United States Patent

[11] 3,568,782

[72] Inventor **Jack C. Cox**
Houston, Tex.

[21] Appl. No. **883,193**
[22] Filed **Dec. 8, 1969**
[45] Patented **Mar. 9, 1971**
[73] Assignee **Tenneco Oil Company**
Houston, Tex.

[54] **METHOD FOR CONTROLLING DRILLING MUD LOSS IN A WELLBORE**
5 Claims, 1 Drawing Fig.

[52] **U.S. Cl.** **175/72,** 166/294, 252/8.5
[51] **Int. Cl.** **E21b 21/04**
[50] **Field of Search** ..... 175/72, 65; 166/292, 294, 282, 283; 252/8.5 (L.C.)

[56] **References Cited**

UNITED STATES PATENTS

2,778,604 1/1957 Reistle, Jr. 175/72X

FOREIGN PATENTS

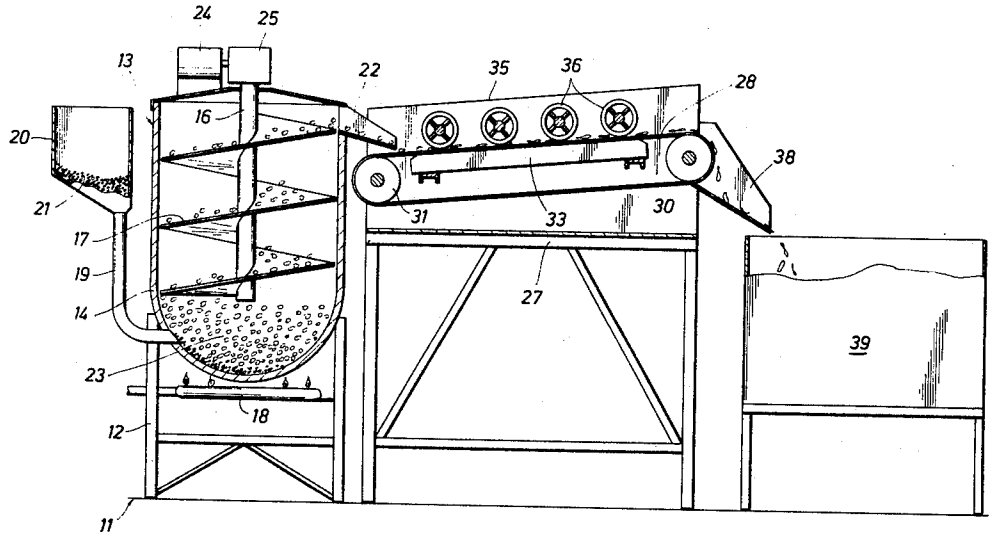
715,900 8/1965 Canada 175/72

OTHER REFERENCES

Rogers, Composition and Properties of Oil Well Drilling Fluids, 3rd Edition, (1963) Gulf Publishing Co. Houston, Texas, page 664. TN 861.R63

