

March 19, 1968

C. INGRAM

3,373,826

CORING DEVICE

Filed March 31, 1966

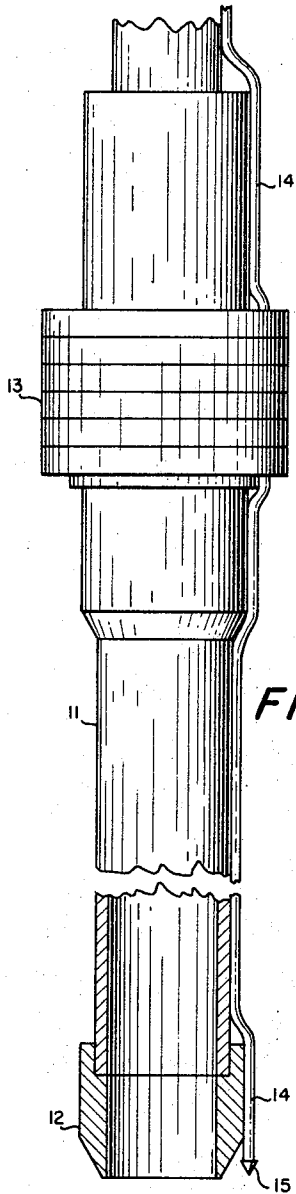


FIG. 1

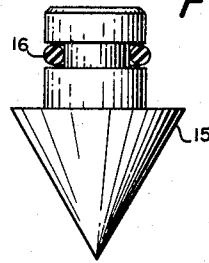


FIG. 3

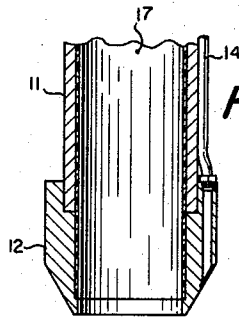


FIG. 2

INVENTOR

CAREY INGRAM

BY *Melvin L. Crane* AGENT

R. Williams ATTORNEY

1

2

3,373,826
CORING DEVICE
 Carey Ingram, 3207 Northampton St. NW.,
 Washington, D.C. 20015
 Filed Mar. 31, 1966, Ser. No. 540,152
 3 Claims. (Cl. 175-5)

ABSTRACT OF THE DISCLOSURE

A device for facilitating the recovery of oceanographic bottom sampling instruments. A small tubular means paralleling the instrument has a loose fitting plug in the bottom end that relieves the vacuum effect created when the instrument is withdrawn from the sediment on the ocean's floor.

The invention described herein may be manufacture and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

The present invention relates generally to apparatus for extracting earth core samples from the ocean floor, and more particularly to improvements therein.

Heretofore, ocean floor cores have been obtained in a number of ways, each of which may be satisfactory for some particular purpose or under some particular circumstance. For instance, it is known in the art to drop free-falling earth corers into the ocean floor, after which the corer is forcefully withdrawn from the bottom as an entire unit, or either the corer cutting portion thereof remains abandoned in the ocean floor. Such earth corer devices are provided with weights which initially cause the corer to sink and are released therefrom or ejected from the corer unit at the time the corer is withdrawn from the sea floor. Such corer devices are provided with a buoyant means which floats the core sample to the surface from which it is taken aboard a ship at a convenient time. As an example of the free corer of the present type, reference is made to Patent No. 3,078,931. One of the disadvantages in using the prior art coring apparatus is that it is difficult to withdraw the core cutting device or core liner from the jettisoned barrel once it is stuck in the sea floor sufficiently to obtain a useful earth's core. Those corer apparatus in which the entire cutting tube and sample is floated to the surface requires an even more buoyant force to float the entire device to the surface. All coring devices have their drawbacks wherein samples are distorted, and even some of these devices are lost due to their remaining in the earth's bottom.

In addition to the free corers of the aforementioned type, it is well known to use cables, winches, and associated power machinery to lower and raise sample obtaining devices to the ocean floor and back to the ship upon which one operates. The latter method is an awkward, expensive, difficult and time consuming proposition in which only a few samples may be obtained over a certain period of time.

