United States Patent [19]

Tatum

[11] **3,909,467**

[45] **Sept. 30, 1975**

[54] **DOWNHOLE TOOL**

[75] Inventor: **John Allen Tatum,** Houston, Tex.

[73] Assignee: **The Randolph Company,** Houston, Tex.

[22] Filed: **Aug. 22, 1973**

[21] Appl. No.: **390,438**

[52] **U.S. Cl.** ..... **260/8;** 156/87; 166/176; 175/325; 260/6; 260/8; 260/9; 260/37 SB; 260/37 EP; 260/42.17; 260/42.18; 260/873; 260/17.4 BB; 308/4 A

[51] **Int. Cl.²** **C08K 7/02;** C08K 7/12; E21B 17/10; E21B 37/02

[58] **Field of Search** ..... 166/176; 175/325; 308/4 A; 260/41 AG, 42.17, 42.18, 8, 9, 6, 37 SB, 37 EP, 873; 156/87

[56] **References Cited**

UNITED STATES PATENTS

1,392,576	10/1921	Goodenberger	264/326
2,604,364	7/1952	Ward	166/176
2,804,678	9/1957	Rockoff	260/42.18
3,197,263	7/1965	Holcombe	308/4 A
3,343,890	9/1967	Homer	308/4 A
3,480,094	11/1969	Morris	308/4 A
3,682,859	8/1972	Taylor et al.	260/42.18

OTHER PUBLICATIONS

Encyclopedia of Pol. Sci. & Techn., Vol. 6, pp. 629–633, (Interscience), (N.Y.), (1967).

Primary Examiner—M. J. Welsh
Assistant Examiner—H. H. Fletcher

[57] **ABSTRACT**

An improved downhole tool for well-logging, drilling, etc., is disclosed. The portions of the tool previously made of ordinary elastomers, such as bumpers, shock absorbers and protectors for electrical connections, are made of a flocked elastomeric material. The material contains 15–40 percent by weight of flocked fibers. The fibers are randomly oriented, and may be any of several materials, including polyester and cotton. The bubbling or "blow-up" previously encountered in these parts of the tool, is eliminated.

10 Claims, 3 Drawing Figures

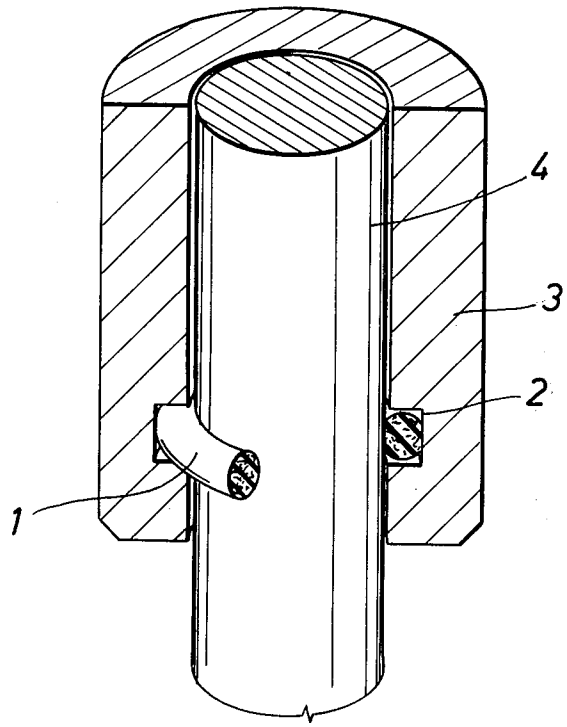
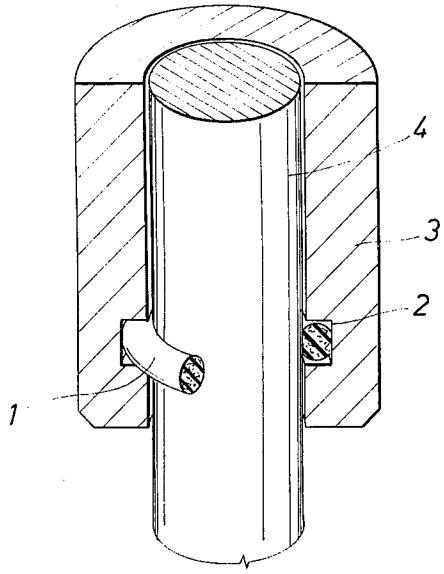


