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DUMP BAILER

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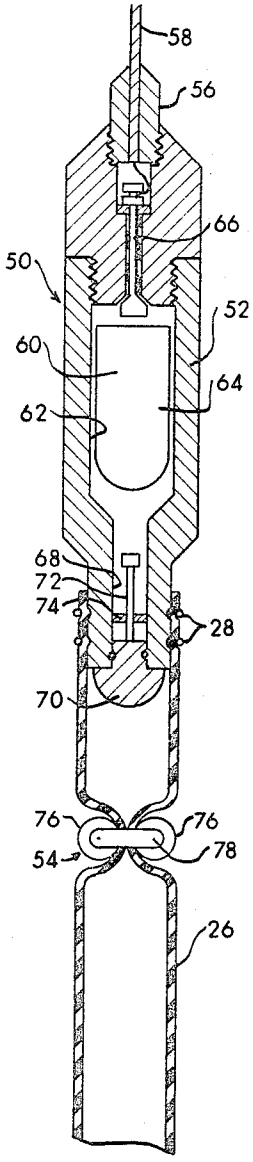

FIG. 2

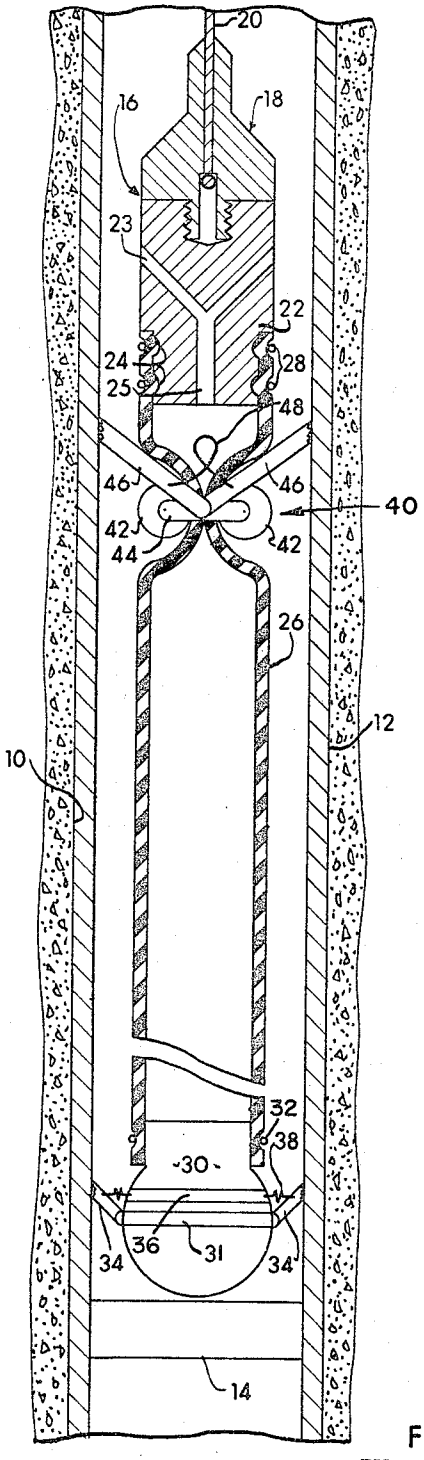

FIG. 1

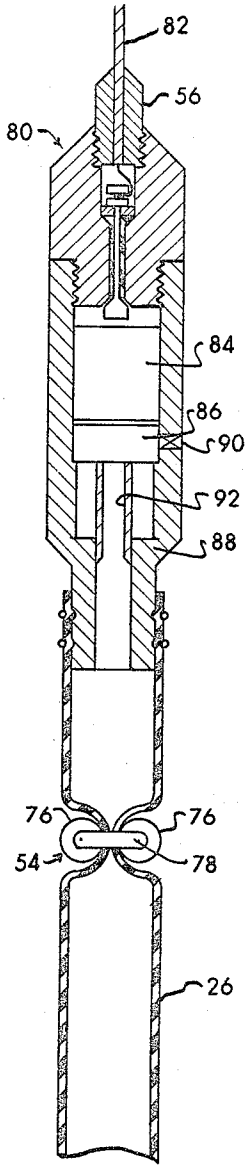

FIG. 3

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DUMP BAILER

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ABSTRACT OF THE DISCLOSURE

A dump bailer for placing material in a well bore or the like. The dump bailer includes a head member having an upper end connected with wire line for positioning the dump bailer in the well bore. A flexible tube forming a materials reservoir is connected with the lower end of the head and filled with the material to be deposited in the well bore. An ejectable plug located in the lower end of the flexible tube retains the material therein. A collapsing member located on the tube is arranged to collapse the tube in a direction perpendicular to the length of the tube. The collapsing member and tube are movable relative to each other, and relative movement therebetween forces the plug and material out of the tubing.

