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BALANCE CHAMBER FOR DEEP SEA CORING

Filed Oct. 21, 1963

FIG. 1

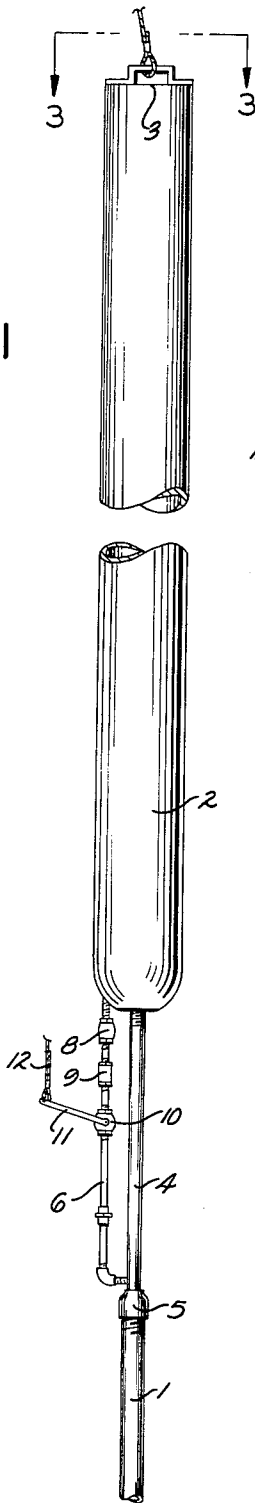


FIG. 2

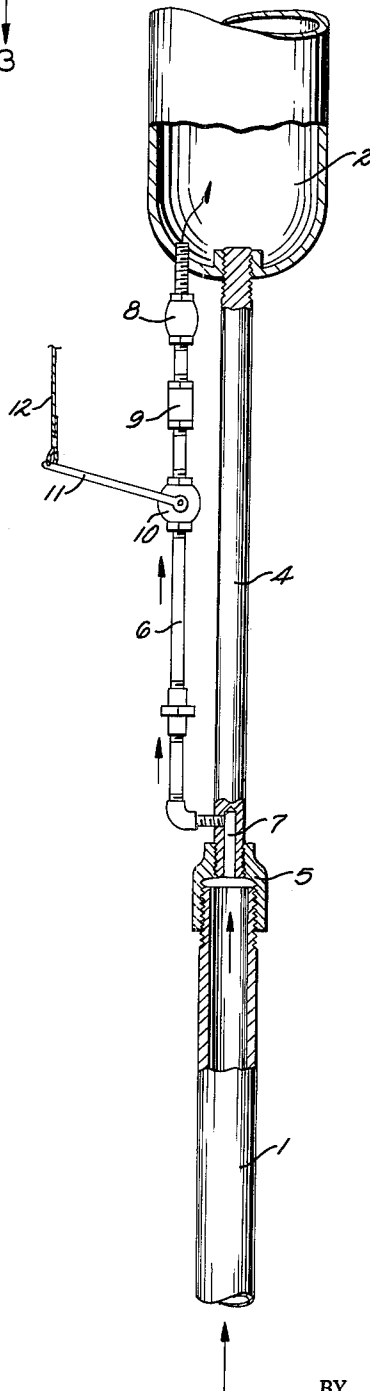
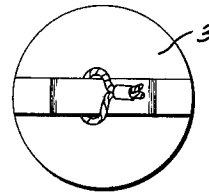


FIG. 3



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BALANCE CHAMBER FOR DEEP SEA CORING
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5 Claims. (Cl. 73-425.2)

This invention relates to a balance chamber for deep sea coring towers, and has particular application to the type or coring tower disclosed in my co-pending application on "Deep Sea Coring Tower," filed of even date herewith.

An object of my invention is to provide a balance chamber which is connected to a core barrel, and which has a lesser pressure within the balance chamber than is exerted at the lower end of the core barrel which has penetrated the floor of the sea or ocean and is under the hydraulic pressure of the sea or ocean.

Another object of my invention is to provide a novel balance chamber of the character stated, in which the chamber is under a relatively low pressure and which can be suddenly opened to the core barrel, so that a pressure imbalance is created to cause a sudden movement of material into the core barrel from the floor of the sea or ocean into which the core barrel has penetrated.

Another object of my invention is to provide a novel balance chamber of the character stated, in which the pipe connection between the balance chamber and the core barrel includes a quick acting valve which can be tripped for the purpose of connecting the balance chamber and the core barrel to permit flow between these parts.

Other objects, advantages and features of invention may appear from the accompanying drawing, the subjoined detailed description and the appended claims.

In the drawing:

FIGURE 1 is a fragmentary side elevation of my balance chamber mounted on a core barrel.

FIGURE 2 is a fragmentary longitudinal sectional view of my balance chamber mounted on a core barrel.

FIGURE 3 is a top plan view of the balance chamber as viewed from line 3-3 of FIGURE 1.

Referring more particularly to the drawing, in a deep sea drilling rig, of the type disclosed in my co-pending application on "Deep Sea Coring Tower" filed of even date herewith, a tubular core barrel 1 is caused to be driven into the ocean floor for the purpose of recovering a sample. This coring operation occurs at substantial depths below the surface of the sea or ocean, for example, several hundred feet, and as a consequence of this depth below the surface of the ocean a hydraulic pressure is maintained, this pressure being in the nature of several hundred pounds per square inch. In order that the core barrel 1 may recover a substantial quantity of the formation at the bottom of the sea, each time that it is withdrawn from its drilling position it is desirable that the pressure within the core barrel may be suddenly lowered, thereby causing the external hydraulic pressure to force a quantity of material into the bottom of the core barrel, and thence upwardly in the barrel to a considerable height. The material recovered in the core barrel may be sand, dirt, gravel, shells, etc., depending upon the character of the ocean bottom.

