United States Patent

Talley, Jr.

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[54] **APPARATUS FOR TREATING DRILL CUTTINGS AT OFFSHORE LOCATIONS**

[72] Inventor: **William A. Talley, Jr.,** Dallas, Tex.

[73] Assignee: **Mobile Oil Corporation,**

[22] Filed: **July 15, 1970**

[21] Appl. No.: **54,949**

[52] **U.S. Cl.**.....**134/56 R,** 134/110, 134/113, 175/208, 210/216

[51] **Int. Cl.**.....**B08b 3/02,** B03b 7/00, E21b 21/00

[58] **Field of Search**.....134/25 R, 56 R, 57 R, 109, 134/110, 113; 175/88, 207, 208; 210/216

[56] **References Cited**

UNITED STATES PATENTS

366,820	7/1887	Donner	134/25 R
3,390,402	6/1968	Goerg	134/109 X
2,660,744	12/1953	Cockrell	134/56 R X
2,576,283	11/1951	Chaney	175/208 X
2,591,209	4/1952	Smith	134/25 R UX
2,732,847	1/1956	Reynolds et al.	134/57 R
1,580,723	4/1926	Hapgood	134/25 R
2,155,854	4/1939	Barnes et al.	134/109 X

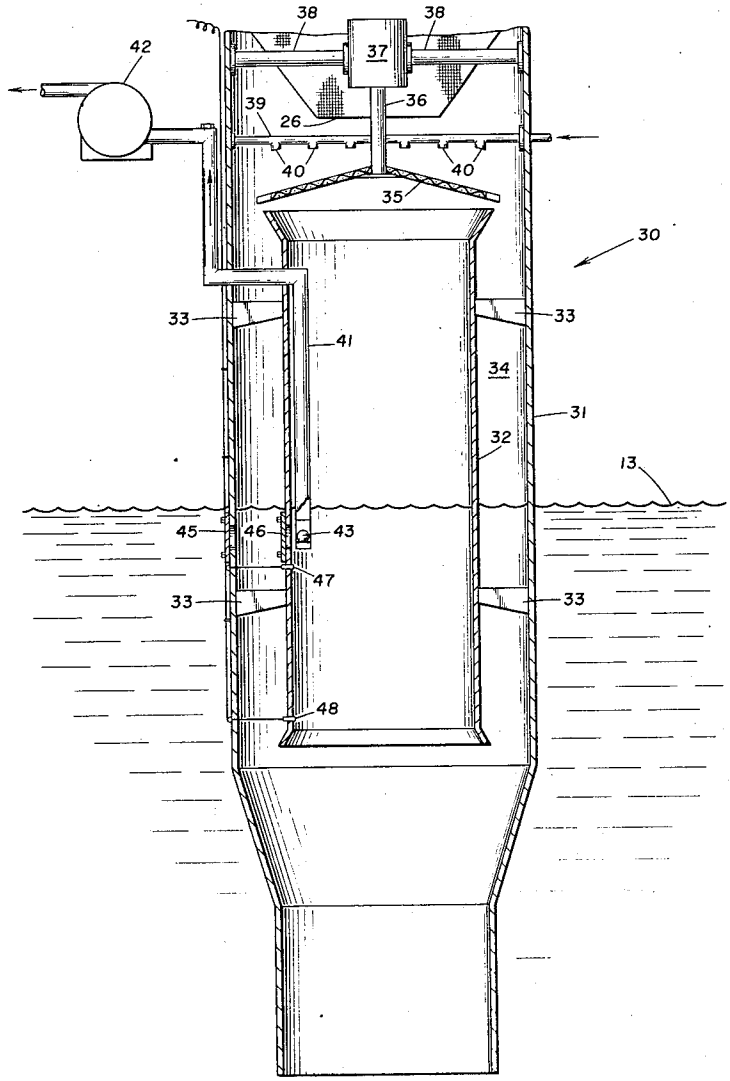
Primary Examiner—Robert L. Bleutge

Attorney—William J. Scherback, Frederick E. Dumoulin, Drude Faulconer, Andrew L. Gaboriault and Sidney A. Johnson

[57] **ABSTRACT**

Apparatus for treating contaminated drill cuttings at an offshore location whereby the cutting can be returned to the water without polluting same. The cuttings pass from the shale shaker into a wash unit where they are sprayed with a wash solution. The spent wash solution and the dislodged contaminants are removed from said unit by a pump while the washed cuttings fall from the lower end of said unit back into the water.