This invention relates to an improved apparatus for depositing cement slurries and other materials in a well bore, and more particularly to a dump bailer having means for positive ejection of the material to be deposited.

Oftentimes it is desired to place various types of liquid materials in a well bore, and one means of depositing such materials has been the use of a dump bailer. Customarily, a dump bailer is generally formed of a cable head which connects the unit to a wireline, a reservoir section which contains material to be deposited and a discharge plug which retains the material in the reservoir section until it reaches the desired location in the well bore, whereupon the plug is moved to a discharge position so that the material may be deposited. It has been the general practice in the art to use general oilfield rigid tubular members for the reservoir section and to utilize gravity deposition of the material in the dump bailer.

Cement slurries are probably the most common material deposited with a dump bailer, and it is not uncommon for the cement slurry to form an initial set before arriving at the desired depth of deposition. In such case, it is very difficult to clean the reservoir section. Accordingly, it is an object of the present invention to provide a dump bailer with means for positive ejection of the material to be deposited. Positive ejection not only aids in cleaning out the reservoir section, but also aids in obtaining a more localized deposition of the material.

When rigid tubular members are used for the reservoir section and a large deposition is required, the length of the dump bailer becomes rather long. Being rigid, there must be sufficient headroom under the hoisting gear to accommodate the entire length of the dump bailer. Hence, it is another object to provide a flexible reservoir section for a dump bailer permitting the dump bailer to be inserted into the well bore without requiring it to be first hoisted its entire length. Having a flexible reservoir section not only permits easier handling and insertion of the dump bailer into the well bore, but also permits reservoir sections of greater capacity. Having a flexible reservoir section also facilitates transportation of the dump bailer to the well site.

Many present dump bailers use a discharge plug which is operated by striking a bridging plug or some other member located in the well bore. In such case, on successive runs the reservoir section may become stuck in previously deposited cement requiring an expensive fishing job. It is a further object to provide a dump bailer having a reservoir section that can easily be parted from the cable head and abandoned with no deleterious effects.

To accomplishd the above objects and other objects which will become apparent to those skilled in the art from the detailed description about to follow, the dump bailer of the present invention is provided with a flexible reservoir section and means which act on the flexible reservoir section with a squeegee action to provide positive ejection of the material in the reservoir section.

Several preferred embodiments are illustrated in the accompanying drawings, in which:

FIG. 1 is a cross-sectional view of the improved dump bailer of the present invention positioned in a well bore.

FIG. 2 is a cross-sectional view of the dump bailer illustrating alternate form of positive ejection.

FIG. 3 is a view similar to FIG. 2 showing another form of the means for positive ejection.

Reference will now be made to the drawings. In locations where there are several potential producing formations, it is quite customary to drill a well bore **10** to a depth which will permit completion of the deepest potential producing formation. Casing **12** is then set to the deepest depth. The deepest formation is completed first and then when this formation is no longer productive, upper formations are completed. Before completing an upper formation, it is customary to set a bridging plug **14** in the casing **12**. To assure a good seal, cement is often deposited on top of the bridging plug **14**. One means of delivering the cement to this location is a dump bailer **16**. FIG. 1 illustrates the improved dump bailer **16** in such a position. As is well known in the art, dump bailers may also be used for many other purposes in depositing material in a well bore.

As can be seen from FIG. 1, the dump bailer **16** has a cable head **18** attaching the dump bailer **16** to a wireline **20**. The wireline **20** positions the dump bailer **16** at the proper depth in the well bore **10**. Attached to the cable head **18** is a suspending and filling head **22**. A pair of grooves **24**—**24** encircle the bottom end of the suspending head **22**. A hollow, generally cylindrical, reservoir **26** has its upper end telescoped over the bottom end of the suspending head **22** and is attached to the suspending head **22** by means of clamps **28** which mate with the grooves **24** to secure the reservoir **26** to the head **22**. The bottom end of the reservoir **26** is closed by a bottom plug **30** which may be secured to the lower end by a clamp **32**. The plug **30** may be formed of cement or other material which will not be deleterious to well operations. In addition to closing the bottom end of the reservoir **26**, the plug **30** provides weight for the tool. The tension on the clamp **32** is sufficient to retain the plug **30** in position at the end of the reservoir **26** against the gravity load of any material in the reservoir **26** but is sufficiently low to permit removal of the plug **30** from the end of the reservoir **26** with a fairly low differential pressure, as will be explained subsequently. On the other hand, the tension of the clamps **28** plus the bite exerted on the reservoir **26** by the grooves **24** is sufficient to retain the reservoir **26** in position on the suspending head **22** under normal operating conditions.