It has been determined that the required withdrawing force is determined in part by a vacuum effect created when the instrument and/or core sample is withdrawn from the sediment from which the core sample is taken. The improvement brought about by the present invention overcomes the vacuum effect by providing a tubular means in conjunction with the well known coring devices in which the tubular means directs water under ambient pressure into the vacuum space thereby relieving the vacuum effect and consequently, the withdrawing force necessary to remove the core and/or corer device from the sediment.

Thus, ocean floor devices which under prior art operations are stuck in the sediment and would not, under prior

art apparatus, be floated from the bottom are enabled according to this invention to be withdrawn from the ocean floor. Therefore many such devices are returned to the surface over that of the operation formerly used in the prior art devices, and these samples are more free of distortion due to the aforementioned vacuum effect.

It is therefore an object of the present invention to provide an improved free-drop earth corer for extracting earth core samples from the ocean floor.

Another object is to provide an improved earth core extractor means that requires no cable, winch machinery, or power equipment for lowering and raising the device to and from the ocean floor.

Still another object is to provide an improved earth corer in which there is less equipment loss, distortion of the retrieved samples and the loss of potentially retrievable samples is less than with previously employed systems.

Other objects and advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in conjunction with the accompanying drawings wherein:

FIG. 1 illustrates an earth corer including the improvement of the present invention shown partially as a cross-sectional view;

FIG. 2 illustrates a plug for one end of the tube; and

FIG. 3 illustrates a partial cross-sectional view of a corer including a liner in combination with the improvement of the present invention.

Now referring to the drawing, there is shown by illustration in FIG. 1, a schematic drawing of a free-fall corer device including a tubular housing 11 with a cutter head 12 on the lower end, a weight means 13 for overcoming the lift of a buoyant material, not shown, for simplification of the drawing, wherein the weight means forces the device to the water's floor and then drives the corer into the sediment of the bottom. The improvement including a pipe or tube 14 secured longitudinally along the outside of the corer barrel or housing. The tube extends toward the bottom to approximately the bottom of the cutter head and upwardly along-side the housing sufficiently such that the upper end of the tube will be above the sediment from which the core is to be taken. The tube is provided at the lower end thereof with a sharp pointed plug 15 which is secured within the end of the tube loosely such that the plug can be easily removed from the tube. The plug is secured within the end of the tube in axial alignment therewith with the sharp pointed and directed away from the tube and has a greater diameter below the end of the tube than that of the tube such that the sharp pointed portion of the plug will aid in forcing the corer into the sediment and for preventing any sediment from going upwardly into the tube. An O-ring 16 is provided to aid in holding the plug within the tube. Instead of the plug, a one-way valve or other such means may be used.

The tube may be added to the prior art corer devices along the outside thereof and may be added to the different devices from which the weights are released or ejected therefrom and then the cutter head, tube and pipe will be lifted from the sediment by the buoyant force. The tubular improvement may also be added to the devices such shown in Patent No. 3,078,931 wherein the tubular housing remains within the sediment bottom with the weight secured thereto and wherein a liner is provided within which the corer has been taken and the liner 17 is brought to the surface by the flotation gear. In those free corer types in which the weights are ejected from the device and the entire device is lifted from the sediment minus the weights, the weights are modified or slotted wherein the tube may be fitted within the weights

alongside the cutting portion of the corer. In the type wherein the weights and the cutter portion of the corer device remains in the sediment and a liner is pulled therefrom by the bouyant force the tubular member can be arranged within the weight such that the tubular member remains with the corer portion that stays within the sediment. In securing the tubular member to the housing portion, straps or bands may be secured about the housing and the tubular member in spaced relationship along the length of the tubular portion or any other suitable means such as epoxy sealer, welding, etc. may be used.

Heretofore the additional tube added to the corer device has been described as being secured to the outside of the formerly made corer devices and in addition thereto. It will be obvious to those skilled in the art that when a new corer device is made, the tubular passage may be made within the housing itself which would not require an additional outer pipe or tube on the outside of the housing such as the above described. Therefore, the teaching of the present invention may be used with prior made corer devices as an addition thereto or formed within new corer devices as an integral part when the corer device is made.