5 Claims, 3 Drawing Figures



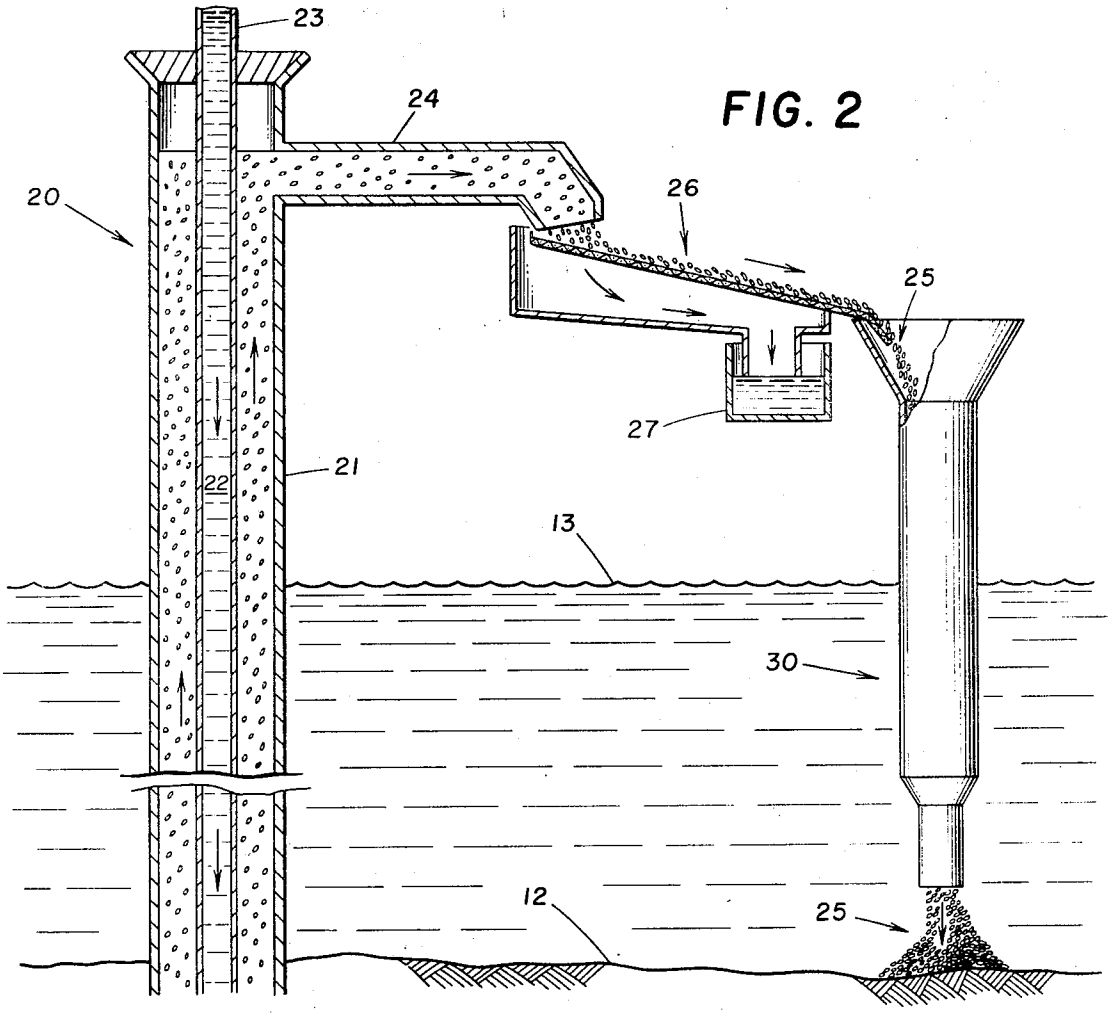


FIG. 2

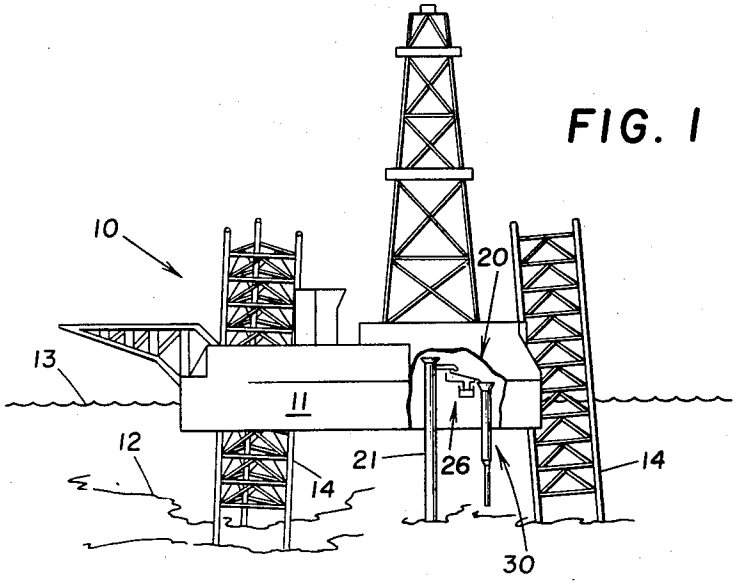


FIG. 1

WILLIAM A. TALLEY, JR.
INVENTOR

BY Drude Faulconer
ATTORNEY

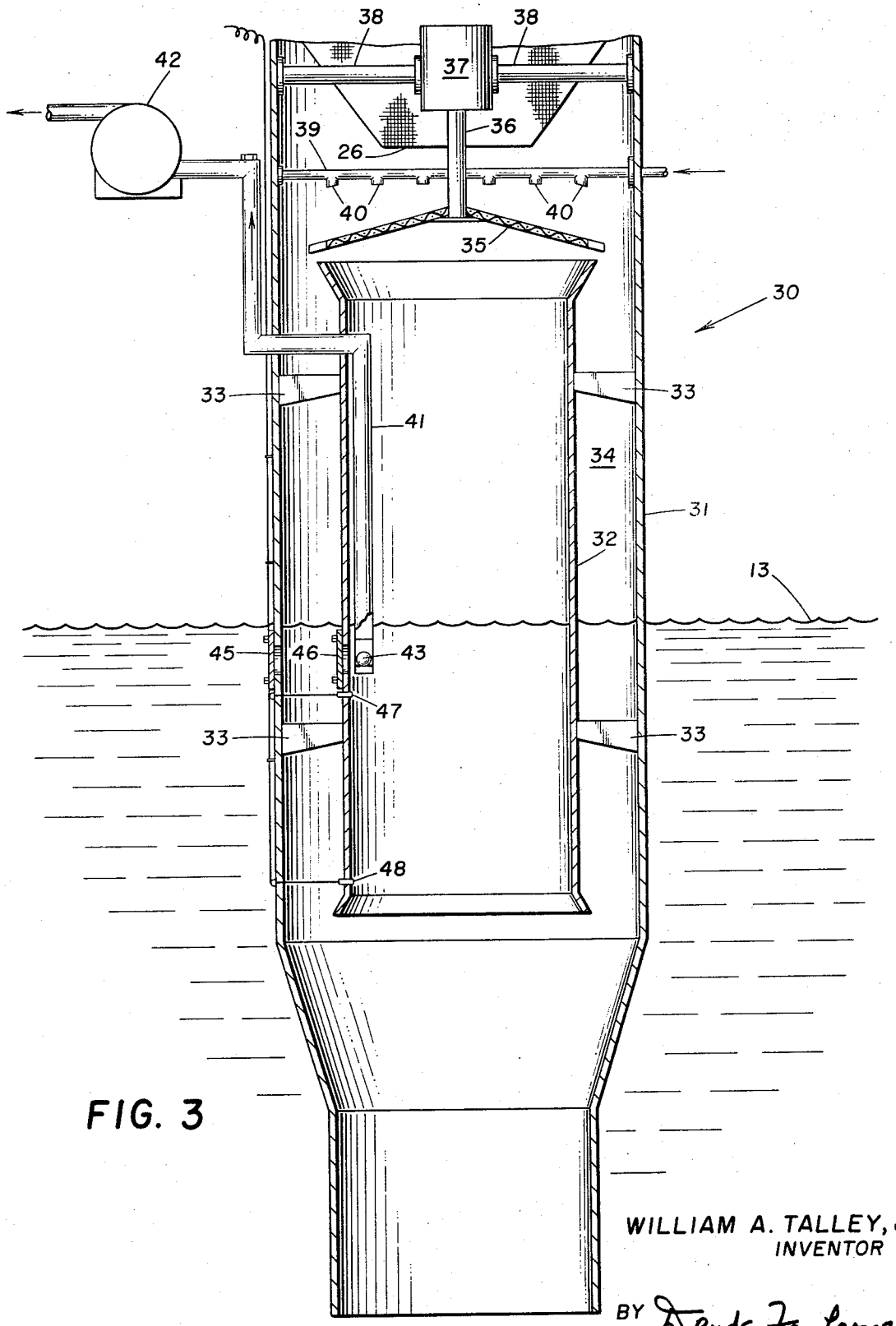


FIG. 3

WILLIAM A. TALLEY, JR.
INVENTOR

BY Drude Faulconer
ATTORNEY

APPARATUS FOR TREATING DRILL CUTTINGS AT OFFSHORE LOCATIONS

BACKGROUND OF THE INVENTION

The present invention relates to apparatus for controlling pollution about a marine drilling location and more particularly relates to means for removing oil or like contaminants from drill cuttings at a marine drilling site before final disposition of the cuttings into the water.

In a rotary drilling operation, a fluid commonly called "mud" is circulated from a storage area on the surface, downward through the drill pipe, out openings in the drill bit, and upward within the borehole to the surface. This return mud carries with it the drill cuttings from the bottom of the borehole. The returning mud along with its entrained drill cuttings is passed onto a "shale shaker" before it is returned to