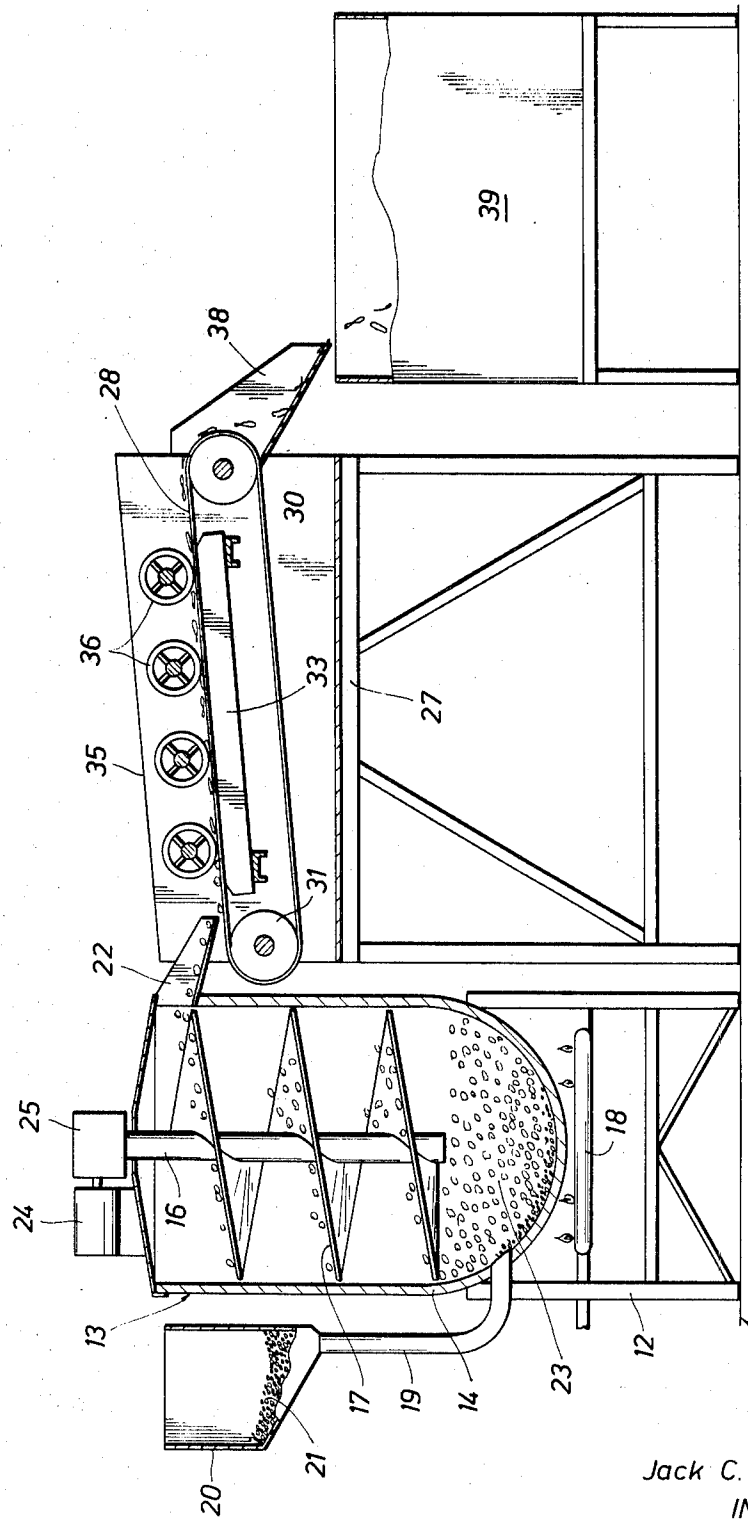
Primary Examiner—Stephen J. Novosad
Attorney—Eugene S. Coddou

ABSTRACT: A method for controlling drilling mud loss from a wellbore penetrating a thief formation. It includes the steps of storing a supply of unpopped cereal grain, such as popcorn, at the well site. Upon the indication of loss of drilling mud to the thief formation, a supply of the cereal grain is popped by passing the same through a heating zone to thereby expand the same and thereafter pumping the expanded material down the wellbore with the drilling mud until the thief formation is plugged.



PATENTED MAR 9 1971

3,568,782



Jack C. Cox
INVENTOR

BY Lee R. Larkin
ATTORNEY

METHOD FOR CONTROLLING DRILLING MUD LOSS IN A WELLBORE

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a method for controlling drilling mud loss to a thief formation which is penetrated by a wellbore during the drilling of a wellbore.

2. Description of the Prior Art

During the drilling of wells, as for example oil wells, it often develops that the drilling fluid, such as drilling mud, escapes through a thief formation which is not structured to withstand the pressures to which it is subjected. The loss of drilling mud through the thief formation may be the result of a crack or fissure in the formation, or because of its general porosity, for example. In the past, it has been common practice to pump different materials down the wellbore and into the formation for the purpose of attempting to stop up or otherwise plug the thief formation. These conventional lost circulation-type materials are commonly transported, stored or sold in the form in which they are pumped down the well. These materials are usually very bulky and present storage problems by virtue of their large volume. Transportation to, and storage of, such material at certain drilling sites, as for example on offshore drilling rigs, is a problem because of the bulk involved, the storage capacity required and the transportation costs involved.

SUMMARY OF THE INVENTION

It is therefore an object of this invention to provide an improved method for controlling drilling mud loss from a wellbore penetrating a thief formation, which method overcomes the aforesaid problems.

Briefly stated, the method of this invention includes the storing of a supply of unpopped cereal grain, such as popcorn, at the well site. In the unpopped state, the cereal grain requires a minimum of transportation costs in transporting to the well site and requires a minimum storage capacity while being stored at the well site. Upon indication of a loss of drilling mud to the thief formation, a supply of the cereal grain is passed through a heating zone to thereby heat and expand the cereal grain, thereby greatly increasing its volume. The expanded cereal grain is then pumped down the wellbore with the drilling fluid into the thief formation. This pumping of the expanded cereal grain is continued until the thief formation is plugged by the expanded cereal grain. In certain instances, it may be desirable to flatten the popped cereal grain prior to pumping the same down the wellbore. Further, it may be desirable to continuously pop a portion of the cereal grain during the pumping operation so as to minimize the storage space required for the popped cereal grain.