In carrying out the teaching of the present invention for operation of a corer device, the tube is added to the outside of prior made corer devices and the weights are accordingly modified to receive the tube therein alongside the housing. The stopper, plug or one-way valve is inserted into the end thereof prior to the device being dropped into the water from a ship. The corer device will be weighted to the bottom of the water as in the prior art devices and will be forced into the sediment as in the prior devices. The plug in the lower end of the additional tube will prevent any sediment from going into the tube. After the device has reached its maximum penetration into the sediment, the weights are ejected from those types in which the entire device is retrieved from the sediment and as the corer device begins its movement from the bottom due to the lift of the bouyant material, a vacuum is created in the area of the bottom of the coring device. This vacuum tends to hold the coring device within the sediment; however, since the space around the tube on the outside of the housing forms a vacuum, the water pressure at the upper end of the plug in the tube is greater than the pressure at the lower end of the plug in the tube; therefore, the plug will be forced from the tube by the water pressure and water will flow into the vacuum area around the corer. Thus the water being forced into the vacuum area will aid in relieving the vacuum and, therefore removal of the corer device and the core sample from the sediment. In those devices as shown by the above-mentioned patented device, the operation of the tube is the same wherein a vacuum is formed about the bottom of the corer device and the water pressure in the tube will force the plug from the end thereof and subsequently forcing water into the vacuum area. Thus, the outer housing weights and the tube will remain in the sediment and the water will aid in forcing the plastic liner including the sediment core from the water's floor. Thus, the additional tubular member on the outside of the devices provide a suitable means for aiding in separating the corer samples from the ocean's bottom.

In case of newly formed coring devices, the tubular passage formed within the housing of the corer device will be plugged or valved and the operation thereof will

be the same as described for the tube added to the outside of the well-known prior art corer devices. Obviously, the passage within the newly made devices will require an opening near the upper end thereof to allow for entry of water forced downward through the tube.

During the period of time that the corer device is being lowered through the water, the plug is held in the tube by means of a rubber O-ring. During penetration, the plug of the sediment will be subjected to an upward force, but will not be driven into the tube as it is seated against the lower end of the tube. However, at the time that the corer device is being pulled from the sediment a vacuum is formed about the bottom thereof such that the water pressure at the upper end of the plug is greater than the pressure at the tip of the plug, therefore, the plug is forced from the tube permitting the water to flow into the vacuum space and relieve the vacuum as it is formed below the bottom of the corer.

Thus, it can be seen that the addition of a small tube to the corer device has its advantages in aiding the withdrawal of the corer device from the sediment or in the case where the plug is received within a liner the corer sample will be aided in its removal from the sediment, tube distortion of retrieved samples, due to the vacuum effect, will be minimized.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. An improved free-drop earth corer device including in combination a weighted core cutting means, means for receiving a core, and flotation means for lifting the core sample to the water surface upon removal of the weights from said core receiving means; the improvement comprising:

a tubular means extending along the length of said core cutting means with the bottom end of said tubular means positioned adjacent to the cutting means and the upper end thereof extending upwardly to a point above the water-sediment interface, and a loose fitting plug inserted into the lower end of said tubular means.

2. An improved free-drop earth corer as claimed in claim 1, wherein:

said tube is secured to the outside of said corer device along the length thereof.

3. An improved free-drop earth corer as claimed in claim 1, wherein:

said tubular means is made within the corer housing extending along the length thereof and having an opening at the top thereof to the outside.

References Cited

UNITED STATES PATENTS

2,798,378	7/1957	Del Raso et al.	175—8
2,951,681	9/1960	Degen	175—21
3,078,931	2/1963	Moore	175—5
3,221,558	12/1965	Lagergren	175—5 X
3,295,616	1/1967	Charlton et al.	175—5

CHARLES E. O'CONNELL, *Primary Examiner*.

R. E. FAVREAU, *Assistant Examiner*.