the storage area. The shaker, which normally sits above the mud storage area, is essentially a screen that is used to separate the drill cuttings and cavings from the mud. The mud falls by gravity through the screen and the cuttings pass over the end of the screen.

Disposal of these cuttings is sometimes a real problem, especially where the drilling operations are carried out at an offshore location. In some instances, the cuttings are passed from the shaker back into the water and are allowed to settle to the bottom. However, as if often the case, when a drilling mud system such as an oil-base mud is used which coats the cuttings with undesirable contaminants, e.g., oil, the cuttings cannot be disposed of directly into the water without the risk of polluting the area around the drilling site. Since this is an untenable condition, cuttings from such operations have to be barged to shore where they are washed or treated to remove the contaminants before the cuttings are disposed of. Therefore, present methods of disposing of contaminated cuttings are both time consuming and expensive.

SUMMARY OF THE INVENTION

The present invention provides apparatus for treating drill cuttings at an offshore location to remove contaminants from the cuttings before the cuttings are returned to the water.

In accordance with the present invention, a wash unit is located at an offshore site and is adapted to receive contaminated drill cuttings from the shaker after they have been separated from the mud. The wash unit has an elongated housing which is open at both ends. The cuttings enter the housing through the upper end thereof and fall on a rotating and/or vibrating screen where they are sprayed with a wash solution. The solution washes the contaminant from the cuttings, and the solution and contaminant pass through the screen into a conduit which is axially aligned within the housing. A pump removes the solution and contaminant from the conduit when they exceed a desired level within the conduit. The washed cuttings fall from the edge of the screen, through an annulus formed between the housing and the conduit, and out the lower end of the housing which is submerged in the water.