The reservoir **26** is formed of tubing made from a flexible elastomer with or without reinforcement from various threads, cloth or other means to reduce elongation. The tubing may be selected from a number of commercially available synthetic materials having sufficient tensile strength and resistance to operate in the environmental temperatures and fluids normally found in oilfield well bore operations. One such material is sold under the trademark "Tygon." Another suitable material would be cloth impregnated with a suitable elastomer such as that sold under the trademark "Fairpene." Other flexible tubing materials as will meet the environmental conditions

may be used. The tubing forming the reservoir may be cut to such a length that it will have the internal capacity to accept the loads customarily used in dump bailer operations. Naturally, in operating, it will be advisable to also have a greater length available in case the operation calls for a greater load. One advantage in using the flexible tubing is that any length required can be used without worrying about the over-all height of the hoisting apparatus available. When solid lengths of tubings are used, it is necessary to restrict their length to the distance that can be accommodated by the hoisting apparatus available. However, when a flexible tube is used as a reservoir, it can be fed into the wellhead as a hose and height of the hoisting apparatus is not critical. Therefore, greater loads can be placed in the well on a single run resulting in less rig time.

In operation, the flexible reservoir **26** of a length to accommodate the material to be deposited is provided with the plug **30** closing its lower end and is then attached to the suspending head **22** by use of the clamps **28—28**. The suspending and filling head **22** is provided with filling ports **23** which are in communication with a central passage **25** in the head **22**, which, in turn, is in communication with the open upper end of the reservoir **26**. After the dump bailer **10** has been so assembled, the material to be deposited is introduced into the reservoir through the filling ports **23**.

As previously mentioned, dump bailers in operation today use gravity feed to deposit the material carried in the dump bailer. The flexible reservoir **26** could be used in a similar manner, in which case the bottom plug would be provided with a latch which would be triggered by the bridge plug **14** or spring-loaded fingers which would grip the wall of the casing on an upward pull of the dump bailer. One such mechanism is shown in the plug **30** attached to FIG. 1 where it can be seen that a band **31** containing a number of pivoted fingers **34** may be attached to the plug **30**. A second band **36** contains springs **38** forcing the fingers **34** into slight contact with the wall of the casing **12**. The ends of the fingers are serrated and will ride over the wall as long as the movement is downward. However, any upward pull on the cable **20** will cause the fingers to engage the wall of the casing **12** and eject the plug **30** from engagement with the end of the reservoir **26**, permitting the material contained therein to be deposited by gravity feed. However, as mentioned, sometimes a cement slurry will set during the trip to the desired depth. Therefore, in its preferred form, the dump bailer of the present invention is provided with means for positively ejecting the material in the reservoir, and, if desired, the release means for the plug **30** may be eliminated.

In FIG. 1, the positive means is shown as a mechanical squeegee action accomplished by a squeegee **40** which is attached to the upper end of the reservoir **26** after the reservoir **26** has been filled with the material to be deposited. The squeegee **40** is formed of a pair of rollers **42** held together by a pair of crossbars **44**. Pivotally attached to the cross bars **44** are a pair of fingers **46** which are urged outwardly by a spring **48**. The ends of the fingers **46** are serrated and ride against the wall of the casing **12** with a slight pressure, permitting the dump bailer to be lowered into the well bore without any excess drag. However, on any upward pull of the cable **20**, the serrated ends of the fingers **46** will dig into the wall of the casing **12**. If desired, the fingers could be held in a free-running position and engagement initiated by means well known in the art.