To achieve this sudden reduction in pressure in the core barrel 1, I provide a balance chamber 2. This balance chamber is about twenty or thirty feet in length and from six to eight inches in diameter, and is normally closed at its upper end 3. The balance chamber 2 is attached to the upper end of the core barrel 1 by means of a rod 4, the rod being threaded into the bottom of the chamber 2 at its upper end and threaded into a coupling

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5 at its lower end. The coupling 5 is threaded on to the upper end of the core barrel 1, thus securing the parts rigidly together and in longitudinal alignment. A pipe 6 connects the core barrel 1 and the balance chamber 2, in that the upper end of the pipe screws through the wall of the balance chamber 2 and into that chamber, as shown in FIGURE 2. The rod 4 is counterbored, as shown at 7, at its lower end and the pipe 6 screws into this counterbore, thereby connecting the pipe to the upper end of the core barrel 1, as shown in FIGURE 2. A check valve 8, of usual and well known construction, is mounted in the pipe 6, and this check valve permits upward flow through the pipe into the balance chamber 2, but prohibits downward flow as of the balance chamber 2. An orifice 9 is also provided in the pipe 6 below the check valve 8, and this orifice restrains free flow of fluid through the pipe 6 so that flow will occur continuously over a longer period of time, and thus gradually reducing the pressure in the upper end of the core barrel 1; this gradual pressure reduction preventing collapse of the core barrel and also permitting material to flow into the bottom of the core barrel at a gradual rate rather than suddenly. An off-on valve 10 is provided in the pipe 6, and when this valve is open or on the balance chamber 2 will be connected with the core barrel 1 to permit flow between these parts. The valve 10 is actuated by an arm 11 thereon and this arm is moved by a rope or cable 12 attached to the outer end thereof. The rope or cable 12 is either tied to a fixed part of the drilling rig, or it may extend to the surface so that the operator may manually pull on the cable 12 to open the valve 10, or the valve may be automatically opened when the core barrel 1 and the balance chamber 2 had moved downwardly a predetermined distance, due to the drilling action of the core barrel 1.

In operation

When the core barrel and the attached balance chamber is lowered into the ocean, and to a considerable depth, the balance chamber 2 will be at a lower pressure than the core barrel 1 (for example, one atmosphere) due to the fact that the valve 10 is closed and also the check valve 8 prevents flow out of the balance chamber 2. The top 3 of the balance chamber is closed or sealed, thus the reduced pressure in the balance chamber will be maintained even though the hydraulic pressure at the depth at which the core barrel operates might be several hundred pounds. After the core barrel 1 has been moved downwardly into the ocean floor a required distance, the valve 10 will be opened or tripped by the cable 12 on its arm 11. The upper end of the core barrel 1 will now have the pressure therein gradually reduced until the pressures in the core barrel and the balance chamber 2 equalize. This equalization of pressure will cause material from the ocean floor to be pushed upwardly into the core barrel 1 to a considerable height; thus a substantial core can be recovered from the ocean floor.

Having described my invention, I claim:

1. A deep sea coring barrel comprising:

- a hollow cylindrical balance chamber and a core barrel positioned in axial alignment,
 - a rod fixedly attached to both the balance chamber and the core barrel and extending between the balance chamber and the core barrel,
 - a pipe extending into the balance chamber at one end and into the core barrel at the other end,
 - a manually operable valve in said pipe positioned between the balance chamber and the core barrel, and a cable extending to the valve to open said valve.
2. A deep sea coring barrel comprising;
- a hollow cylindrical balance chamber and a core barrel positioned in axial alignment,

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a pipe extending into the balance chamber at one end and into the core barrel at the other end,
 a manually operable valve in said pipe positioned between the balance chamber and the core barrel,
 a cable extending to the valve to open said valve,
 and a check valve positioned in said pipe.

3. A deep sea coring barrel comprising:

a hollow cylindrical balance chamber and a core barrel positioned in axial alignment,
 a pipe extending into the balance chamber at one end and into the core barrel at the other end,
 a manually operable valve in said pipe positioned between the balance chamber and the core barrel,
 a cable extending to the valve to open said valve,
 a check valve positioned in said pipe,
 and an orifice fitting in said pipe.

4. A deep sea coring barrel comprising;

a hollow cylindrical balance chamber and a core barrel positioned in axial alignment,
 a rod fixedly attached to both the balance chamber and the core barrel and extending between the balance chamber and the core barrel,
 a pipe extending into the balance chamber at one end and into the core barrel at the other end,
 a manually operable valve in said pipe positioned between the balance chamber and the core barrel,
 a cable extending to the valve to open said valve,
 and a check valve positioned in said pipe.

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5. A deep sea coring barrel comprising;

a hollow cylindrical balance chamber and a core barrel positioned in axial alignment,
 a rod fixedly attached to both the balance chamber and the core barrel and extending between the balance chamber and the core barrel,
 a pipe extending into the balance chamber at one end and into the core barrel at the other end,
 a manually operable valve in said pipe positioned between the balance chamber and the core barrel,
 a cable extending to the valve to open said valve,
 a check valve positioned in said pipe,
 and an orifice fitting in said pipe.

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