For a better understanding of the present invention, reference may be had to the following detailed description taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of an offshore drilling platform incorporating the present invention;

FIG. 2 is a schematical view of a typical mud circulation system incorporating the present invention; and

FIG. 3 is a cross-sectional view of the wash unit of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring more particularly to the drawings, a typical offshore drilling rig **10** is disclosed in FIG. 1 which has a platform **11** supported on marine bottom **12** of the body of water **13** by means of legs **14**. A derrick **15** is mounted on platform **11** which is used to carry out normal rotary drilling operations. Although a fixed platform is shown for illustrative purposes, it should be realized that the present invention can be used equally as well with other offshore drilling apparatus; e.g., floating drilling vessels, submergible barge platforms, etc.

In rotary drilling operations, a fluid commonly called mud is circulated into and out of the hole being drilled for a number of reasons, one being to carry drill cuttings out of the borehole. A typical mud circulation system **20** for a rotary drilling operation is illustrated broadly in FIG. 1 and more in detail in FIg. 2. In the illustrated system, conductor pipe **21** extends from platform **11** into marine bottom **12**. Mud **22** is taken from a storage area (not shown) on the platform and by means of pumps (not shown) is circulated down the interior of drill pipe **23**, out openings in a drill bit (not shown) which is attached to the lower end of pipe **23**, back up the annulus between drill pipe **23** and conductor pipe **21**, and out through mud return line **24**. The mud carries with it drill cuttings **25**. The mud as it exits return line **24** is deposited on shale shaker **26** which is normally comprised of an oscillating screen that allows the mud to pass therethrough but is of such a size to retain as many of the cuttings as is practical. The mud flows from shaker **26** into mud trough **27** which returns it to the storage area (not shown).

Where the mud being used does not coat the cuttings with any undesirable contaminants, the cuttings are sometimes returned directly to the body of water **13**. However, as is often the case, a special mud system has to be employed in offshore drilling operations which coats the cuttings with contaminants that wash free when the cuttings are returned to the water, thereby causing undesirable pollution problems. An example of such a mud system is one commonly called "oil-base" mud. This mud coats the cuttings with oil which adheres thereto even after the cuttings are mechanically separated from the mud. If these cuttings are returned untreated to the water, the oil most likely will wash off and form an untenable oil slick on the water. Such contaminated cuttings are normally barged to shore for treatment before disposal. Now, in accordance with the present invention, such cuttings can be treated directly at the offshore location to remove the contaminants and can then be returned to the water with no barging being required.

The contaminated cuttings pass from shaker **26** into wash unit **30**. As seen in FIG. 3, wash unit **30** is comprised of an elongated housing **31** which is open at both

ends with the lower end adapted to extend into the body of water 13. An open conduit 32 is axially aligned within housing 31 and secured thereto by means of support members 33 so that an annulus 34 is formed between the conduit and the housing. Cutting collection means 35 is positioned above conduit 32 and is sized to completely cover the upper end of conduit 32 but not to extend completely over annulus 34. Collection means 35 can be of any fluid permeable material which allows liquid to pass therethrough but which prevents the cuttings from doing so. Preferably, collection means 35 is constructed from screen material. Collection means 35 is preferably mounted on shaft 36 of motor 37 which in turn is connected to housing 31 by struts 38. Motor 37 is of the type which will rotate and/or vibrate collection means 35 when it is in operation.

Positioned above collection means 35 within housing 31 is a means to deliver a wash solution to the cuttings while they are on collection means 35. This means is comprised of one or more pipes 39 which extend into housing 31 and which are adapted to be connected to a source of wash solution (not shown). Each pipe 39 has a plurality of nozzles 40 which direct the wash solution downward onto collection means 35.