Once the fingers **46** are engaged, further upward movement of the dump bailer **10** in the well bore **12** will cause the squeegee **40** to remain stationary while the reservoir **26** is pulled upwardly. The initial upward movement of the tool will cause a pressure by the squeegee pumping action to be built up in the reservoir **26**. This pressure will cause the bottom plug **30** to be disengaged from the bottom end of the reservoir **26**. Release of the plug **30** will permit ejection of the material contained in the reservoir. Well fluid may flow through the ports **23** and passage **25** to the top of the reservoir **26** and equalize pressure. The tension on the clamps **28** should be sufficient to retain the upper end of the reservoir **26** in place while the tool is being pulled upward with the squeegee **40** remaining stationary. By pulling on the cable **20**, the tool will move upward. As the squeegee **40** remains stationary, all of the material will be squeezed from the reservoir **26** causing a positive deposition of material in the reservoir. The squeegee **40** will drop off and remain in the well along with the bottom plug **30**. Upon returning to the surface, a new bottom plug **30**, refilling and the addition of a new squeegee **40**, makes the dump bailer ready for another run.

FIG. 2 illustrates a dump bailer **50** incorporating the flexible hoselike reservoir **26** having its bottom end closed by the plug **30** (not shown) and having its upper end attached to a suspending head **52** by clamps **28**. However, the means for providing positive ejection instead of relying on pulling the dump bailer back up the well bore past a stationary squeegee, has a squeegee **54** which operates as a result of gas pressure generated in the head **52**.

The dump bailer **50** has a cable head **56** through which a wireline cable **58**, having at least one electrical conductor passes. The cable head **56** affixes the cable **58** mechanically to the dump bailer **50**. The cable **58** is used to move the dump bailer **50** through the borehole as well as providing electrical power to ignite the gas generating means. The cable head **56** is attached to the head **52** which contains the gas generating means **60**.

The head **52** is provided with a charge chamber **62** in which is positioned a slow-burning propellant charge **64**. At the upper end of the chamber **62**, there is provided an insulated electrical igniter **66** which receives its electrical energy from a conductor in the cable **58**. The electrical energy ignites the charge **64** which generates gas. The lower end of the head **52** has an axial passage **68**, which communicates with the chamber **62** and the bottom exterior of the head **52** or, in effect, the top of the reservoir **26**. The passage **68** is provided with a sealed plug **70** having a headed stem **72** which passes through a central port in a multi-ported member **74** located in the passage **68**. The plug **70** seals the chamber **62** from fluid in the reservoir **26**. The member **74** prevents dislodgement of the plug **70** from the head **52** upon the generation of gas pressure by the burning charge **64** to prevent its interfering with the squeegee action. The member **74** has by-pass ports which permit gas generated by the charge **64** to reach the top of the reservoir **26**.

In operation, the head **52** is made up with the igniter **66**, charge **64**, and fluid seal plug **70** installed. The plug **30** is attached to the bottom end of the flexible reservoir **26**, and the reservoir **26** is then filled with the material to be deposited. After the reservoir **26** is filled, the squeegee **54** is put in place on the upper end of the flexible reservoir **26**. The upper end is then securely attached to the end of the head **52** by the clamps **28**. The squeegee **54** is formed of a pair of rollers **76** attached together by a pair of crossbars **78**.

When the dump bailer **50** is lowered to the desired depth, the charge **64** is ignited by the igniter **66** from the surface as is well known in the art. The burning of the propellant charge **64** results in the generation of a gas which flows through passage **68** and acts on the top of the reservoir **26**, causing the squeegee **54** to move downward building up pressure which first ejects the plug. Then, as the squeegee moves downward, as a result of the gas pressure, the material is deposited.

The dump bailer **10** illustrated in FIG. 1 operates on a wireline cable **20** that does not require an electrical conductor. However, any upward pull may set the squeegee assembly, in which case any further upward pull will eject the material in the reservoir **26**. The dump bailer **50**

illustrated in FIG. 2 requires a single conductor cable **58** to supply sufficient energy to ignite the charge **64**. FIG. 3 illustrates a dump bailer **80** having a more sophisticated form of positive ejection. However, it requires a multiconductor cable **82** capable of delivering substantial electrical energy to the dump bailer.

Instead of relying on the gas generated by the charge **64**, the dump bailer **80** is provided with an electrical motor **84** which drives a positive displacement pump **86** located in the head **88**. The head **88** has a valve **90** which permits entry of well fluid into the pump **86**. The fluid is then pumped down a passage **92** to the top of the reservoir **26** where it acts on the squeegee **54**. Again, differential pressure causes the squeegee **54** to build up pressure in the reservoir **26** which first causes the plug **30** to be ejected and then results in positive deposition of the material from the reservoir **26**.

