

[45] **Feb. 13, 1973**

[54] **MIXTURE OF A RADIOACTIVE TRACER SUBSTANCE AND A PROPELLENT FOR MARKING DRILLING TOOLS FOR DEEP WELLS AND SIMILAR BOREHOLES**

[75] Inventor: **Herbert Becker,** Frankfurt/Main, Germany

[73] Assignee: **Farbwerke Hoechst Aktengesellschaft vormals Meister Lucius Bruning,** Frankfurt/Main, Germany

[22] Filed: **June 2, 1969**

[21] Appl. No.: **829,808**

[52] **U.S. Cl.**.....**149/38,** 252/301.1 R, 252/8.5, 175/3.5, 175/42, 149/88

[51] **Int. Cl.**.....**C06b 15/00**

[58] **Field of Search** 252/8.5, 301.1; 149/37, 38, 149/39, 88; 175/3.5, 42

[56] **References Cited**

UNITED STATES PATENTS

2,995,526 8/1961 De Ment.....149/85 X

Primary Examiner—Carl D. Quarforth
Assistant Examiner—Stephen J. Lechert, Jr.
Attorney—Curtis, Morris & Safford

[57] **ABSTRACT**

For the expulsion of radioactive indicators from tracer cavities in drilling tools for deep wells and similar boreholes propellants are used which do not react with the water of the circulating drilling fluid in stoichiometric proportions. The propellents consist of a mixture of aluminum powder and an alkali metal peroxide as the primer and an explosive as the gas-yielding component. Ammonium picrate may be used with special advantage as the gas-yielding component.

2 Claims, No Drawings

MIXTURE OF A RADIOACTIVE TRACER SUBSTANCE AND A PROPELLENT FOR MARKING DRILLING TOOLS FOR DEEP WELLS AND SIMILAR BOREHOLES

The present invention relates to a mixture of a radioactive tracer substance and a propellent which, when coming into contact with water, decomposes with explosive force with the evolution of gas. Mixtures of this type are embedded in the tracer cavities with which the drilling tools for deep wells and similar boreholes are provided in order to control the amount of wear which has occurred.

It has already been described in British Patent Specification No. 1,126,916 that the highest permissible amount of wear in drilling tools for deep wells and similar boreholes can be detected by means of radioactive indicators. At the sites which are especially exposed to abrasion the drilling tools are provided with tracer cavities in which a mixture of a radioactive indicator and a propellent is embedded and which are then closed. When the highest permissible amount of wear has occurred, the tracer cavities are cut open, the aqueous drilling fluid comes into contact with the propellent and owing to a chemical reaction gas is evolved which expells the indicator from the tracer cavity.

As propellants there have hitherto been proposed, for example, alkali metals, their hydrides and, furthermore, alanates, i.e., substances in which the reaction takes place with water, whereby the evolution of gas takes place, in stoichiometric proportions. The prerequisite for a reliable response is that, when the tracer cavity is cut open, a sufficient cross-section is laid bare through which the water can penetrate. Otherwise the evolution of gas and, therewith, the expulsion of the indicator takes place intermittently. Under unfavorable circumstances, for example owing to the cross-section of the entry being clogged, the evolution of gas may even cease entirely whereby the entire control of the amount of wear becomes unreliable.

The present invention avails itself of the fact that mixtures of finely divided aluminum and alkali metal peroxides react even on the addition of small amounts of water with explosive force, in which case the water only has a catalytic function and does not participate in the reaction in stoichiometric proportion.

The mixtures to be embedded in the tracer cavities in drilling tools for deep wells and similar boreholes consist of a radioactive tracer substance and a propellent which evolves gas upon the addition of water. In accordance with the invention, there is used as a propellent a mixture of finely divided aluminum and an alkali metal peroxide as the primer and an explosive as the gas-evolving component.

As finely divided aluminum there is advantageously used an aluminum powder commercially used, for example, in the form of aluminum bronze for paints.

As component yielding gas there may fundamentally be used any explosive which can be exploded or

detonated by the exploding mixture of finely divided aluminum and alkali metal peroxide. However, explosives having a low melting point, for example TNT, are suitable in a lesser degree because, owing to the high temperatures of the frilling tools, there is a danger that the explosive melts, envelops the primer mixture and, thereby, prevents the propellent to come into contact with water. Furthermore, those substances may not be used which form salts with heavy metals, which salts are susceptible to shocks and impacts such, for example, as picric acid.

Ammonium picrate may be employed with special advantage in the mixtures to be used according to the invention. It is stable up to temperatures exceeding 200°C and does not form heavy metal salts.

The finely divided aluminum and alkali metal peroxide may be, but must not be present in stoichiometric proportions in the mixture. For a good priming, the amount of peroxide required is half that which would be necessary in the stoichiometric relationship in accordance with the equation $2\ Al + 3\ Me_2O_2 \rightarrow Al_2O_3 + 3\ Me_2O$. Also with double the stoichiometric amount of peroxide there is still attained a satisfactory priming, however, the effect rapidly declines below or above the indicated limits.

As radioactive indicator there is advantageously used krypton 85, preferably in the form of its clathrate with hydroquinone, as described in British Patent Specification No. 1,126,916.

The quantitative ratio of the primer mixture to the explosive is not critical. For example, the mixtures indicated in the Table following hereunder yield good results, the amounts in each case also being given in parts by volume because the dosage according to parts by volume is especially convenient. As aluminum there was used the so-called aluminum bronze.

Table

	Al	Na_2O_2	NH_4 picrate
volume ratio	1	1	1
weight ratio	1	2.6	1.4
volume ratio	1	2	1
weight ratio	1	5.2	1.4
volume ratio	1	2	2
weight ratio	1	5.2	2.8
volume ratio	1	3	1
weight ratio	1	7.8	1.4
volume ratio	1	3	2
weight ratio	1	7.8	2.8

I claim:

1. In a composition of matter adaptable to use for indicating wear in drilling tools, said composition consisting essentially of a mixture of a radioactive tracer, ammonium picrate, and a water-activated primer for said ammonium picrate, the improvement wherein said primer is a mixture of finely-divided aluminum and an alkali metal peroxide.

2. A composition as in claim 1 wherein said radioactive tracer is the hydroquinone clathrate of krypton 85.

* * * * *