FIG. 1



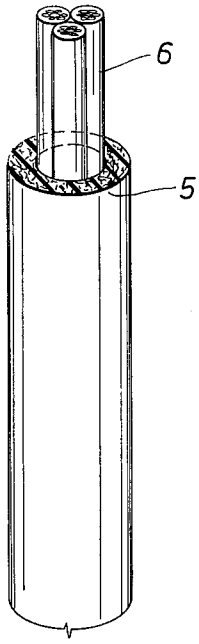


FIG. 2

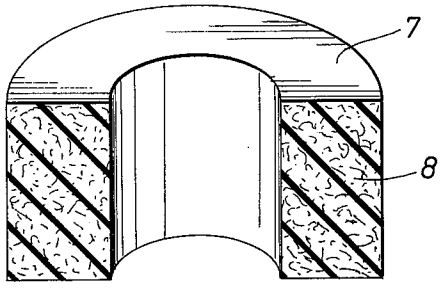


FIG. 3

DOWNHOLE TOOL

FIELD OF THE INVENTION

This invention relates to downhole well tools.

BACKGROUND OF THE INVENTION

Under the high gas pressures that can exist in an oil or gas well, rubber parts of downhole tools are susceptible to blow-up or "bubbling," thus shortening the useful life of such parts. The phenomenon is apparently caused by the fact that gas permeates the rubber at high pressure, and, upon removal of the tool from the hole, the sudden reduction in pressure occurs before the gas can escape, thus resulting in bubbling of the rubber elastomer.

The problem is especially severe when hydrogen sulfide is present in the well gas, since permeation of the rubber with H_2S results in embrittlement of the rubber, as well as bubbling.

Accordingly, it is a feature of this invention to eliminate bubbling in parts of downhole tools.

It is a further feature of this invention to prevent embrittlement of rubber parts of downhole tools, in an H_2S environment.

It is still another feature of this invention to provide a longer-lived downhole tool.

Further features and advantages of the invention will appear from a consideration of the detailed description to follow, including the claims and the drawings.

SUMMARY OF THE INVENTION

In general, according to the present invention, the elastomeric parts of downhole tools, such as bumpers, shock absorbers, and protectors for electrical connections, are composed of an elastomeric material containing from **15** to **50** percent by weight of randomly oriented flocked fibers. **15** to **40** percent is the preferred range. The fibers may be of any of a number of non-thermoplastic materials, including polyester and cotton.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** shows a typical tool section employing the present invention.

FIG. **2** illustrates an electrical cable section employing the present invention.

FIG. **3** is a cross-sectional view of a flocked rubber object according to the present invention.

DETAILED DESCRIPTION

Many parts of the downhole tools are customarily made of elastomeric materials, and subject to the bubbling problems discussed above. Such parts can be made as described herein, and include, for example:

Rubber boots, for electrical protection.
Packing rings.
Bridle boots, covering the hook between cable and tool.
Seals.
Protectors for electrical connections.
Coverings for positioning springs used in sonic and induction well logging.
O-rings
Bumpers.
Shock absorbers.
Pressure seals.
All kinds of packers.

Suitable flexural elastomeric materials which may be employed in the present invention include, for example: Neoprene rubber; acrylonitrile-butadiene rubber (buna-N rubber); silicone rubber; fluoroelastomers, such as Viton (a trademark of E,I, DuPont de Nemours Co.); epichlorohydrin rubber, such as Hydrin (a trademark of the B.F. Goodrich Company).