Summarizing, in general it can be seen that by using a flexible hoselike reservoir to hold the material to be deposited, it is easier to get the material in the well bore than by using stiff threaded oilfield tubular member as a reservoir. The flexible reservoir is also easier to transport. Since the flexible reservoir can be fed into the borehole like a hose, the headroom under the hoisting gear is no limitation, and, therefore, the reservoir section can be of longer length and greater capacity. Also, the reservoir section being hoselike and to a degree collapsible, it is possible to provide means of positive ejection through a squeegee action to positively deposit the material in the reservoir.

I claim:

1. A dump bailer for depositing material in a well bore comprising:

a reservoir section formed of a length of flexible tubing;

a bottom plug closing one end of the reservoir section;

a supporting head having a lower portion to which the upper end of reservoir section is attached and an upper portion mechanically attaching a wireline cable for positioning the dump bailer in the well bore;

means to fill the reservoir with material to be deposited;

squeegee means formed of two spaced rollers attached together by crossbars secured to the upper end of the flexible tubing forming the reservoir section;

a pair of pivotally spring loaded fingers attached to the crossbars for engaging the walls of the borehole upon any upward movement of the dump bailer whereby the squeegee means remains stationary, and then as the dump bailer is moved upward, the pressure in the bottom of the reservoir is increased ejecting the bottom plug and then positively depositing the material in the reservoir.

2. The dump bailer specified in claim **1** in which the filler means is in open communication with the top of the reservoir and permits entry of well fluid to equalize pressure in the top of reservoir section during ejection operation.

3. A dump bailer for depositing material in a well bore comprising:

a reservoir section formed of a length of flexible tubing;

a bottom plug closing one end of the reservoir section;

a supporting head having a lower portion to which the upper end of reservoir section is attached and an upper portion mechanically attaching a wireline cable having an electrical conductor;

means to fill the reservoir with material to be deposited;

squeegee means attached to the upper end of the flexible tubing forming the reservoir section;

gas generating means in the head operable from the surface, the gas generated by said gas generating means exerting a pressure on top of the squeegee means attached to the reservoir section forcing it downward ejecting the plug and positively depositing the material in the reservoir section.

4. The dump bailer specified in claim **3** in which the gas generating means is formed of a slow burning propellant charge.

5. A dump bailer for depositing material in a well bore comprising:

a reservoir section formed of a length of flexible tubing;

a bottom plug closing one end of the reservoir section;

a supporting head having a lower portion to which the upper end of reservoir section is attached and an upper portion mechanically attaching a wireline cable having electrical conductors capable of supplying electrical power to the dump bailer;

squeegee means attached to the upper end of the flexible tubing forming the reservoir section;

an electrical motor in the head;

a pump in the head, the pump being driven by the electrical motor;

an inlet in the head permitting well fluid to enter the pump;

a passage in the head from the discharge end of the pump to the top of the reservoir, whereby upon energization of the pump well fluid is directed to the top of the squeegee to force it downward increasing the pressure in the lower end of the reservoir ejecting the plug and positively depositing the material in the reservoir.

6. A dump bailer for depositing material in a well bore comprising:

a reservoir section formed of a length of flexible tubing;

a bottom plug closing one end of the reservoir section;

a suspending head having a lower portion to which the upper end of reservoir section is attached and an upper portion mechanically attaching a wireline cable;

means to fill the reservoir with material to be deposited;

squeegee means attached to the upper end of the flexible tubing forming the reservoir section; and

means to actuate the squeegee means and cause the squeegee to move down the reservoir section thereby ejecting the bottom plug and then positively depositing the material in the reservoir.

7. A dump bailer for depositing material in a well bore comprising:

a reservoir section formed of a length of flexible tubing;

a bottom plug closing one end of the reservoir section;

a supporting head having a lower portion to which the upper end of reservoir section is attached and an upper portion mechanically attaching a wireline cable, which positions the dump bailer at the proper depth in the borehole;

means to fill the reservoir with material to be deposited;

collapsing means engaging said reservoir section and collapsing said tubing in a direction generally perpendicular to the length of said tubing, said collapsing means and reservoir section being relatively movable lengthwise of said tubing to force said plug and material from said reservoir section.

8. A method for depositing flowable material in a well bore comprising:

attaching a plug to one end of a flexible tube capable of withstanding environmental characteristics of a well bore;

filling the tube with flowable material desired to be deposited in the well bore;

attaching the upper end of the tube a head provided with a cable;

positioning the tube in the well bore at the desired location; and

exerting a squeegee action on the upper end of the tube causing the plug to be dislodged and the material deposited.

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