BRIEF DESCRIPTION OF THE DRAWINGS

Reference to the DRAWING will further explain the invention.

The numeral 11 generally designates a platform at the well site which has mounted thereon a support frame 12 which supports thereabove a large popcorn popper generally designated by the numeral 13, which is comprised of a metal kettle 14 having an auger mounted therein, which auger is comprised of an auger shaft 16 having an auger blade 17 both of which extend down into kettle 14 and are arranged for elevating the popped popcorn therefrom. Auger shaft 16 is arranged to be driven by motor 24 through gearbox 25.

Kettle 14 also has an inlet means in the lower part thereof in the form of conduit 19 which connects with feeder hopper 20 having a supply of raw or unpopped popcorn 21 therein. Kettle 14 also has an outlet shoot 22 by which the popped popcorn escapes from kettle 14.

Mounted on platform 11 adjacent to support frame 12 is a table 27 which supports an endless conveyor belt 28 which is mounted on pulleys 30 and 31, one of which is driven so as to advance any material deposited upon the upper surface of conveyor belt 28 to the right as shown in the drawing. Conveyor belt 28 is also arranged to pass over a pressure plate 33 mounted between pulleys 30 and 31, as shown. Table 27 also supports an upper housing 35 which has mounted therein a plurality of adjustable pressure rollers 36, the axes of which are generally transverse to the line of movement of conveyor belt 28.

The popped popcorn is discharged from chute 22 onto the left end of conveyor belt 28, as shown in the drawing, and thereafter passes under rollers 36 which are arranged to flatten the popped popcorn by the pressure applied against belt 28 and pressure plate 33.

The flattened popped popcorn is discharged from conveyor belt 28 to a chute 38, which is arranged to discharge into conventional drilling mud tank 39. Mud tank 39 may be provided with agitating means (not shown) to thoroughly mix the popped popcorn with the drilling mud. The mud, so mixed, is thereafter drawn from mud tank 39 and pumped downwardly through the wellbore by conventional means.

In operation, a supply of unpopped popcorn is always maintained at the drilling site. In the unpopped state, the popcorn requires a small amount of storage space and the transportation costs required for transporting it there are at a minimum.

Upon the first indication of loss of drilling mud to a thief formation, a supply of the raw popcorn is then flowed into popcorn popper 13 through conduit 19 from hopper 20. Metal kettle 14 is arranged to be heated by gas burner 18 supported therebelow, to provide the desired heating conditions to metal kettle 14. Temperature in kettle 14 is maintained at the desired temperature to effect popping of the popcorn. As the popcorn is popped, it expands greatly as shown by the numeral 23. It is removed from kettle 14 by operation of auger shaft 16 and auger blade 17. The popped popcorn is then discharged out chute 22 onto conveyor belt 28 where it is flattened and thereafter discharged into mud tank 39, from which it is then circulated down the wellbore, as by pumping in conventional manner. The pumping of the expanded cereal grain down the wellbore with the drilling mud is continued until the thief formation is plugged by the expanded cereal grain.

Other cereal grains besides popcorn can be used, as for example puffed wheat, puffed rice, and the like, all of which grains experience a tremendous increase in volume when rapidly heated, which expansion will generally be referred to as popping.

It will thus be apparent that this invention eliminates the need for a large storage volume for storing conventional loss circulation materials at a well site. By continuously operating the apparatus described above, there is no requirement for the storage of a large amount of expanded material for use as loss circulation material. It therefore eliminates the costs of storing a large volume of material and of transporting such materials.

Further modifications and alternate embodiments will be apparent to those skilled in the art in view of this description.

I claim:

1. In a method for controlling drilling mud loss from a wellbore penetrating a thief formation, the combination of steps comprising:

storing a supply of unpopped cereal grain at the well site;

upon the indication of loss of drilling mud to said thief formation, passing a supply of said cereal grain through a heating zone to thereby heat and expand said cereal grain;

pumping said expanded cereal grain down said wellbore with said drilling mud and into said thief formation; and

continuing said pumping of expanded cereal grain until said thief formation is plugged by said expanded cereal grain.

2. The invention as claimed in claim 1 including: flattening said popped cereal grain prior to pumping thereof down said wellbore.

3. The invention as claimed in claim 1 wherein: a portion of said unpopped cereal grain is substantially continuously popped and pumped down said wellbore until said thief formation is plugged.

4. The invention as claimed in claim 1 wherein: said cereal grain is popcorn.

5. The invention as claimed in claim 1 wherein:

said cereal grain is popcorn;

a portion of said popcorn is substantially continuously popped and pumped down said wellbore until said thief formation is plugged; and

and said popped popcorn is flattened prior to pumping thereof down aid wellbore.