According to the present invention flocked fibers are evenly distributed in the elastomeric material of such tool parts, in a concentration of from about 15 to about 50 percent, by weight. The preferred range is 15 to 40 percent. At concentrations above 40 percent, the strength of the material is increased, but there may be a degradation in resiliency.

The fibers may be of any of a number of non-thermoplastic materials, e.g., rayon polyesters, cotton, asbestos, glass, or wool. The fibers should be able to withstand temperatures of 300°–500° F. commonly encountered in boreholes. Mixtures of acceptable fibers of different materials are especially preferred.

The length of the fibers should be from one sixty-fourth in. to one-fourth in. These lengths may be obtained by chopping. Generally, the longer lengths will be more suitable for larger objects. I have found that an equally distributed mixture of fiber lengths between one sixty-fourth in. and one-eighth in. works particularly well.

Although it has been known to use long fibers of defined orientation geometry to provide gas release paths in elastomers during curing thereof, such materials have not heretofore been used in downhole tools. Moreover, the present invention is entirely different in concept, since it employs short, randomly oriented fibers, which would not be expected to solve the bubbling problems previously discussed herein.

The tools of the present invention are designed for use under high-presssure conditions. The boreholes are customarily liquid-filled.

Typical embodiments of the improved downhole tool of the present invention are illustrated generally in the drawings.

In FIG. **1**, an O-ring **1** of flocked-fiber-filled rubber is shown seated in a groove **2** between two tubular sections **3** and **4**.

In FIG. **2**, a flocked-fiber-filled rubber material **5** is employed as a sheathing around an insulated electrical cable **6**.

FIG. **3** illustrates a toroidal shaped member **7**, such as a bumper, which would surround a tool section. The bumper contains short, randomly oriented fibers **8**.

The subject matter of which I seek letters patent is defined by the following claims:

I claim:

1. In a device designed for use under high pressure conditions in a liquid-filled borehole, having at least one component of gas-permeable flexural material, the improvement comprising:

said flexural material having uniformly distributed therethrough from 15% to 50 percent by weight of randomly oriented flocked fibers, said fibers being of non-thermoplastic material and having lengths from about one sixty-fourth inch to about one-fourth inch.

2. The device of claim **1** wherein said flocked fibers comprise a mixture of fibers of varying lengths.

3. The device of claim **1** wherein said flexural material is selected from the group consisting of neoprene

rubber, acrylonitrile-butadiene rubber, silicone rubber, fluoro-elastomer, and epichlorohydrin rubber.

4. The device of claim **1** wherein said fibers are selected from the group of materials consisting of rayon, polyesters, cotton, wool, asbestos, and glass.

5. A method of enhancing life of a downhole tool having at least one component of gas-permeable flexural material, comprising the step of uniformly incorporating throughout said flexural material randomly oriented fibers, in a concentration of from about 15 to about 50 percent by weight, said fibers having lengths between about 1/**64** inch and about ¼ inch.

6. The method of claim **5** wherein said fibers are selected from the group consisting of rayon, polyesters, cotton, wool, asbestos, and glass.

7. The method of claim **6,** wherein said flexural material is selected from the group consisting of neoprene rubber, acrylonitrile-butadiene rubber, silicone rubber, fluoroelastomer, and epichlorohydrin rubber.

8. A method of preventing bubbling of an elastomeric tool component upon withdrawal from a high pressure borehole, comprising forming said component of 50–85 percent of elastomeric material and 15–50 percent of randomly oriented flocked fibers having lengths from about 1/**64** inch to about ¼ inch.

9. The method of claim **8,** wherein said fibers are selected from the group consisting of rayon, polyesters, cotton, wool, asbestos, and glass.

10. The method of claim **9,** wherein said elastomeric material is selected from the group consisting of neoprene rubber, acrylonitrile-butadiene rubber, silicone rubber, fluoroelastomer, and epichlorohydrin rubber.

* * * * *