A flowline 41 extends into conduit 32 and is connected to pump 42. Float valve 43 is provided in flowline 41 which allows flow only in one direction, that being into flowline 41. Both housing 31 and conduit 32 have aligned openings therein which are normally closed by plates 45, 46, respectively; the openings being for inspection purposes and for replacing valve 43, if necessary. Automatic control means 47, 48 are provided in conduit 32 for starting and stopping pump 42. As shown, both control means 47 and 48 are electrical switches (e.g., Invalco Leveltronic Model 5402 Switch) which are responsive to dielectric material, i.e., oil and/or wash solution, whereby the operation of pump 42 is effectively controlled by the level of dielectric material within conduit 32. Of course other level actuated means could be used for controlling the operation of the pump and are well within the skill of the art.

In accordance with the present invention, contaminated cuttings at an offshore location are treated as follows. Cuttings 25 pass from shale shaker 26 into the upper end of housing 31 of wash unit 30 and fall onto the center portion screen 35 as it is being rotated and/or vibrated by motor 37. Wash solution under pressure is delivered onto the cuttings while they are on screen 35 through nozzles 40. The wash solution used will depend on what contaminants are to be washed from the cuttings. For example, if oil is the contaminant, an aqueous solution of a surfactant such as biodegradable sulfonated straight chain hydrocarbon, e.g., normal dodecobenzyl sulfonate (household detergent) can be used.

The wash solution is sprayed onto the cuttings and it along with dislodged contaminant passes through screen 35 into conduit 32. Conduit 32 being open at its lower end and being partially submerged in the body of water 13 will be partially filled with water. The wash solution and contaminants being lighter than water will collect on the top of the water and as the level of the wash solution and contaminants increases, control means 47, 48 actuate pump 42 to pump the wash solution and contaminant from conduit 32 to a disposal area (not shown). When the level decreases, control means 47, 48 stop the pump 42. It should be recognized that although conduit 32 is disclosed as being open at its lower end, it could be closed and still operate in basically the same manner. In this event, a single float-operated switch actuated by the level within conduit 32 could be used to control pump 42.

The cuttings as they are washed will move outward on screen 35 and will drop off the edge thereof through annulus 34, and back into the body of water 13. It is possible that some of the cuttings may still contain small amounts of contaminants when they leave screen 35 but if such is the case, the contaminants should wash free as the cuttings hit the water within annulus 34 and will float on said water. A small suction line (not shown) can be periodically lowered into annulus 34 to remove this material, if it is found necessary.

What is claimed is:

1. A wash unit for treating drill cuttings at an offshore location comprising:
   - an elongated housing open at both ends, the upper end adapted to receive said drill cuttings and the lower end adapted to extend into the water at said location when said unit is in an operable position;
   - conduit means open at its upper end axially aligned with and mounted in said housing, said conduit means having smaller cross-sectional dimensions than said housing so that an annulus is formed between said housing and said conduit means;
   - fluid permeable means mounted in said housing above said upper end of said conduit means for collecting said cuttings as they enter said housing, said fluid permeable means being sized to completely cover said upper end of said conduit means but not to extend completely over said annulus between said housing and said conduit means;
   - means for delivering a wash solution to said cuttings while they are on said fluid permeable means; and
   - means for removing from said conduit means said wash solution and any contaminants removed from said cuttings by said solution after said solution and said contaminants pass through said fluid permeable means.

2. The wash unit of claim 1 wherein:
   - said fluid permeable means is a screen.

3. The wash unit of claim 2 including:
   - means for rotatably mounting said screen within said housing; and
   - means to rotate and/or vibrate said screen.

4. The wash unit of claim 3 wherein said means for removing said wash solution and contaminants comprises:
   - a flowline extending into said conduit means; and
   - a pump attached to said conduit.

5. The wash unit of claim 4 including:
   - control means responsive to the level of said wash solution and contaminants in said conduit means for stopping and starting said pump.

* * * * *

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,688,781 Dated September 5, 1972

Inventor(s) William A. Talley, Jr.

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Title Page, Assignee, "Mobile" should be --Mobil--;
Abstract, line 2, "cutting" should be --cuttings--.

Column 1, line 29, "if" should be --is--.

Signed and sealed this 13th day of March 1973.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents